Local Government Energy Audit Report

New 1st Ave Elementary School

August 26, 2019

Prepared for:

Newark Public Schools
214 1st Avenue
Newark, New Jersey 07107

Prepared by:

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Disclaimer

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

TRC 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 to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual measures and conditions. TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

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

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

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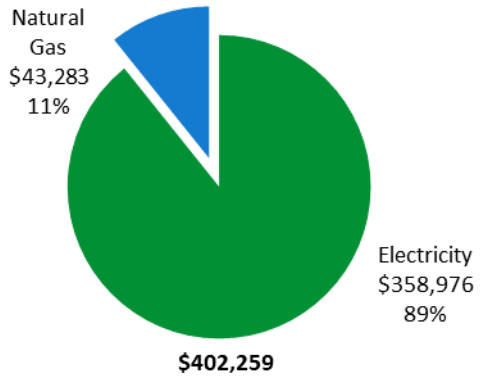
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for New 1st Ave Elementary School. This report provides you with information about the Elementary School'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 to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $402,259 Electricity: 2,962,536 kWh Natural Gas: 57,699 Therms	
ENERGY STAR® Benchmarking Score	8 *(1-100 scale)*	This building performs below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

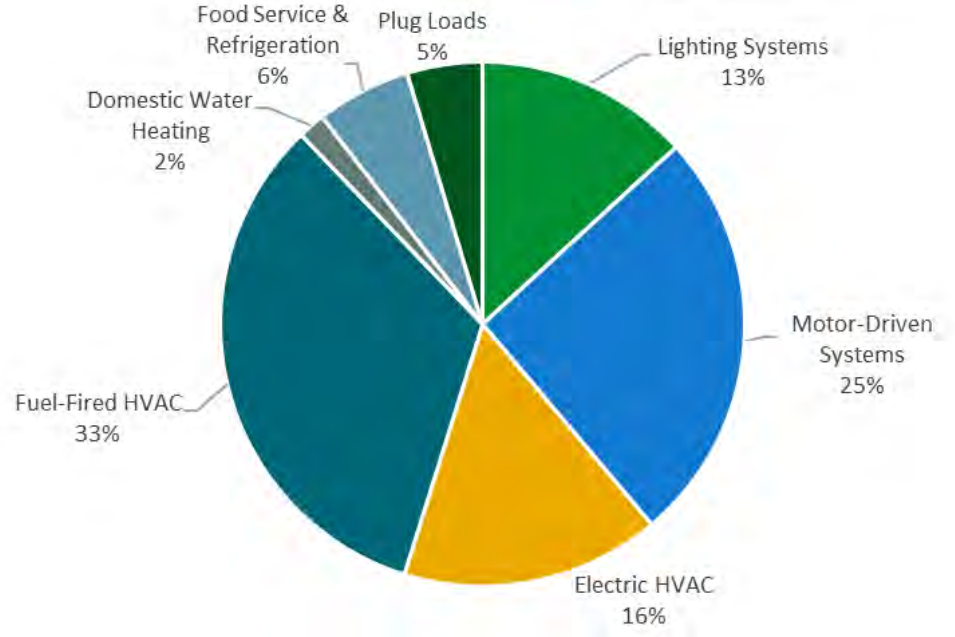


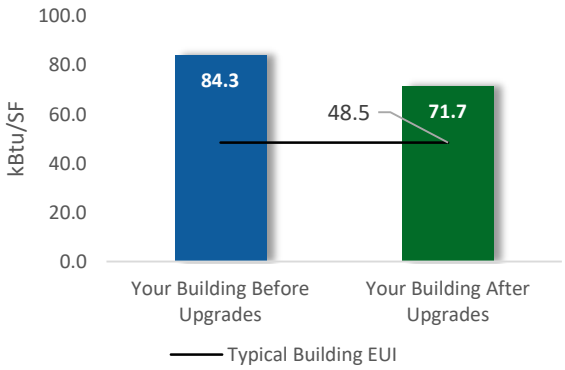
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

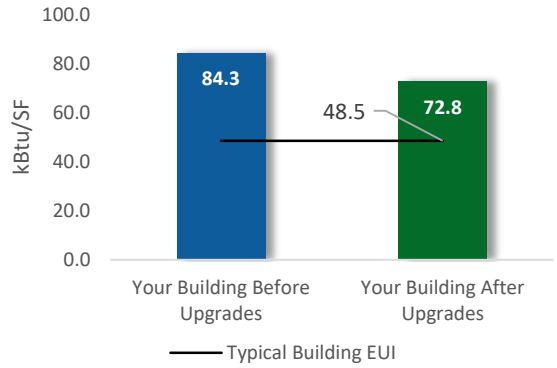
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$547,006
Potential Rebates & Incentives[1]	$51,506
Annual Cost Savings	$86,459
Annual Energy Savings	Electricity: 719,047 kWh
Greenhouse Gas Emission Savings	357 Tons
Simple Payback	5.7 Years
Site Energy Savings (all utilities)	15%



Scenario 2: Cost Effective Package[2]

Installation Cost	$288,874
Potential Rebates & Incentives	$29,906
Annual Cost Savings	$79,326
Annual Energy Savings	Electricity: 660,175 kWh
Greenhouse Gas Emission Savings	327 Tons
Simple Payback	3.3 Years
Site Energy Savings (all utilities)	14%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	None

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

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

#	Energy Conservation Measure	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		**353,742**	**56.7**	**-70**	**$42,338**	**$635,072**	**$122,672**	**$22,932**	**$99,740**	**2.4**	**348,014**
ECM 1	Install LED Fixtures	55,873	8.1	-10	$6,695	$100,432	$37,398	$4,830	$32,568	4.9	55,097
ECM 2	Retrofit Fixtures with LED Lamps	297,870	48.6	-60	$35,643	$534,639	$85,274	$18,102	$67,172	1.9	292,916
Lighting Control Measures		**75,044**	**10.6**	**-15**	**$8,981**	**$71,848**	**$50,487**	**$4,850**	**$45,637**	**5.1**	**73,817**
ECM 3	Install Occupancy Sensor Lighting Controls	51,268	8.9	-11	$6,132	$49,054	$36,762	$4,850	$31,912	5.2	50,371
ECM 4	Install High/Low Lighting Controls	23,776	1.7	-4	$2,849	$22,793	$13,725	$0	$13,725	4.8	23,446
Motor Upgrades		**11,997**	**2.7**	**0**	**$1,454**	**$21,806**	**$53,369**	**$0**	**$53,369**	**36.7**	**12,081**
ECM 5	Premium Efficiency Motors	11,997	2.7	0	$1,454	$21,806	$53,369	$0	$53,369	36.7	12,081
Variable Frequency Drive (VFD) Measures		**2,682**	**0.4**	**0**	**$325**	**$4,875**	**$3,236**	**$450**	**$2,786**	**8.6**	**2,701**
ECM 6	Install VFDs on Kitchen Hood Fan Motors	2,682	0.4	0	$325	$4,875	$3,236	$450	$2,786	8.6	2,701
Electric Chiller Replacement		**46,874**	**18.6**	**0**	**$5,680**	**$113,596**	**$204,764**	**$21,600**	**$183,164**	**32.2**	**47,202**
ECM 7	Install High Efficiency Chillers	46,874	18.6	0	$5,680	$113,596	$204,764	$21,600	$183,164	32.2	47,202
HVAC System Improvements		**7,502**	**0.0**	**0**	**$909**	**$9,999**	**$264**	**$0**	**$264**	**0.3**	**7,554**
ECM 8	Install Pipe Insulation	7,502	0.0	0	$909	$9,999	$264	$0	$264	0.3	7,554
Domestic Water Heating Upgrade		**95,664**	**64.8**	**-264**	**$9,613**	**$133,076**	**$42,761**	**$1,474**	**$41,287**	**4.3**	**65,446**
ECM 9	Install High Efficiency Gas-Fired Water Heater	77,313	64.8	-264	$7,389	$110,840	$42,603	$1,474	$41,129	5.6	46,967
ECM 10	Install Low-Flow DHW Devices	18,350	0.0	0	$2,224	$22,235	$158	$0	$158	0.1	18,479
Food Service & Refrigeration Measures		**13,321**	**1.2**	**0**	**$1,614**	**$22,963**	**$5,095**	**$200**	**$4,895**	**3.0**	**13,414**
ECM 11	Refrigerator/Freezer Case Electrically Commutated Motors	5,898	0.7	0	$715	$10,720	$1,517	$0	$1,517	2.1	5,939
ECM 12	Refrigeration Controls	5,811	0.3	0	$704	$11,267	$3,348	$150	$3,198	4.5	5,852
ECM 13	Vending Machine Control	1,612	0.2	0	$195	$977	$230	$50	$180	0.9	1,623
Custom Measures		**112,221**	**0.0**	**260**	**$15,546**	**$77,729**	**$64,360**	**$0**	**$64,360**	**4.1**	**143,407**
ECM 14	Computer Power Management Software	16,279	0.0	0	$1,973	$9,863	$7,360	$0	$7,360	3.7	16,392
ECM 15	Retro-Commissioning Study & HVAC Improvements	95,942	0.0	260	$13,573	$67,866	$57,000	$0	$57,000	4.2	127,014
TOTALS (COST EFFECTIVE MEASURES)		**660,175**	**133.7**	**-89**	**$79,326**	**$955,561**	**$288,874**	**$29,906**	**$258,967**	**3.3**	**654,352**
TOTALS (ALL MEASURES)		**719,047**	**155.0**	**-89**	**$86,459**	**$1,090,963**	**$547,006**	**$51,506**	**$495,500**	**5.7**	**713,635**

