Local Government Energy Audit Report

West New York Public School No. 4 (Annex)

April 1, 2022

Prepared for:
West New York Board of Education
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Disclaimer

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

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

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

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

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

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ENERGY EFFICIENCY INCENTIVE & REBATE TRANSITION

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

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

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

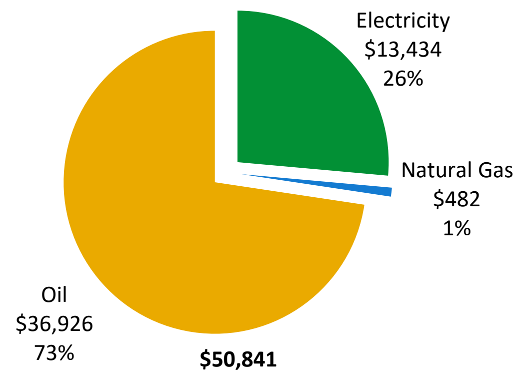
New utility programs are expected to start rolling out in the spring and summer of 2021. Keep up to date with developments by visiting the NJCEP website.

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for West New York Public School No. 4 (Annex). 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: $50,841 Electricity: 101,488 kWh Natural Gas: 318 Therms No. 2 Fuel Oil: 18,631 Gallons	
ENERGY STAR® Benchmarking Score	84 *(1-100 scale)*	Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance, and lower your energy bills even more.



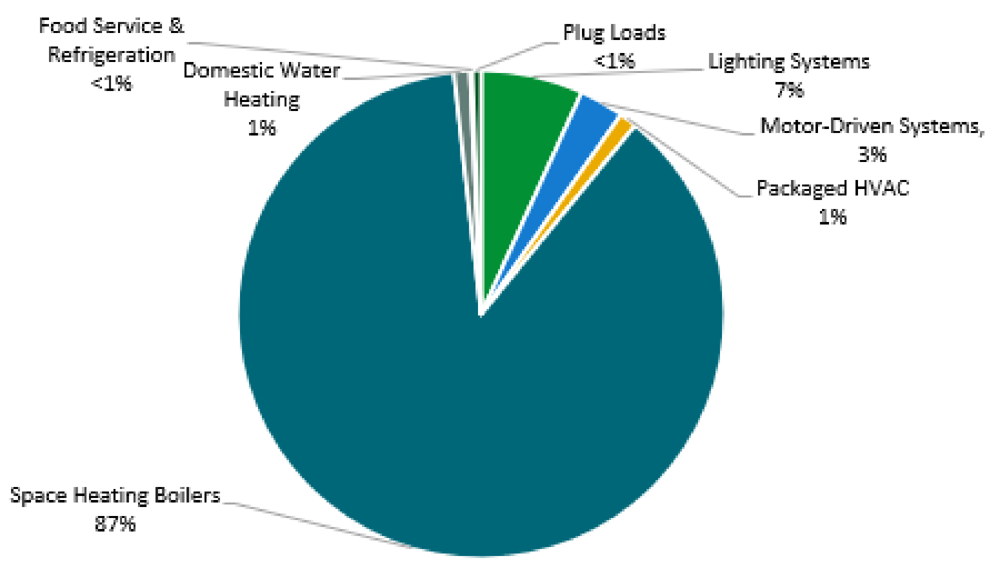


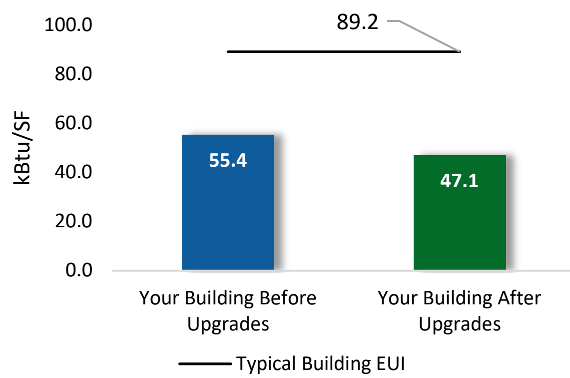
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

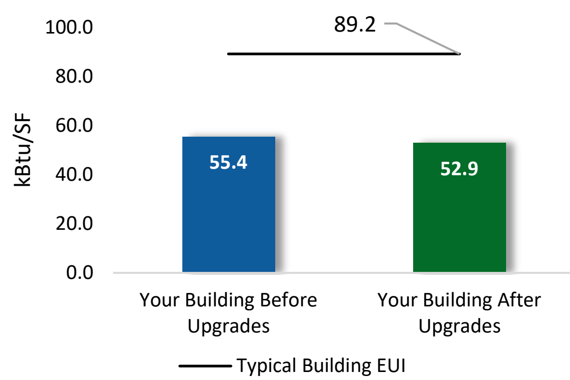
Scenario 1: Full Package (All Evaluated Measures)

Installation Cost	$183,141
Potential Rebates & Incentives[1]	$15,123
Annual Cost Savings	$9,843
Annual Energy Savings	Electricity: 41,643 kWh Natural Gas: 79 Therms No. 2 Fuel Oil: 2,125 Gallons
Greenhouse Gas Emission Savings	46 Tons
Simple Payback	17.1 Years
Site Energy Savings (All Utilities)	15%



Scenario 2: Cost Effective Package[2]

Installation Cost	$41,862
Potential Rebates & Incentives	$10,035
Annual Cost Savings	$5,250
Annual Energy Savings	Electricity: 39,588 kWh Natural Gas: 79 Therms No. 2 Fuel Oil: -55 Gallons
Greenhouse Gas Emission Savings	20 Tons
Simple Payback	6.1 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			**27,403**	**10.4**	**-13**	**$3,448**	**$18,164**	**$4,700**	**$13,464**	**3.9**	**25,540**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	297	0.1	0	$37	$257	$40	$217	5.8	277
ECM 2	Retrofit Fixtures with LED Lamps	Yes	27,106	10.3	-12	$3,410	$17,906	$4,660	$13,246	3.9	25,263
Lighting Control Measures			**7,622**	**3.0**	**-4**	**$959**	**$15,309**	**$3,465**	**$11,844**	**12.4**	**7,101**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	6,293	2.7	-3	$792	$12,384	$1,505	$10,879	13.7	5,863
ECM 4	Install High/Low Lighting Controls	Yes	1,329	0.3	-1	$167	$2,925	$1,960	$965	5.8	1,238
Motor Upgrades			**196**	**0.1**	**0**	**$26**	**$1,516**	**$0**	**$1,516**	**58.4**	**197**
ECM 5	Premium Efficiency Motors	No	196	0.1	0	$26	$1,516	$0	$1,516	58.4	197
Variable Frequency Drive (VFD) Measures			**4,564**	**1.0**	**0**	**$604**	**$8,152**	**$1,800**	**$6,352**	**10.5**	**4,595**
ECM 6	Install VFDs on Heating Water Pumps	Yes	4,564	1.0	0	$604	$8,152	$1,800	$6,352	10.5	4,595
Unitary HVAC Measures			**73**	**0.1**	**0**	**$10**	**$703**	**$0**	**$703**	**73.1**	**73**
ECM 7	Install High Efficiency Air Conditioning Units	No	73	0.1	0	$10	$703	$0	$703	73.1	73
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**96**	**$1,367**	**$85,660**	**$5,088**	**$80,572**	**58.9**	**15,646**
ECM 8	Install High Efficiency Steam Boilers	No	0	0.0	96	$1,367	$85,660	$5,088	$80,572	58.9	15,646
HVAC System Improvements			**0**	**0.0**	**12**	**$168**	**$165**	**$34**	**$131**	**0.8**	**1,740**
ECM 9	Install Pipe Insulation	Yes	0	0.0	12	$168	$165	$34	$131	0.8	1,740
Domestic Water Heating Upgrade			**0**	**0.0**	**5**	**$72**	**$72**	**$36**	**$36**	**0.5**	**556**
ECM 10	Install Low-Flow DHW Devices	Yes	0	0.0	5	$72	$72	$36	$36	0.5	556
Custom Measures			**1,786**	**0.0**	**207**	**$3,190**	**$53,400**	**$0**	**$53,400**	**16.7**	**35,593**
ECM 11	Installation of an Energy Management System	No	1,786	0.0	207	$3,190	$53,400	$0	$53,400	16.7	35,593
TOTALS (COST EFFECTIVE MEASURES)			**39,588**	**14.4**	**0**	**$5,250**	**$41,862**	**$10,035**	**$31,827**	**6.1**	**39,533**
TOTALS (ALL MEASURES)			**41,643**	**14.5**	**302**	**$9,843**	**$183,141**	**$15,123**	**$168,018**	**17.1**	**91,042**

* - 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.

