Local Government Energy Audit Report

West New York Early Childhood School (Hudson ECC)

April 1, 2022

Prepared for:
West New York Board of Education
5204 Hudson Ave
West New York, New Jersey 07093

Prepared by:
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Disclaimer

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

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

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

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

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

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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.

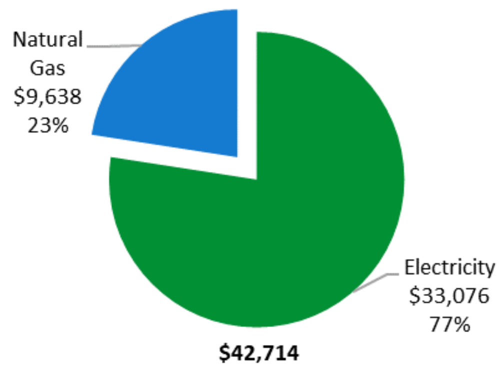
These "next generation" energy efficiency programs feature new ways of managing and delivering programs historically administered by New Jersey's Clean Energy Program™ (NJCEP). All of the investor-owned gas and electric utility companies will now also offer complementary energy efficiency programs and 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 Early Childhood School (Hudson ECC). 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: $42,714 Electricity: 222,829 kWh Natural Gas: 10,163 Therms	
ENERGY STAR® Benchmarking Score	58 *(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.

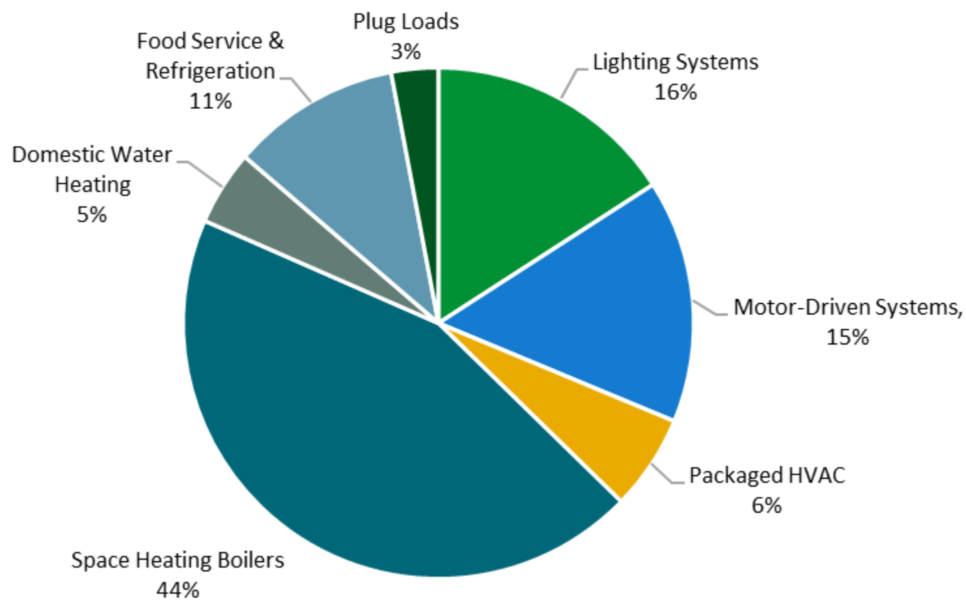


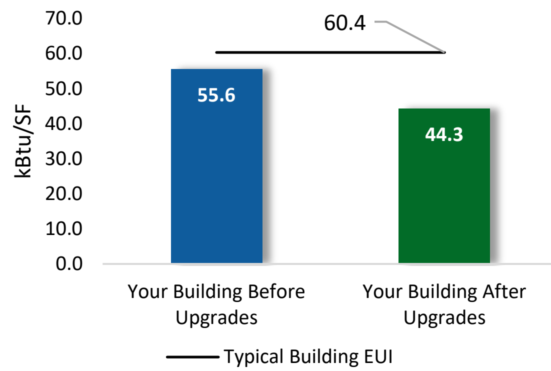
Figure 1 - Energy Use by System

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.

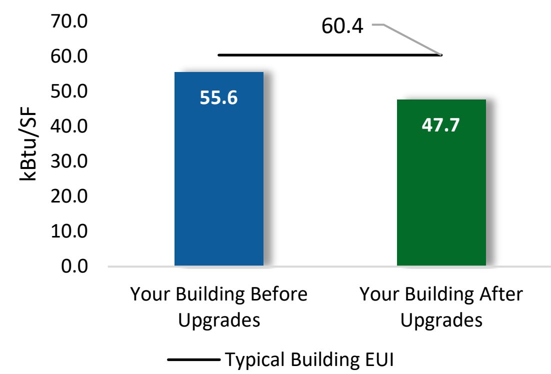
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$194,236
Potential Rebates & Incentives[1]	$24,862
Annual Cost Savings	$11,862
Annual Energy Savings	Electricity: 72,794 kWh Natural Gas: 1,115 Therms
Greenhouse Gas Emission Savings	43 Tons
Simple Payback	14.3 Years
Site Energy Savings (all utilities)	20%



Scenario 2: Cost Effective Package[2]

Installation Cost	$47,783
Potential Rebates & Incentives	$12,426
Annual Cost Savings	$10,106
Annual Energy Savings	Electricity: 66,494 kWh Natural Gas: 249 Therms
Greenhouse Gas Emission Savings	35 Tons
Simple Payback	3.5 Years
Site Energy Savings (all utilities)	14%



On-site Generation Potential

Photovoltaic	Low
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			**45,227**	**10.6**	**-8**	**$6,640**	**$20,936**	**$5,145**	**$15,791**	**2.4**	**44,638**
ECM 1	Install LED Fixtures	Yes	7,066	0.0	0	$1,049	$3,562	$800	$2,762	2.6	7,116
ECM 2	Retrofit Fixtures with LED Lamps	Yes	38,160	10.6	-8	$5,591	$17,374	$4,345	$13,029	2.3	37,522
Lighting Control Measures			**11,871**	**3.3**	**-2**	**$1,739**	**$15,245**	**$5,290**	**$9,955**	**5.7**	**11,663**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	9,566	2.7	-2	$1,401	$10,070	$1,335	$8,735	6.2	9,399
ECM 4	Install High/Low Lighting Controls	Yes	2,305	0.6	0	$338	$5,175	$3,955	$1,220	3.6	2,265
Variable Frequency Drive (VFD) Measures			**9,200**	**1.1**	**26**	**$1,613**	**$11,163**	**$1,875**	**$9,288**	**5.8**	**12,316**
ECM 5	Install VFDs on Heating Water Pumps	Yes	6,069	1.1	0	$901	$8,152	$1,800	$6,352	7.1	6,112
ECM 6	Install VFDs on Kitchen Hood Fan Motors	Yes	3,130	0.0	26	$712	$3,010	$75	$2,935	4.1	6,204
Unitary HVAC Measures			**6,300**	**12.6**	**0**	**$935**	**$108,150**	**$8,925**	**$99,225**	**106.1**	**6,344**
ECM 7	Install High Efficiency Air Conditioning Units	No	6,300	12.6	0	$935	$108,150	$8,925	$99,225	106.1	6,344
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**87**	**$821**	**$38,302**	**$3,511**	**$34,792**	**42.4**	**10,139**
ECM 8	Install High Efficiency Hot Water Boilers	No	0	0.0	87	$821	$38,302	$3,511	$34,792	42.4	10,139
Domestic Water Heating Upgrade			**0**	**0.0**	**9**	**$85**	**$136**	**$76**	**$60**	**0.7**	**1,056**
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	9	$85	$136	$76	$60	0.7	1,056
Food Service & Refrigeration Measures			**197**	**0.0**	**0**	**$29**	**$303**	**$40**	**$263**	**9.0**	**198**
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	197	0.0	0	$29	$303	$40	$263	9.0	198
TOTALS (COST EFFECTIVE MEASURES)			**66,494**	**15.0**	**25**	**$10,106**	**$47,783**	**$12,426**	**$35,357**	**3.5**	**69,871**
TOTALS (ALL MEASURES)			**72,794**	**27.6**	**111**	**$11,862**	**$194,236**	**$24,862**	**$169,375**	**14.3**	**86,354**

* - All incentives presented in this table are included as placeholders 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 & Power (CHP)

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

Ongoing Electric Savings with Demand Response

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

2 Existing Conditions

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for West New York Early Childhood School (Hudson ECC). 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 August 26, 2021, TRC performed an energy audit at West New York Early Childhood School (Hudson ECC) located in West New York, New Jersey. TRC met with Rick Solares and Andy Garcia to review the facility operations and help focus our investigation on specific energy-using systems.

West New York Early Childhood School (Hudson ECC) is a two-story, 31,976 square foot building built in 2002. Spaces include classrooms and offices, as well as a multipurpose room, a kitchen, a conference room, corridors, stairwells, restrooms, storage rooms, and electrical and mechanical spaces.

Lighting for the facility is provided mainly by linear fluorescent T8 fixtures. Three rooftop units (RTUs) and two boilers provide cooling and heating to spaces. There is one passenger elevator located in the facility.

2.2 Building Occupancy

The facility is occupied from July to September, with the school year ending for students in July and restarting in September. The building is closed on the weekends, and the facility closes at 7:00 PM on weekdays. During a typical day, the facility is occupied by approximately 40 staff and 170 students.

