Local Government Energy Audit Report

Merriam Avenue

March 12, 2019

Prepared for:
Newton Board of Education
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Newton, NJ 07860

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Disclaimer

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

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual measures and conditions. TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

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

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

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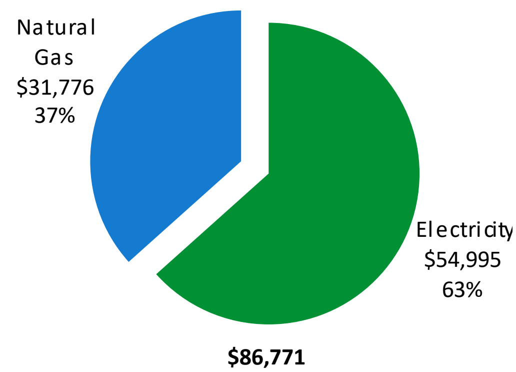
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Merriam Avenue. 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 Energy Services (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 help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $86,771 Electricity: 399,601 kWh Natural Gas: 39,928 Therms	
ENERGY STAR® Benchmarking Score	26 *(1-100 scale)*	This building performs at or below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.



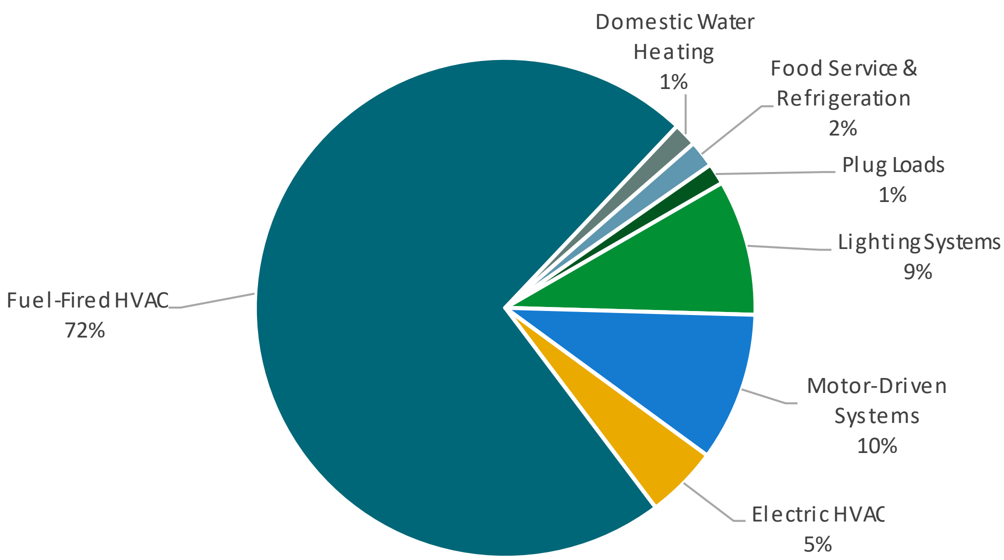


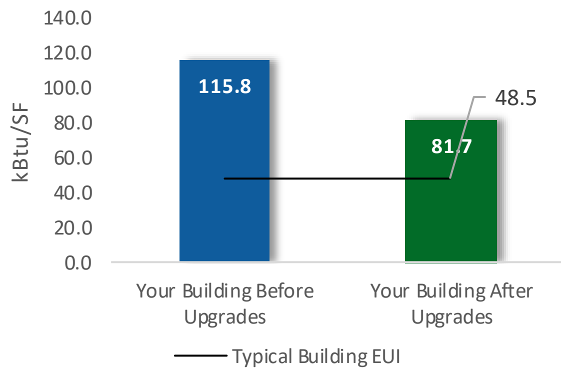
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

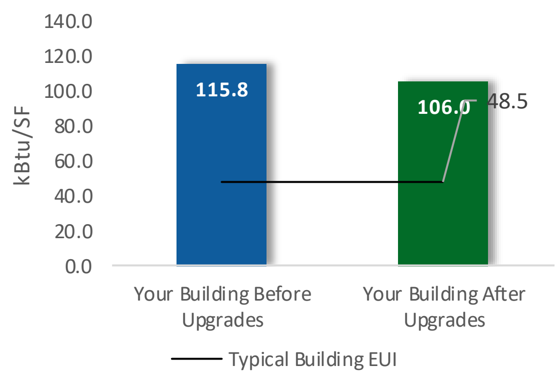
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$374,095
Potential Rebates & Incentives[1]	$25,656
Annual Cost Savings	$28,943
Annual Energy Savings	Electricity: 148,306 kWh Natural Gas: 10,721 Therms
Greenhouse Gas Emission Savings	137 Tons
Simple Payback	12.0 Years
Site Energy Savings (all utilities)	29%



Scenario 2: Cost Effective Package[2]

Installation Cost	$131,654
Potential Rebates & Incentives	$19,377
Annual Cost Savings	$18,178
Annual Energy Savings	Electricity: 131,901 kWh Natural Gas: 31 Therms
Greenhouse Gas Emission Savings	67 Tons
Simple Payback	6.2 Years
Site Energy Savings (all utilities)	8%



On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	None

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

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

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Lifetime Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**80,982**	**28.8**	**-13**	**$11,041**	**$165,609**	**$85,196**	**$14,924**	**$70,272**	**6.4**	**80,010**
ECM 1	Install LED Fixtures	18,127	2.5	0	$2,495	$37,421	$36,707	$3,800	$32,907	13.2	18,254
ECM 2	Retrofit Fixtures with LED Lamps	62,855	26.4	-13	$8,546	$128,188	$48,489	$11,124	$37,365	4.4	61,756
Lighting Control Measures		**5,397**	**2.2**	**-1**	**$734**	**$5,870**	**$10,338**	**$595**	**$9,743**	**13.3**	**5,303**
ECM 3	Install Occupancy Sensor Lighting Controls	2,939	1.2	-1	$400	$3,197	$4,938	$595	$4,343	10.9	2,887
ECM 4	Install High/Low Lighting Controls	2,458	1.0	-1	$334	$2,674	$5,400	$0	$5,400	16.2	2,415
Motor Upgrades		**6,475**	**1.8**	**0**	**$891**	**$13,367**	**$43,705**	**$0**	**$43,705**	**49.0**	**6,520**
	Premium Efficiency Motors	6,475	1.8	0	$891	$13,367	$43,705	$0	$43,705	49.0	6,520
Variable Frequency Drive (VFD) Measures		**45,521**	**12.5**	**0**	**$6,265**	**$93,973**	**$35,933**	**$3,858**	**$32,076**	**5.1**	**45,840**
ECM 5	Install VFDs on Constant Volume (CV) Fans	24,123	6.9	0	$3,320	$49,800	$15,947	$1,920	$14,027	4.2	24,292
ECM 6	Install VFDs on Heating Water Pumps	8,776	1.9	0	$1,208	$18,117	$13,103	$0	$13,103	10.8	8,838
ECM 7	Install Boiler Draft Fan VFDs	12,622	3.7	0	$1,737	$26,056	$6,883	$1,938	$4,945	2.8	12,710
Electric Unitary HVAC Measures		**8,282**	**4.9**	**0**	**$1,140**	**$17,096**	**$53,358**	**$1,104**	**$52,254**	**45.8**	**8,339**
	Install High Efficiency Air Conditioning Units	8,282	4.9	0	$1,140	$17,096	$53,358	$1,104	$52,254	45.8	8,339
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**1,065**	**$8,475**	**$169,509**	**$140,543**	**$5,175**	**$135,368**	**16.0**	**124,697**
	Install High Efficiency Hot Water Boilers	0	0.0	1,048	$8,339	$166,782	$134,399	$3,575	$130,824	15.7	122,691
	Install High Efficiency Furnaces	0	0.0	17	$136	$2,726	$6,145	$1,600	$4,545	33.3	2,006
HVAC System Improvements		**643**	**0.0**	**4**	**$120**	**$1,805**	**$2,719**	**$0**	**$2,719**	**22.6**	**1,116**
	Implement Demand Control Ventilation (DCV)	643	0.0	4	$120	$1,805	$2,719	$0	$2,719	22.6	1,116
Domestic Water Heating Upgrade		**0**	**0.0**	**17**	**$139**	**$1,386**	**$186**	**$0**	**$186**	**1.3**	**2,039**
ECM 8	Install Low-Flow DHW Devices	0	0.0	17	$139	$1,386	$186	$0	$186	1.3	2,039
Food Service & Refrigeration Measures		**1,007**	**0.1**	**0**	**$139**	**$1,663**	**$2,116**	**$0**	**$2,116**	**15.3**	**1,014**
	Replace Refrigeration Equipment	1,007	0.1	0	$139	$1,663	$2,116	$0	$2,116	15.3	1,014
TOTALS		**148,306**	**50.4**	**1,072**	**$28,943**	**$470,277**	**$374,095**	**$25,656**	**$348,440**	**12.0**	**274,877**

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

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

Figure 2 – Evaluated Energy Improvements

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

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

Energy Conservation Measure		SmartStart	Direct Install	Pay For Performance
ECM 1	Install LED Fixtures	X	X	
ECM 2	Retrofit Fixtures with LED Lamps	X	X	
ECM 3	Install Occupancy Sensor Lighting Controls	X	X	
ECM 4	Install High/Low Lighting Controls		X	
ECM 5	Install VFDs on Constant Volume (CV) HVAC	X	X	
ECM 6	Install VFDs on Hot Water Pumps		X	
ECM 7	Install Boiler Draft Fan VFDs	X	X	
ECM 8	Install Low-Flow Domestic Hot Water Devices		X	

Figure 3 – Funding Options

New Jersey Clean Energy Programs At-A-Glance

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

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

Individual Measures with SmartStart

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

Turnkey Installation with Direct Install

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

Whole Building Approach with Pay for Performance

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

More Options from Around the State

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

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

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

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

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces electric loads at commercial facilities when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. By enabling commercial facilities to reduce their 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 Merriam Avenue. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs. This report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

TRC Energy Services (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 November 6, 2018, TRC performed an energy audit at Merriam Avenue located in Newton, NJ. TRC met with Joseph Vankirk to review the facility operations and help focus our investigation on specific energy-using systems.