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

Options from Around the State

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

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

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

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

Ongoing Electric Savings with Demand Response

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

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for West New York Public School No. 4 (Annex). 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 September 1, 2021, TRC performed an energy audit at West New York Public School No. 4 (Annex) located in West New York, New Jersey. TRC met with Rick Solares to review the facility operations and help focus our investigation on specific energy-using systems.

West New York Public School No. 4 (Annex) is a four-story, 53,400 square foot building built in 1922. Only two (basement and first floor) out of the four floors are being used. The rest were vacant at the time of the audit. Spaces include classrooms and offices, an auditorium, a gymnasium, a kitchen, a library, lounges, corridors, stairwells, restrooms, storage rooms, and electrical and mechanical spaces.

2.2 Building Occupancy

The facility is occupied from September to July, with the school year ending for students in July and restarting in September. The facility is closed on weekends and closes at 8:00 PM on weekdays. During a typical day, the facility is occupied by approximately 20 staff and 100 students.

Building Name	Weekday/Weekend	Operating Schedule
West New York Public School No. 4 (Annex)	Weekday	6:00 AM - 6:00 PM
	Weekend	Closed

Figure 3 - Building Occupancy Schedule

2.3 Building Envelope

West New York Public School No. 4 (Annex) is a four-floor building. Building walls are lathe and plaster interior with a brick façade. The back side of the building walls appear to have some water intrusion while the front side has water proofing and is in good condition. The building has pitched and flat roof sections. The original building is 100 years old, and many parts of the roof are compromised causing substantial leakage.

The windows are single pane, double hung with aluminum frames. The windows are in poor condition and in need of replacement. Exterior doors have aluminum frames; most of them are in poor condition with very little weather-stripping. Degraded window and door seals increase drafts and outside air infiltration.

We strongly recommend that the facility consider making improvements to the building envelope. While typically not cost effective based on energy savings alone, we have provided some guidance on window upgrades in Section 4.10.

Flat roof portion

Exterior door

Window

Pitched roof

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also several 75-Watt T12 fixtures. Additionally, there are some 13W, 18W, 26W and 42W compact fluorescent lamps (CFL) and a 150W incandescent lamp. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts. The gymnasium has 200W high bay LED fixtures. Exit signs are 2W LED units.

Fixture types include 1-, 2- 3- or 4-lamp, 2-, 4- or 8-foot-long troffer and surface mounted fixtures and 2-foot fixtures with U-bend tube lamps. Interior lighting Interior lighting levels were generally sufficient. Most fixtures are in good condition. Exterior fixtures include wall packs with 40W LED fixtures and 42W CFL lamp fixtures. Exterior fixtures are controlled by a timeclock.

4-foot T8 - Boiler room

13W CFL – Janitorial closet

42W CFL - Gymnasium

200W LED fixtures

150W Incandescent - Basement storage

EXIT signs

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators are equipped with supply fan motors and pneumatically controlled outside air dampers and fan coil valves connected to the distribution system. They provide heating and ventilation to classrooms. This system is original to the building and appears to be in fair operating condition.

Unitary Electric HVAC Equipment

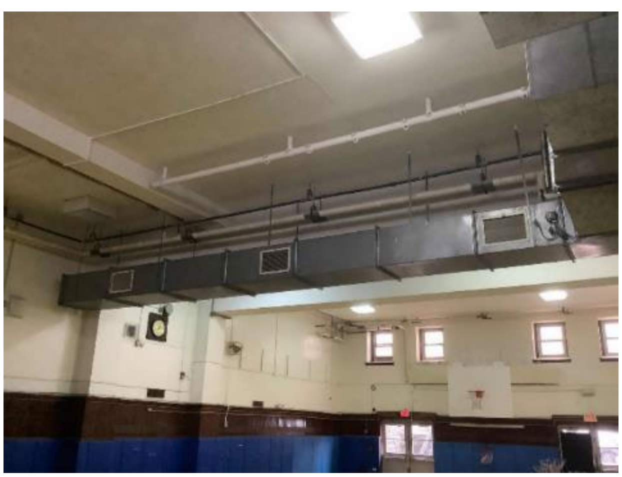
Several classrooms and offices use window air conditioning (AC) units. These vary in capacity between 1-ton and 1.25 tons. The units are in good condition. The have an average EER of 11.

Main office – Window AC

Nurse's office – Window AC

Air Handling Units (AHUs)

The gymnasium is conditioned by an air handling unit. This unit is equipped with a supply fan motor and hot water heating coil. The unit motors were inaccessible during the energy audit. The supply fan motor is assumed to be 1.5 hp, constant speed, and standard efficiency. The motors are old have been evaluated for replacement.



Gymnasium AHU

Gymnasium AHU

2.6 Steam to Hot Water Heating System

Two, 2,120 MBh fuel oil fired steam boilers serve the building heating load. The burners are fully modulating at a nominal efficiency of 78%. The boilers are configured in a lead-lag control scheme. Both boilers are required under high load conditions. Installed in 1997, they are in fair condition.

The hydronic distribution system is a two-pipe heating only system. The steam produced is converted to hot water using a heat exchanger. The hot water is distributed to the unit ventilators and air handlers using two 5 hp constant speed hot water pumps.

Steam boilers

Heating hot water pumps

Fuel Oil pump

Unit ventilator

2.7 Domestic Hot Water

Hot water is produced by a 65 gallon 251 MBh gas-fired storage water heater with an 80% rating.

Fractional hp circulation pumps distribute water to end uses. The domestic hot water pipes are partially insulated, and the existing insulation is in good condition.

DHW

2.8 Plug Load and Vending Machines

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

There are approximately 15 computer workstations throughout the facility. Plug loads throughout the building include general cafe and office equipment. There are classroom typical loads such as smart boards, projectors, and fans.

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

Printer/Copier

Refrigerator

2.9 Water-Using Systems

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

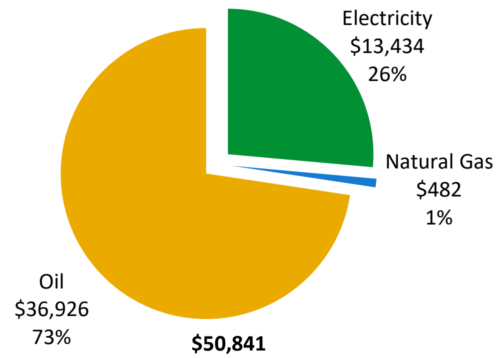
Typical restroom sink

Typical restroom sinks

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	101,488 kWh	$13,434
Natural Gas	318 Therms	$482
No. 2 Fuel Oil	18,631 Gallons	$36,926
Total		**$50,841**