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

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

Figure 2 – Evaluated Energy Improvements

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

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

Energy Conservation Measure		SmartStart	Direct Install	Pay For Performance
ECM 1	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	Premium Efficiency Motors			x
ECM 6	Install VFDs on Single-Speed Kitchen Hoods	x		x
ECM 7	Install High Efficiency Chillers	x		x
ECM 8	Install Pipe Insulation			x
ECM 9	Install High Efficiency Gas Water Heater	x		x
ECM 10	Install Low-Flow Domestic Hot Water Devices			x
ECM 11	Refrigerator/Freezer Case Electrically Commutated Motors			x
ECM 12	Refrigeration Controls	x		x
ECM 13	Vending Machine Control	x		x
ECM 14	Computer Power Management Software			x
ECM 15	Retro-Commissioning Study & HVAC Improvements			x

Figure 3 – Funding Options

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

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

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

Individual Measures with SmartStart

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

Turnkey Installation with Direct Install

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

Whole Building Approach with Pay for Performance

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

More Options from Around the State

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

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

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

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

Ongoing Electric Savings with Demand Response

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

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for New 1st Ave Elementary School. This report provides information on how the Elementary School uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs. This report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

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

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

2.1 Site Overview

On January 3, 2019, TRC performed an energy audit at New 1st Ave Elementary School located in Newark, New Jersey. TRC met with Ms. Park (Head of Facilities) to review the Elementary School operations and help focus our investigation on specific energy-using systems.

New 1st Ave Elementary School is a three-story, 188,424 square foot building built in 2007. Spaces include: classrooms, a gymnasium, a music suite, an auditorium, offices, a cafeteria, a kitchen, a media center, corridors, stairwells, a basement parking garage, and mechanical space. The building is 100% heated and cooled. The building has multiple HVAC systems, there is a hydronic system served by gas-fired condensing hot water boilers and air-cooled scroll chillers that supply coils in roof top units and energy recovery make-up air units. These air handling units serve larger areas such as the auditorium, cafeteria, gymnasium, and music suite. The building is also conditioned by a ground source water heat pump system which serves the majority of classrooms and offices. The original gas-fired domestic hot water heaters began leaking and had exhaust issues within a few years of being installed. The facility abandoned this system in place and installed electric domestic hot water heaters.

Facility concerns include the inaccessibility of the building Energy Management System (EMS). Facility staff also reported that there is a lack of control over the HVAC systems and equipment. Staff indicated that the control system is not fully operational, and the maintenance team does not have access to adjust settings for most of the roof top units. Actuators and valves need frequent replacement. The heat pumps also require frequent maintenance. There is a great interest in upgrading HVAC controls and improving the existing building EMS.

This building has a high energy use intensity (EUI), and it is believed that this is likely due to the lack of HVAC control functionality. This building has a high cost use intensity as well, and it is believed that this is likely due to on-peak operation of the chillers and ice storage system.

The scope of this report is to outline cost effective equipment upgrades and suggest operations and maintenance measures. There is likely an opportunity for additional savings if the site undertakes a comprehensive evaluation of HVAC systems to optimize control strategies, correct inefficiencies, replace faulty control ancillary equipment, and ensure facility staff has access for control. For example, facility staff may elect to optimize the ice storage system to operate the chillers at night during off peak hours to reduce electrical demand costs. Optimization of existing controls is beyond the scope of this energy audit and is recommended for further investigation. This building has a significant opportunity for retro-commissioning based on the quantity and type of HVAC systems serving the Elementary School.

2.2 Building Occupancy

The Elementary School is occupied year-round. Typical weekday occupancy is 113 staff and 1,200 students. Building occupancy also includes continuing custodial and maintenance activities. The sites used by the Newark Public School District for summer school varies on an annual basis. It should be noted that the energy and economic analysis for this building is based on the use of the building during the utility billing period, and that results will vary based on changes to building use patterns.

Occupancy	Weekday/Weekend	Operating Schedule
Normal School Day	Weekday	6:00AM - 8:00PM
	Weekend (Saturday)	6:00AM - 8:00PM
After Hours Cleaning	Weekday	8:00PM - 11:00PM
	Weekend (Saturday)	8:00PM - 11:00PM
Summer School	Weekday	8:00AM - 6:00PM
	Weekend	Rare Use

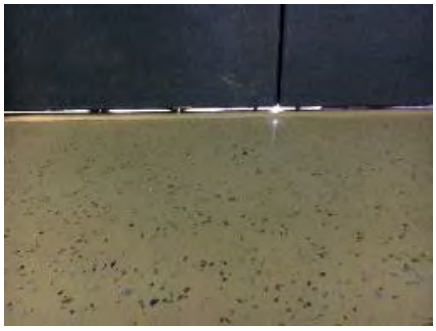
Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a brick or concrete masonry unit (CMU) facade. The roof is mixture of flat and pitched sections. The flat area is covered with a rubber membrane and the pitched area includes metal decking. The roof is in good condition. Windows are double-pane and operable with metal frames. Windows are in good condition, as are the glass-to-frame seals and operable window weather seals, showing little evidence of excessive wear. Exterior doors are metal with metal frames. The main entrance are steel framed glass windows. Doors are in good condition; however, they have worn door seals. Degraded window and door seals increase drafts and outside air infiltration.