Building Name	Weekday/Weekend	Operating Schedule
West New York Early Childhood School (Hudson ECC)	Weekday	6:00 AM - 7:00 PM
	Weekend	Closed

Figure 3 - Building Occupancy Schedule

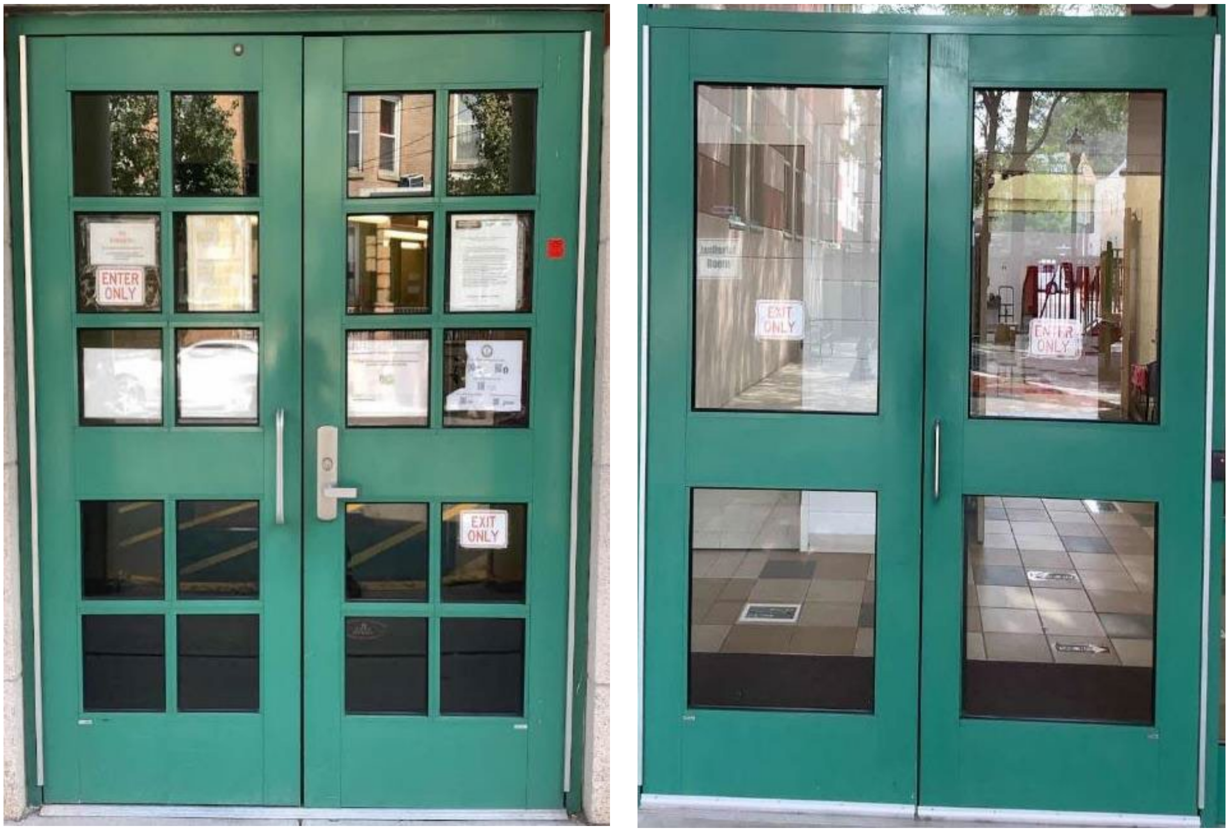
2.3 Building Envelope

West New York Early Childhood School (Hudson ECC) is a two-floor building. Building walls are concrete block over structural steel with a brick facade. The roof is flat and covered with a grey membrane, and it is in good condition.

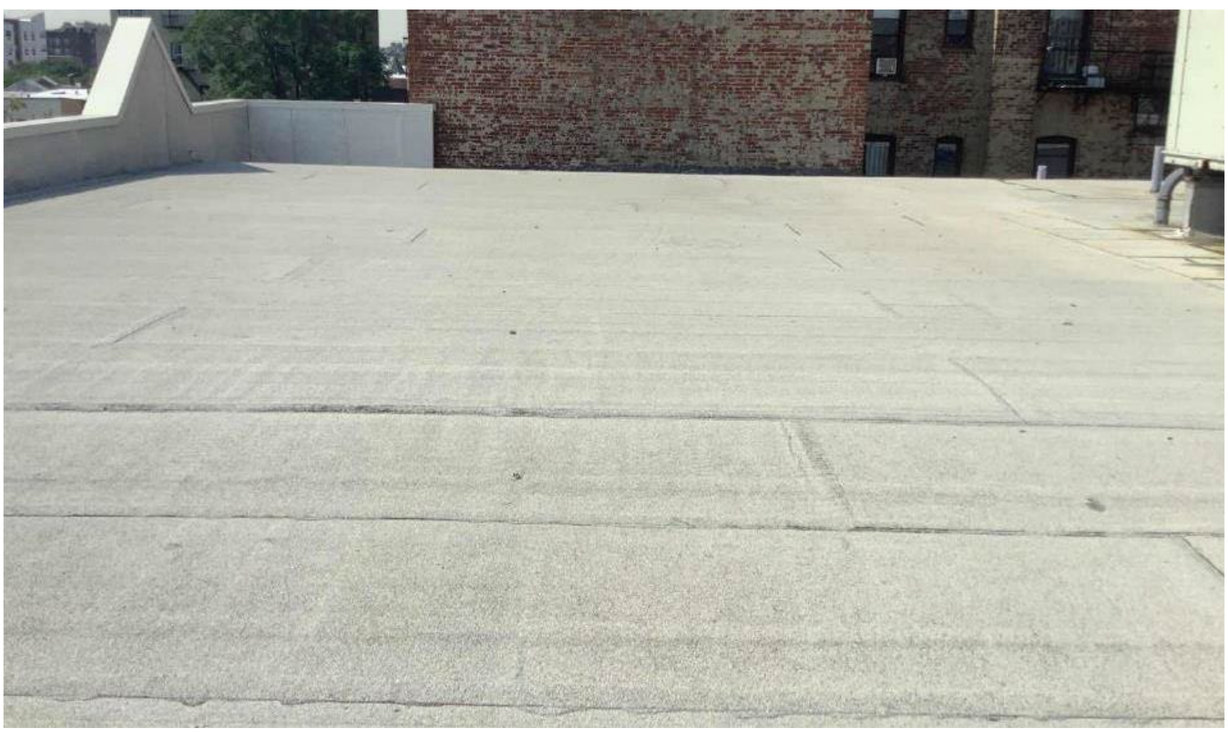
The windows are double glazed and have aluminum frames with thermal breaks. The glass-to-frame seals are in good condition. The operable window weather seals are in good condition, showing no evidence of excess wear. Exterior doors have aluminum frames and are in good condition with undamaged door seals. Overall, the building envelope appears in good condition.

Building Walls

Building Windows



Entrance & Exit Doors



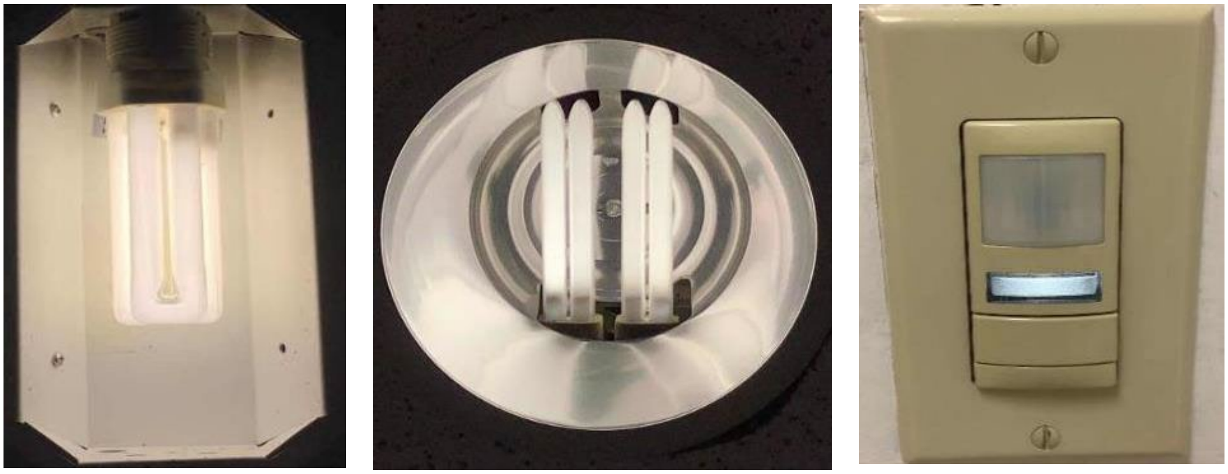
Roof

2.4 Lighting Systems

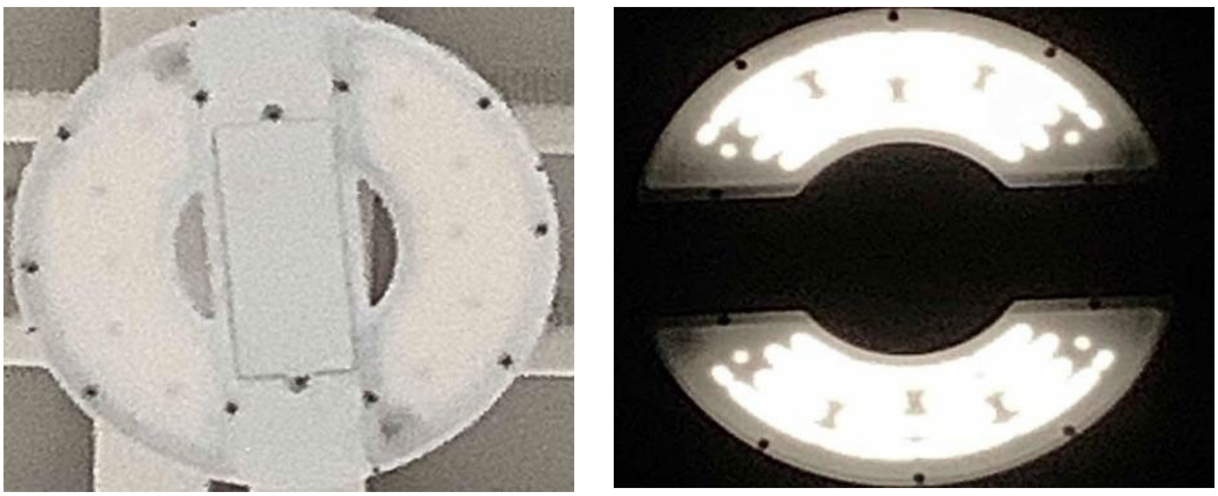
The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. Fixture types include 1-lamp, 2-lamp, 3-lamp, and 4-lamp, 4-foot long recessed, surface mounted, and pendant fixtures and 2-foot fixtures with linear tube lamps. Compact fluorescent lamps (CFL), incandescent, LED, and high-pressure sodium (HPS) lamps are also used in some spaces. Typically, CFLs at this site use 26-watts and 42-watts, incandescent lamps require 25-watts, and the HPS lamps draw 250-watts. Exit signs use LED sources. Gymnasium fixtures have manually controlled high-bay LED lamps.