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

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

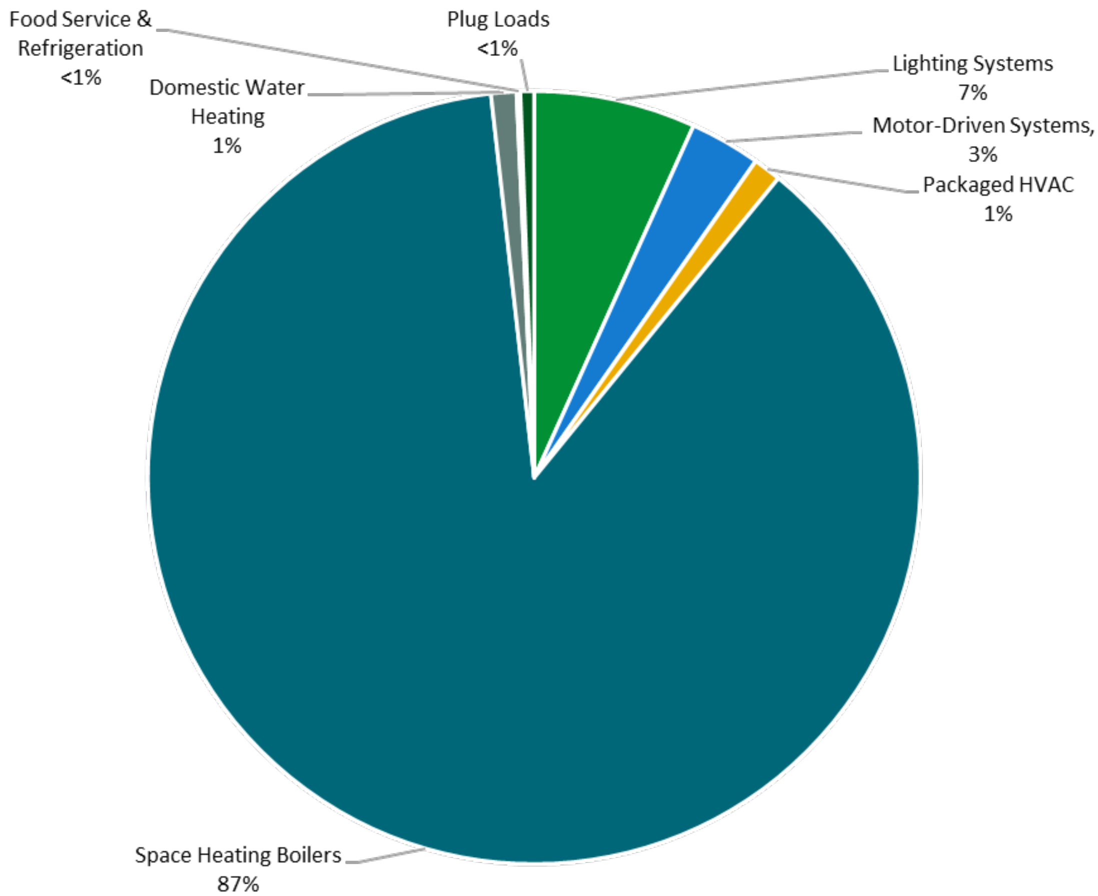
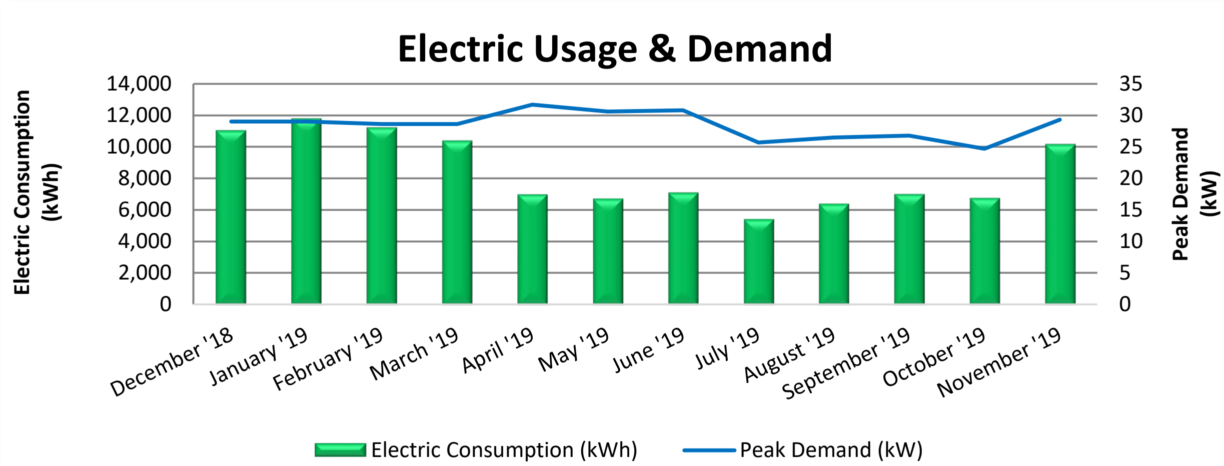


Figure 4 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class General Lighting & Power (GLP), with electric production provided by East Coast Power, a third-party supplier.



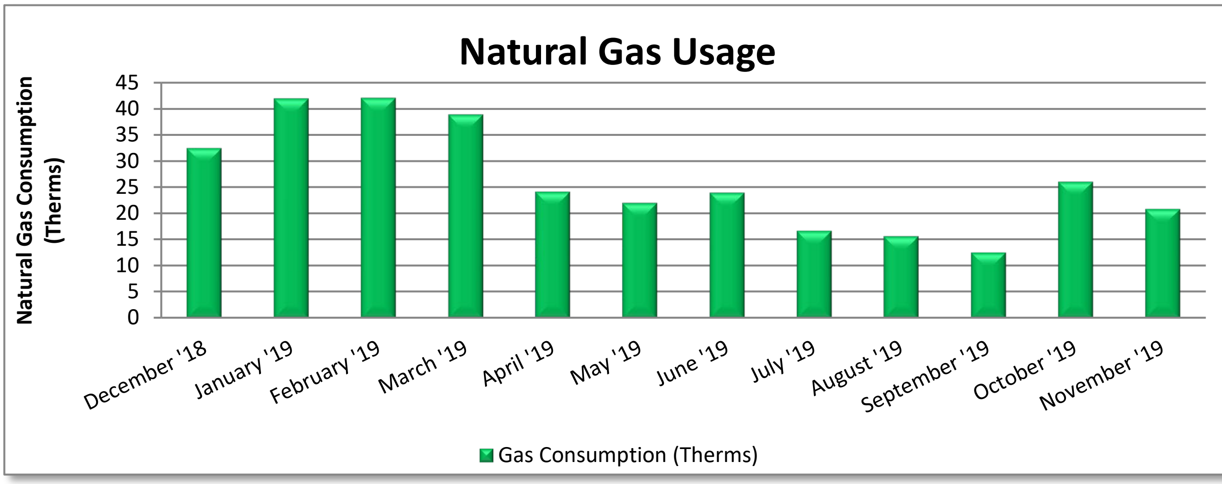
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
1/8/19	32	11,065	29	$114	$1,219
2/7/19	30	11,800	29	$114	$1,652
3/8/19	29	11,233	29	$112	$1,240
4/9/19	32	10,400	29	$112	$1,456
5/8/19	29	7,008	32	$125	$848
6/7/19	30	6,722	31	$422	$1,093
7/9/19	32	7,128	31	$424	$1,137
8/7/19	29	5,433	26	$354	$899
9/6/19	30	6,415	27	$365	$1,008
10/7/19	31	7,032	27	$105	$846
11/5/19	29	6,781	25	$97	$812
12/6/19	31	10,193	29	$115	$1,187
Totals	**364**	**101,210**	**32**	**$2,460**	**$13,397**
Annual	**365**	**101,488**	**32**	**$2,467**	**$13,434**

Notes:

- Peak demand of 32 kW occurred in April '19.
- Average demand over the past 12 months was 28 kW.
- The average electric cost over the past 12 months was $0.132/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

PSE&G delivers natural gas under rate class General Service Gas (GSG), with natural gas supply provided by East Coast Power & Gas, a third-party supplier.



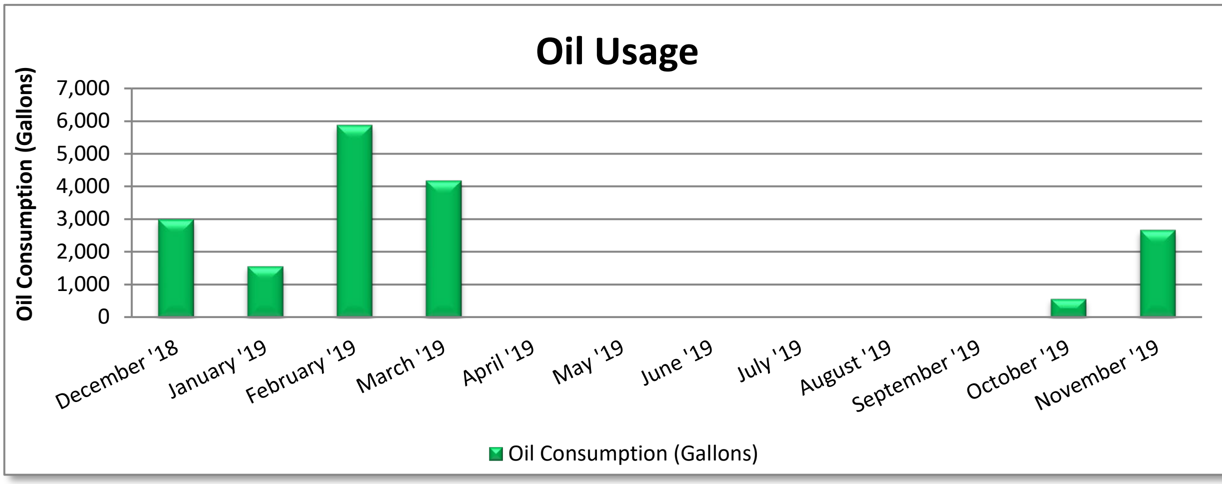
Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
1/8/19	33	33	$49
2/6/19	29	42	$68
3/8/19	30	42	$54
4/8/19	31	39	$63
5/8/19	30	24	$34
6/7/19	30	22	$32
7/9/19	32	24	$34
8/7/19	29	17	$28
9/10/19	34	16	$27
10/7/19	27	13	$25
11/7/19	31	26	$36
12/6/19	29	21	$32
Totals	**365**	**318**	**$482**
Annual	**365**	**318**	**$482**

Notes:

- The average gas cost for the past 12 months is $1.517/therm, which is the blended rate used throughout the analysis.
- Gas usage is for domestic water heating only.

3.3 No. 2 Fuel Oil

Rachles/Michele's Oil Co delivers no. 2 fuel oil to the project site.