Building Facade

Building Facade



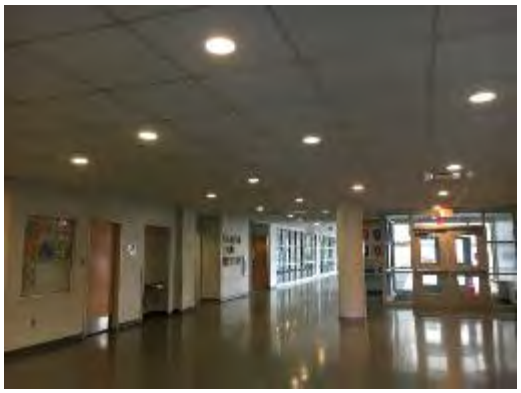
Door with Worn Weather-Stripping

Building Courtyard

2.4 Lighting Systems

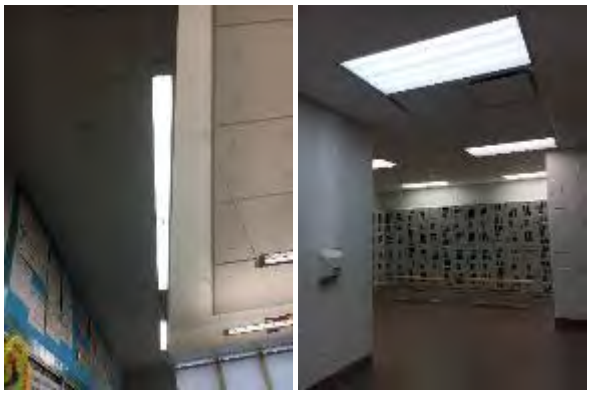
The primary interior lighting system 4-foot 32-Watt linear fluorescent T8 lamps. There are also several compact fluorescent lamp (CFL) fixtures and U-lamp T8 fixtures. There are metal halide lamp high bay fixtures in the gymnasium and metal halide lamp fixtures in the cafeteria. Additionally, there are some incandescent general-purpose lamps. All fluorescent lamp fixtures use electronic ballasts.

Fixtures throughout the building include recessed troffer fixtures, continuous row pendant fixtures, and recessed can fixtures. Light fixtures are in good condition. All exit signs throughout the building are LED. All interior lighting levels were generally sufficient; however, the main office and a few other rooms are currently over lit. Interior light fixtures are manually controlled via wall switches or occupancy sensors.

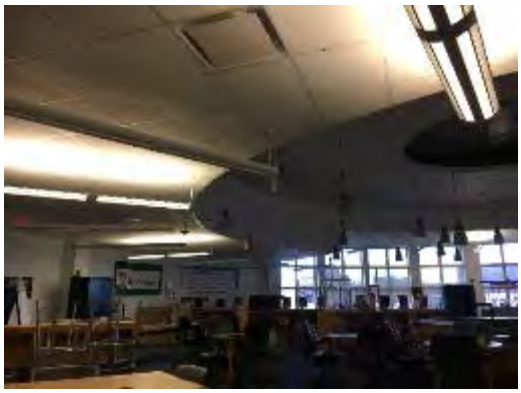


CFL Recessed Can Lighting

CFL Wall Sconce and Pendant Mounted Lighting

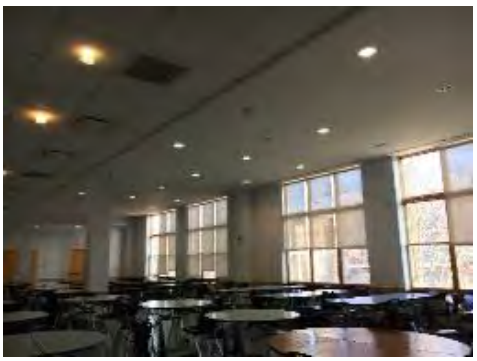


Linear Fluorescent T8 Fixtures



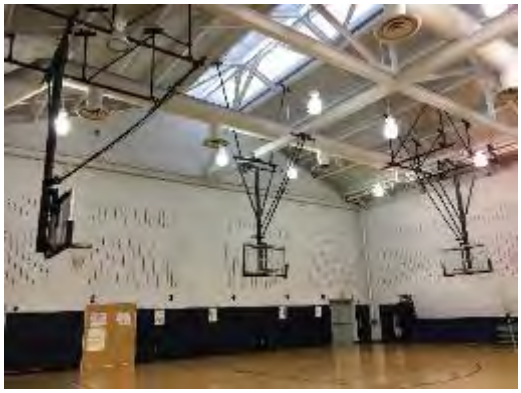
Linear Fluorescent T8 Pendant-mounted Fixtures

Linear Fluorescent T8 Pendant-mounted Fixtures

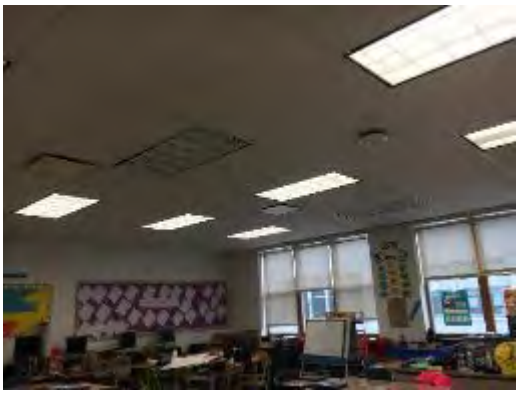


CFL and HID Fixtures in Cafeteria

Linear Fluorescent T8 Pendant-mounted Fixtures



HID High Bay Fixtures in Gym



Linear Fluorescent T8 Recessed Troffer Fixtures

Wall Switches and Occupancy Sensor

Exterior lighting is provided by wall pack fixtures and recessed can fixtures. These fixtures contain high-pressure sodium lamps, metal halide lamps, or CFLs. Exterior light fixtures are controlled by time clocks.

HID Lamp on Roof

CFL Recessed Can Fixtures

2.5 Ground Source Heat Pump System

The majority of individual classrooms and offices are conditioned by a ground source water heat pump system. There are bore-holes beneath the building which are utilized for ground heat transfer. There are approximately 68 ceiling-mounted heat pumps within the building. The distribution system includes two 50 hp, VFD-controlled, ground source water pumps. These are high-efficiency and operate with a lead-lag control scheme. The system was designed to operate eight roof top dry coolers on the roof in cases when the ground source loop becomes overheated, typically in summer. However, facility staff reported that they are never used; the conditions that would require their use are typically not met. This high-efficiency system is utilized year-round to heat and cool the classrooms and offices throughout the building.

Ground Source Water Pumps and VFDs

Ground Source Water Pump Motors

2.6 Air Handling Systems

Unitary Electric HVAC

There are electric unit heaters and cabinet heaters located in stairwells, vestibules, and storage rooms within the building. These on average have a 5kW heating element and are controlled by manual dial thermostats. They are in good condition.

Electric Unit Heater

Electric Cabinet Heater

Make Up Air Units

There are three make up air units (MUAs) controlled by the building energy management system (EMS). These units are equipped with an energy recovery wheel. The supply fans are driven by 10 hp VFD controlled motors. The heat wheels are driven by 5 hp VFD controlled motors. These are high-efficiency systems; however, facility staff reported that one of these heat wheels is inoperable and needs to be replaced. The MUAs bring in 100% outdoor air for the three sections of the building and utilize the exhaust air to pre-condition the incoming fresh air to the school. These MUA provide ventilation for classrooms, offices, and hallways throughout the school.

Make Up Air Unit

Roof Top Units

The larger areas in the building are conditioned by roof top units (RTUs). There are eleven units, and each is equipped with both hot water coil and chilled water coils. These units are equipped with economizers, which are in fair condition. These RTUs provide ventilation to the auditorium, music suite, cafeteria, media center, and gymnasium. They are equipped with variable frequency drives (VFD) to control supply and exhaust fans, providing demand control ventilation capability.

The RTUs are controlled by the building energy management system (EMS). Staff reported that the functionality of the EMS has never been adequate and that they have had to resort to manual control of the RTU. Reportedly, there are seven RTUs to which the facility maintenance team has no access.