Merriam Avenue is a two-story, 46,260 square foot building built in 1964. Spaces include: classrooms, gymnasium, all purpose room, cafeteria, library, offices, corridors, stairwells, a commercial kitchen and basement mechanical space.

Over the last several years the facility has replaced all its existing T12 fluorescent fixtures with T8 fluorescent fixtures. Package roof top units with built in furnaces and direct expansion cooling coils provide heating and cooling to selected areas. Two hot water boilers provide supplemental hot water heating to unit ventilators and radiators.

2.2 Building Occupancy

The facility is occupied year-round and school operates from September through June. Typical weekday occupancy is 104 staff and 450 students.

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

Building Name	Weekday/Weekend	Operating Schedule
Merriam Avenue	Weekday	8:00 AM - 4:00 PM
	Weekend	Unoccupied

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel. The roof is flat and covered with white membrane, and it is in good condition.

The walls are made of poured concrete with a brick veneer and sheet rock block interior finish.

The flat roof is supported with steel trusses and a reinforced concrete deck and finished with an insulated layer and a covering of PVC.

Steel trusses support a pitched roof with a wood deck covered with a standing seam metal roofing system. Roof encloses conditioned space. The thermal barrier is between this space and the conditioned space below at the roof.

Most of the windows are either single or double pane glazed, double pane windows have low-e glass and aluminum frames with a thermal break. The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, but showing major evidence of excessive wear. Exterior doors have aluminum as well as wood frames and are in good condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.

Windows typically occupy about 15% to 20% of the surface area of the walls. Single pane windows can significantly add to heating and cooling costs (15% to 25% per the US DOE). Single pane windows are responsible for the loss of more heat per square foot of area in winter and gain more heat in summer than any other surface of a building envelope. TRC observed that most of the windows at Newton High School are inefficient single pane windows. Replacing these with double pane low e-glass windows can have a significant impact on your heating and cooling energy costs.

Double paned windows have two sheets of glass in a window frame instead of just one in a single pane. Between the glass panes is a small space filled with insulating gas to provide additional insulation. Double-paned windows are often as much as 40%-50% more efficient than traditional single-pane windows.

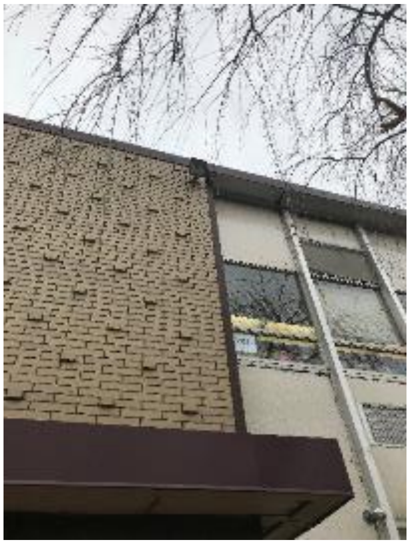


Image 1 School Exterior

Image 2 School Windows

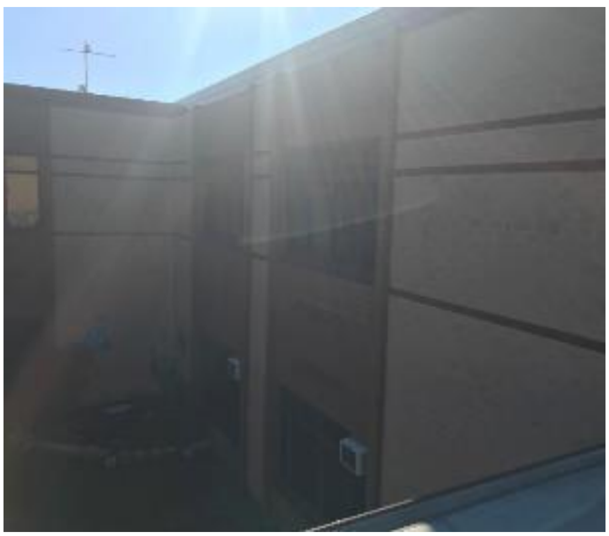


Image 3 Exterior Walls

Image 4 Building Envelope

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also several 28-Watt T5 fixtures. Additionally, there are some compact fluorescent lamps (CFL), incandescent and LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts.

Fixture types include 2, 3, or 4-lamp, 2 and 4-foot long troffer fixtures and 2-foot fixtures with U-bend and linear tube lamps. Most fixtures are in good condition.

Gymnasium and all-purpose room fixtures have 28-Watt T5 linear fluorescent lamps and are controlled by occupancy sensors.

Media center fixtures have 32-Watt T8 linear fluorescent and CFL lamps and are controlled by occupancy sensors and wall switches. All exit signs are LED. Interior lighting levels were generally sufficient.

Image 5 Classroom Lighting

Image 6 LED Bulb Fixture

Image 7 All Purpose Room Lighting

Image 8 Hallway Lighting

Lighting fixtures in classrooms are controlled by occupancy sensors.

Exterior fixtures include wall packs with 70-Watt, 100-Watt, 150-Watt high pressure sodium fixtures as well as 175-Watt and 250-Watt metal halide fixtures. Exterior light fixtures are controlled by time clocks and/or photocells.

Image 9 Exterior HPS Fixture

Image 10 Exterior CFL Fixture

Image 11 Exterior LED Fixture

Image 12 Exterior Metal Halide Fixture

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators have 0.25 hp supply fan motors and pneumatically controlled valves and outside air dampers that operate with a pneumatic control system. This system is original to the building and appears to be in fair operating condition. They are served by the hot water heating loop fed by the boilers.

Packaged Units

Media center, computer lab, music room and the administration area are served with seven Trane RTU packaged air conditioning (AC) units with gas fired furnaces and direct expansion cooling coils. They are controlled by the building energy management system (EMS). These 8.80 to 10.40 EER units have a heating capacity ranging from 40 to 203 MBh and cooling capacity ranging from 2-ton to 12.50-tons. These units are equipped with economizers that are in good condition.

Two Trane heating and ventilation units (HV-1 and HV-2) have 7.5 hp supply fans and are used to provide fresh air, and are EMS controlled. Both HV units serve the gym.

Refer to Appendix A for detailed information about each unit.

Air Conditioners

Classrooms are cooled by 12,000 Btu window AC units. The units are in good condition. They have efficiency ratings of approximately 10 EER. They are not ENERGY STAR® qualified.

Image 13 RTU Lennox Unit

Image 14 Trane RTU Unit

Image 15 Exhaust Fans on Roof

Image 16 RTUs on Roof

2.6 Heating Hot Water Systems

One Well McLain 5810 MBh and one Cleaver Brooks 4706 MBh hot water boiler serve the building heating load needs. The burners are non-modulating with a nominal efficiency of 80%. The boilers are configured in a lead-lag control scheme. Only one boiler is required under high load conditions. Installed in 1964, they are in fair condition with a service contract in place.

The boilers serve a primary/secondary distribution system with a constant speed 5 hp pump circulating the primary loop and two constant speed 5 hp heating hot water pumps operating in lead/lag fashion on the secondary loop. A three-way valve controls the secondary loop temperature via an aquastat. The boilers provide hot water to unit ventilators and radiators throughout the building.

For daytime operation, hot water is supplied at 180°F when the outside air temperature is low, and the setpoint is adjusted linearly to 140°F when the outside air is above 32°F and the setpoint is adjusted to 100°F when outside air is above 65°F.

During nighttime operation, hot water is supplied at 160°F when the outside air temperature is low, and the setpoint is adjusted linearly to 120°F when the outside air is above 32°F and the setpoint is adjusted to 80°F when outside air is above 65°F. The system is locked out at an outside temperature of 50°F.

Image 17 HHW Primary Pumps

Image 18 HHW Secondary Pumps

Image 19 Boiler 1

Image 20 Boiler 2

2.7 Building Energy Management Systems (EMS)

A Tracer summit EMS controls the HVAC equipment, the boilers, the air handlers, and the package units. The EMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, humidity, heating water loop temperatures and chilled water loop temperatures. Half of Merriam Avenue is not associated with an EMS. We recommend that you work with your EMS control team to find out a possible solution to include that equipment on the current system. In addition, we recommended Merriam Avenue change some of the older equipment with new high efficiency equipment which will comply with the current EMS.