No. 2 Fuel Oil Billing Data			
Period Ending	Days in Period	Oil Usage (Gallons)	Fuel Cost
1/8/19	30	3,010	$5,501
1/29/19	21	1,575	$2,979
3/1/19	31	5,892	$11,881
3/20/19	19	4,191	$8,642
4/20/19	31	0	$0
5/20/19	30	0	$0
6/20/19	31	0	$0
7/20/19	30	0	$0
8/20/19	31	0	$0
9/20/19	31	0	$0
10/29/19	39	572	$1,171
11/25/19	27	2,677	$5,334
Totals	**351**	**17,917**	**$35,509**
Annual	**365**	**18,631**	**$36,926**

Notes:

- The average no. 2 fuel oil cost for the past 12 months is $1.982/Gallon, which is the blended rate used throughout the analysis.
- Fuel deliveries do not necessarily correspond to periods of use.

3.4 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	84

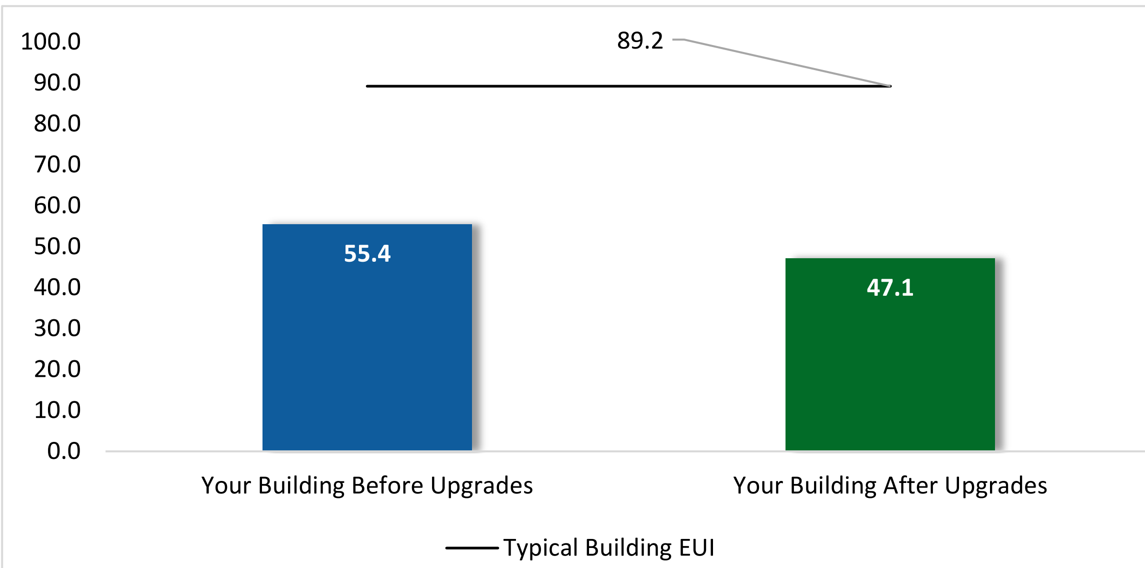


Figure 5 - Energy Use Intensity Comparison[3]

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

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

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

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

4 Energy Conservation Measures

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

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

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

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**27,403**	**10.4**	**-13**	**$3,448**	**$18,164**	**$4,700**	**$13,464**	**3.9**	**25,540**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	297	0.1	0	$37	$257	$40	$217	5.8	277
ECM 2	Retrofit Fixtures with LED Lamps	Yes	27,106	10.3	-12	$3,410	$17,906	$4,660	$13,246	3.9	25,263
Lighting Control Measures			**7,622**	**3.0**	**-4**	**$959**	**$15,309**	**$3,465**	**$11,844**	**12.4**	**7,101**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	6,293	2.7	-3	$792	$12,384	$1,505	$10,879	13.7	5,863
ECM 4	Install High/Low Lighting Controls	Yes	1,329	0.3	-1	$167	$2,925	$1,960	$965	5.8	1,238
Motor Upgrades			**196**	**0.1**	**0**	**$26**	**$1,516**	**$0**	**$1,516**	**58.4**	**197**
ECM 5	Premium Efficiency Motors	No	196	0.1	0	$26	$1,516	$0	$1,516	58.4	197
Variable Frequency Drive (VFD) Measures			**4,564**	**1.0**	**0**	**$604**	**$8,152**	**$1,800**	**$6,352**	**10.5**	**4,595**
ECM 6	Install VFDs on Heating Water Pumps	Yes	4,564	1.0	0	$604	$8,152	$1,800	$6,352	10.5	4,595
Unitary HVAC Measures			**73**	**0.1**	**0**	**$10**	**$703**	**$0**	**$703**	**73.1**	**73**
ECM 7	Install High Efficiency Air Conditioning Units	No	73	0.1	0	$10	$703	$0	$703	73.1	73
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**96**	**$1,367**	**$85,660**	**$5,088**	**$80,572**	**58.9**	**15,646**
ECM 8	Install High Efficiency Steam Boilers	No	0	0.0	96	$1,367	$85,660	$5,088	$80,572	58.9	15,646
HVAC System Improvements			**0**	**0.0**	**12**	**$168**	**$165**	**$34**	**$131**	**0.8**	**1,740**
ECM 9	Install Pipe Insulation	Yes	0	0.0	12	$168	$165	$34	$131	0.8	1,740
Domestic Water Heating Upgrade			**0**	**0.0**	**5**	**$72**	**$72**	**$36**	**$36**	**0.5**	**556**
ECM 10	Install Low-Flow DHW Devices	Yes	0	0.0	5	$72	$72	$36	$36	0.5	556
Custom Measures			**1,786**	**0.0**	**207**	**$3,190**	**$53,400**	**$0**	**$53,400**	**16.7**	**35,593**
ECM 11	Installation of an Energy Management System	No	1,786	0.0	207	$3,190	$53,400	$0	$53,400	16.7	35,593
TOTALS			**41,643**	**14.5**	**302**	**$9,843**	**$183,141**	**$15,123**	**$168,018**	**17.1**	**91,042**

* - 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		**27,403**	**10.4**	**-13**	**$3,448**	**$18,164**	**$4,700**	**$13,464**	**3.9**	**25,540**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	297	0.1	0	$37	$257	$40	$217	5.8	277
ECM 2	Retrofit Fixtures with LED Lamps	27,106	10.3	-12	$3,410	$17,906	$4,660	$13,246	3.9	25,263
Lighting Control Measures		**7,622**	**3.0**	**-4**	**$959**	**$15,309**	**$3,465**	**$11,844**	**12.4**	**7,101**
ECM 3	Install Occupancy Sensor Lighting Controls	6,293	2.7	-3	$792	$12,384	$1,505	$10,879	13.7	5,863
ECM 4	Install High/Low Lighting Controls	1,329	0.3	-1	$167	$2,925	$1,960	$965	5.8	1,238
Variable Frequency Drive (VFD) Measures		**4,564**	**1.0**	**0**	**$604**	**$8,152**	**$1,800**	**$6,352**	**10.5**	**4,595**
ECM 6	Install VFDs on Heating Water Pumps	4,564	1.0	0	$604	$8,152	$1,800	$6,352	10.5	4,595
HVAC System Improvements		**0**	**0.0**	**12**	**$168**	**$165**	**$34**	**$131**	**0.8**	**1,740**
ECM 9	Install Pipe Insulation	0	0.0	12	$168	$165	$34	$131	0.8	1,740
Domestic Water Heating Upgrade		**0**	**0.0**	**5**	**$72**	**$72**	**$36**	**$36**	**0.5**	**556**
ECM 10	Install Low-Flow DHW Devices	0	0.0	5	$72	$72	$36	$36	0.5	556
TOTALS		**39,588**	**14.4**	**0**	**$5,250**	**$41,862**	**$10,035**	**$31,827**	**6.1**	**39,533**

* - 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		**27,403**	**10.4**	**-13**	**$3,448**	**$18,164**	**$4,700**	**$13,464**	**3.9**	**25,540**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	297	0.1	0	$37	$257	$40	$217	5.8	277
ECM 2	Retrofit Fixtures with LED Lamps	27,106	10.3	-12	$3,410	$17,906	$4,660	$13,246	3.9	25,263

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 Fluorescent Fixtures with LED Lamps and Drivers

Retrofit fluorescent fixtures by removing the fluorescent tubes and ballasts and replacing them with LED tubes and LED drivers (if necessary), which are designed to be used in retrofitted fluorescent fixtures.

The measure uses the existing fixture housing but replaces the electric components with more efficient lighting technology, which use less power than other lighting technologies but provides equivalent lighting output. Maintenance savings may also be achieved since LED tubes last longer than fluorescent tubes and, therefore, do not need to be replaced as often.

Affected building areas: all areas with fluorescent fixtures with T12 tubes.

ECM 2: Retrofit Fixtures with LED Lamps

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

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

Affected Building Areas: all areas with fluorescent fixtures with T8 tubes, CFL, and incandescent.