Interior light fixtures are mainly controlled by manual wall switches, with some occupancy sensors used in restrooms. All light fixtures are in good condition. Interior lighting levels were generally sufficient. Exterior fixtures include canopy and wall mounted HPS, CFL, and incandescent fixtures. Exterior fixtures are timer controlled.

Linear Fluorescent T8 Fixtures



CFL Lamps & Occupancy Sensor



Gymnasium High Bay LED Fixtures

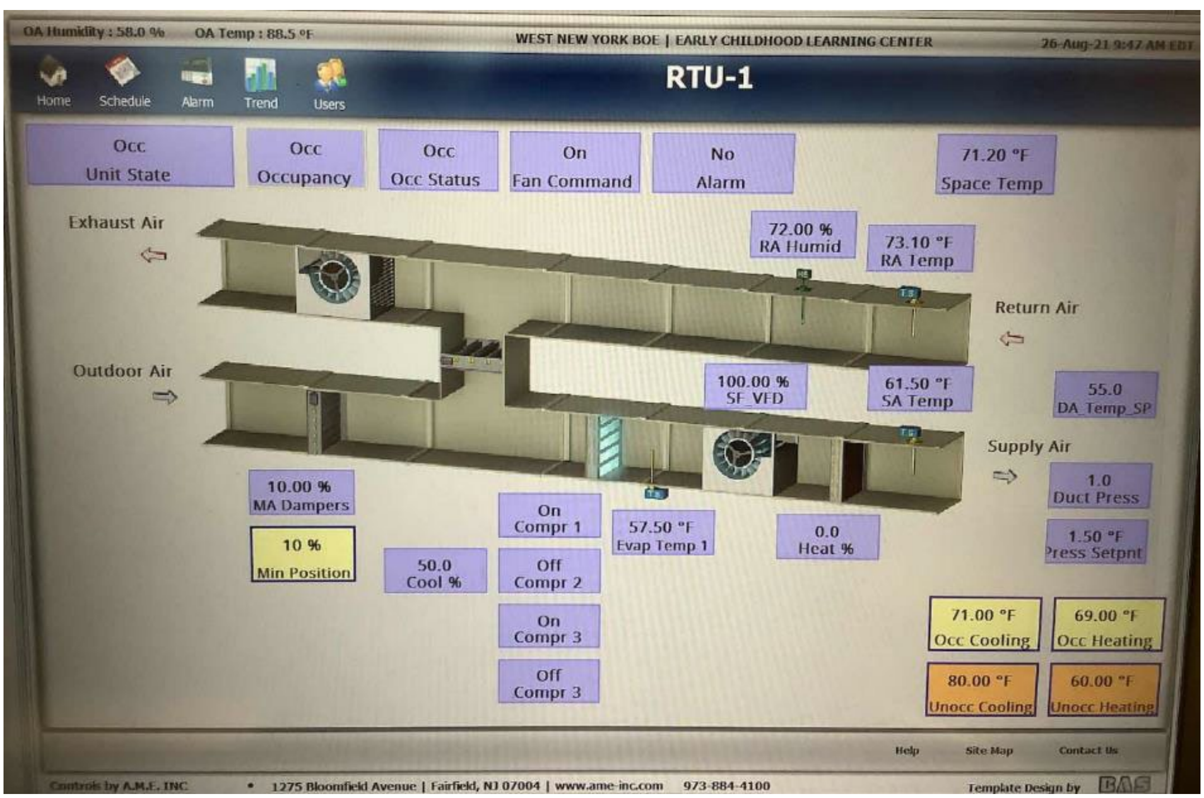
Exterior CFL & Incandescent Fixtures

2.5 Air Handling Systems

Packaged Units

The facility is conditioned by three Trane® packaged RTUs serving variable air volume boxes throughout the building, controlled by the on-site building energy management system (EMS). The units are equipped with variable frequency drive (VFD) controlled supply and exhaust fan motors, direct exchange cooling coils, and hot water heating coils. Hot water is supplied by the boilers. The units have cooling capacities that range between 25- to 40-tons, with estimated efficiencies of 10 EER. Installed in 2001, they are in fair condition.

Roof Top Unit RTU-1



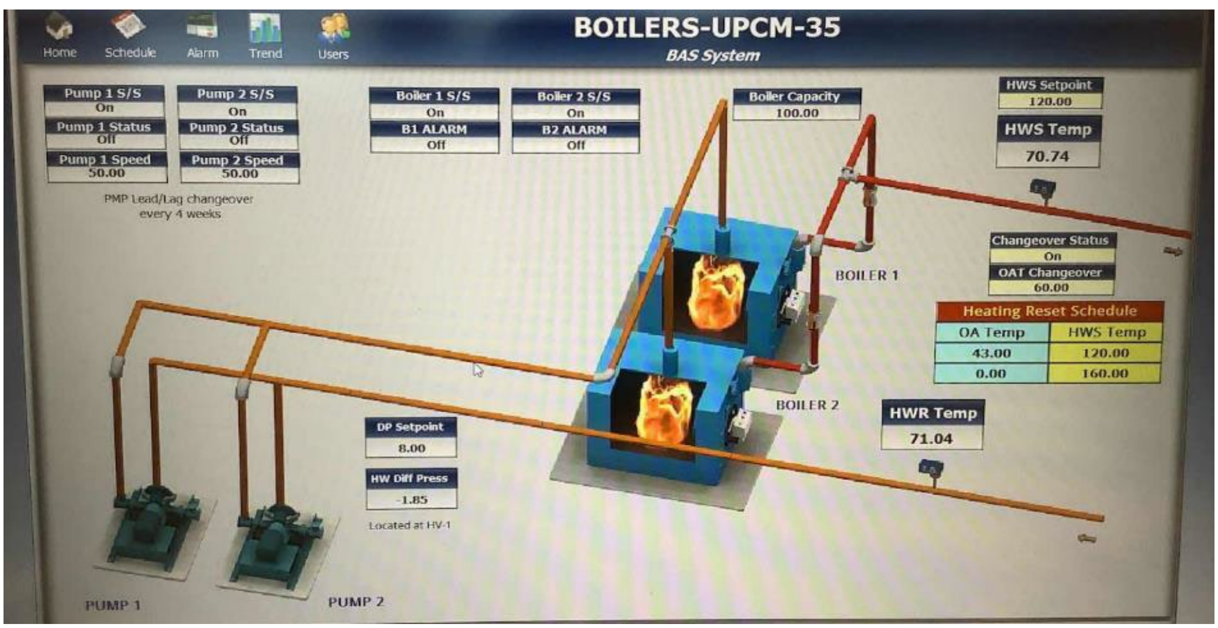
Roof Top Unit RTU-1 EMS Diagram View

2.6 Heating Hot Water Systems

The building heating system consists of two Lochinvar® gas-fired hot water boilers, each with an output capacity of 797.85 MBh. The burners are fully modulating at a nominal efficiency of 81%. The boilers are configured in a lead-lag control scheme and are controlled by the building's EMS. Both boilers are required under high load conditions. Installed in 2001, they are in fair condition. There is a service contract in place.

The boilers are configured in a constant flow primary distribution with two 5-hp constant speed hot water pumps operating with a lead-lag control scheme. The boilers provide hot water to the RTUs. Boiler schedules and temperatures are controlled and monitored using the on-site EMS.

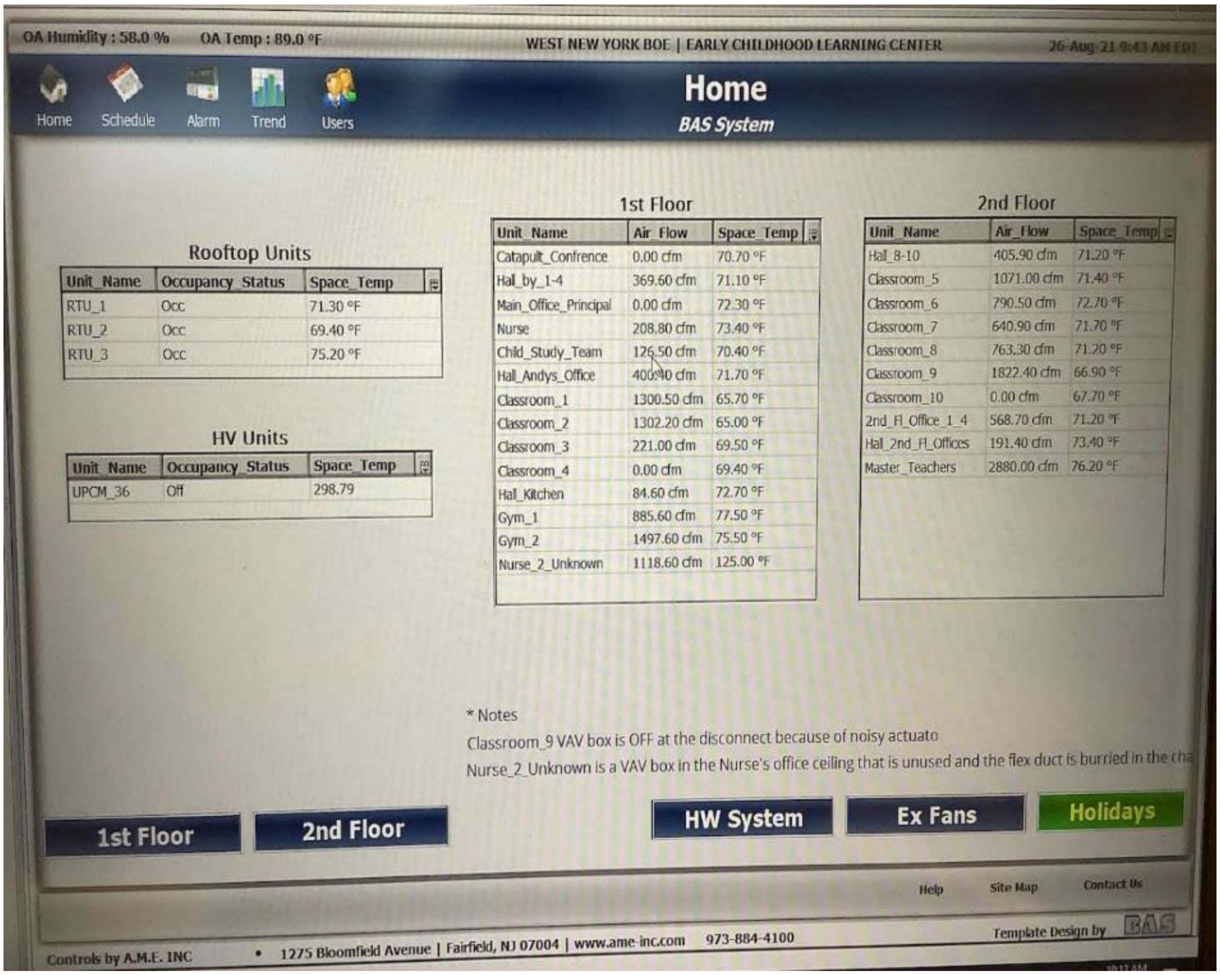
Hot Water Boiler & Heating Hot Water Pumps