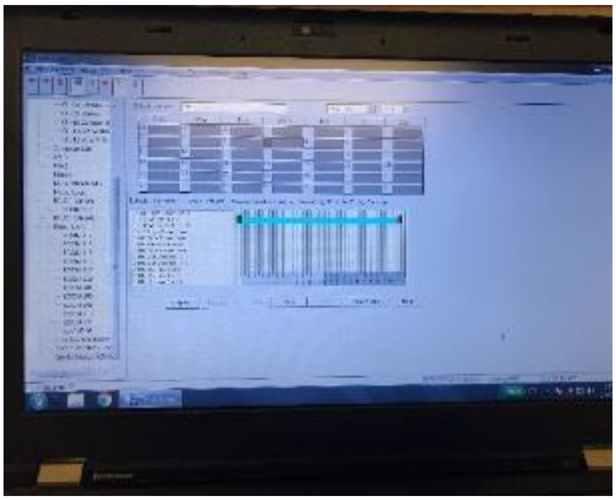


Image 21 Equipment Schedule from EMS

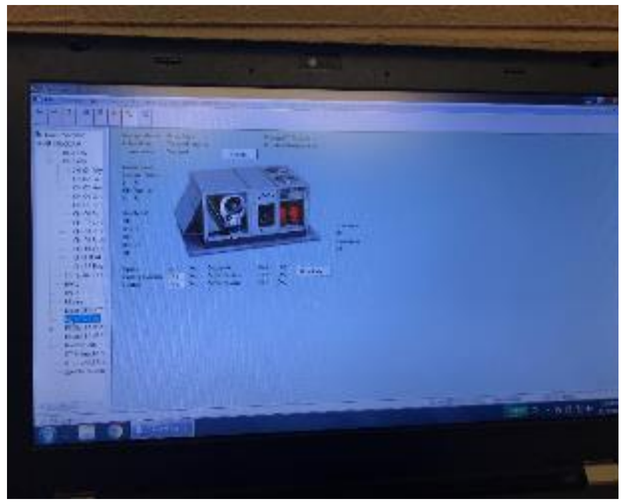


Image 22 RTU graphic on EMS

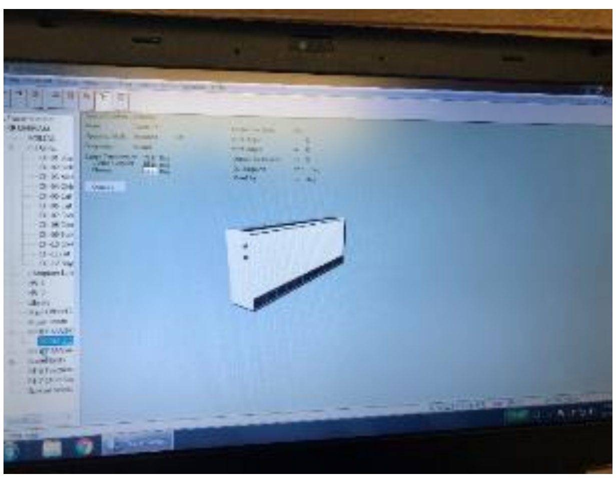


Image 23 Relief Fan graphic on EMS

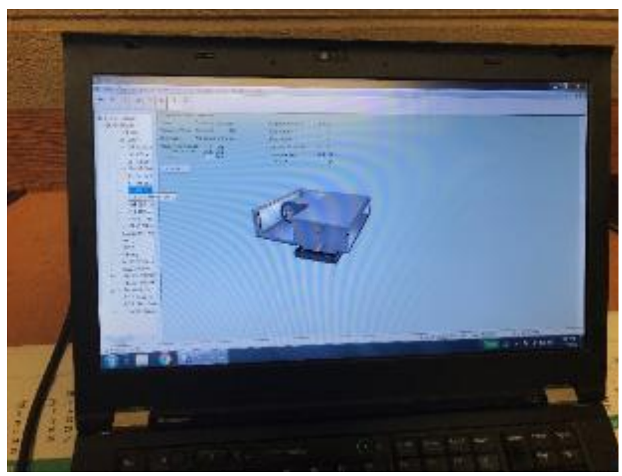


Image 24 Corridor Heater Units

2.8 Domestic Hot Water

Hot water is produced with a 100 gallon 199 MBh Bradford White gas-fired storage water heater with an 80% efficiency. At the time of the site visit, the domestic water heaters were set at 140°F.

One 0.2 hp circulation pump distributes water to end uses. The circulation pump operates continuously. The domestic hot water pipes are insulated, and the insulation is in good condition.

Image 25 Hot Water Heater

Image 26 Hot Water Heater Nameplate

2.9 Food Service Equipment

The kitchen has a mixture of gas and electric equipment that is used to store lunches for students which was originally prepared at the high school. One gas and one electric convection oven are required to heat the food and one insulated electric holding cabinet keeps food warm. Equipment is high efficiency and is in good condition.

The dishwasher is an ENERGY STAR® high temperature, single tank type Hobart unit with electric booster heater.

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

Image 27 Convection Ovens

Image 28 Food Service Table

Image 29 Dishwasher

Image 30 Dishwasher Tank

2.10 Refrigeration

The kitchen has three stand-up refrigerators with solid doors. There is a freezer chest and one refrigerator chest. All equipment is high efficiency and in good condition.

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

Image 31 Commercial Refrigerator

Image 32 Commercial Freezer

2.11 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 1.4% of total building energy use. This is lower than a typical building.

You seem to already be doing a great job managing your electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 68 computer work stations throughout the facility. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as smart boards, projectors, and printers.

There is a washer and dryer located in the boiler room.

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

Image 33 Copy Machine

Image 34 Medium and Small Printer

Image 35 Regular Refrigerator

Image 36 Microwave

2.12 Water-Using Systems

There are 12 restrooms with toilets, urinals, and sinks. Faucet flow rates are at 2.5 gallons per minute (gpm) or higher. Toilets are rated at 2.5 gallons per flush (gpf) and urinals are rated at 2.2 gpf.

2.13 On-Site Generation

Merriam Avenue has a 286-kW photovoltaic (PV) array with approximately 627 panels that were installed in 2013 by Sunlight General Capital. This system provides approximately 20% of the electricity used at this facility.

Merriam Avenue has an emergency generator that, in the event of a power outage, serves the entire building but is only used for emergency needs.

Image 37 Solar Panels on Roof

Image 38 Solar Array

Image 39 Parking Lot Panels

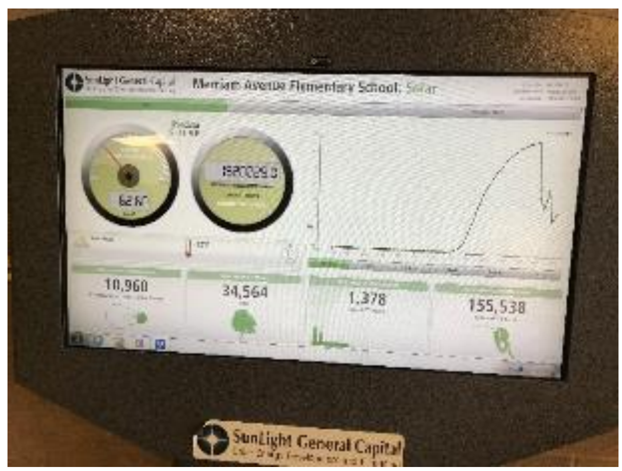
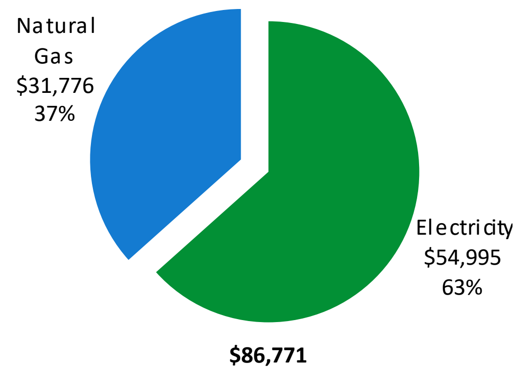


Image 40 Generation Display for awareness

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	399,601 kWh	$54,995
Natural Gas	39,928 Therms	$31,776
Total		**$86,771**



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

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

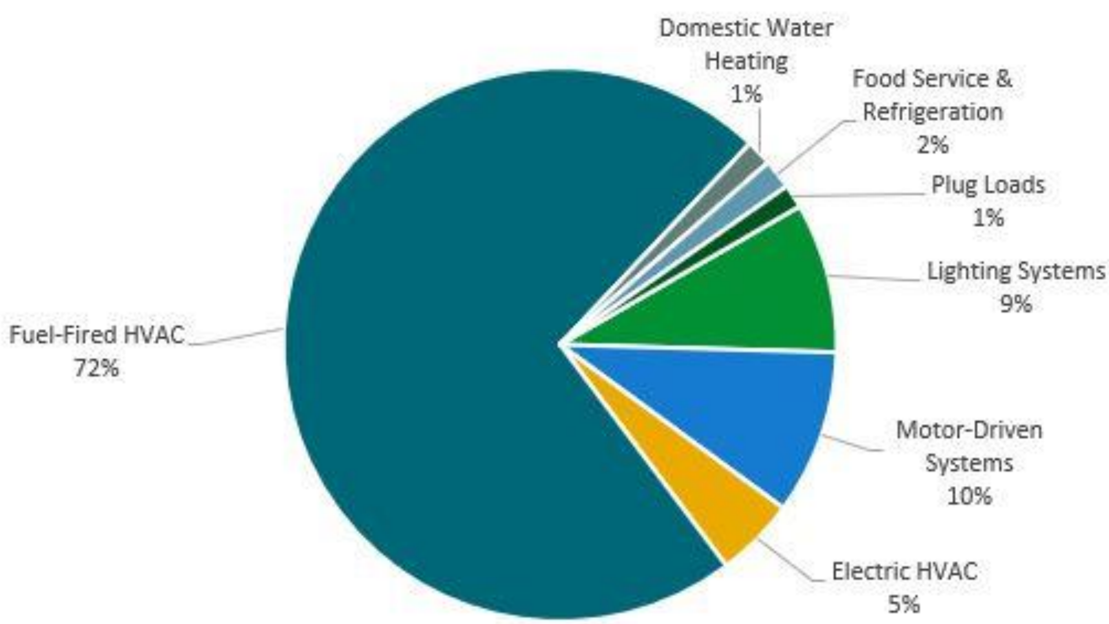
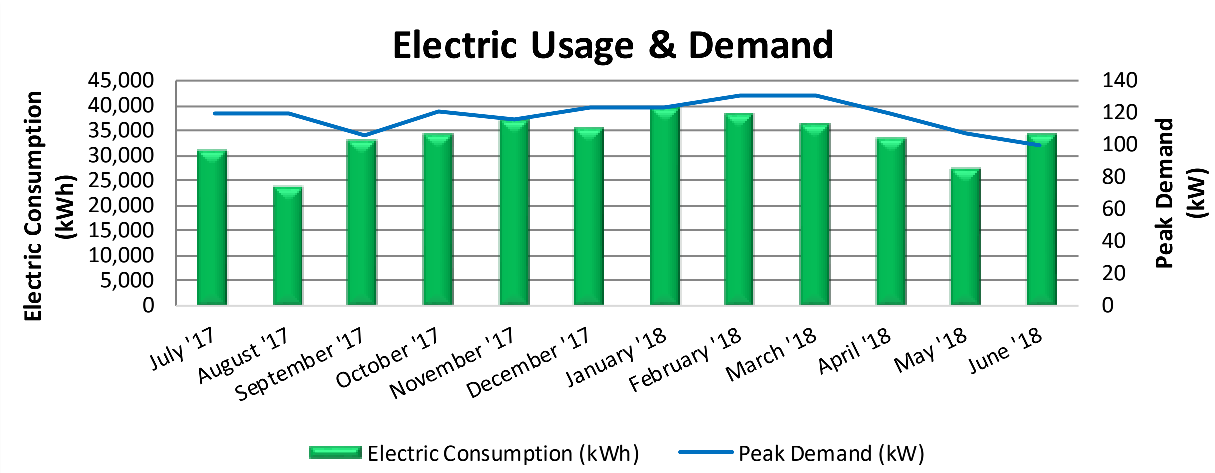


Figure 5 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under rate class Monthly General Service Secondary, with electric production provided by Sunlight General Sussex Solar, a third-party supplier.