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		**7,622**	**3.0**	**-4**	**$959**	**$15,309**	**$3,465**	**$11,844**	**12.4**	**7,101**
ECM 3	Install Occupancy Sensor Lighting Controls	6,293	2.7	-3	$792	$12,384	$1,505	$10,879	13.7	5,863
ECM 4	Install High/Low Lighting Controls	1,329	0.3	-1	$167	$2,925	$1,960	$965	5.8	1,238

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

ECM 3: Install Occupancy Sensor Lighting Controls

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

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

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

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

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

ECM 4: Install High/Low Lighting Controls

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

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

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

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

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

Affected Building Areas: hallways and stairwells.

4.3 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**196**	**0.1**	**0**	**$26**	**$1,516**	**$0**	**$1,516**	**58.4**	**197**
ECM 5	Premium Efficiency Motors	196	0.1	0	$26	$1,516	$0	$1,516	58.4	197

ECM 5: Premium Efficiency Motors

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

Affected Motors: mechanical 1 AHU supply and return fan motors.

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

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**4,564**	**1.0**	**0**	**$604**	**$8,152**	**$1,800**	**$6,352**	**10.5**	**4,595**
ECM 6	Install VFDs on Heating Water Pumps	4,564	1.0	0	$604	$8,152	$1,800	$6,352	10.5	4,595

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

ECM 6: Install VFDs on Heating Water Pumps

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

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

Affected Pumps: two 5 hp heating hot water pumps.

4.5 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		**73**	**0.1**	**0**	**$10**	**$703**	**$0**	**$703**	**73.1**	**73**
ECM 7	Install High Efficiency Air Conditioning Units	73	0.1	0	$10	$703	$0	$703	73.1	73

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 window AC units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 7: Install High Efficiency AC Units

We evaluated replacing standard efficiency packaged AC units with high efficiency packaged AC 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: basement office window AC.

4.6 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**	**96**	**$1,367**	**$85,660**	**$5,088**	**$80,572**	**58.9**	**15,646**
ECM 8	Install High Efficiency Steam Boilers	0	0.0	96	$1,367	$85,660	$5,088	$80,572	58.9	15,646

ECM 8: Install High Efficiency Steam Boilers

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

For the purpose of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. Since you have a hydronic distribution system in place, it may be more cost effective to replacing the existing boilers with hot water boilers and reconfigure the piping to the loop. If the boiler loop can be operated with a return water temperature of 130 F or lower, condensing hot water boilers might be an option, providing additional savings. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load.

Replacing the boilers on a one for one basis with the current technology, has a long payback based on energy savings and may not be justifiable based simply on energy considerations. However, the boilers have reached 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.

4.7 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**	**12**	**$168**	**$165**	**$34**	**$131**	**0.8**	**1,740**
ECM 9	Install Pipe Insulation	0	0.0	12	$168	$165	$34	$131	0.8	1,740

ECM 9: Install Pipe Insulation

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

Affected Systems: hot water piping, domestic hot water piping.

4.8 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**5**	**$72**	**$72**	**$36**	**$36**	**0.5**	**556**
ECM 10	Install Low-Flow DHW Devices	0	0.0	5	$72	$72	$36	$36	0.5	556

ECM 10: 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.

4.9 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		**1,786**	**0.0**	**207**	**$3,190**	**$53,400**	**$0**	**$53,400**	**16.7**	**35,593**
ECM 11	Installation of an Energy Management System	1,786	0.0	207	$3,190	$53,400	$0	$53,400	16.7	35,593

ECM 11: Installation of an Energy Management System (EMS)

Most larger facilities have some type of EMS, which provides for centralized, remote control and monitoring of HVAC equipment, and sometimes lighting or other building systems. An EMS utilizes a system of temperature and pressure sensors that obtain feedback about field conditions and provide signals to control systems that adjust HVAC system operation for optimal functioning. Thirty years ago, most control systems were pneumatic systems driven by compressed air, with pneumatic thermostats and air driven actuators for valves and dampers. Pneumatic 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 an EMS 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 EMS 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 it be used as a basis for design and construction.

A high-level evaluation of potential savings and costs is provided for demonstration purposes only. It is a screening evaluation for the potential in installing an EMS. Based on industry standards and previous project experience, the potential energy savings may be up to 20% of existing HVAC energy use. The average cost for installing and EMS may be between $2 and $4 per square foot. Actual savings and costs will need to be outlined by the specific contractor engaged to implement the system. For the purposes of this report, we have conservatively estimated savings to be 6% of the HVAC energy consumption baseline.

4.10 Measures for Future Consideration

There are additional opportunities for improvement that West New York Board of Education may wish to consider. These potential upgrades typically require further analysis, involve substantial capital investment, and/or include significant system reconfiguration. These 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.

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

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

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

Window Replacements

Energy efficient windows are an important consideration when improving the building envelope. The heat transfer through the glass panes are responsible for a significant portion of the facility's heating and cooling energy consumption. We recommend replacing single-pane windows with double-pane windows, and we recommend models that are gas-filled with low-e coatings to reduce heat loss. Windows should be selected with low U-factors to maximize energy savings. The U-factor is the rate at which the window conducts non-solar heat flow and is a key indicator of performance. The lower the U-factor, the higher the efficiency of the window. Window frames and sashes should be efficient as well. If metal frames are specified or required by code, the frame extrusions should have a thermal break to reduce conduction through the frame. As part of the installation, the window frames should be properly sealed with caulk materials to ensure the mitigation of air infiltration. Building envelopes that limit air infiltration and that have adequate fenestrations play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Window system replacement is an expensive upgrade that generally involves architectural elements. We recommend this as a measure for further study.

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[4] . Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

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,

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

filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the AC or heat pump system, which increases the load on the distribution fans.

Ductwork Maintenance

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

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

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

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

Steam Trap Repair and Replacement

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

Boiler Maintenance

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

Water Heater Maintenance

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

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

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

Water Conservation

Installing dual flush or low-flow toilets and low-flow/waterless urinals are ways to reduce water use. The EPA WaterSense® ratings for urinals is 0.5 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[5] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[6] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

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

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

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

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

Procurement Strategies

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

6 On-site Generation

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

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

6.1 Solar Photovoltaic

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

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

This facility does not appear to meet the minimum criteria for a cost-effective solar PV installation. To be cost-effective, a solar PV array needs certain minimum criteria, such as sufficient and sustained electric demand and sufficient flat or south-facing rooftop or other unshaded space on which to place the PV panels. The graphic below displays the results of the PV potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.

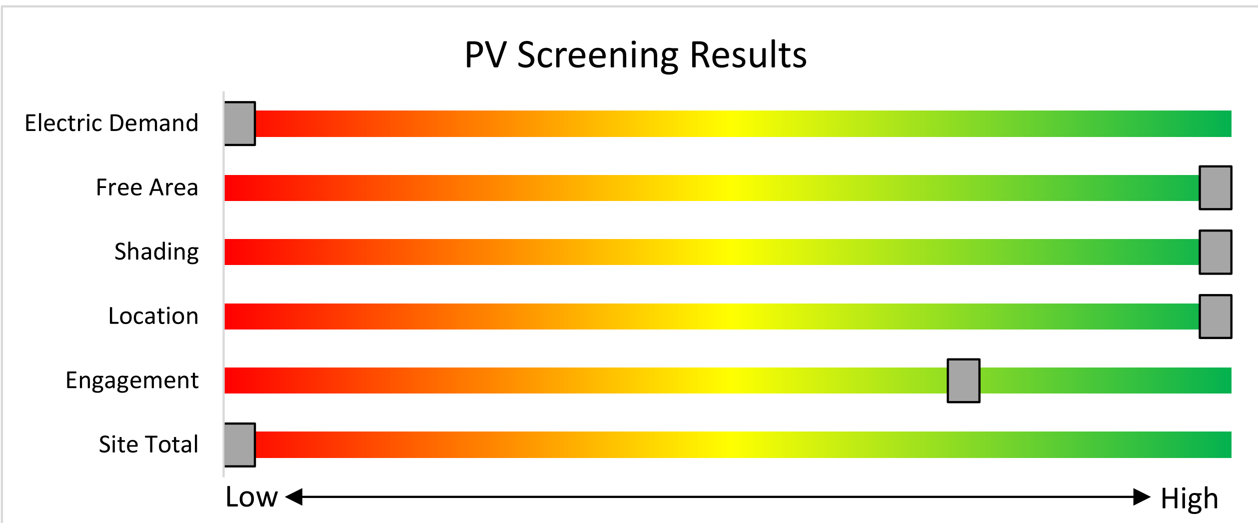


Figure 8 - Photovoltaic Screening

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.

Low or infrequent thermal load, and lack of space for siting the equipment are the most significant factors contributing to the lack of CHP potential.