Hot Water System EMS Diagram View

2.7 Building EMS

An A.M.E. Inc.® EMS controls the HVAC equipment, the boilers, and the RTUs. The EMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, humidity, and heating water loop temperatures.



Building EMS for Hudson ECC

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2.8 Domestic Hot Water

Hot water is produced by one 399 MBh gas-fired, 250-gallon capacity PVI® storage water heater. The unit was installed in 2001 and is in fair condition. Two 1/6 hp circulation pumps distribute water to end uses. The circulation pumps operate continuously. The domestic hot water pipes are insulated, and the insulation is in good condition.

Gas-fired Storage Tank Water Heater & Circulation Pumps

2.9 Food Service Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare meals for students. Most cooking is done using a convection gas-fired oven. Bulk prepared foods are held in several electric holding cabinets. One food holding cabinet is high efficiency with the remaining equipment being standard, and all are in good condition.

The dishwasher is a non-ENERGY STAR® high temperature, door type unit. There is no booster heater present.

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

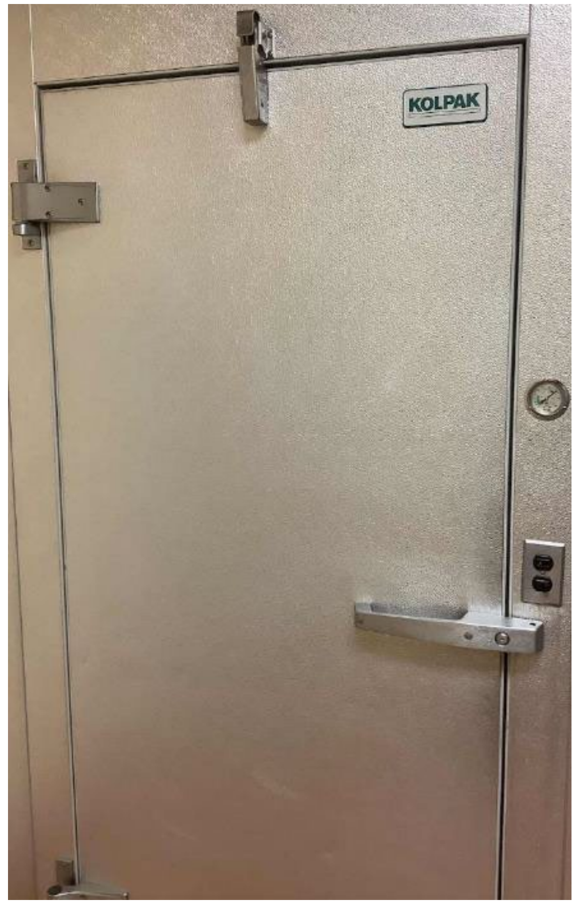

Gas-fired Convection Oven & Electric Holding Cabinet

2.10 Refrigeration

The kitchen has one stand-up refrigerator and one stand-up freezer with solid doors. All equipment is standard efficiency and in good condition.

The walk-in refrigerator has an estimated 0.54-ton compressor located on the roof and a one-fan evaporator. The unit is equipped with evaporator fan controls. There was also a walk-in freezer in the kitchen, but it was broken and has not been used for several years according to facility staff.

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



Stand-Up & Walk-in Refrigerators

2.11 Plug Load & Vending Machines

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

There are approximately 25 computer workstations throughout the facility. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as smartboards and typical office loads such as copiers, printers, microwaves, coffee machines, and mini fridges.

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

Residential Refrigerator & Copier Machine

2.12 Water-Using Systems

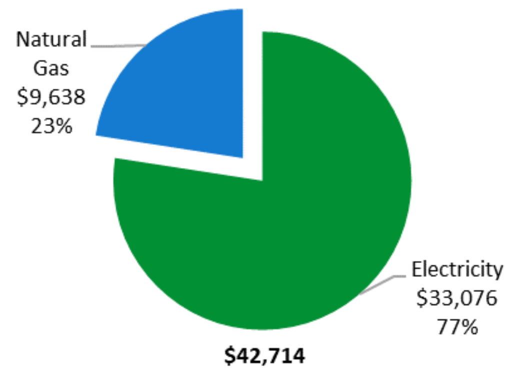
There are 15 restrooms throughout the facility with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher.

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	222,829 kWh	$33,076
Natural Gas	10,163 Therms	$9,638
Total		**$42,714**



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

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

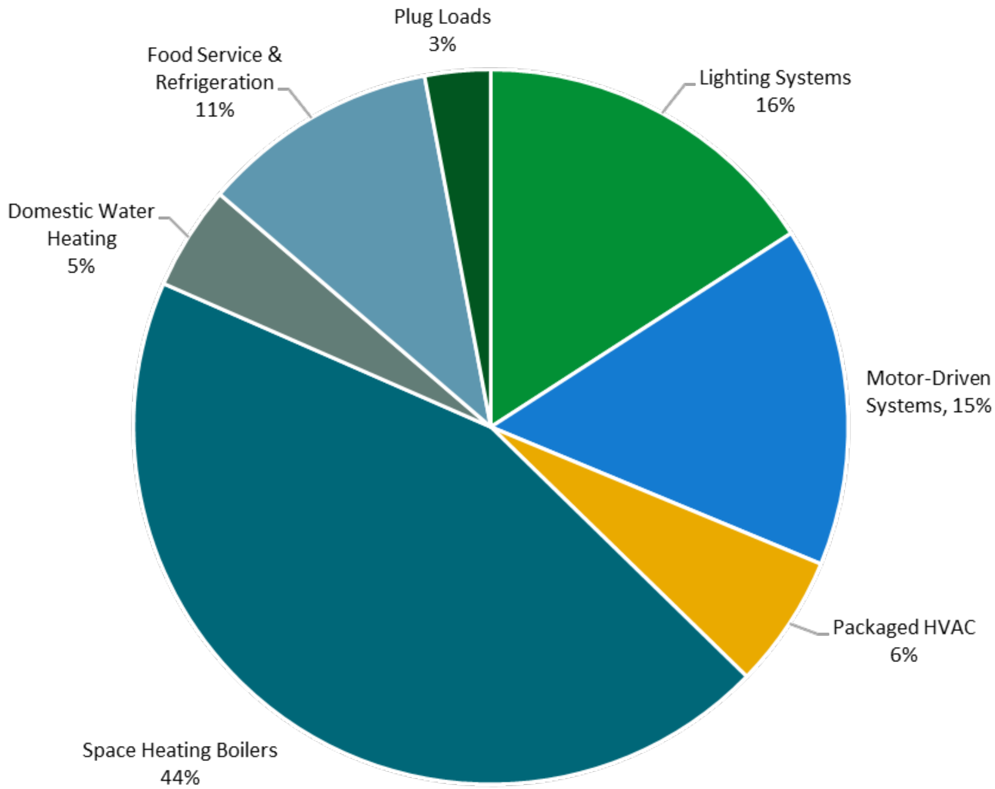
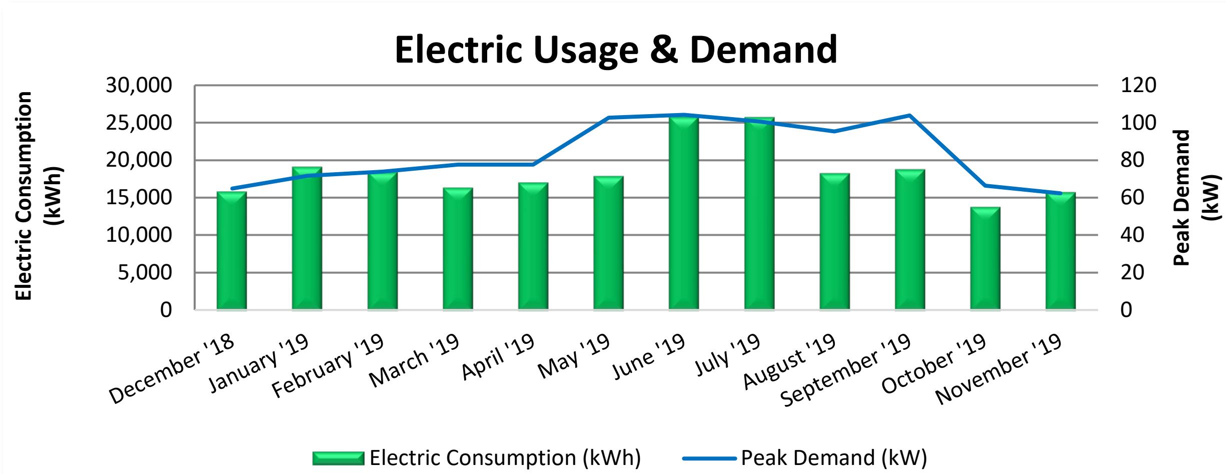