Roof Top Unit

Roof Top Unit

2.7 Heating Hot Water System

Four Fulton model PHW-2000 PulsePak 1840 Mbh and one Fulton model PHW-1400 1288 Mbh high-efficiency condensing hot water boilers serve the building heating load. The burners are fully-modulating with nominal efficiency of 92%. The boilers are configured in an automated control scheme. Multiple boilers are required under high load conditions. Installed in 2006, they are in fair condition; however, there are two boilers which need frequent maintenance to stay operational.

The hydronic distribution system is a 2-pipe, heating-only system. Hot water is supplied to coils in the roof top units and energy recovery make-up air units. The boilers are configured in a variable flow primary distribution with two 40 hp VFD-controlled hot water pumps operating with a lead-lag control scheme. Pump motors are in good condition and high-efficiency. Piping is insulated and the insulation is in good condition. On the day of the audit, some boilers were set to supply hot water at 180°F, while others were set to supply hot water at 131°F when the outside air temperature was 45°F.

Hot Water Boilers

Modulating Control Panel

Hot Water Pumps and VFDs

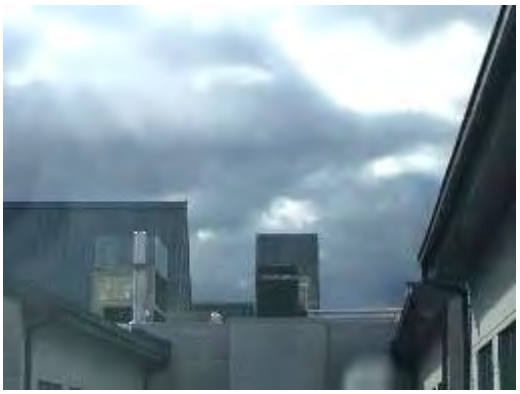
Hot Water Pump Motors

2.8 Chilled Water and Ice Storage System

The chiller plant consists of two 120-ton, McQuay model AGZ120BH air-cooled scroll chillers and a total of eight 2000-lb, Calmac (Model: 1190 C 4-F) ice storage tanks, comprising a thermal energy storage system (TES). TES systems are designed to offset the chiller capacity needed for space cooling during peak periods. The chillers are packaged units with high ambient and ventilation fans. The chillers are configured in a primary- distribution loop with four 75 hp, VFD-controlled chilled water pump motors. The chillers are supplied by two 50 hp, VFD-controlled condenser water pump motors. Pump motors are in good condition and high-efficiency. Chilled water is supplied to coils in roof top units and energy recovery make-up air units.

The chillers are currently operated to serve the ice storage system during peak hours. The energy benchmarking and information provided by the facility support this. This increases the electrical demand costs of the facility. There may be an opportunity for ice storage system optimization to ensure that the chillers operate during off peak hours; this should be further investigated.

Facility staff reported that the control system doesn't always function, and that actuators and valves require frequent maintenance. It is likely that the control system was intended to provide a chilled water supply. Temperature is reset based on outside air temperature; however, the current functionality and set points are unknown.



Chillers

Ice Storage

2.9 Building Energy Management Systems (EMS)

A Johnson Controls Metasys® EMS is wired to control the major HVAC system and equipment, although facility staff reported that this system is not functional nor complete.

The EMS at one time provided equipment scheduling control and control for space temperatures, supply air temperatures, outside air damper positions, heating water loop temperatures, chilled water loop temperatures, and ground source heat pump loop temperatures. The controls system allowed for manual adjustments of these temperatures to account for local heating and cooling issues. However, this EMS is no longer operational, does not have a graphical display, and was not accessible at the time of the audit. The site staff expressed a strong interest in upgrading the EMS.

Thermostats

2.10 Domestic Hot Water

Hot water is produced with four 119-gallon, AO Smith (Model DVE 120 920) 54 kW electric storage tank water heaters. These were installed in 2007 and are in good condition; their installation was due to the original gas-fired domestic hot water heaters began leaking and had exhaust issues within a few years of being installed. The facility abandoned this original system in place and installed the aforementioned electric domestic hot water heaters. Fractional horsepower circulation pumps distribute water to end uses. The domestic hot water pipes are not insulated.

Electric Storage Tank Water Heaters

Uninsulated Piping

Old Custom Gas Water Heaters–No Longer in Use

High-flow Sink Aerator vs Low-flow Sink Aerator

Locker Room Showers–Not in Use

High-flow Showerhead

2.11 Food Service Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare meals for students. Most cooking is done using gas rack ovens, gas steamer, and electric griddle. Bulk prepared foods are held in several electric holding cabinets. Equipment is high-efficiency and in good condition. There is no dishwasher.

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

Cooking Equipment

2.12 Refrigeration

The kitchen has several stand-up refrigerators and freezers with solid doors. There are also energy efficient refrigerator chests. All equipment is high-efficiency and in good condition. The walk-in cooler has an estimated 0.6-ton compressor and a two fan evaporator. The walk-in medium temperature freezer has an estimated 1.20-ton compressor and a three fan evaporator. This walk-in refrigeration equipment appears to have no evaporator fan control but does have electric defrost control.

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

Refrigeration Equipment

Refrigeration Equipment

Refrigeration Equipment

Walk-in Cooler Evaporator

Walk-in Freezer Evaporator

2.13 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 5% percent of total building energy use. This is higher than a typical building. You may wish to consider paying particular attention to minimizing your plug load usage. This report makes suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 324 computer work stations throughout the Elementary School and there are approximately 420 laptops/Chromebooks. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as Smart Boards, smartboards/projectors, small office printers, and fans.

There are several residential-style refrigerators throughout the building that vary in condition and efficiency. There is one refrigerated beverage vending machine and one non-refrigerated vending machine. Vending machines are not equipped with occupancy-based controls.

Laptop Cart

Typical Plug Loads

Desktop Computers

Vending Machines

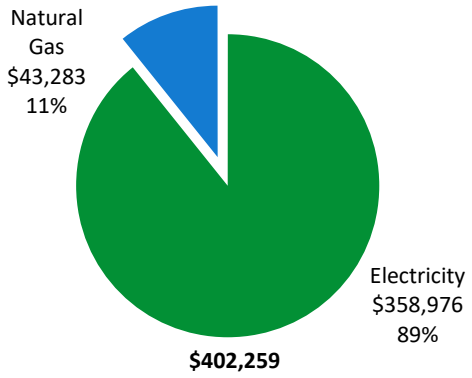
2.14 Water-Using Systems

There are restrooms with toilets, urinals, and sinks. Faucet flow rates are either low-flow, rated for 0.5 gallons per minute (gpm) or high-flow, rated at 2.2 gpm. Showers in the locker rooms are not used. Toilets and urinals vary in rated gallons per flush (gpf).

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	2,962,536 kWh	$358,976
Natural Gas	57,699 Therms	$43,283
Total		**$402,259**



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.