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

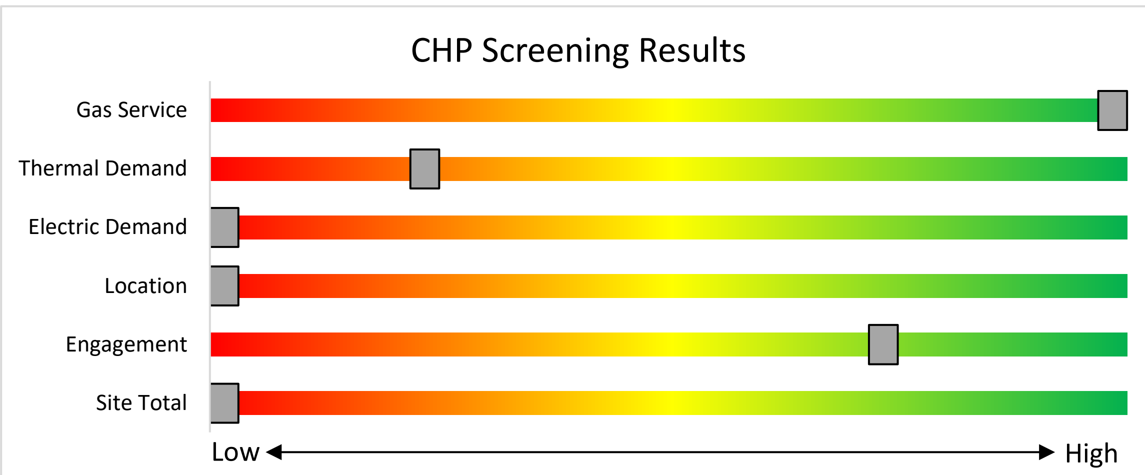


Figure 9 - Combined Heat and Power Screening

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

7 Project Funding and Incentives

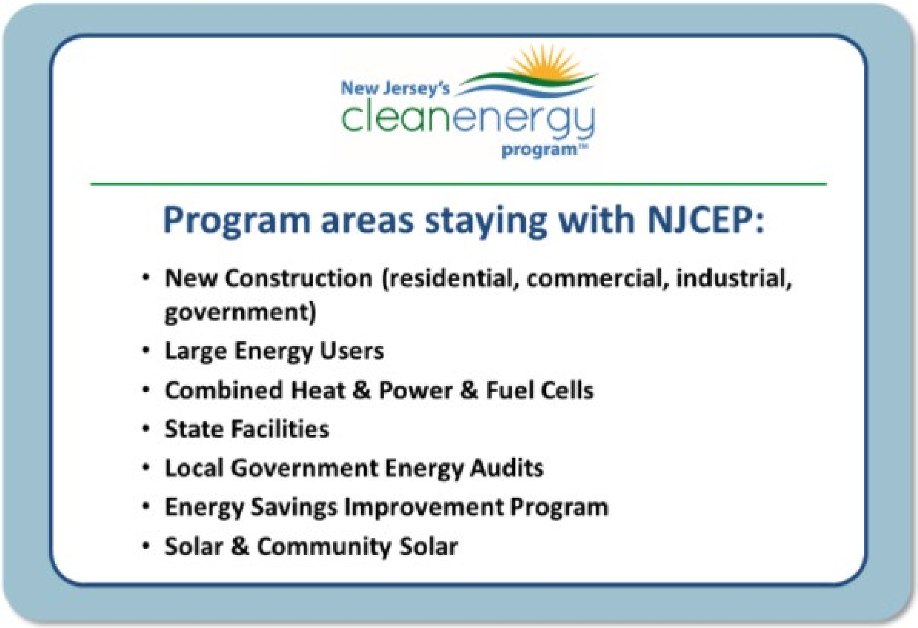
Ready to improve your building's performance? Your utility provider may be able to help.

7.1 Utility Energy Efficiency Programs

New utility programs are expected to start rolling out in the spring and summer of 2021. Keep up to date with developments by visiting the NJCEP website.

8 New Jersey's Clean Energy Programs

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



8.1 Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

8.2 Energy Savings Improvement Program

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

8.3 Successor Solar Incentive Program (SuSI)

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

Administratively Determined Incentive (ADI) Program

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

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

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

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

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

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

Competitive Solar Incentive Program

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

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

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

9 PROJECT DEVELOPMENT

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

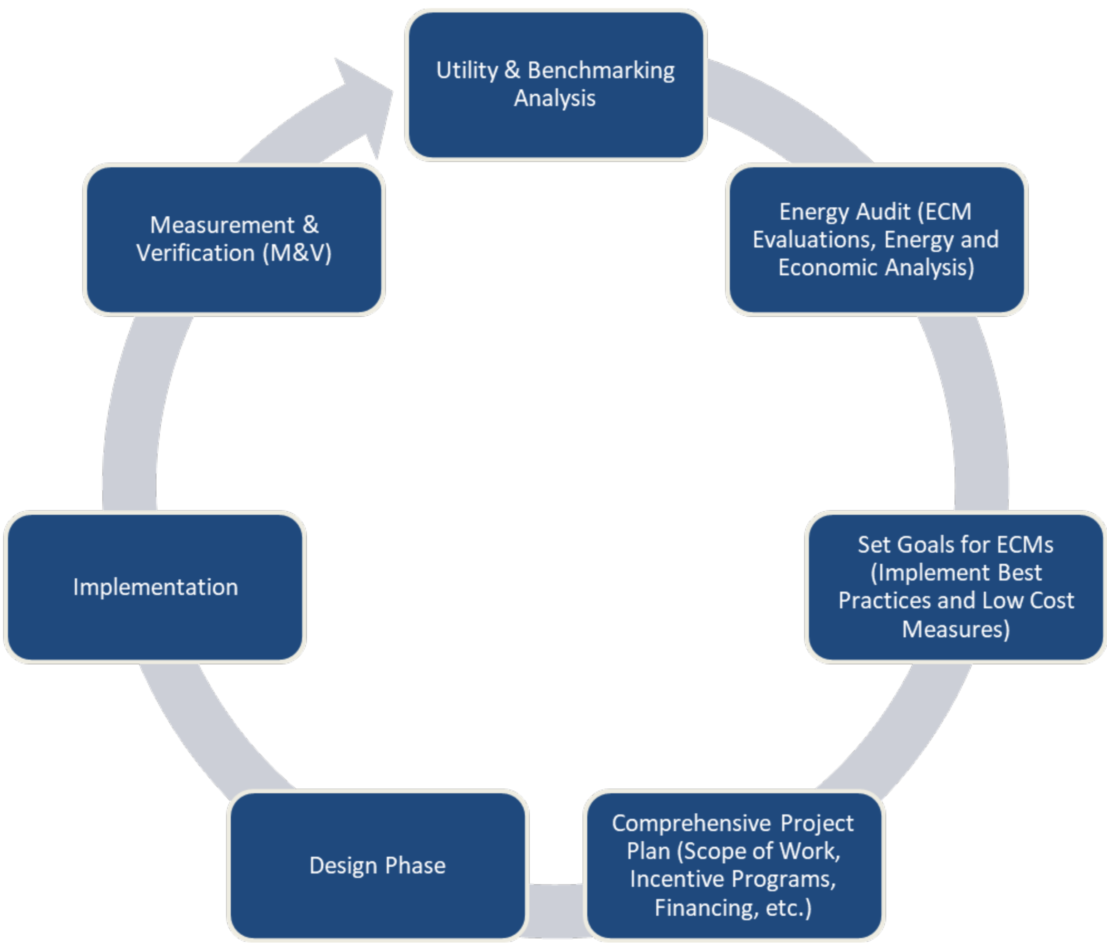


Figure 10 – Project Development Cycle

10 Energy Purchasing and Procurement Strategies

10.1 Retail Electric Supply Options

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

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

A list of licensed third-party electric suppliers is available at the NJBPU website[7].

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[8].