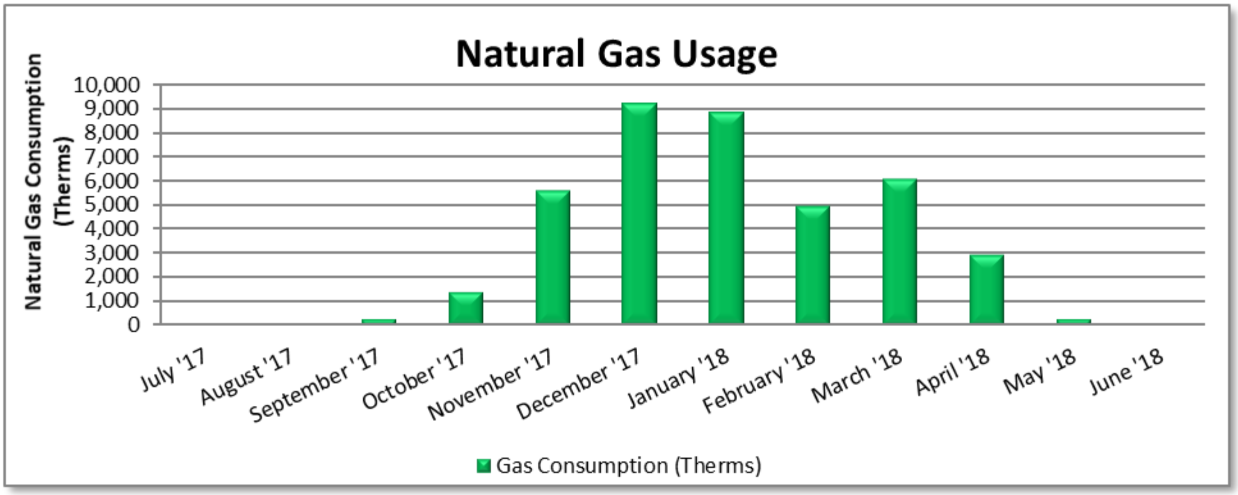
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
7/25/17	29	30,845	120	$387	$4,709
8/24/17	30	23,801	120	$387	$4,515
9/24/17	31	32,640	106	$681	$4,160
10/24/17	30	33,992	121	$732	$3,441
11/23/17	30	36,661	115	$698	$4,739
12/29/17	36	35,104	123	$769	$5,376
1/26/18	28	39,040	123	$746	$5,125
2/27/18	32	37,865	131	$745	$5,037
3/28/18	29	36,014	131	$796	$4,888
4/25/18	28	33,417	119	$687	$4,362
5/29/18	34	27,177	108	$611	$3,675
6/27/18	29	34,140	100	$602	$5,120
Totals	**366**	**400,696**	**131**	**$7,842**	**$55,146**
Annual	**365**	**399,601**	**131**	**$7,820**	**$54,995**

Notes:

- Peak demand of 131 kW occurred in February and March 2018.
- The average electric cost over the past 12 months was $0.138/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.
- On-site generation is through a PPA and the site purchases the generated electricity from Sunlight solar capital. Some of the electricity generated on-site is used on-site and the remainder is exported to the grid.

3.2 Natural Gas

PSE&G delivers natural gas under rate class General Service, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
8/4/17	30	103	$482
9/4/17	31	144	$507
10/5/17	31	289	$599
11/4/17	30	1,405	$1,318
12/5/17	31	5,629	$4,026
1/5/18	31	9,235	$6,571
2/4/18	30	8,866	$6,115
3/6/18	30	4,964	$4,633
4/5/18	30	6,122	$4,388
5/6/18	31	2,981	$2,213
6/4/18	29	300	$595
7/6/18	32	0	$415
Totals	**366**	**40,038**	**$31,863**
Annual	**365**	**39,928**	**$31,776**

Notes:

- The average gas cost for the past 12 months is $0.796/therm, which is the blended rate used throughout the analysis.
- Utility graph indicates that school uses most amount of natural gas during winter season to produce heat from hot water boilers whereas summer season natural gas usage is very little or negligible.

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 county, 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	26

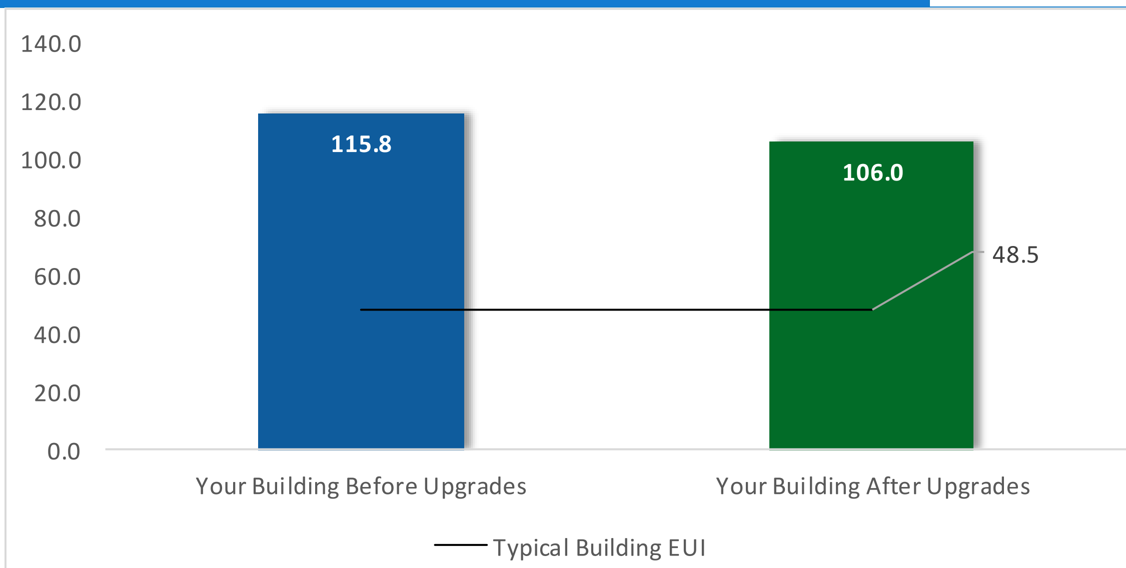


Figure 6 - Energy Use Intensity Comparison

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

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. A number of factors can cause as 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.

Tracking Your Energy Performance

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

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

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

For more information on ENERGY STAR® and Portfolio Manager®, visit their website.[3]

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

4 ENERGY CONSERVATION MEASURES

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

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

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

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

Appendix A: Equipment Inventory & Recommendations provides a detailed list of the locations and recommended upgrades for each energy conservation measure.

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**80,982**	**28.8**	**-13**	**$11,041**	**$85,196**	**$14,924**	**$70,272**	**6.4**	**80,010**
ECM 1	Install LED Fixtures	18,127	2.5	0	$2,495	$36,707	$3,800	$32,907	13.2	18,254
ECM 2	Retrofit Fixtures with LED Lamps	62,855	26.4	-13	$8,546	$48,489	$11,124	$37,365	4.4	61,756
Lighting Control Measures		**5,397**	**2.2**	**-1**	**$734**	**$10,338**	**$595**	**$9,743**	**13.3**	**5,303**
ECM 3	Install Occupancy Sensor Lighting Controls	2,939	1.2	-1	$400	$4,938	$595	$4,343	10.9	2,887
ECM 4	Install High/Low Lighting Controls	2,458	1.0	-1	$334	$5,400	$0	$5,400	16.2	2,415
Motor Upgrades		**6,475**	**1.8**	**0**	**$891**	**$43,705**	**$0**	**$43,705**	**49.0**	**6,520**
	Premium Efficiency Motors	6,475	1.8	0	$891	$43,705	$0	$43,705	49.0	6,520
Variable Frequency Drive (VFD) Measures		**45,521**	**12.5**	**0**	**$6,265**	**$35,933**	**$3,858**	**$32,076**	**5.1**	**45,840**
ECM 5	Install VFDs on Constant Volume (CV) Fans	24,123	6.9	0	$3,320	$15,947	$1,920	$14,027	4.2	24,292
ECM 6	Install VFDs on Heating Water Pumps	8,776	1.9	0	$1,208	$13,103	$0	$13,103	10.8	8,838
ECM 7	Install Boiler Draft Fan VFDs	12,622	3.7	0	$1,737	$6,883	$1,938	$4,945	2.8	12,710
Electric Unitary HVAC Measures		**8,282**	**4.9**	**0**	**$1,140**	**$53,358**	**$1,104**	**$52,254**	**45.8**	**8,339**
	Install High Efficiency Air Conditioning Units	8,282	4.9	0	$1,140	$53,358	$1,104	$52,254	45.8	8,339
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**1,065**	**$8,475**	**$140,543**	**$5,175**	**$135,368**	**16.0**	**124,697**
	Install High Efficiency Hot Water Boilers	0	0.0	1,048	$8,339	$134,399	$3,575	$130,824	15.7	122,691
	Install High Efficiency Furnaces	0	0.0	17	$136	$6,145	$1,600	$4,545	33.3	2,006
HVAC System Improvements		**643**	**0.0**	**4**	**$120**	**$2,719**	**$0**	**$2,719**	**22.6**	**1,116**
	Implement Demand Control Ventilation (DCV)	643	0.0	4	$120	$2,719	$0	$2,719	22.6	1,116
Domestic Water Heating Upgrade		**0**	**0.0**	**17**	**$139**	**$186**	**$0**	**$186**	**1.3**	**2,039**
ECM 8	Install Low-Flow DHW Devices	0	0.0	17	$139	$186	$0	$186	1.3	2,039
Food Service & Refrigeration Measures		**1,007**	**0.1**	**0**	**$139**	**$2,116**	**$0**	**$2,116**	**15.3**	**1,014**
	Replace Refrigeration Equipment	1,007	0.1	0	$139	$2,116	$0	$2,116	15.3	1,014
TOTALS		**148,306**	**50.4**	**1,072**	**$28,943**	**$374,095**	**$25,656**	**$348,440**	**12.0**	**274,877**