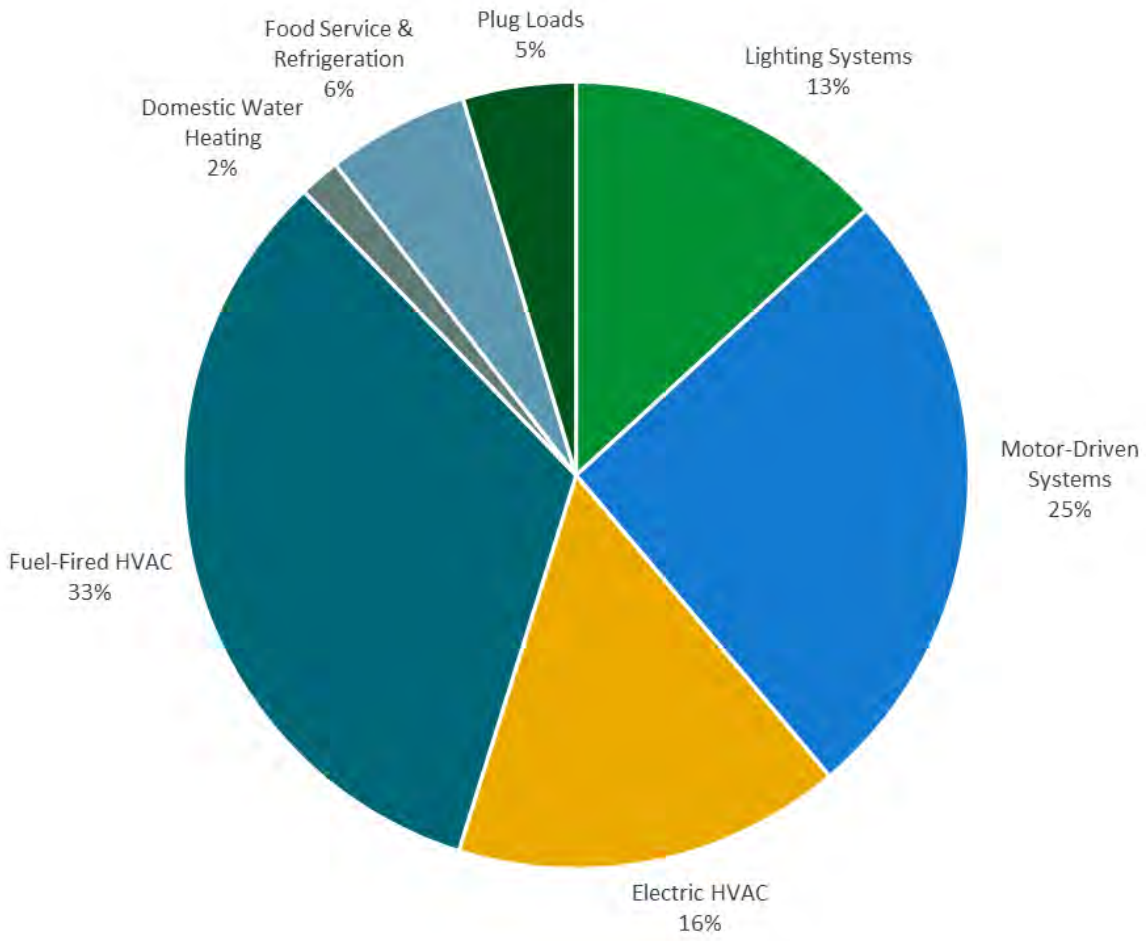
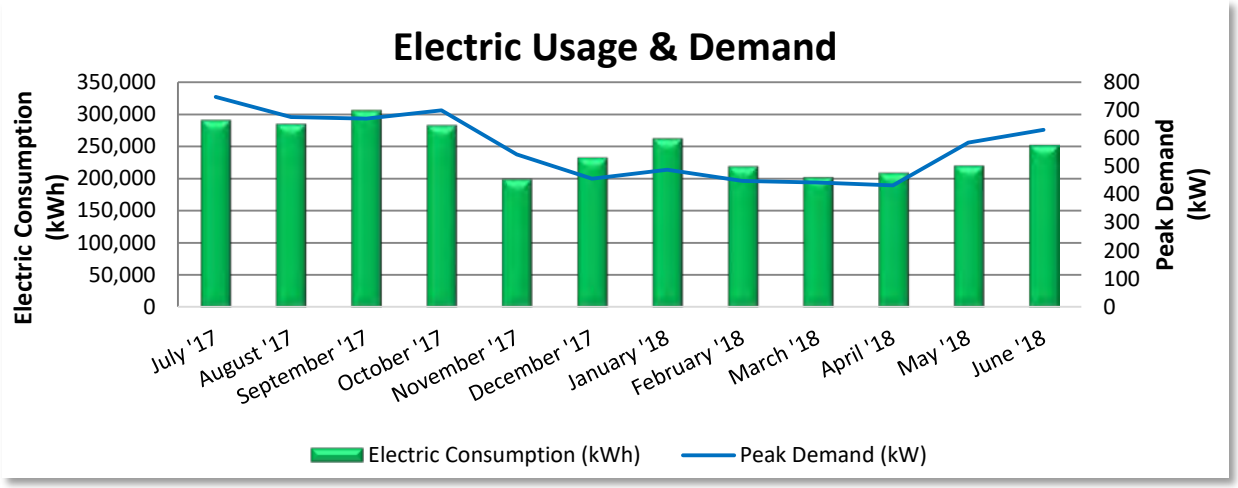


Figure 5 - Energy Balance

3.1 Electricity

PSE&G supplies and delivers electricity under rate class LPLS.



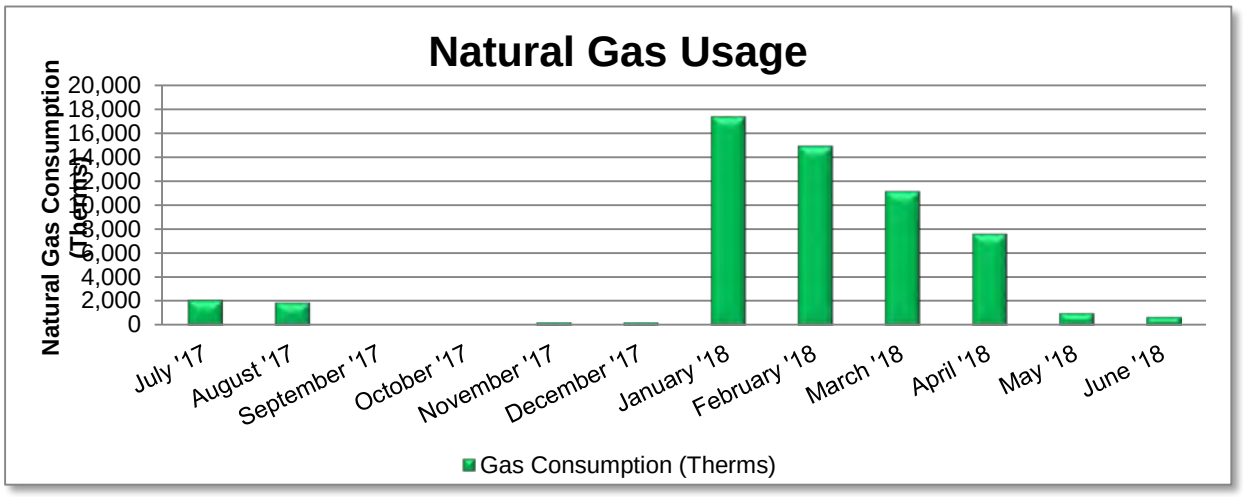
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
7/21/17	29	290,733	748	$2,816	$37,714
8/20/17	30	284,872	676	$2,547	$32,409
9/20/17	31	306,249	671	$2,528	$33,638
10/19/17	29	282,842	701	$2,640	$28,644
11/17/17	29	199,261	544	$2,047	$24,465
12/20/17	33	232,876	457	$1,723	$25,402
1/20/18	31	262,427	488	$1,839	$50,888
2/18/18	29	219,531	449	$1,693	$25,877
3/22/18	32	202,451	444	$1,671	$23,803
4/21/18	30	209,121	433	$1,630	$22,260
5/20/18	29	220,265	586	$2,206	$19,764
6/22/18	33	251,908	631	$2,376	$34,114
Totals	**365**	**2,962,536**	**748**	**$25,717**	**$358,976**
Annual	**365**	**2,962,536**	**748**	**$25,717**	**$358,976**

Notes:

- Peak demand of 748 kW occurred in July '17.
- The average electric cost over the past 12 months was $0.121/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.
- The average demand across these twelve months of data is 569 kW.
- The annual electrical usage of the facility has increased by 32% since 2014.

3.2 Natural Gas

PSE&G supplies and delivers natural gas under rate class LVG.