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 102	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,728	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,192	0.5	1,306	-1	$164	$927	$215	4.3
Classroom 105	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 106	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 107	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 108	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 109	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Corridor 108	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,650	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,650	0.0	120	0	$15	$37	$10	1.7
Corridor 1st Floor	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 1st Floor	7	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,650	2, 4	Relamp	Yes	7	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	2,519	0.1	562	0	$71	$578	$280	4.2
Corridor 1st Floor	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,650	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,650	0.0	120	0	$15	$37	$10	1.7
Corridor 1st Floor	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,650	2, 4	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,519	0.3	1,620	-1	$204	$663	$330	1.6
Janitorial 108	1	Compact Fluorescent: (2) 13W Double Biaxial Plug-In Lamps	Wall Switch	S	26	960	2	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	19	960	0.0	7	0	$1	$25	$2	27.2
Main Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.1	290	0	$37	$416	$75	9.3
Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,728	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,728	0.0	97	0	$12	$73	$20	4.4
Nurses Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.1	290	0	$37	$416	$75	9.3
Office - Resources	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,728	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,728	0.0	97	0	$12	$73	$20	4.4
Office 101	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Office 103	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Office 104	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.1	290	0	$37	$416	$75	9.3
Office 110	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Restroom - 102	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,728	0.0	57	0	$7	$37	$10	3.7
Restroom - 103	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,728	0.0	57	0	$7	$37	$10	3.7
Restroom - 107	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,728	0.0	57	0	$7	$37	$10	3.7
Restroom - 108	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,728	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,728	0.0	30	0	$4	$18	$5	3.5
Restroom - Coed 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,728	0.0	57	0	$7	$37	$10	3.7

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Restroom - Nurse	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,728	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,728	0.0	30	0	$4	$18	$5	3.5
Classroom 201	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 202	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 204	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.3	726	0	$91	$635	$135	5.5
Classroom 205	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 208	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 209	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 210	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 211	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Corridor 2nd Floor	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 2nd Floor	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,650	2, 4	Relamp	Yes	12	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	2,519	0.2	963	0	$121	$669	$480	1.6
Janitorial 208	1	Compact Fluorescent: (2) 13W Double Biaxial Plug-In Lamps	Wall Switch	S	26	960	2	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	19	960	0.0	7	0	$1	$25	$2	27.2
Janitorial 306	1	Compact Fluorescent: (2) 13W Double Biaxial Plug-In Lamps	Wall Switch	S	26	960	2	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	19	960	0.0	7	0	$1	$25	$2	27.2
Library	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.4	1,016	0	$128	$781	$175	4.7
Library	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,728	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,192	0.1	256	0	$32	$262	$60	6.3
Lounge 203	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Restroom - 203	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,728	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,728	0.0	97	0	$12	$73	$20	4.4
Restroom - 208	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,728	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,728	0.0	30	0	$4	$18	$5	3.5
Restroom - 306	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,728	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,728	0.0	97	0	$12	$73	$20	4.4
Restroom - Teachers 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,728	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,728	0.0	30	0	$4	$18	$5	3.5
Storage 203	1	Compact Fluorescent: (3) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	78	960	2	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Wall Switch	55	960	0.0	22	0	$3	$38	$3	12.4
Auditorium	3	Compact Fluorescent: (2) 18W Double Biaxial Plug-In Lamps	Wall Switch	S	36	1,728	2, 3	Relamp	Yes	3	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	26	1,192	0.0	94	0	$12	$345	$41	25.8
Auditorium	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
Auditorium	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.5	1,306	-1	$164	$1,197	$250	5.8
Auditorium	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	1,728	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.1	145	0	$18	$73	$20	2.9

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 301	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	435	0	$55	$489	$95	7.2
Classroom 301	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,728	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,192	0.1	256	0	$32	$262	$60	6.3
Classroom 302	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 303	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 304	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	435	0	$55	$489	$95	7.2
Classroom 305	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 305	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,728	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,728	0.0	97	0	$12	$73	$20	4.4
Classroom 306	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 307	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 308	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	580	0	$73	$562	$115	6.1
Classroom 308	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,728	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,728	0.0	97	0	$12	$73	$20	4.4
Corridor 3rd Floor #1	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 3rd Floor #1	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,650	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,650	0.0	64	0	$8	$18	$5	1.6
Corridor 3rd Floor #1	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,650	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,650	0.0	181	0	$23	$55	$15	1.7
Corridor 3rd Floor #1	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,650	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,650	0.0	204	0	$26	$73	$20	2.1
Corridor 3rd Floor #2	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 3rd Floor #2	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,650	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,650	0.0	64	0	$8	$18	$5	1.6
Corridor 3rd Floor #2	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,650	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,650	0.0	181	0	$23	$55	$15	1.7
Corridor 3rd Floor #2	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,650	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,650	0.0	204	0	$26	$73	$20	2.1
Office 311	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.1	145	0	$18	$189	$40	8.2
Storage Auditorium	2	Compact Fluorescent: (2) 18W Double Biaxial Plug-In Lamps	Wall Switch	S	36	960	2, 3	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	26	662	0.0	35	0	$4	$166	$4	37.1
Boiler 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
Boiler Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	S	32	960	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	960	0.0	17	0	$2	$18	$5	6.3
Boiler Room	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	960	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	662	0.3	363	0	$46	$599	$125	10.4
Boiler Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	None	S	114	960	2	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	None	58	960	0.1	161	0	$20	$219	$60	7.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Corridor Basement	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 Basement	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,650	2, 4	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,519	0.2	1,073	0	$135	$706	$315	2.9
Corridor Basement	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,650	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,650	0.0	106	0	$13	$72	$10	4.7
Electric Meter Room	1	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	960	2	Relamp	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	960	0.0	36	0	$5	$89	$20	14.9
Electrical - Boiler Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	960	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	662	0.1	81	0	$10	$189	$40	14.7
Gymnasium	1	Compact Fluorescent: (2) 42W Triple Biaxial Plug-In Lamps	Wall Switch	S	84	1,728	2	Relamp	No	1	LED Lamps: PL-L (Biax) Lamps	Wall Switch	59	1,728	0.0	43	0	$5	$27	$2	4.6
Gymnasium	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
Gymnasium	6	LED - Fixtures: High-Bay	Wall Switch	S	200	1,728	3	None	Yes	6	LED - Fixtures: High-Bay	Occupancy Sensor	200	1,192	0.3	643	0	$81	$270	$35	2.9
Gymnasium	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,728	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,728	0.0	28	0	$3	$33	$6	7.6
Kitchen	2	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	S	158	1,728	1, 3	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,192	0.2	374	0	$47	$373	$60	6.7
Kitchen	1	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	1,728	2	Relamp	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	1,728	0.0	66	0	$8	$89	$20	8.3
Kitchen	2	Linear Fluorescent - T8: 8' T8 (59W) - 2L	None	S	110	1,728	2	Relamp	No	2	LED - Linear Tubes: (2) 8' Lamps	None	72	1,728	0.1	131	0	$17	$177	$40	8.3
Mechanical 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	960	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	662	0.1	81	0	$10	$189	$40	14.7
Multipurpose Room	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Multipurpose Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,728	0.0	57	0	$7	$37	$10	3.7
Multipurpose Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,728	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,728	0.0	97	0	$12	$73	$20	4.4
Multipurpose Room	13	Linear Fluorescent - T8: 8' T8 (59W) - 2L	Wall Switch	S	110	1,728	2, 3	Relamp	Yes	13	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	1,192	0.5	1,355	-1	$170	$1,421	$295	6.6
Multipurpose Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,728	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,728	0.0	50	0	$6	$72	$10	9.9
Office - Basement	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,728	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,192	0.1	256	0	$32	$262	$60	6.3
Office - Custodians	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	960	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	662	0.1	202	0	$25	$453	$85	14.5
Restroom - Female B	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,192	0.2	435	0	$55	$489	$95	7.2
Restroom - Male B	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,728	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,192	0.2	542	0	$68	$850	$115	10.8
Stairs A	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs A	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,650	2, 4	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	2,519	0.1	642	0	$81	$596	$320	3.4
Stairs B	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
Stairs B	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,650	2, 4	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	2,519	0.1	642	0	$81	$596	$320	3.4
Stairs C	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs C	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,650	2, 4	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	2,519	0.1	642	0	$81	$596	$320	3.4
Storage B10	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	960	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	662	0.1	81	0	$10	$189	$20	16.7
Storage B10	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	960	2, 3	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	662	0.4	605	0	$76	$818	$150	8.8
Storage B10	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	960	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	960	0.0	28	0	$4	$72	$10	17.8
Storage B11	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	960	2, 3	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	662	0.4	568	0	$71	$854	$160	9.7
Storage Basement 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	960	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	960	0.0	32	0	$4	$37	$10	6.7
Storage Basement 1	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	960	2, 3	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	662	0.2	213	0	$27	$489	$60	16.0
Storage Basement Stairs	1	Incandescent: (1) 150W A19 Screw-In Lamp	Wall Switch	S	150	1,728	2	Relamp	No	1	LED Lamps: A19 Lamps	Wall Switch	23	1,728	0.1	219	0	$28	$17	$1	0.6
Exterior	2	Compact Fluorescent: (1) 42W Triple Biaxial Plug-In Lamp	Timeclock		42	4,380	2	Relamp	No	2	LED Lamps: PL-L (Biax) Lamps	Timeclock	30	4,380	0.0	105	0	$14	$27	$2	1.8
Exterior	10	LED - Fixtures: Security	Timeclock		40	4,380		None	No	10	LED - Fixtures: Security	Timeclock	40	4,380	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
Classroom 102	Classroom 102	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 105	Classroom 105	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 106	Classroom 106	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 107	Classroom 107	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 108	Classroom 108	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 109	Classroom 109	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Office - Resources	Office - Resources	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Office 101	Office 101	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Office 104	Office 104	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Office 110	Office 110	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 210	Classroom 210	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Lounge 203	Lounge 203	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Storage B10	Storage B10	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Storage B11	Storage B11	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Stairs A	Stairs A	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Stairs B	Stairs B	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Stairs C	Stairs C	1	Fan Coil Unit	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Auditorium	Auditorium	2	Supply Fan	3.0	89.5%	No			B	0		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical 1	Mechanical 1	1	Supply Fan	1.5	82.2%	No			B	1,920	5	Yes	86.5%	No		0.0	98	0	$13	$758	$0	58.4
Auditorium	Auditorium	2	Return Fan	3.0	89.5%	No			B	0		No	89.5%	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
Mechanical 1	Mechanical 1	1	Return Fan	1.5	82.2%	No			B	1,920	5	Yes	86.5%	No		0.0	98	0	$13	$758	$0	58.4
Boiler Room	Boiler	1	Air Compressor	0.5	83.0%	No			W	720		No	83.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Room	3	Boiler Feed Water Pump	0.5	60.0%	No			W	1,460		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Room	2	Combustion Air Fan	3.0	81.5%	No			W	490		No	81.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Room	2	Condensate Pump	0.5	70.0%	No			W	1,460		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Room	2	Condensate Pump	1.0	70.0%	No			W	1,460		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Gymnasium	Gymnasium	1	Exhaust Fan	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Kitchen	Kitchen	1	Exhaust Fan	0.3	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler	2	Heating Hot Water Pump	5.0	89.5%	No			W	1,460	6	No	89.5%	Yes	2	1.0	4,564	0	$604	$8,152	$1,800	10.5
Boiler Room	Boiler	1	DHW Circulation Pump	0.2	60.0%	No			W	1,460		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical 1	Boiler	1	DHW Circulation Pump	0.1	60.0%	No			W	1,460		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Fuel Oil Pump	3	Process Pump	0.5	70.0%	No			W	490		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Glycol pump	1	Process Pump	0.2	60.0%	No			W	490		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler	1	Condensate Pump	0.8	70.0%	No			W	1,460		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler	1	Condensate Pump	0.5	70.0%	No			W	1,460		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged HVAC Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions: 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	Proposed Conditions: 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	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 102	Classroom 102	1	Window AC	1.25		11.20		Frigidaire	FFRE153	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 105	Classroom 105	1	Window AC	1.25		11.20		Frigidaire	FFRE153	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 106	Classroom 106	1	Window AC	1.25		11.20		Frigidaire	FFRE153	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 107	Classroom 107	1	Window AC	1.25		11.20		Frigidaire	FFRE153	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 108	Classroom 108	1	Window AC	1.25		11.20		Frigidaire	FFRE153	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 109	Classroom 109	1	Window AC	1.25		11.20		Frigidaire	FFRE153	W		No							0.0	0	0	$0	$0	$0	0.0
Main Office	Main Office	1	Window AC	1.25		11.20		Frigidaire	FFRE153	W		No							0.0	0	0	$0	$0	$0	0.0
Main Office	Main Office	1	Window AC	1.25		10.80		LG	LW1512ERS	W		No							0.0	0	0	$0	$0	$0	0.0
Nurses Office	Nurses Office	1	Window AC	1.50		10.70		LG	LW1812ER	W		No							0.0	0	0	$0	$0	$0	0.0
Office 101	Office 101	1	Window AC	1.25		11.20		Frigidaire	FFRE153	W		No							0.0	0	0	$0	$0	$0	0.0
Office 103	Office 103	1	Window AC	1.25		11.20		Frigidaire	FFRE153	W		No							0.0	0	0	$0	$0	$0	0.0
Office 104	Office 104	1	Window AC	1.25		11.20		Frigidaire	FFRE153	W		No							0.0	0	0	$0	$0	$0	0.0
Office 110	Office 110	1	Window AC	1.25		11.20		Frigidaire	FFRE154	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 210	Classroom 210	1	Window AC	1.25		11.20		Frigidaire	FFRE155	W		No							0.0	0	0	$0	$0	$0	0.0
Lounge 203	Lounge 203	1	Window AC	1.25		11.20		Frigidaire	FFRE156	W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 303	Classroom 303	1	Window AC	1.25		11.20		Frigidaire	FFRE157	W		No							0.0	0	0	$0	$0	$0	0.0
Office - Basement	Office - Basement	1	Window AC	1.00		10.30		Sharp	Unknown	B	7	Yes	1	Window AC	1.00		12.00		0.1	73	0	$10	$703	$0	73.1