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

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

Figure 7 – All Evaluated ECMs

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#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**80,982**	**28.8**	**-13**	**$11,041**	**$85,196**	**$14,924**	**$70,272**	**6.4**	**80,010**
ECM 1	Install LED Fixtures	18,127	2.5	0	$2,495	$36,707	$3,800	$32,907	13.2	18,254
ECM 2	Retrofit Fixtures with LED Lamps	62,855	26.4	-13	$8,546	$48,489	$11,124	$37,365	4.4	61,756
Lighting Control Measures		**5,397**	**2.2**	**-1**	**$734**	**$10,338**	**$595**	**$9,743**	**13.3**	**5,303**
ECM 3	Install Occupancy Sensor Lighting Controls	2,939	1.2	-1	$400	$4,938	$595	$4,343	10.9	2,887
ECM 4	Install High/Low Lighting Controls	2,458	1.0	-1	$334	$5,400	$0	$5,400	16.2	2,415
Variable Frequency Drive (VFD) Measures		**45,521**	**12.5**	**0**	**$6,265**	**$35,933**	**$3,858**	**$32,076**	**5.1**	**45,840**
ECM 5	Install VFDs on Constant Volume (CV) Fans	24,123	6.9	0	$3,320	$15,947	$1,920	$14,027	4.2	24,292
ECM 6	Install VFDs on Heating Water Pumps	8,776	1.9	0	$1,208	$13,103	$0	$13,103	10.8	8,838
ECM 7	Install Boiler Draft Fan VFDs	12,622	3.7	0	$1,737	$6,883	$1,938	$4,945	2.8	12,710
Domestic Water Heating Upgrade		**0**	**0.0**	**17**	**$139**	**$186**	**$0**	**$186**	**1.3**	**2,039**
ECM 8	Install Low-Flow DHW Devices	0	0.0	17	$139	$186	$0	$186	1.3	2,039
TOTALS		**131,901**	**43.6**	**3**	**$18,178**	**$131,654**	**$19,377**	**$112,277**	**6.2**	**133,191**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance criteria
** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Figure 8 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**80,982**	**28.8**	**-13**	**$11,041**	**$85,196**	**$14,924**	**$70,272**	**6.4**	**80,010**
ECM 1	Install LED Fixtures	18,127	2.5	0	$2,495	$36,707	$3,800	$32,907	13.2	18,254
ECM 2	Retrofit Fixtures with LED Lamps	62,855	26.4	-13	$8,546	$48,489	$11,124	$37,365	4.4	61,756

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 pressure sodium and metal halide 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 retrofitted 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 fixtures

ECM 2: Retrofit Fixtures with LED Lamps

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

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

Affected building areas: classrooms, media center, gymnasium, all purpose room, offices, cafeteria

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**5,397**	**2.2**	**-1**	**$734**	**$10,338**	**$595**	**$9,743**	**13.3**	**5,303**
ECM 3	Install Occupancy Sensor Lighting Controls	2,939	1.2	-1	$400	$4,938	$595	$4,343	10.9	2,887
ECM 4	Install High/Low Lighting Controls	2,458	1.0	-1	$334	$5,400	$0	$5,400	16.2	2,415

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 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: classrooms, media center, gymnasium, all purpose room, offices, storage areas, cafeteria

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 requirements. 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.

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

Affected building areas: hallways and corridors

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 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**6,475**	**1.8**	**0**	**$891**	**$43,705**	**$0**	**$43,705**	**49.0**	**6,520**
	Premium Efficiency Motors	6,475	1.8	0	$891	$43,705	$0	$43,705	49.0	6,520

Premium Efficiency Motors

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

Affected motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Classrooms & Vestibules	UV-1	24	Supply Fan	0.3	Vertical UV Motor
Classrooms & Vestibules	UV-2	24	Supply Fan	0.3	Horizontal UV Motor
Roof	HV-1	1	Supply Fan	7.5	Heating & Ventilation Unit
Roof	HV-2	1	Supply Fan	7.5	Heating & Ventilation Unit
Roof	F-8	1	Exhaust Fan	5.0	1st/2nd Fl class relief
Roof	F-16	1	Exhaust Fan	1.5	Gym 118 Miximum Relief

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Roof	F-17	1	Exhaust Fan	1.5	Gym 118 Miximum Relief
Mech Room	P-1	1	Heating Hot Water Pump	5.0	Secondary Loop
Mech Room	P-2	1	Heating Hot Water Pump	5.0	Secondary Loop
Mech Room	B-1	1	Combustion Air Fan	5.0	Boiler Burner
Mech Room	B-2	1	Combustion Air Fan	7.5	Boiler Burner
Mech Room	P-3	1	Heating Hot Water Pump	5.0	Primary Loop
Mech Room	P-4	1	Heating Hot Water Pump	5.0	Primary Loop
Roof	RTU-2	1	Supply Fan	2.0	Existing Music Room
Roof	RTU-3	1	Supply Fan	2.0	Computer Lab 101B
Roof	RTU-4	1	Supply Fan	5.0	Media Center 101,101A

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

The simple payback of this measure is projected to exceed the expected life of the replacement equipment, however, inverter duty rated motors will be required for use with VFD's as described below. Existing motors should be evaluated for replacement on a case by case basis if the VFD measures are to be implemented.

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**45,521**	**12.5**	**0**	**$6,265**	**$35,933**	**$3,858**	**$32,076**	**5.1**	**45,840**
ECM 5	Install VFDs on Constant Volume (CV) Fans	24,123	6.9	0	$3,320	$15,947	$1,920	$14,027	4.2	24,292
ECM 6	Install VFDs on Heating Water Pumps	8,776	1.9	0	$1,208	$13,103	$0	$13,103	10.8	8,838
ECM 7	Install Boiler Draft Fan VFDs	12,622	3.7	0	$1,737	$6,883	$1,938	$4,945	2.8	12,710

Variable frequency drives control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed VFDs, we have included replacing the controlled motor with a new motor —unless the existing motor meets or exceeds IHP 2014 standards—to conservatively account for the cost of an inverter duty rated motor. The savings and cost associated with the new motor are presented with the Premium Efficiency Motor measures. If the proposed VFD measure is not selected for implementation the motor replacement should be reevaluated.

ECM 5: Install VFDs on Constant Volume (CV) Fans

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

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

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

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing must be determined during the final project design. The control system programming should maintain the minimum air flow whenever the compressor is operating.

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

Affected air handlers: HV-1 & 2, RTU- 2, 3 & 4

ECM 6: Install VFDs on Heating Water Pumps

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

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

Affected pumps: P-1,2,3 & 4

ECM 7: Install Boiler Draft Fan VFDs

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

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

Affected fans: B-1 to B-2

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

4.5 Electric Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**8,282**	**4.9**	**0**	**$1,140**	**$53,358**	**$1,104**	**$52,254**	**45.8**	**8,339**
	Install High Efficiency Air Conditioning Units	8,282	4.9	0	$1,140	$53,358	$1,104	$52,254	45.8	8,339

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 at this facility 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 cooling units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

Install High Efficiency Air Conditioning Units

We evaluated replacement of 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 load, and the estimated annual operating hours.

This measure is part of a measure to replace package units at this site and as such must be considered in combination with ECM – Install High Efficiency Furnaces. However, the combined simple payback of this measure is projected to exceed the expected life of the replacement equipment.

4.6 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**1,065**	**$8,475**	**$140,543**	**$5,175**	**$135,368**	**16.0**	**124,697**
	Install High Efficiency Hot Water Boilers	0	0.0	1,048	$8,339	$134,399	$3,575	$130,824	15.7	122,691
	Install High Efficiency Furnaces	0	0.0	17	$136	$6,145	$1,600	$4,545	33.3	2,006

Install High Efficiency Hot Water Boilers

We evaluated replacement of the 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 at this facility. 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.

The simple payback of this measure is projected to exceed the expected life of the replacement equipment.

The boiler replacement was evaluated on a one-for-one replacement at the current boiler capacities per the LGEA Program. When the boilers are replaced we recommend that you work with the design team to size the boilers to the school's current heating requirements. We also recommend that you consider installing multiple modular boilers to improve the heating water system part load performance and redundancy. These approaches may also improve the cost effectiveness of the boiler replacement.

<u>Install High Efficiency Furnaces</u>

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

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

This measure is part of a measure to replace package units at this site and as such must be considered in combination with ECM-High Efficiency Air Conditioning Units.

4.7 HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**643**	**0.0**	**4**	**$120**	**$2,719**	**$0**	**$2,719**	**22.6**	**1,116**
	Implement Demand Control Ventilation (DCV)	643	0.0	4	$120	$2,719	$0	$2,719	22.6	1,116

Implement Demand Control Ventilation (DCV)

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

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

Energy savings associated with DCV are based on hours of operation, space occupancy, system air flow, outside air reduction, and other factors. Energy savings results from eliminating unnecessary ventilation and space conditioning. Our analysis suggests that the DCV will not be cost effective for the evaluated systems.

Affected building areas: Media center

4.8 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**17**	**$139**	**$186**	**$0**	**$186**	**1.3**	**2,039**
ECM 8	Install Low-Flow DHW Devices	0	0.0	17	$139	$186	$0	$186	1.3	2,039

ECM 8 Install Low-Flow DHW Devices

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

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

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

Additional cost savings may result from reduced water usage.

4.9 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**1,007**	**0.1**	**0**	**$139**	**$2,116**	**$0**	**$2,116**	**15.3**	**1,014**
	Replace Refrigeration Equipment	1,007	0.1	0	$139	$2,116	$0	$2,116	15.3	1,014

Replace Refrigeration Equipment

Replace existing commercial refrigerators and freezers with new ENERGY STAR® rated equipment. The energy savings associated with this measure come from reduced energy usage, due to more efficient technology, and reduced run times.

The simple payback for this measure is projected to extend beyond the useful life of the replacement equipment.

5 Energy Efficient Best Practices

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs. 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.[4] 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.