Gas Billing Data				
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**	**TRC Estimated Usage?**
7/21/17	29	2,137	$1,472	No
8/20/17	30	1,936	$1,321	No
9/20/17	31	0	$107	No
10/19/17	29	0	$107	No
11/17/17	29	275	$276	No
12/20/17	33	277	$283	No
1/20/18	31	17,439	$12,686	No
2/18/18	29	14,988	$11,806	No
3/22/18	32	11,204	$8,161	No
4/21/18	30	7,661	$5,758	Yes
5/20/18	29	1,053	$748	No
6/22/18	33	731	$557	No
Totals	**365**	**57,699**	**$43,283**	
Annual	**365**	**57,699**	**$43,283**	

Notes:

- The average gas cost for the past 12 months is $0.750/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) *Portfolio Manager®* software. Benchmarking compares your building's energy use to that of similar buildings across the 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	**8**

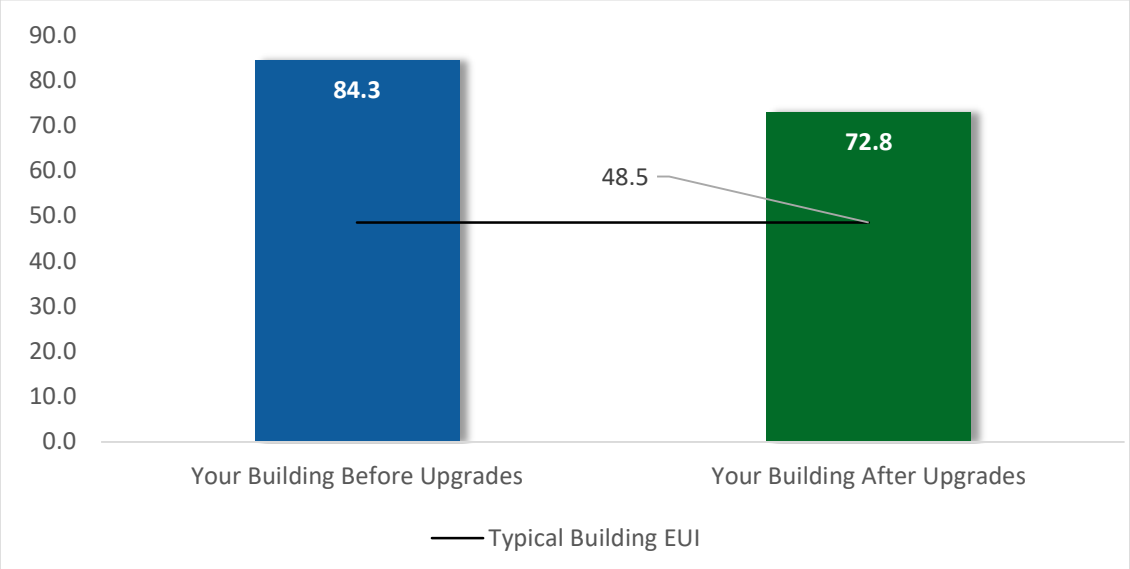


Figure 6 - Energy Use Intensity Comparison

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 *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the New Jersey Board of Public Utilities. 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.

#	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		**353,742**	**56.7**	**-70**	**$42,338**	**$122,672**	**$22,932**	**$99,740**	**2.4**	**348,014**
ECM 1	Install LED Fixtures	55,873	8.1	-10	$6,695	$37,398	$4,830	$32,568	4.9	55,097
ECM 2	Retrofit Fixtures with LED Lamps	297,870	48.6	-60	$35,643	$85,274	$18,102	$67,172	1.9	292,916
Lighting Control Measures		**75,044**	**10.6**	**-15**	**$8,981**	**$50,487**	**$4,850**	**$45,637**	**5.1**	**73,817**
ECM 3	Install Occupancy Sensor Lighting Controls	51,268	8.9	-11	$6,132	$36,762	$4,850	$31,912	5.2	50,371
ECM 4	Install High/Low Lighting Controls	23,776	1.7	-4	$2,849	$13,725	$0	$13,725	4.8	23,446
Motor Upgrades		**11,997**	**2.7**	**0**	**$1,454**	**$53,369**	**$0**	**$53,369**	**36.7**	**12,081**
ECM 5	Premium Efficiency Motors	11,997	2.7	0	$1,454	$53,369	$0	$53,369	36.7	12,081
Variable Frequency Drive (VFD) Measures		**2,682**	**0.4**	**0**	**$325**	**$3,236**	**$450**	**$2,786**	**8.6**	**2,701**
ECM 6	Install VFDs on Kitchen Hood Fan Motors	2,682	0.4	0	$325	$3,236	$450	$2,786	8.6	2,701
Electric Chiller Replacement		**46,874**	**18.6**	**0**	**$5,680**	**$204,764**	**$21,600**	**$183,164**	**32.2**	**47,202**
ECM 7	Install High Efficiency Chillers	46,874	18.6	0	$5,680	$204,764	$21,600	$183,164	32.2	47,202
HVAC System Improvements		**7,502**	**0.0**	**0**	**$909**	**$264**	**$0**	**$264**	**0.3**	**7,554**
ECM 8	Install Pipe Insulation	7,502	0.0	0	$909	$264	$0	$264	0.3	7,554
Domestic Water Heating Upgrade		**95,664**	**64.8**	**-264**	**$9,613**	**$42,761**	**$1,474**	**$41,287**	**4.3**	**65,446**
ECM 9	Install High Efficiency Gas-Fired Water Heater	77,313	64.8	-264	$7,389	$42,603	$1,474	$41,129	5.6	46,967
ECM 10	Install Low-Flow DHW Devices	18,350	0.0	0	$2,224	$158	$0	$158	0.1	18,479
Food Service & Refrigeration Measures		**13,321**	**1.2**	**0**	**$1,614**	**$5,095**	**$200**	**$4,895**	**3.0**	**13,414**
ECM 11	Refrigerator/Freezer Case Electrically Commutated Motors	5,898	0.7	0	$715	$1,517	$0	$1,517	2.1	5,939
ECM 12	Refrigeration Controls	5,811	0.3	0	$704	$3,348	$150	$3,198	4.5	5,852
ECM 13	Vending Machine Control	1,612	0.2	0	$195	$230	$50	$180	0.9	1,623
Custom Measures		**112,221**	**0.0**	**260**	**$15,546**	**$64,360**	**$0**	**$64,360**	**4.1**	**143,407**
ECM 14	Computer Power Management Software	16,279	0.0	0	$1,973	$7,360	$0	$7,360	3.7	16,392
ECM 15	Retro-Commissioning Study & HVAC Improvements	95,942	0.0	260	$13,573	$57,000	$0	$57,000	4.2	127,014
TOTALS		**719,047**	**155.0**	**-89**	**$86,459**	**$547,006**	**$51,506**	**$495,500**	**5.7**	**713,635**