Figure 4 - Energy Balance

3.1 Electricity

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



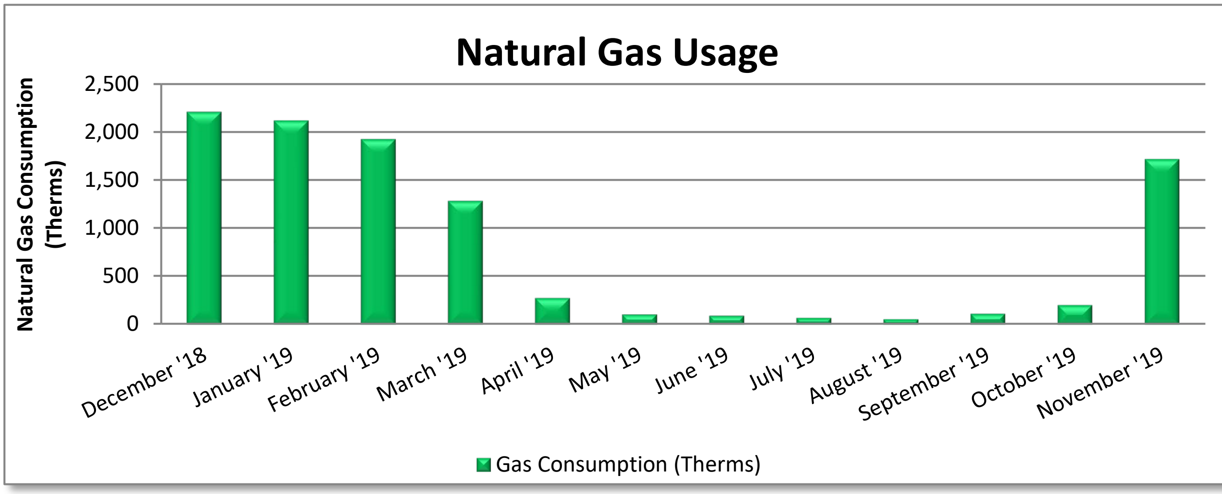
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
1/8/19	34	15,860	65	$244	$2,153
2/5/19	28	19,121	72	$268	$2,404
3/7/19	30	18,432	74	$277	$2,348
4/7/19	31	16,379	78	$281	$2,171
5/7/19	30	17,027	78	$281	$2,257
6/6/19	30	17,889	103	$1,300	$3,399
7/8/19	32	25,782	104	$1,320	$4,183
8/6/19	29	25,689	101	$1,274	$4,133
9/5/19	30	18,270	95	$1,208	$3,350
10/4/19	29	18,810	104	$390	$2,585
11/4/19	31	13,819	66	$250	$1,961
12/5/19	31	15,751	62	$234	$2,133
Totals	**365**	**222,829**	**104**	**$7,326**	**$33,076**
Annual	**365**	**222,829**	**104**	**$7,326**	**$33,076**

Notes:

- Peak demand of 104 kW occurred in June '19.
- Average demand over the past 12 months was 83 kW.
- The average electric cost over the past 12 months was $0.148/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

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



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
1/7/19	33	2,206	$1,788
2/5/19	29	2,117	$2,042
3/7/19	30	1,922	$1,784
4/7/19	31	1,284	$904
5/7/19	30	278	$195
6/6/19	30	106	$193
7/8/19	32	93	$186
8/6/19	29	69	$174
9/5/19	30	56	$167
10/4/19	29	115	$202
11/4/19	31	202	$527
12/5/19	31	1,716	$1,476
Totals	**365**	**10,163**	**$9,638**
Annual	**365**	**10,163**	**$9,638**

Notes:

- The average gas cost for the past 12 months is $0.948/therm, which is the blended rate used throughout the analysis.
- The reduced natural gas consumption from April '19 to October '19 likely reflects usage for domestic hot water and cooking equipment only.

3.3 Benchmarking

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

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

Benchmarking Score	58

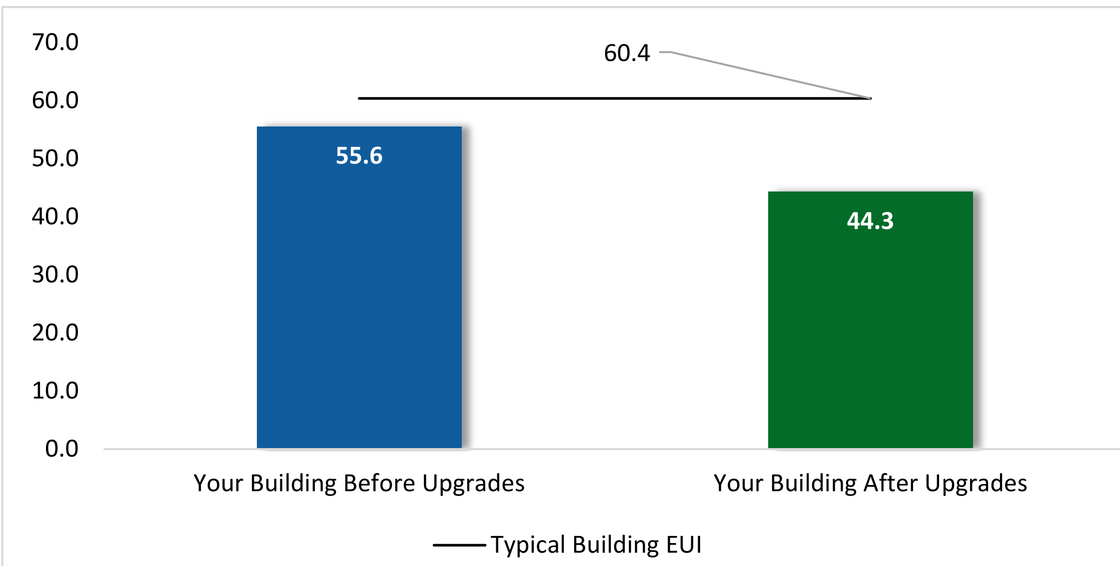


Figure 5 - Energy Use Intensity Comparison[3]

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

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

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

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

4 Energy Conservation Measures

The goal of this audit report is to identify and evaluate potential energy efficiency improvements 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			**45,227**	**10.6**	**-8**	**$6,640**	**$20,936**	**$5,145**	**$15,791**	**2.4**	**44,638**
ECM 1	Install LED Fixtures	Yes	7,066	0.0	0	$1,049	$3,562	$800	$2,762	2.6	7,116
ECM 2	Retrofit Fixtures with LED Lamps	Yes	38,160	10.6	-8	$5,591	$17,374	$4,345	$13,029	2.3	37,522
Lighting Control Measures			**11,871**	**3.3**	**-2**	**$1,739**	**$15,245**	**$5,290**	**$9,955**	**5.7**	**11,663**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	9,566	2.7	-2	$1,401	$10,070	$1,335	$8,735	6.2	9,399
ECM 4	Install High/Low Lighting Controls	Yes	2,305	0.6	0	$338	$5,175	$3,955	$1,220	3.6	2,265
Variable Frequency Drive (VFD) Measures			**9,200**	**1.1**	**26**	**$1,613**	**$11,163**	**$1,875**	**$9,288**	**5.8**	**12,316**
ECM 5	Install VFDs on Heating Water Pumps	Yes	6,069	1.1	0	$901	$8,152	$1,800	$6,352	7.1	6,112
ECM 6	Install VFDs on Kitchen Hood Fan Motors	Yes	3,130	0.0	26	$712	$3,010	$75	$2,935	4.1	6,204
Unitary HVAC Measures			**6,300**	**12.6**	**0**	**$935**	**$108,150**	**$8,925**	**$99,225**	**106.1**	**6,344**
ECM 7	Install High Efficiency Air Conditioning Units	No	6,300	12.6	0	$935	$108,150	$8,925	$99,225	106.1	6,344
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**87**	**$821**	**$38,302**	**$3,511**	**$34,792**	**42.4**	**10,139**
ECM 8	Install High Efficiency Hot Water Boilers	No	0	0.0	87	$821	$38,302	$3,511	$34,792	42.4	10,139
Domestic Water Heating Upgrade			**0**	**0.0**	**9**	**$85**	**$136**	**$76**	**$60**	**0.7**	**1,056**
ECM 9	Install Low-Flow DHW Devices	Yes	0	0.0	9	$85	$136	$76	$60	0.7	1,056
Food Service & Refrigeration Measures			**197**	**0.0**	**0**	**$29**	**$303**	**$40**	**$263**	**9.0**	**198**
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	197	0.0	0	$29	$303	$40	$263	9.0	198
TOTALS			**72,794**	**27.6**	**111**	**$11,862**	**$194,236**	**$24,862**	**$169,375**	**14.3**	**86,354**

* - All incentives presented in this table are included as placeholders 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		**45,227**	**10.6**	**-8**	**$6,640**	**$20,936**	**$5,145**	**$15,791**	**2.4**	**44,638**
ECM 1	Install LED Fixtures	7,066	0.0	0	$1,049	$3,562	$800	$2,762	2.6	7,116
ECM 2	Retrofit Fixtures with LED Lamps	38,160	10.6	-8	$5,591	$17,374	$4,345	$13,029	2.3	37,522
Lighting Control Measures		**11,871**	**3.3**	**-2**	**$1,739**	**$15,245**	**$5,290**	**$9,955**	**5.7**	**11,663**
ECM 3	Install Occupancy Sensor Lighting Controls	9,566	2.7	-2	$1,401	$10,070	$1,335	$8,735	6.2	9,399
ECM 4	Install High/Low Lighting Controls	2,305	0.6	0	$338	$5,175	$3,955	$1,220	3.6	2,265
Variable Frequency Drive (VFD) Measures		**9,200**	**1.1**	**26**	**$1,613**	**$11,163**	**$1,875**	**$9,288**	**5.8**	**12,316**
ECM 5	Install VFDs on Heating Water Pumps	6,069	1.1	0	$901	$8,152	$1,800	$6,352	7.1	6,112
ECM 6	Install VFDs on Kitchen Hood Fan Motors	3,130	0.0	26	$712	$3,010	$75	$2,935	4.1	6,204
Domestic Water Heating Upgrade		**0**	**0.0**	**9**	**$85**	**$136**	**$76**	**$60**	**0.7**	**1,056**
ECM 9	Install Low-Flow DHW Devices	0	0.0	9	$85	$136	$76	$60	0.7	1,056
Food Service & Refrigeration Measures		**197**	**0.0**	**0**	**$29**	**$303**	**$40**	**$263**	**9.0**	**198**
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	197	0.0	0	$29	$303	$40	$263	9.0	198
TOTALS		**66,494**	**15.0**	**25**	**$10,106**	**$47,783**	**$12,426**	**$35,357**	**3.5**	**69,871**

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

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

Figure 7 – 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		**45,227**	**10.6**	**-8**	**$6,640**	**$20,936**	**$5,145**	**$15,791**	**2.4**	**44,638**
ECM 1	Install LED Fixtures	7,066	0.0	0	$1,049	$3,562	$800	$2,762	2.6	7,116
ECM 2	Retrofit Fixtures with LED Lamps	38,160	10.6	-8	$5,591	$17,374	$4,345	$13,029	2.3	37,522

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

ECM 1: Install LED Fixtures

Replace existing fixtures containing high intensity discharge (HID) lamps with new LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

In some cases, HID fixtures can be retrofit with screw-based LED lamps. Replacing an existing HID fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing the HID lamp with a LED screw-in lamp is typically a less expensive retrofit. We recommend you work with your lighting contractor to determine which retrofit solution is best suited to your needs and will be compatible with the existing fixtures.