Doors and Windows

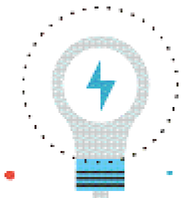
Close exterior doors and windows in heated and cooled areas. Leaving doors and windows open leads to a loss of heat during the winter and chilled air during the summer. Reducing air changes per hour (ACH) can lead to increased occupant comfort as well as heating and cooling savings, especially when combined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

Window Treatments/Coverings

Use high-reflectivity films or cover windows with shades or shutters to reduce solar heat gain and reduce the load on cooling and heating systems. Older, single pane windows and east or west-facing windows are especially prone to solar heat gain. In addition, use shades or shutters at night during cold weather to reduce heat loss.

[4] 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.

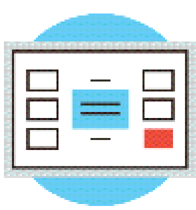
Lighting Controls

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.

Motor Maintenance

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

Thermostat Schedules and Temperature Resets



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

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Boiler Maintenance

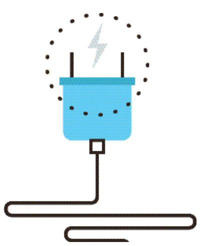
Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is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

Water Heater Maintenance

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

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

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips.[5] Your local utility may offer incentives or rebates for this equipment.

Computer Power Management Software

Many computers consume power during nights, weekends, and holidays. Screen savers are commonly confused as a power management strategy. This contributes to avoidable, excessive electrical energy consumption. There are innovative power management software packages available that are designed to deliver significant energy saving and provide ongoing tracking measurements. A central power management platform helps enforce energy savings policies as well as identify and eliminate underutilized devices.

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

Water Conservation

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

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

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

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

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

Procurement Strategies

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

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

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

6 On-site Generation

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

This facility appears to not 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 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.

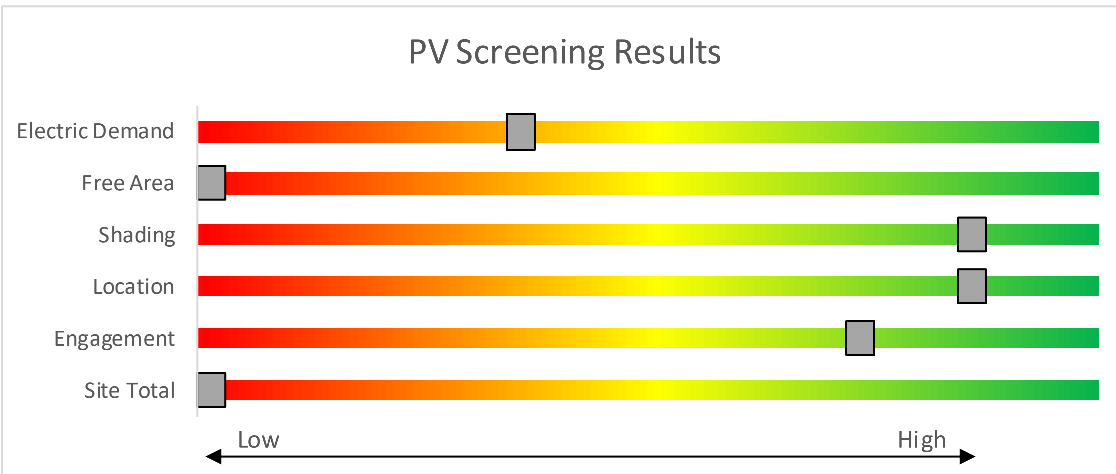


Figure 9 - Photovoltaic Screening

Solar Renewable Energy Credit (SREC) Registration Program (SRP)

Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SREC Registration Program before starting construction. Once your PV system is up and running, you periodically earn credits, which can then be sold on the open market for up to 15 years.

If you are considering installing solar photovoltaics on your building, visit www.njcleanenergy.com/srec for more information about the SREC Registration Program.

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:

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

6.2 Combined Heat and Power

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

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

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

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

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

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

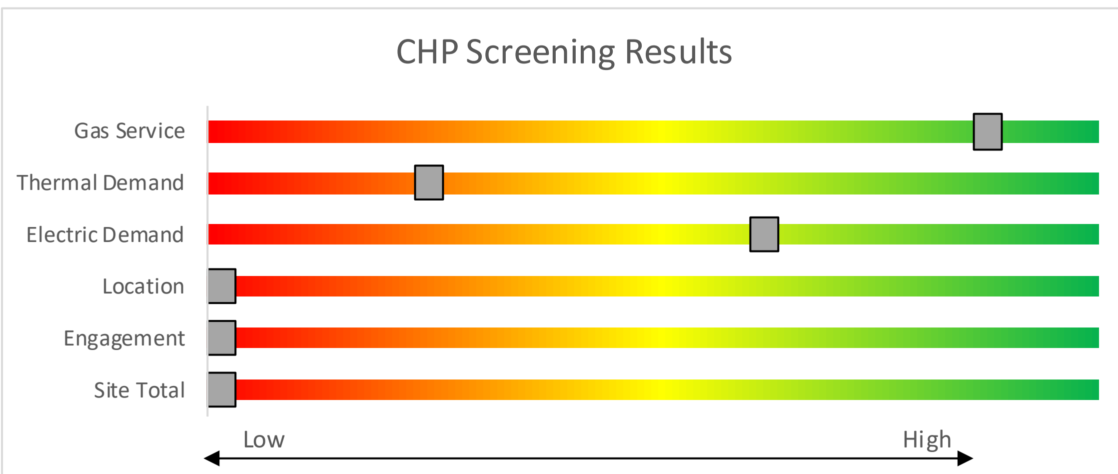


Figure 10 - Combined Heat and Power Screening

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

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

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

7.1 SmartStart

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

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

Equipment with Prescriptive Incentives Currently Available:

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

Incentives

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

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

How to Participate

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

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

7.2 Direct Install

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

Incentives

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

How to Participate

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

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

7.3 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 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

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

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

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

8.2 Retail Natural Gas Supply Options

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

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

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

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

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	**Fixture Quantity**	**Fixture Description**	**Control System**	**Light Level**	**Watts per Fixture**	**Annual Operating Hours**	**ECM #**	**Fixture Recommendation**	**Add Controls?**	**Fixture Quantity**	**Fixture Description**	**Control System**	**Watts per Fixture**	**Annual Operating Hours**	**Total Peak kW Savings**	**Total Annual kWh Savings**	**Total Annual MMBtu Savings**	**Total Annual Energy Cost Savings**	**Total Installation Cost**	**Total Incentives**	**Simple Payback w/ Incentives in Years**
Boys 2nd Fl	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,104	0.1	276	0	$38	$560	$75	12.9
Girls 2nd Fl	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,104	0.1	276	0	$38	$560	$75	12.9
2nd Fl Hallway	34	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 4	Relamp	Yes	34	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	1,104	1.0	2,348	0	$319	$3,664	$340	10.4
Elevator Machine Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.0	51	0	$7	$72	$10	9.0
Janitor Closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.0	51	0	$7	$72	$10	9.0
Storage	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.0	51	0	$7	$72	$10	9.0
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.0	51	0	$7	$72	$10	9.0
Shipping	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.0	102	0	$14	$145	$20	9.0
1st Fl Hallway	68	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 4	Relamp	Yes	68	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	1,104	1.9	4,695	-1	$638	$7,327	$680	10.4
Stairs 2	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.1	204	0	$28	$290	$40	9.0
Stairs 3	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.1	204	0	$28	$290	$40	9.0
Faculty bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,104	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,104	0.0	35	0	$5	$72	$10	13.0
Storage 2	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	200	2	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	200	0.1	26	0	$3	$290	$40	72.0
Bathroom	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,600	0.1	204	0	$28	$290	$40	9.0
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,600	0.0	51	0	$7	$72	$10	9.0
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,600	0.0	51	0	$7	$72	$10	9.0
Bathroom 104	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,600	0.0	51	0	$7	$72	$10	9.0
General Office	13	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	13	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,600	0.3	664	0	$90	$942	$130	9.0
Vice Principal	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,600	0.1	153	0	$21	$217	$30	9.0
Principal	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,600	0.1	204	0	$28	$290	$40	9.0
Nurse Office	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,600	0.2	408	0	$56	$580	$80	9.0
Bathroom 2	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,104	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,104	0.0	35	0	$5	$72	$10	13.0
Boys 1st Fl	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,104	2	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,104	0.1	141	0	$19	$290	$40	13.0
Girls 1st Fl	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,104	2	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,104	0.1	141	0	$19	$290	$40	13.0
Exterior	5	Metal Halide: (1) 250W Lamp	Timeclock		295	3,640	1	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	75	3,640	0.6	4,004	0	$551	$4,830	$500	7.9

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Exterior	12	Metal Halide: (1) 175W Lamp	Timeclock		215	3,640	1	Fixture Replacement	No	12	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	53	3,640	1.0	7,098	0	$977	$11,592	$1,200	10.6
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,600	0.0	99	0	$13	$73	$20	4.0
1st Fl Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	2, 4	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	1,104	0.1	130	0	$18	$73	$20	3.0
Room 201	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,600	2	Relamp	No	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,600	0.3	788	0	$107	$584	$160	4.0
elevator	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,600	0.0	87	0	$12	$55	$15	3.4
Gym Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.1	222	0	$30	$380	$65	10.4
Room 100	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	2, 3	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.7	1,663	0	$226	$1,092	$260	3.7
Room 101	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	2, 3	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.7	1,663	0	$226	$1,092	$260	3.7
Room 124	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	2, 3	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.5	1,109	0	$151	$818	$185	4.2
Room 120	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	2, 3	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.7	1,663	0	$226	$1,092	$260	3.7
Room 121	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.2	443	0	$60	$489	$95	6.5
Room 219	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.4	1,045	0	$142	$657	$180	3.4
Room 221	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.4	1,045	0	$142	$657	$180	3.4
Room 220	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.1	261	0	$36	$164	$45	3.4
Room 217	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.4	1,045	0	$142	$657	$180	3.4
Room 218	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.1	261	0	$36	$164	$45	3.4
Room 216	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.5	1,307	0	$178	$822	$225	3.4
Room 215	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.4	1,045	0	$142	$657	$180	3.4
Room 213	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.4	1,045	0	$142	$657	$180	3.4
Room 214	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.5	1,307	0	$178	$822	$225	3.4
Room 111	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.4	1,045	0	$142	$657	$180	3.4
Room 113	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.4	1,045	0	$142	$657	$180	3.4
Room 112	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.4	1,045	0	$142	$657	$180	3.4
Room 115	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.4	1,045	0	$142	$657	$180	3.4
Room 114	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.2	523	0	$71	$329	$90	3.4