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

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

Figure 7 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**353,742**	**56.7**	**-70**	**$42,338**	**$122,672**	**$22,932**	**$99,740**	**2.4**	**348,014**
ECM 1	Install LED Fixtures	55,873	8.1	-10	$6,695	$37,398	$4,830	$32,568	4.9	55,097
ECM 2	Retrofit Fixtures with LED Lamps	297,870	48.6	-60	$35,643	$85,274	$18,102	$67,172	1.9	292,916
Lighting Control Measures		**75,044**	**10.6**	**-15**	**$8,981**	**$50,487**	**$4,850**	**$45,637**	**5.1**	**73,817**
ECM 3	Install Occupancy Sensor Lighting Controls	51,268	8.9	-11	$6,132	$36,762	$4,850	$31,912	5.2	50,371
ECM 4	Install High/Low Lighting Controls	23,776	1.7	-4	$2,849	$13,725	$0	$13,725	4.8	23,446
Variable Frequency Drive (VFD) Measures		**2,682**	**0.4**	**0**	**$325**	**$3,236**	**$450**	**$2,786**	**8.6**	**2,701**
ECM 6	Install VFDs on Kitchen Hood Fan Motors	2,682	0.4	0	$325	$3,236	$450	$2,786	8.6	2,701
HVAC System Improvements		**7,502**	**0.0**	**0**	**$909**	**$264**	**$0**	**$264**	**0.3**	**7,554**
ECM 8	Install Pipe Insulation	7,502	0.0	0	$909	$264	$0	$264	0.3	7,554
Domestic Water Heating Upgrade		**95,664**	**64.8**	**-264**	**$9,613**	**$42,761**	**$1,474**	**$41,287**	**4.3**	**65,446**
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ECM 11	Refrigerator/Freezer Case Electrically Commutated Motors	5,898	0.7	0	$715	$1,517	$0	$1,517	2.1	5,939
ECM 12	Refrigeration Controls	5,811	0.3	0	$704	$3,348	$150	$3,198	4.5	5,852
ECM 13	Vending Machine Control	1,612	0.2	0	$195	$230	$50	$180	0.9	1,623
Custom Measures		**112,221**	**0.0**	**260**	**$15,546**	**$64,360**	**$0**	**$64,360**	**4.1**	**143,407**
ECM 14	Computer Power Management Software	16,279	0.0	0	$1,973	$7,360	$0	$7,360	3.7	16,392
ECM 15	Retro-Commissioning Study & HVAC Improvements	95,942	0.0	260	$13,573	$57,000	$0	$57,000	4.2	127,014
TOTALS		**660,175**	**133.7**	**-89**	**$79,326**	**$288,874**	**$29,906**	**$258,967**	**3.3**	**654,352**

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

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

Figure 8 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**353,742**	**56.7**	**-70**	**$42,338**	**$122,672**	**$22,932**	**$99,740**	**2.4**	**348,014**
ECM 1	Install LED Fixtures	55,873	8.1	-10	$6,695	$37,398	$4,830	$32,568	4.9	55,097
ECM 2	Retrofit Fixtures with LED Lamps	297,870	48.6	-60	$35,643	$85,274	$18,102	$67,172	1.9	292,916

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

ECM 1: Install LED Fixtures

Replace existing fixtures containing metal halide and high-pressure sodium lamps with new LED light fixtures. This measure saves energy by installing LEDs, which use less power than other technologies with a comparable light output.

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

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

Affected building areas: gymnasium, cafeteria, and exterior fixtures.

ECM 2: Retrofit Fixtures with LED Lamps

Replace fluorescent T8, compact fluorescent lamps (CFLs), halogen, or incandescent lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as direct replacements for most other lighting technologies.

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

Affected building areas: all areas except for the gymnasium.

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		**75,044**	**10.6**	**-15**	**$8,981**	**$50,487**	**$4,850**	**$45,637**	**5.1**	**73,817**
ECM 3	Install Occupancy Sensor Lighting Controls	51,268	8.9	-11	$6,132	$36,762	$4,850	$31,912	5.2	50,371
ECM 4	Install High/Low Lighting Controls	23,776	1.7	-4	$2,849	$13,725	$0	$13,725	4.8	23,446

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

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

Affected building areas: offices, conference rooms, classrooms, gymnasium, cafeteria, music rooms, media center, restrooms, and storage rooms.

ECM 4: Install High/Low Lighting Controls

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

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety 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.

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

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

Affected building areas: hallways and parking garage.

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		**11,997**	**2.7**	**0**	**$1,454**	**$53,369**	**$0**	**$53,369**	**36.7**	**12,081**
ECM 5	Premium Efficiency Motors	11,997	2.7	0	$1,454	$53,369	$0	$53,369	36.7	12,081

ECM 5: Premium Efficiency Motors

We evaluated the 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.

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 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*.

Premium efficiency motors have been proposed to be installed in conjunction with proposed VFD motor measures, and the associated costs for those replacement motors have been included in the costs for ECM 6.

Premium efficiency motors have additionally been proposed for the following.

Affected motors are summarized on the following page:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor
Mechanical Room	Ground Source Water Return	1	Water-Source Heat Pump Circulation Pump	50.0
Mechanical Room	Ground Source Water Return	1	Water-Source Heat Pump Circulation Pump	50.0
Mechanical Room	Chilled Water Supply	1	Chilled Water Pump	75.0
Mechanical Room	Chilled Water Supply	1	Chilled Water Pump	75.0
Roof	RTU-1	1	Supply Fan	20.0
Roof	RTU-1	1	Exhaust Fan	10.0
Roof	RTU-2	1	Supply Fan	15.0
Roof	RTU-2	1	Exhaust Fan	7.5
Roof	RTU-6	1	Supply Fan	7.5
Roof	RTU-6	1	Exhaust Fan	5.0
Roof	RTU-5	1	Supply Fan	7.5
Location	**Area(s)/System(s) Served**	**Motor Quantity**	**Motor Application**	**HP Per Motor**
Roof	RTU-5	1	Exhaust Fan	2.0
Roof	RTU-3,4	2	Supply Fan	20.0
Roof	RTU-3,4	2	Exhaust Fan	10.0
Roof	RTU-7,8	2	Supply Fan	15.0
Roof	RTU-7,8	2	Exhaust Fan	7.5
Roof	RTU-9,10	2	Supply Fan	7.5
Roof	RTU-9,10	2	Exhaust Fan	5.0
Roof	RTU-11	1	Supply Fan	7.5

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		**2,682**	**0.4**	**0**	**$325**	**$3,236**	**$450**	**$2,786**	**8.6**	**2,701**
ECM 6	Install VFDs on Kitchen Hood Fan Motors	2,682	0.4	0	$325	$3,236	$450	$2,786	8.6	2,701

VFDs control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed VFDs, we have included replacing the controlled motor with a new motor—unless the existing motor meets or exceeds IHP 2014 standards—to conservatively account for the cost of an inverter duty rated motor.

ECM 6: Install VFDs on Kitchen Hood Fan Motors

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

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

4.5 Electric Chillers

#	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 Chiller Replacement		**46,874**	**18.6**	**0**	**$5,680**	**$204,764**	**$21,600**	**$183,164**	**32.2**	**47,202**
ECM 7	Install High Efficiency Chillers	46,874	18.6	0	$5,680	$204,764	$21,600	$183,164	32.2	47,202

ECM 7: Install High-Efficiency Chillers

We evaluated the replacement of the older inefficient electric chillers with new high-efficiency chillers. The type of chiller to be installed depends on the magnitude of the cooling load and variability of the cooling load profile, for example:

- Positive displacement chillers are usually under 600 tons of cooling capacity, and centrifugal chillers generally start at 150 tons of cooling capacity.
- Constant speed chillers should be used to meet cooling loads with little or no variation, while variable speed chillers are more efficient for variable cooling load profiles.
- Water-cooled chillers are more efficient than air-cooled chillers but require cooling towers and additional pumps to circulate the cooling water.
- In any given size range, variable speed chillers tend to have better partial load efficiency, but worse full load efficiency, than constant speed chillers.

Energy savings result from the improvement in chiller efficiency and matching the right type of chiller to the cooling load. The energy savings are calculated based on the cooling capacity of the new chiller, improvement in efficiency compared with the base case equipment, cooling load profile, and estimated annual operating hours of the chiller before and after the upgrade.

For the purposes of this analysis, we evaluated the replacement of chillers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your design team to select chillers that are sized appropriately for the cooling load at the Elementary School. In some cases, the plant energy use can be reduced by selecting multiple chillers that match the facility load profile rather than one or two large chillers. This can also improve the chiller plant reliability through increased redundancy. In this case, a further study involving the thermal energy storage system should include an evaluation of the chiller. Energy savings are maximized by proper selection of new equipment based on the cooling load profile.