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

Affected building areas: exterior high-pressure sodium (HPS) fixtures.

ECM 2: Retrofit Fixtures with LED Lamps

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

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

Affected building areas: all areas with CFL lamps and fluorescent fixtures with T8 tubes, exterior incandescent fixtures.

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		**11,871**	**3.3**	**-2**	**$1,739**	**$15,245**	**$5,290**	**$9,955**	**5.7**	**11,663**
ECM 3	Install Occupancy Sensor Lighting Controls	9,566	2.7	-2	$1,401	$10,070	$1,335	$8,735	6.2	9,399
ECM 4	Install High/Low Lighting Controls	2,305	0.6	0	$338	$5,175	$3,955	$1,220	3.6	2,265

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 room, classrooms, multipurpose room, 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.

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

Affected building areas: hallways and stairwells.

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

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**9,200**	**1.1**	**26**	**$1,613**	**$11,163**	**$1,875**	**$9,288**	**5.8**	**12,316**
ECM 5	Install VFDs on Heating Water Pumps	6,069	1.1	0	$901	$8,152	$1,800	$6,352	7.1	6,112
ECM 6	Install VFDs on Kitchen Hood Fan Motors	3,130	0.0	26	$712	$3,010	$75	$2,935	4.1	6,204

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

ECM 5: Install VFDs on Heating Water Pumps

Install VFDs to control heating water pumps. Two-way valves must serve the hot water coils and the hot water loop must have a differential pressure sensor installed. If 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: heating hot water pumps.

ECM 6: Install VFDs on Kitchen Hood Fan Motors

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

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

4.4 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**6,300**	**12.6**	**0**	**$935**	**$108,150**	**$8,925**	**$99,225**	**106.1**	**6,344**
ECM 7	Install High Efficiency Air Conditioning Units	6,300	12.6	0	$935	$108,150	$8,925	$99,225	106.1	6,344

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

ECM 7: Install High Efficiency Air Conditioning Units

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

Affected units: RTU 1 – 3.

4.5 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**87**	**$821**	**$38,302**	**$3,511**	**$34,792**	**42.4**	**10,139**
ECM 8	Install High Efficiency Hot Water Boilers	0	0.0	87	$821	$38,302	$3,511	$34,792	42.4	10,139

ECM 8: Install High Efficiency Hot Water Boilers

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

The most notable efficiency improvement is condensing hydronic boilers which can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F. Therefore, condensing hydronic boilers are evaluated when the return water temperature is less than 130°F during most of the operating hours.

For the purposes of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load. In many cases installing multiple modular boilers rather than one or two large boilers will result in higher overall plant efficiency while providing additional system redundancy.

Replacing the boilers has a long payback 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 boiler is eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes. We also recommend working with your mechanical design team to determine whether the heating system can operate with return water temperatures below 130°F, which would allow the use of condensing boilers.

4.6 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**9**	**$85**	**$136**	**$76**	**$60**	**0.7**	**1,056**
ECM 9	Install Low-Flow DHW Devices	0	0.0	9	$85	$136	$76	$60	0.7	1,056

ECM 9: Install Low-Flow Domestic Hot Water (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.

4.7 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**197**	**0.0**	**0**	**$29**	**$303**	**$40**	**$263**	**9.0**	**198**
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	197	0.0	0	$29	$303	$40	$263	9.0	198

ECM 10: Refrigerator/Freezer Case Electrically Commutated Motors

Replace shaded pole or permanent split capacitor motors with electronically commutated (EC) motors in the walk-in cooler. Fractional horsepower EC motors are significantly more efficient than mechanically commutated, brushed motors, particularly at low speeds or partial load. By using variable-speed technology, EC motors can optimize fan usage. Because these motors are brushless and use DC power, losses due to friction and phase shifting are eliminated.

Savings for this measure consider both the increased efficiency of the motor as well as the reduction in refrigeration load due to motor heat loss.

5 ENERGY EFFICIENT BEST PRACTICES

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

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

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

Energy Tracking with ENERGY STAR® Portfolio Manager®

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

Weatherization

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

Doors and Windows

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

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

Lighting Maintenance

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

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

Lighting Controls

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

Motor Maintenance

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

Fans to Reduce Cooling Load

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

Economizer Maintenance

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

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

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

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 check for fire dampers or balancing dampers that have failed closed.

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

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

Boiler Maintenance

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

Water Heater Maintenance

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

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

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

Water Conservation

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

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

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

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

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

[7] 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 low 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.

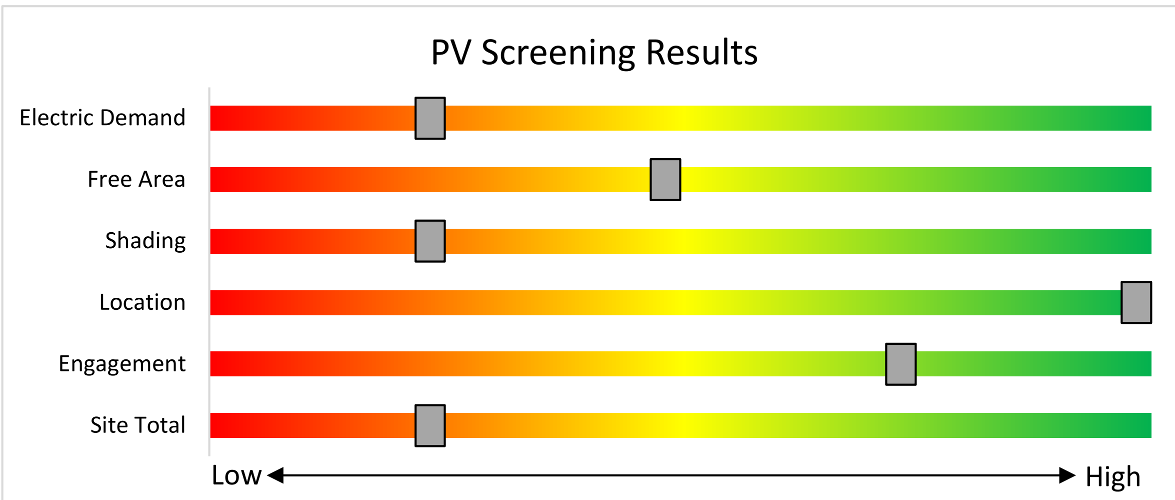

Figure 8 - Photovoltaic Screening

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.

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

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

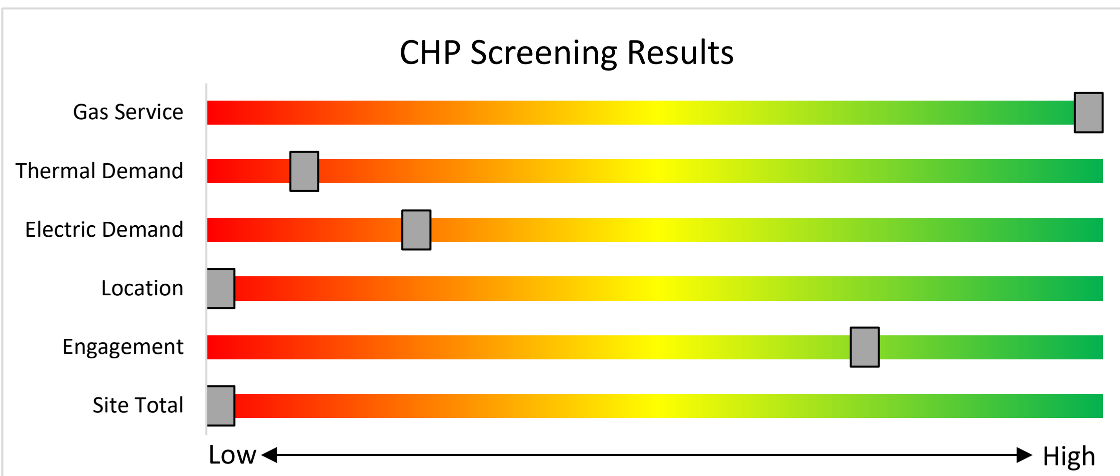

Figure 9 - Combined Heat and Power Screening

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

7 Project Funding and Incentives

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

7.1 Utility Energy Efficiency Programs

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 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 ECMs, ensuring that ESIP projects are cash flow positive for the life of the contract.

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

How to Participate

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

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

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

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

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

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

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

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. 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 includes the review of multiple bids for project work, incorporate potential operational & maintenance (O&M) cost savings and maximize your incentive potential.