Space Heating Boiler Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions: System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	Proposed Conditions: ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	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
Boiler room	All school	2	Forced Draft Steam Boiler	2,120	HB Smith	M450A	B	8	Yes	2	Forced Draft Steam Boiler	2,120	81.00%	Et	0.0	0	96	$1,367	$85,660	$5,088	58.9

Pipe Insulation Recommendations

Location	Area(s)/System(s) Affected	Recommendation Inputs: ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	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
Condensate pump	Boiler	9	8	2.00	0.0	0	8	$120	$100	$16	0.7
Boiler room	DHW	9	9	2.00	0.0	0	3	$48	$65	$18	1.0

DHW Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions: System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	Proposed Conditions: ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	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
Boiler room	Restrooms	1	Storage Tank Water Heater (> 50 Gal)	AO Smith	BTR 251A 118	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

Location	Recommedation Inputs: ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	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
Restrooms	10	10	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	5	$72	$72	$36	0.5

Commercial Refrigerator/Freezer Inventory & Recommendations

Location	Existing Conditions: Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	Proposed Conditions: ECM #	Install ENERGY STAR Equipment?	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
Kitchen	1	Refrigerator Chest	Powers		Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Refrigerator Chest	Ojeda		Yes		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

Location	Existing Conditions: Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
PS4 Annex	3	Coffee Machine	400	No		
PS4 Annex	15	Desktop	145	No		
PS4 Annex	3	Microwave	900	No		
PS4 Annex	1	Paper Shredder	200	No		
PS4 Annex	15	Printer - Medium	80	No		
PS4 Annex	2	Printer - Copier	200	No		
PS4 Annex	3	Refrigerator Mini	60	No		
PS4 Annex	1	Refrigerator - residential	200	No		
PS4 Annex	2	Smart Board	2	No		
PS4 Annex	1	Toaster Oven	1,200	No		
PS4 Annex	3	Water cooler	520	No		

Custom (High Level) Measure Analysis

Installation of an Energy Management System

Building Square Footage	26,700	**Fuel Utility Rate**	$14.300 MMBtu
Percent of Conditioned Area Impacted	100%	**Blended Electric Utility Rate**	$0.132 kWh

Existing Conditions						Proposed Conditions					Energy Impact & Financial Analysis										
Description	Area(s)/System(s) Served	Remaining Useful Life	Total HVAC Motor Usage kWh	Total HVAC Electric Usage kWh	Total HVAC Fuel Usage MMBtu	Description	% Savings HVAC Motor Usage kWh	% Savings HVAC Electric Usage kWh	% Savings HVAC Fuel Usage MMBtu	Estimated Cost per Sqft	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Base Incentives	Enhanced Incentives	Total Incentives	Total Net Cost	Payback w/o Incentives in Years	Simple Payback w/ Incentives in Years
Limited/No HVAC Controls	HVAC Equipment & Systems	15	25,603	10,114	2,582	Installation of an Energy Management System	5%	5%	8%	$2.00	0.00	1,786	207	$3,190	$53,400	$0	$0	$0	$53,400	16.74	16.74

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.

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

West New York Public School No. 4 (Annex)

Primary Property Type: K-12 School
Gross Floor Area (ft²): 53,400
Built: 1922

For Year Ending: December 31, 2019
Date Generated: October 18, 2021

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
West New York Public School No. 4 (Annex) 316 66th Street West New York, New Jersey 07093	West New York Board of Education 6028 Broadway West New York, NJ 07093 (201) 553-4000	Dean Austin 6028 Broadway West New York, NJ 07093 (201) 553-4000 x 30063 daustin@wnyschools.net

Property ID: 15498202

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
57.7 kBtu/ft²

Source EUI
69.8 kBtu/ft²

Annual Energy by Fuel	
Fuel Oil (No. 2) (kBtu)	2,703,550 (88%)
Natural Gas (kBtu)	31,748 (1%)
Electric - Grid (kBtu)	343,842 (11%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	89.2
National Median Source EUI (kBtu/ft²)	108
% Diff from National Median Source EUI	-35%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	234

Signature & Stamp of Verifying Professional

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

LP Signature: ______________________Date: ___________

Licensed Professional

____ ________
,
(____)____-______
____

Professional Engineer or Registered Architect Stamp
(if applicable)

APPENDIX C: GLOSSARY

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

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

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