	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Media Center	44	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	44	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	1.6	3,833	-1	$521	$2,410	$660	3.4
Room 103	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.7	1,830	0	$249	$1,150	$315	3.4
Room 102	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.5	1,307	0	$178	$822	$225	3.4
Room 104	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.5	1,307	0	$178	$822	$225	3.4
Conference Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,600	2	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.1	348	0	$47	$219	$60	3.4
Mech Room 2nd Fl	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	440	2	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	440	0.1	96	0	$13	$219	$60	12.2
2nd Fl Custodian	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	200	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	200	0.0	7	0	$1	$37	$10	26.9
Janitor Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	200	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	200	0.0	7	0	$1	$37	$10	26.9
Girls 2nd Fl	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	296	0	$40	$416	$75	8.5
Gym storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	200	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	138	0.1	37	0	$5	$262	$40	44.2
Media Center Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.0	116	0	$16	$73	$20	3.4
Server room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.0	116	0	$16	$73	$20	3.4
storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	222	0	$30	$226	$30	6.5
kitchen	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.4	1,035	0	$141	$781	$175	4.3
Stage	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	28	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.7	1,626	0	$221	$1,022	$280	3.4
Staffroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	296	0	$40	$416	$75	8.5
Room 122	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.5	1,330	0	$181	$927	$215	3.9
Copy Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	222	0	$30	$380	$65	10.4
Boiler Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.1	232	0	$32	$146	$40	3.4
Maintenance	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	222	0	$30	$380	$65	10.4
Vestibule	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	296	0	$40	$416	$75	8.5
Custodian	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.0	58	0	$8	$37	$10	3.4
Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	222	0	$30	$226	$30	6.5
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.0	58	0	$8	$37	$10	3.4
Room 211	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4

	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 212	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 210	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 209	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 207	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 208	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 206	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Boys 2nd Fl	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.1	232	0	$32	$146	$40	3.4
Room 204	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 202	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 203	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 205	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Boys 1st Fl	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.1	232	0	$32	$146	$40	3.4
Girls 1st Fl	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.1	232	0	$32	$146	$40	3.4
Room 106	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 105	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 107	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 109	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 108	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Room 110	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.4	871	0	$118	$548	$150	3.4
Boys 1st Fl	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.1	174	0	$24	$110	$30	3.4
Girls 1st Fl	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.1	174	0	$24	$110	$30	3.4
Custodian	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,600	0.0	58	0	$8	$37	$10	3.4
Room 100	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,600	2	Relamp	No	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,600	0.1	154	0	$21	$91	$25	3.2
Room 101	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,600	2	Relamp	No	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,600	0.1	154	0	$21	$91	$25	3.2
Bathroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,600	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,600	0.0	62	0	$8	$37	$10	3.2

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Copy Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,600	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,600	0.0	31	0	$4	$18	$5	3.2
Room 122	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,600	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,600	0.0	28	0	$4	$33	$6	6.9
Storage	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	S	33	1,600	2	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,600	0.0	56	0	$8	$65	$12	6.9
All purpose room	12	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Wall Switch	S	120	1,600	2, 3	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,104	0.7	1,689	0	$230	$1,146	$275	3.8
Gym	20	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Occupancy Sensor	S	120	1,104	2	Relamp	No	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,104	0.9	1,506	0	$205	$1,461	$400	5.2
Exterior	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock		18	3,640		None	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	18	3,640	0.0	0	0	$0	$0	$0	0.0
Staff Bathroom	1	LED - Fixtures: Ceiling Mount	Wall Switch	S	13	1,600		None	No	1	LED - Fixtures: Ceiling Mount	Wall Switch	13	1,600	0.0	0	0	$0	$0	$0	0.0
Staff Bathroom	1	LED - Fixtures: Ceiling Mount	Wall Switch	S	13	1,600		None	No	1	LED - Fixtures: Ceiling Mount	Wall Switch	13	1,600	0.0	0	0	$0	$0	$0	0.0
closet	1	LED - Fixtures: Ceiling Mount	Wall Switch	S	13	1,600		None	No	1	LED - Fixtures: Ceiling Mount	Wall Switch	13	1,600	0.0	0	0	$0	$0	$0	0.0
Boiler Room	1	LED - Fixtures: Ceiling Mount	Wall Switch	S	11	1,600		None	No	1	LED - Fixtures: Ceiling Mount	Wall Switch	11	1,600	0.0	0	0	$0	$0	$0	0.0
1st Fl Hallway	17	LED - Fixtures: Ceiling Mount	Wall Switch	S	11	1,600	4	None	Yes	17	LED - Fixtures: Ceiling Mount	High/Low Control	11	1,104	0.0	97	0	$13	$600	$0	45.3
1st Fl Hallway	1	LED - Fixtures: Ceiling Mount	Wall Switch	S	45	1,600	4	None	Yes	1	LED - Fixtures: Ceiling Mount	High/Low Control	45	1,104	0.0	25	0	$3	$0	$0	0.0
Bathroom	1	LED - Fixtures: Ceiling Mount	Occupancy Sensor	S	9	1,104		None	No	1	LED - Fixtures: Ceiling Mount	Occupancy Sensor	9	1,104	0.0	0	0	$0	$0	$0	0.0
Caselight	3	Incandescent: Bulb (60W) - 1L	Wall Switch	S	60	1,600	2	Relamp	No	3	LED Screw-In Lamps: Bulb (9W) - 1L	Wall Switch	9	1,600	0.1	269	0	$37	$52	$3	1.3
Faculty bathroom	1	Incandescent: Bulb (60W) - 1L	Wall Switch	S	60	1,600	2	Relamp	No	1	LED Screw-In Lamps: Bulb (9W) - 1L	Wall Switch	9	1,600	0.0	90	0	$12	$17	$1	1.3
Therapy room	1	Incandescent: Bulb (60W) - 1L	Wall Switch	S	60	1,600	2	Relamp	No	1	LED Screw-In Lamps: Bulb (9W) - 1L	Wall Switch	9	1,600	0.0	90	0	$12	$17	$1	1.3
Bathroom	1	Incandescent: Bulb (60W) - 1L	Wall Switch	S	60	1,600	2	Relamp	No	1	LED Screw-In Lamps: Bulb (9W) - 1L	Wall Switch	9	1,600	0.0	90	0	$12	$17	$1	1.3
Exterior	12	High-Pressure Sodium: (1) 70W Lamp	Timeclock		95	3,640	1	Fixture Replacement	No	12	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	21	3,640	0.4	3,232	0	$445	$11,592	$1,200	23.4
Exterior	2	High-Pressure Sodium: (1) 150W Lamp	Timeclock		188	3,640	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	45	3,640	0.1	1,041	0	$143	$1,932	$200	12.1
Exterior	7	High-Pressure Sodium: (1) 100W Lamp	Timeclock		138	3,640	1	Fixture Replacement	No	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	30	3,640	0.4	2,752	0	$379	$6,762	$700	16.0
2nd Fl Hallway	9	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	9	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Storage 2	1	Exit Signs: LED - 2 W Lamp	None		6	200		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	200	0.0	0	0	$0	$0	$0	0.0
Gym	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Media Center	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
Room 100	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 101	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
All purpose room	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stage	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Shipping	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs 2	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
Stairs 3	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
1st Fl Hallway	16	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	16	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
1st Fl Hallway	17	Compact Fluorescent: 4 Pin (42W) - 1L	Wall Switch	S	42	1,600	2, 4	Relamp	Yes	17	LED Screw-In Lamps: Bulb - 1L	High/Low Control	29	1,104	0.3	650	0	$88	$1,029	$0	11.6
Vestibule	2	Compact Fluorescent: 4 Pin (42W) - 1L	Wall Switch	S	42	1,600	2	Relamp	No	2	LED Screw-In Lamps: Bulb - 1L	Wall Switch	29	1,600	0.0	44	0	$6	$50	$0	8.4
2nd Fl Hallway	16	Compact Fluorescent: 4 Pin (32W) - 1L	Wall Switch	S	32	1,600	2, 4	Relamp	Yes	16	LED Screw-In Lamps: Bulb - 1L	High/Low Control	22	1,104	0.2	466	0	$63	$1,004	$0	15.8
Media Center	6	Compact Fluorescent: 4 Pin (32W) - 1L	Wall Switch	S	32	1,600	2, 3	Relamp	Yes	6	LED Screw-In Lamps: Bulb - 1L	Occupancy Sensor	22	1,104	0.1	175	0	$24	$421	$35	16.3
stairs 1	10	Compact Fluorescent: 4 Pin (26W) - 2L	Wall Switch	S	26	1,600	2	Relamp	No	10	LED Screw-In Lamps: Bulb - 2L	Wall Switch	18	1,600	0.1	137	0	$19	$504	$0	27.0