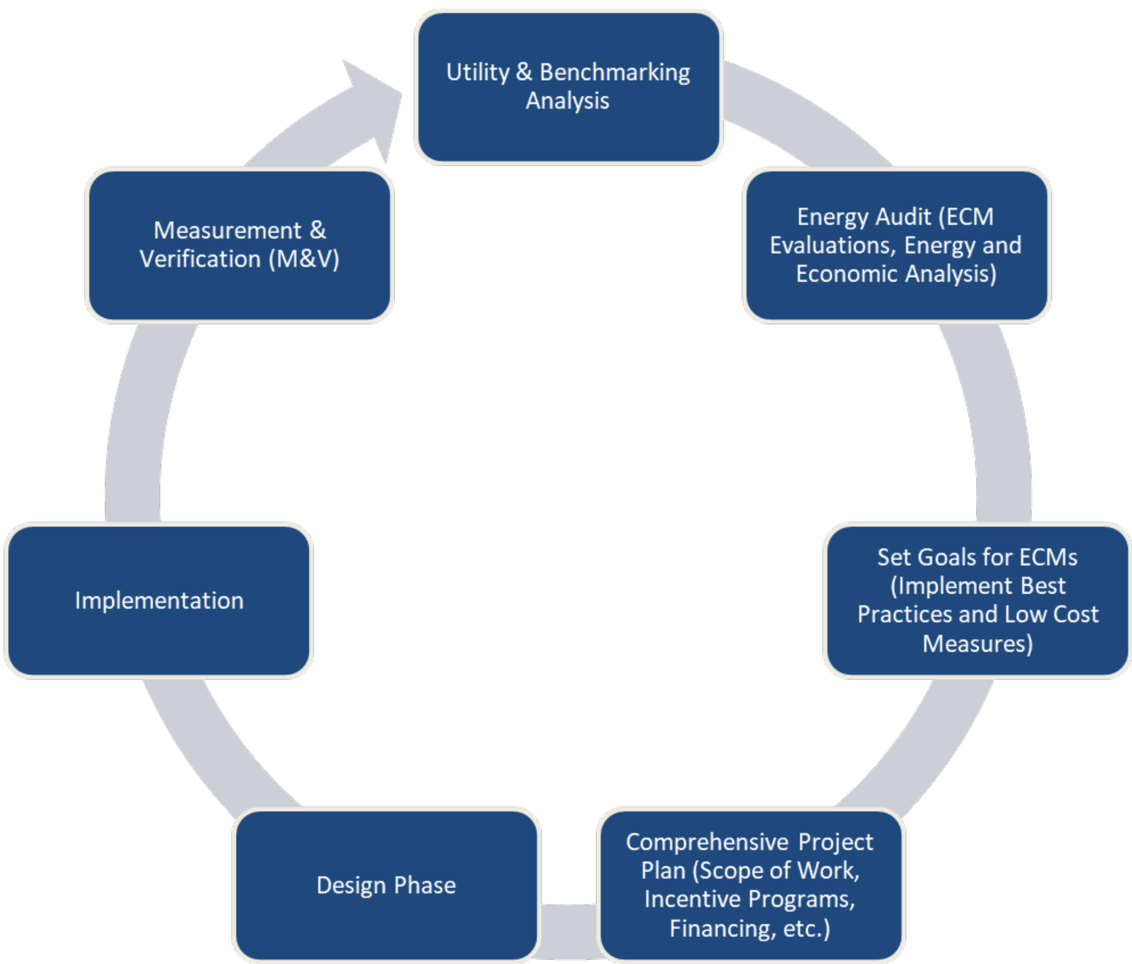

Figure 10 – Project Development Cycle

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. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

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

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

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 that fluctuate monthly. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third-party supplier for natural gas commodity.

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

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Boiler Room	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,830	2	Relamp	No	13	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,830	0.3	864	0	$127	$475	$130	2.7
Classroom 1	5	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,288	2, 3	Relamp	Yes	5	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.1	333	0	$49	$125	$10	2.4
Classroom 1	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,288	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,579	0.1	221	0	$32	$73	$20	1.6
Classroom 1	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.2	845	0	$124	$562	$115	3.6
Classroom 1	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.4	1,268	0	$186	$708	$155	3.0
Classroom 2	5	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,288	2, 3	Relamp	Yes	5	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.1	333	0	$49	$125	$10	2.4
Classroom 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,288	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,579	0.1	221	0	$32	$73	$20	1.6
Classroom 2	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.2	845	0	$124	$562	$115	3.6
Classroom 2	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.4	1,268	0	$186	$708	$155	3.0
Classroom 3	5	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,288	2, 3	Relamp	Yes	5	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.1	333	0	$49	$125	$10	2.4
Classroom 3	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,288	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,579	0.1	221	0	$32	$73	$20	1.6
Classroom 3	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.2	845	0	$124	$562	$115	3.6
Classroom 3	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.4	1,268	0	$186	$708	$155	3.0
Classroom 4	4	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,288	2, 3	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.1	266	0	$39	$100	$8	2.4
Classroom 4	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,288	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,579	0.1	221	0	$32	$73	$20	1.6
Classroom 4	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.2	845	0	$124	$562	$115	3.6
Classroom 4	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.2	793	0	$116	$544	$110	3.7
Conference Room	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.5	1,744	0	$255	$872	$200	2.6
Corridor 1st	4	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,640	2, 4	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	37	1,822	0.1	307	0	$45	$325	$148	3.9
Corridor 1st	4	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,640	2, 4	Relamp	Yes	4	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	37	1,822	0.1	307	0	$45	$325	$148	3.9
Corridor 1st	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
Corridor 1st	2	LED - Fixtures: Ceiling Mount	Wall Switch	S	20	2,640	4	None	Yes	2	LED - Fixtures: Ceiling Mount	High/Low Control	20	1,822	0.0	36	0	$5	$0	$0	0.0
Corridor 1st	30	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,640	2, 4	Relamp	Yes	30	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,822	0.5	1,916	0	$281	$1,673	$1,200	1.7
Corridor 2nd	1	Compact Fluorescent: (1) 42W Double Biaxial Plug-In Lamp	Wall Switch	S	42	2,640	2, 4	Relamp	Yes	1	LED Lamps: PL-L (Biax) Lamps	High/Low Control	30	1,822	0.0	62	0	$9	$14	$1	1.4

	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 2nd	2	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,640	2, 4	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	37	1,822	0.0	154	0	$23	$50	$4	2.0
Corridor 2nd	8	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 2nd	34	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,640	2, 4	Relamp	Yes	34	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,822	0.5	2,172	0	$318	$1,971	$1,360	1.9
Corridor 2nd	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,640	2, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,822	0.2	976	0	$143	$742	$360	2.7
Corridor Kitchen Receiving	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 Kitchen Receiving	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,640	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,640	0.0	144	0	$21	$55	$15	1.9
Corridor Middle Floor	1	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,640	2, 4	Relamp	Yes	1	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	37	1,822	0.0	77	0	$11	$25	$2	2.0
Corridor Middle Floor	6	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,640	2, 4	Relamp	Yes	6	LED Lamps: GX23 (Plug-In) Lamps	High/Low Control	37	1,822	0.1	461	0	$68	$375	$222	2.3
Corridor Middle 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 Middle Floor	7	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,640	2, 4	Relamp	Yes	7	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	1,822	0.1	447	0	$65	$578	$280	4.5
Electrical Room 1st Floor	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	660	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	455	0.1	61	0	$9	$189	$40	16.7
Electrical Room 1st Floor #2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	660	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	455	0.0	30	0	$4	$37	$10	5.9
Electrical Room Security	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	660	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	660	0.0	24	0	$4	$37	$10	7.6
Elevator	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	2,288	3	None	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,579	0.0	23	0	$3	$116	$20	29.0
Kitchen	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
Kitchen	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,288	2, 3	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,579	0.5	1,862	0	$273	$1,000	$235	2.8
Main Entrance	2	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,860	2, 3	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,973	0.0	167	0	$24	$166	$24	5.8
Main Entrance	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
Main Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,860	2, 3	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,973	0.2	698	0	$102	$489	$95	3.9
Multipurpose / Gymnasium	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
Multipurpose / Gymnasium	8	LED - Fixtures: High-Bay	Wall Switch	S	100	2,288	3	None	Yes	8	LED - Fixtures: High-Bay	Occupancy Sensor	100	1,579	0.2	624	0	$91	$270	$35	2.6
Multipurpose / Gymnasium	6	LED - Fixtures: Wall Sconces	Wall Switch	S	20	2,288	3	None	Yes	6	LED - Fixtures: Wall Sconces	Occupancy Sensor	20	1,579	0.0	94	0	$14	$270	$35	17.1
Office - CST	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.3	951	0	$139	$599	$125	3.4
Office - Nurse	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,288	2, 3	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,579	0.3	1,117	0	$164	$708	$155	3.4
Office - Principal	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,288	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,579	0.1	372	0	$55	$262	$60	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
Office - Security	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,288	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,579	0.1	372	0	$55	$262	$60	3.7
Restroom - Class 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Restroom - Class 2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Restroom - Class 3	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Restroom - Class 4	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Restroom - Female 1st Floor	1	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	None	S	52	2,288	2, 3	Relamp	Yes	1	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.0	67	0	$10	$25	$2	2.4
Restroom - Female 1st Floor	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	2,288	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.1	317	0	$46	$380	$65	6.8
Restroom - Male 1st Floor	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	2,288	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.1	317	0	$46	$380	$65	6.8
Restroom - Nurse	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Stairs A	4	Compact Fluorescent: (1) 42W Triple Biaxial Plug-In Lamp	Wall Switch		42	2,640	2, 4	Relamp	Yes	4	LED Lamps: PL-L (Biax) Lamps	High/Low Control	30	1,822	0.1	247	0	$36	$279	$144	3.7
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 B	8	Compact Fluorescent: (1) 42W Triple Biaxial Plug-In Lamp	Wall Switch		42	2,640	2, 4	Relamp	Yes	8	LED Lamps: PL-L (Biax) Lamps	High/Low Control	30	1,822	0.1	495	0	$72	$558	$288	3.7
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
Stairs C	8	Compact Fluorescent: (1) 42W Triple Biaxial Plug-In Lamp	Wall Switch		42	2,640	2, 4	Relamp	Yes	8	LED Lamps: PL-L (Biax) Lamps	High/Low Control	30	1,822	0.1	495	0	$72	$558	$288	3.7
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
Storage Gym	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	660	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	660	0.0	24	0	$4	$37	$10	7.6
Storage Kitchen	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	660	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	660	0.0	24	0	$4	$37	$10	7.6
Classroom 10	1	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,288	2, 3	Relamp	Yes	1	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.0	67	0	$10	$25	$2	2.4
Classroom 10	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,288	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,579	0.1	221	0	$32	$73	$20	1.6
Classroom 10	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.2	845	0	$124	$562	$115	3.6
Classroom 10	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.3	951	0	$139	$599	$125	3.4
Classroom 5	3	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,288	2, 3	Relamp	Yes	3	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.1	200	0	$29	$75	$6	2.4
Classroom 5	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.2	845	0	$124	$562	$115	3.6
Classroom 5	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.3	1,110	0	$163	$653	$140	3.2
Classroom 6	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.2	845	0	$124	$562	$115	3.6