Motor Inventory & Recommendations

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classrooms & Vestibules	UV-1	24	Supply Fan	0.3	60.0%	No	B	2,745	NR	Yes	69.5%	No		0.6	2,099	0	$289	$15,194	$0	52.6
Classrooms & Vestibules	UV-2	24	Supply Fan	0.3	60.0%	No	B	2,745	NR	Yes	69.5%	No		0.6	2,099	0	$289	$15,194	$0	52.6
Roof	HV-1	1	Supply Fan	7.5	88.5%	No	W	3,391	NR, 5	Yes	90.2%	Yes	1	2.2	8,312	0	$1,144	$5,321	$600	4.1
Roof	HV-2	1	Supply Fan	7.5	88.5%	No	W	3,391	NR, 5	Yes	90.2%	Yes	1	2.2	8,312	0	$1,144	$5,321	$600	4.1
Roof	F-1	1	Exhaust Fan	0.1	60.0%	No	B	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-2	1	Exhaust Fan	0.1	60.0%	No	B	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-3	1	Exhaust Fan	0.1	60.0%	No	B	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-4	1	Exhaust Fan	0.3	65.0%	No	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-5	1	Exhaust Fan	0.3	65.0%	No	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-6	1	Exhaust Fan	0.5	68.0%	No	B	2,745		No	68.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-7	1	Exhaust Fan	0.3	65.0%	No	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-8	1	Exhaust Fan	5.0	87.5%	Yes	B	2,745	NR	Yes	89.5%	No		0.1	196	0	$27	$1,341	$0	49.7
Roof	F-9	1	Exhaust Fan	0.3	65.0%	Yes	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-10	1	Exhaust Fan	0.5	68.0%	Yes	B	2,745		No	68.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-11	1	Exhaust Fan	0.3	65.0%	Yes	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-12	1	Exhaust Fan	0.3	65.0%	Yes	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-13	1	Exhaust Fan	0.3	65.0%	Yes	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-14	1	Exhaust Fan	0.3	65.0%	No	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-15	1	Exhaust Fan	0.3	65.0%	No	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-16	1	Exhaust Fan	1.5	84.0%	Yes	B	2,745	NR	Yes	86.5%	No		0.0	79	0	$11	$820	$0	75.1

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	F-17	1	Exhaust Fan	1.5	84.0%	Yes	B	2,745	NR	Yes	86.5%	No		0.0	79	0	$11	$820	$0	75.1
Roof	F-18	1	Exhaust Fan	0.3	65.0%	Yes	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-19	1	Exhaust Fan	0.3	65.0%	Yes	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-20	1	Exhaust Fan	0.3	65.0%	Yes	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-21	1	Exhaust Fan	0.3	65.0%	No	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	F-22	1	Exhaust Fan	0.1	60.0%	No	B	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Mech Room	P-1	1	Heating Hot Water Pump	5.0	87.5%	No	W	1,373	NR, 6	Yes	89.5%	Yes	1	0.5	2,282	0	$314	$4,076	$0	13.0
Mech Room	P-2	1	Heating Hot Water Pump	5.0	87.5%	No	W	1,373	NR, 6	Yes	89.5%	Yes	1	0.5	2,282	0	$314	$4,076	$0	13.0
Mech Room	B-1	1	Combustion Air Fan	5.0	85.5%	No	W	2,745	NR, 7	Yes	86.5%	Yes	1	1.5	4,584	0	$631	$3,987	$775	5.1
Mech Room	B-2	1	Combustion Air Fan	7.5	87.5%	No	B	3,391	NR, 7	Yes	91.0%	Yes	1	2.4	8,694	0	$1,197	$4,738	$1,163	3.0
Mech Room	Air Compressor	1	Air Compressor	1.0	85.5%	No	W	2,190		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Mech Room	Recirculation Pump	1	Other	0.2	60.0%	No	W	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Mech Room	P-3	1	Heating Hot Water Pump	5.0	87.5%	No	W	1,373	NR, 6	Yes	89.5%	Yes	1	0.5	2,282	0	$314	$4,076	$0	13.0
Mech Room	P-4	1	Heating Hot Water Pump	5.0	87.5%	No	W	1,373	NR, 6	Yes	89.5%	Yes	1	0.5	2,282	0	$314	$4,076	$0	13.0
Roof	RTU-1	1	Supply Fan	1.0	82.5%	No	B	2,745		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU-2	1	Supply Fan	2.0	84.0%	No	W	2,745	NR, 5	Yes	86.5%	Yes	1	0.6	1,923	0	$265	$3,261	$160	11.7
Roof	RTU-3	1	Supply Fan	2.0	84.0%	No	W	2,745	NR, 5	Yes	86.5%	Yes	1	0.6	1,923	0	$265	$3,261	$160	11.7
Roof	RTU-4	1	Supply Fan	5.0	87.5%	No	W	2,745	NR, 5	Yes	89.5%	Yes	1	1.5	4,565	0	$628	$4,076	$400	5.9
Roof	RTU-5	1	Supply Fan	1.0	82.5%	No	B	2,745		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU-6	1	Supply Fan	0.3	60.0%	No	B	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU-7	1	Supply Fan	0.3	60.0%	No	B	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU-1	1	Packaged AC	4.00		B	NR	Yes	1	Packaged AC	4.00		14.00		0.6	997	0	$137	$9,076	$368	63.5
Roof	RTU-2	1	Packaged AC	7.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU-3	1	Packaged AC	7.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU-4	1	Packaged AC	12.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU-5	1	Packaged AC	4.00		B	NR	Yes	1	Packaged AC	4.00		14.00		1.0	1,702	0	$234	$9,076	$368	37.2
Roof	RTU-6	1	Packaged AC	2.00		B	NR	Yes	1	Packaged AC	2.00		14.00		0.5	775	0	$107	$4,538	$184	40.8
Roof	RTU-7	1	Packaged AC	2.00		B	NR	Yes	1	Packaged AC	2.00		14.00		0.5	775	0	$107	$4,538	$184	40.8
Roof	RTU	2	Packaged AC	4.00		W		No							0.0	0	0	$0	$0	$0	0.0
Classrooms	Classrooms	24	Window AC	1.00		B	NR	Yes	24	Window AC	1.00		12.00		2.4	4,032	0	$555	$26,130	$0	47.1
Staffroom	staffroom	1	Ductless Mini-Split AC	2.00		W		No							0.0	0	0	$0	$0	$0	0.0

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	B-1	1	Non-Condensing Hot Water Boiler	######	B	NR	Yes	1	Non-Condensing Hot Water Boiler	######	85.00%	Ec	0.0	0	309	$2,461	$86,568	$0	35.2
Boiler Room	B-2	1	Non-Condensing Hot Water Boiler	######	B	NR	Yes	1	Non-Condensing Hot Water Boiler	######	85.00%	Ec	0.0	0	739	$5,878	$47,831	$3,575	7.5
Roof	RTU-1	1	Furnace	95.60	B	NR	Yes	1	Furnace	95.60	95.00%	AFUE	0.0	0	6	$48	$2,166	$400	36.8
Roof	RTU-2	1	Furnace	160.00	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	RTU-3	1	Furnace	160.00	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	RTU-4	1	Furnace	203.00	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	RTU-5	1	Furnace	95.60	B	NR	Yes	1	Furnace	95.60	95.00%	AFUE	0.0	0	6	$48	$2,166	$400	36.8
Roof	RTU-6	1	Furnace	40.00	B	NR	Yes	1	Furnace	40.00	95.00%	AFUE	0.0	0	3	$20	$906	$400	25.2
Roof	RTU-7	1	Furnace	40.00	B	NR	Yes	1	Furnace	40.00	95.00%	AFUE	0.0	0	3	$20	$906	$400	25.2
Vestibule & Toilet	CH-1 to 6,11,12	8	Warm Air Unit Heater	15.90	W		No						0.0	0	0	$0	$0	$0	0.0
Gym/classroom Corridor	CH-7,8,10	3	Warm Air Unit Heater	42.40	W		No						0.0	0	0	$0	$0	$0	0.0
Stair 124	CH-9	1	Warm Air Unit Heater	47.00	W		No						0.0	0	0	$0	$0	$0	0.0
Mech Room	UH-1,2,4	3	Warm Air Unit Heater	32.10	W		No						0.0	0	0	$0	$0	$0	0.0
Gym Storage 120	UH-3	1	Warm Air Unit Heater	15.00	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	RTU	2	Furnace	120.00	W		No						0.0	0	0	$0	$0	$0	0.0

Demand Control Ventilation Recommendations

		Recommendation Inputs					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Number of Zones	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU-4	NR	2.00	12.50	0.00	203.00	0.0	643	4	$120	$2,719	$0	22.6

DHW Inventory & Recommendations

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

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	8	26	Faucet Aerator (Lavatory)	2.50	0.50	0.0	0	17	$139	$186	$0	1.3

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Refrigerator Chest	No	NR	Yes	0.1	1,007	0	$139	$2,116	$0	15.3
Kitchen	1	Freezer Chest	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Convection Oven (Full Size)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Electric Convection Oven (Half Size)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Yes		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	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	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Single Tank Conveyor (High Temp)	Electric	Electric	Yes		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

Location	Existing Conditions			
	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Classrooms	68	Computers	120.0	Yes
Classrooms	17	Projectors	120.0	Yes
Classrooms	13	Small Printer	46.0	Yes
Staffrooms	6	Medium Printer	55.0	Yes
Copy room	3	Copy Machine	600.0	Yes
Kitchen/breakroom	6	Regular Refrigerator	255.0	No
Kitchen/breakroom	4	Microwave	800.0	No
Classrooms	5	Smart boards	2.0	No
Classrooms	6	LED Tv	120.0	Yes
Kitchen/breakroom	4	Food warmer table	120.0	Yes
Breakroom	1	Toaster	300.0	No
Breakroom	1	Coffee Maker	300.0	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]

Merriam Avenue School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 46,260
Built: 1964

For Year Ending: May 31, 2018
Date Generated: December 03, 2018

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
Merriam Avenue School 81 Merriam Avenue Newton, New Jersey 07860	________________ , (____)____-______	____ _______ , (____)____-______ ________________

Property ID: 6622926

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
116.3 kBtu/ft²

Source EUI
173.5 kBtu/ft²

Annual Energy by Fuel	
Electric - Solar (kBtu)	505,425 (9%)
Natural Gas (kBtu)	4,026,097 (75%)
Electric - Grid (kBtu)	850,472 (16%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	91.4
National Median Source EUI (kBtu/ft²)	136.2
% Diff from National Median Source EUI	27%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	351

Signature & Stamp of Verifying Professional

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

Signature: ____________________Date: __________

Licensed Professional

____ _______
,
(____)____-______
____

Professional Engineer 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 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.
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.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of 1/8th of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use
VAV	*Variable air volume*
VFD	*Variable frequency drive*: a controller used to vary the speed of an electric motor.
WaterSense™	The symbol for water efficiency. The WaterSense program is managed by the EPA.
Watt (W)	Unit of power commonly used to measure electricity use.