	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 6	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.5	1,744	0	$255	$872	$200	2.6
Classroom 7	2	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,288	2, 3	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.0	133	0	$20	$50	$4	2.4
Classroom 7	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,288	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,579	0.1	221	0	$32	$73	$20	1.6
Classroom 7	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.2	845	0	$124	$562	$115	3.6
Classroom 7	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.4	1,427	0	$209	$763	$170	2.8
Classroom 8	2	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,288	2, 3	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.0	133	0	$20	$50	$4	2.4
Classroom 8	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,288	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,579	0.1	221	0	$32	$73	$20	1.6
Classroom 8	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.2	845	0	$124	$562	$115	3.6
Classroom 8	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.4	1,427	0	$209	$763	$170	2.8
Classroom 9	2	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,288	2, 3	Relamp	Yes	2	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.0	133	0	$20	$50	$4	2.4
Classroom 9	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,288	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,579	0.1	221	0	$32	$73	$20	1.6
Classroom 9	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,579	0.2	845	0	$124	$562	$115	3.6
Classroom 9	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.4	1,427	0	$209	$763	$170	2.8
Classroom Greenhouse	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,288	2, 3	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,579	0.3	1,117	0	$164	$708	$155	3.4
Electrical Room 2nd Floor	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	660	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	660	0.0	24	0	$4	$37	$10	7.6
Janitor Closet 1st Floor	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	660	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	660	0.0	24	0	$4	$37	$10	7.6
Janitor Closet 2nd Floor	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	660	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	660	0.0	24	0	$4	$37	$10	7.6
Mechanical Elevator	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	660	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	660	0.0	24	0	$4	$37	$10	7.6
Office - 2nd Floor #1	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,288	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,579	0.1	372	0	$55	$262	$60	3.7
Office - 2nd Floor #2	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,288	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,579	0.1	372	0	$55	$262	$60	3.7
Office - 2nd Floor #3	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,288	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,579	0.1	372	0	$55	$262	$60	3.7
Office - 2nd Floor #4	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,288	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,579	0.1	372	0	$55	$262	$60	3.7
Office - Custodian	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.1	476	0	$70	$434	$80	5.1
Office - Social Workers	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,288	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,579	0.4	1,268	0	$186	$708	$155	3.0
Office - Social Workers #2	6	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Wall Switch	S	52	2,288	2, 3	Relamp	Yes	6	LED Lamps: GX23 (Plug-In) Lamps	Occupancy Sensor	37	1,579	0.1	400	0	$59	$420	$47	6.4

	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 - Class 10	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Restroom - Class 5	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Restroom - Class 6	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Restroom - Class 7	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Restroom - Class 8	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Restroom - Class 9	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,288	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,288	0.0	83	0	$12	$37	$10	2.2
Restroom - Female 2nd Floor	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,973	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.0	72	0	$10	$37	$10	2.5
Restroom - Male 2nd Floor	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,973	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,973	0.0	72	0	$10	$37	$10	2.5
Exterior	1	Compact Fluorescent: (2) 26W Double Biaxial Plug-In Lamps	Timeclock		52	4,015	2	Relamp	No	1	LED Lamps: GX23 (Plug-In) Lamps	Timeclock	37	4,015	0.0	60	0	$9	$25	$2	2.6
Exterior	2	Compact Fluorescent: (1) 42W Triple Biaxial Plug-In Lamp	Timeclock		42	4,015	2	Relamp	No	2	LED Lamps: PL-L (Biax) Lamps	Timeclock	30	4,015	0.0	96	0	$14	$27	$2	1.7
Exterior	8	High-Pressure Sodium: (1) 250W Lamp	Timeclock		295	4,015	1	Fixture Replacement	No	8	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	75	4,015	0.0	7,066	0	$1,049	$3,562	$800	2.6
Exterior	3	Incandescent: (4) 25W Screw-in Lamps	Timeclock		100	4,015	2	Relamp	No	3	LED Lamps: (4) B10 Lamps	Timeclock	15	4,015	0.0	1,024	0	$152	$291	$0	1.9
Storage Outdoor	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	660	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	455	0.1	61	0	$9	$189	$20	18.9

Motor Inventory & Recommendations

		Existing Conditions									Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Manufacturer	Model	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Domestic Hot Water	1	Combustion Air Fan	0.3	65.0%	No	Dayton		W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Kitchen	1	Kitchen Hood Exhaust Fan	1.0	82.5%	No	Cook		W	5,250	6	No	85.5%	Yes	1	0.0	3,130	26	$712	$3,010	$75	4.1
Roof	School Building	2	Exhaust Fan	0.3	62.5%	No	Cook		W	2,340		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Domestic Hot Water	2	DHW Circulation Pump	0.2	60.0%	No	Grundfos		W	8,760		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Elevator	Elevator	1	Other	20.0	91.0%	No	Thyssen Krupp		W	300		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Sump Pump	1	Process Pump	0.3	62.5%	No			W	730		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Heating System	2	Heating Hot Water Pump	5.0	87.5%	No	US Motors		W	1,825	5	No	89.5%	Yes	2	1.1	6,069	0	$901	$8,152	$1,800	7.1
Roof	RTU1	1	Supply Fan	15.0	91.0%	Yes	Trane		B	1,925		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU1	1	Exhaust Fan	7.5	88.5%	Yes	Trane		B	1,925		No	88.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU2	1	Supply Fan	15.0	91.0%	Yes	Trane		B	1,980		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU2	1	Exhaust Fan	7.5	88.5%	Yes	Trane		B	1,980		No	88.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU3	1	Supply Fan	10.0	89.5%	Yes	Trane		B	1,870		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU3	1	Exhaust Fan	3.0	86.5%	Yes	Trane		B	1,870		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0

Packaged HVAC Inventory & Recommendations

		Existing Conditions									Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/IEER/EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Roof	School Building	1	Package Unit	40.00	300.00	10.00		Trane	SLHFC-40	B	7	Yes	1	Package Unit	40.00	300.00	12.50		4.8	2,400	0	$356	$41,194	$3,400	106.1
Roof	School Building	1	Package Unit	40.00	300.00	10.00		Trane	SLHFC-40	B	7	Yes	1	Package Unit	40.00	300.00	12.50		4.8	2,400	0	$356	$41,194	$3,400	106.1
Roof	School Building	1	Package Unit	25.00	150.00	10.00		Trane	SLHFC-25	B	7	Yes	1	Package Unit	25.00	150.00	12.50		3.0	1,500	0	$223	$25,763	$2,125	106.2

Space Heating Boiler Inventory & Recommendations

		Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Heating System	2	Non-Condensing Hot Water Boiler	798	Lochinvar	CBN0985	B	8	Yes	2	Condensing Hot Water Boiler	798	91.00%	Et	0.0	0	87	$821	$38,302	$3,511	42.4

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	PVI	500N 250A-TP	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
West New York Early Childhood School (Hudson ECC)	9	19	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	9	$85	$136	$76	0.7

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions				Proposed Conditions				Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Manufacturer	Model	ECM #	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Cooler (35F to 55F)	Kolpak / Bohn	ADT065ASWGJ	10	Yes	No	No	0.0	197	0	$29	$303	$40	9.0

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	Manufacturer	Model	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Continental	2R	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	Continental	1F	No		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	Manufacturer	Model	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Convection Oven (Full Size)	Vulcan		No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Gas Fryer	Vulcan		No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Winston		Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Metro		No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Gas Rack Oven (Single)	Vulcan		No		No	0.0	0	0	$0	$0	$0	0.0

Dishwasher Inventory & Recommendations

	Existing Conditions							Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Manufacturer	Model	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Door Type (High Temp)	Champion	DH1	Electric	None	No		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Hudson ECC	5	Coffee Machine	500	No		
Hudson ECC	25	Desktop	120	No		
Hudson ECC	6	Fan (Large)	400	No		
Hudson ECC	6	Microwave	1,000	No		
Hudson ECC	1	Paper Shredder	146	No		
Hudson ECC	21	Printer (Medium/Small)	450	No		
Hudson ECC	2	Printer/Copier (Large)	600	No		
Hudson ECC	1	Refrigerator (Mini)	175	No		
Hudson ECC	3	Refrigerator (Residential)	340	No		
Hudson ECC	3	Smart Board	215	Yes		
Hudson ECC	2	Television	224	No		
Hudson ECC	1	Toaster Oven	600	No		
Hudson ECC	1	Water Cooler	192	Yes		
Hudson ECC	2	Water Fountain	370	No		
Hudson ECC	1	Server	1,000	No		

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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

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ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

West New York Early Childhood School (Hudson ECC)

Primary Property Type: K-12 School
Gross Floor Area (ft²): 31,976
Built: 2002

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 Early Childhood School (Hudson ECC) 5204 Hudson Avenue 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: 15547678

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
55.6 kBtu/ft²

Source EUI
100.1 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	1,016,284 (57%)
Electric - Grid (kBtu)	761,595 (43%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	60.4
National Median Source EUI (kBtu/ft²)	108.6
% Diff from National Median Source EUI	-8%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	125

Signature & Stamp of Verifying Professional

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

LP Signature: ______________________Date: ___________

Licensed Professional

____ ________
,
(____)____-______
____

Professional Engineer or Registered Architect Stamp
(if applicable)

APPENDIX C: GLOSSARY

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

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

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