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

4.6 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		**7,502**	**0.0**	**0**	**$909**	**$264**	**$0**	**$264**	**0.3**	**7,554**
ECM 8	Install Pipe Insulation	7,502	0.0	0	$909	$264	$0	$264	0.3	7,554

ECM 8: Install Pipe Insulation

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

4.7 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**95,664**	**64.8**	**-264**	**$9,613**	**$42,761**	**$1,474**	**$41,287**	**4.3**	**65,446**
ECM 9	Install High Efficiency Gas-Fired Water Heater	77,313	64.8	-264	$7,389	$42,603	$1,474	$41,129	5.6	46,967
ECM 10	Install Low-Flow DHW Devices	18,350	0.0	0	$2,224	$158	$0	$158	0.1	18,479

ECM 9: Install High-Efficiency Gas-Fired Water Heater

Replace the existing electric storage tank water heaters with gas-fired, high-efficiency condensing storage tank water heaters. Energy savings result from the increased efficiency of the unit, which uses less gas to heat water, and fewer operating hours to maintain the tank water temperature.

ECM 10: Install Low-Flow DHW Devices

Install low-flow devices to reduce overall hot water demand. The following are low-flow rates for devices. It is recommended to reduce hot water usage by replacing faucet aerators in restrooms.

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

Low-flow devices reduce the overall water flow from the fixture while still providing adequate pressure for washing. Additional cost savings may result from reduced water usage.

4.8 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		**13,321**	**1.2**	**0**	**$1,614**	**$5,095**	**$200**	**$4,895**	**3.0**	**13,414**
ECM 11	Refrigerator/Freezer Case Electrically Commutated Motors	5,898	0.7	0	$715	$1,517	$0	$1,517	2.1	5,939
ECM 12	Refrigeration Controls	5,811	0.3	0	$704	$3,348	$150	$3,198	4.5	5,852
ECM 13	Vending Machine Control	1,612	0.2	0	$195	$230	$50	$180	0.9	1,623

ECM 11: Refrigerator/Freezer Case Electrically Commutated Motors

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

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

ECM 12: Refrigeration Controls

Install additional controls to optimize the operation of walk-in coolers and freezers. Many walk-in coolers and freezers have evaporator fans that run continuously. The measure adds a control system feature to automatically shut off evaporator fans when not needed. Energy savings for these controls account for reduction in compressor and fan operating hours as well as reduction in the refrigeration heat load as appropriate.

ECM 13: Vending Machine Control

Vending machines operate continuously, even during unoccupied hours. Install occupancy sensor controls to reduce energy use. These controls power down vending machines when the vending machine area has been vacant for some time and power up the machines at necessary regular intervals or when the surrounding area is occupied. Energy savings are dependent on the vending machine and activity level in the area surrounding the machines.

4.9 Custom 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)
Custom Measures		**112,221**	**0.0**	**260**	**$15,546**	**$64,360**	**$0**	**$64,360**	**4.1**	**143,407**
ECM 14	Computer Power Management Software	16,279	0.0	0	$1,973	$7,360	$0	$7,360	3.7	16,392
ECM 15	Retro-Commissioning Study & HVAC Improvements	95,942	0.0	260	$13,573	$57,000	$0	$57,000	4.2	127,014

ECM 14: Computer Power Management Software

We evaluated the implementation of computer power management software at a high level. The computing environment in most school and office facilities includes desktops, which are typically left on over nights, weekends and holidays. Screen savers are commonly confused as a power management strategy. This contributes to excessive electrical energy consumption, which may be avoided by proper management. There are innovative software packages available in the market today that are designed to deliver significant energy saving and provide ongoing tracking measurements.

Operational and maintenance benefits are captured using a central power management platform where issues may be diagnosed and problematic devices may be isolated. Energy savings policies may be enforced as well as identifying and eliminating underutilized devices. This measure investigates the potential benefits to implementing computer power management software to better match the energy use to user needs.

This measure in effort to increase the plug load management of the school district was of interest for facility personnel. Further analysis should be conducted for the feasibility of this measure. An entire baseline tracking of existing computing fleet energy use would need to be performed to optimize proposed software strategies. This would need to be implemented in conjunction with the IT department. This is not an investment grade analysis nor should be used as a basis for design and construction.

ECM 15: Retro-Commissioning Study & HVAC Improvements

The upgrading of an Energy Management System (EMS) would increase the efficiency of the building HVAC system operation. This evaluation is provided at a high level as it is of great interest for facility personnel.

Due to the complexity of today's HVAC systems and controls, it is likely for systems to be operating incorrectly or below potential efficiency. Retro-commissioning studies reveal hidden deficiencies and highlights operational and maintenance (O&M) issues that could have been avoided as well as exposes hidden control system problems. There are valuable benefits to retro-commissioning in existing buildings. It is a detailed and specialized process that reviews how an HVAC system is controlled and designed to operate. Applying retro-commissioning to existing facilities includes planning, discovering root causes of inefficiencies, developing a cost-effective

project delivery, and focusing on optimizing value to the building owner. The study includes functional system testing under various modes, such as heating or cooling loads, occupied and unoccupied modes, varying outside air temperature and space temperatures. This is a systematic process to ensure that the building energy systems perform interactively according to the original design intent and the current operational needs of the facility.

Retro-commissioning is a common practice recommended by the American Society of Heating Refrigeration and Energy (ASHRAE) to be revisited every couple of years. We recommend contacting an engineering firm who specializes in energy control systems and retro-commissioning for a detailed evaluation and implementation costs. Facility operations personnel would work with the engineers to develop goals and objectives. During on site testing, the qualified personnel conducting the study would immediately make any no/low-cost improvements as identified. Furthermore, for any suggested corrective actions which require the purchase of material, a contractor who specializes in that scope of work would be contacted to implement the remaining improvements.

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

4.10 Additional Measures for Further Consideration

There are additional opportunities for improvement that are beyond the scope of this energy audit through the LGEA program. We mention them here to give an idea of other potential upgrades that may be chosen to be included if the implementation approach or preferred incentive program is more comprehensive in nature. If the school district moves forward toward implementation of a large district wide project under the Energy Savings Improvement Program (ESIP), we would recommend considering the following measures to be evaluated. We also recommend working with your ESCO and design team to select a comprehensive project that is inclusive of interactive affects.

Ice Storage System Optimization

The thermal ice storage system may be optimized such that the chillers operate during off peak hours. This will save electrical demand costs that can be substantial as each month, the facility is billed based on the annual peak demand as well as the summer peak demand during the cooling season. We recommend that this ice storage system be investigated further.

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.

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.

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

Motor Maintenance

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

Fans to Reduce Cooling Load

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

Destratification Fans

For areas with high ceilings, destratification fans f air balance the air temperature from floor to ceiling. They help reduce the recovery time needed to warm the space after nightly temperature setbacks and will increase occupants' the comfort level.

Areas with high ceilings require the heating system to heat a larger volume of space than that which is occupied. As the warm air rises, the warmest space is at the ceiling level, rather than floor level. Higher temperatures at the ceiling accelerate heat loss through the roof, which requires additional energy consumption by the heating equipment to compensate for this accelerated heat transfer.

Economizer Maintenance

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

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

Chiller Maintenance

Service chillers regularly to keep them operating properly. Chillers are responsible for a substantial portion of a commercial building's overall energy usage and when they do not work well, there is usually a noticeable increase in energy bills and increased occupant complaints. Regular diagnostics and service can save five to ten percent of the cost of operating your chiller. If you already have a maintenance contract in place, your existing service company should be able to provide these services.

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.

Duct Sealing

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

Boiler Maintenance

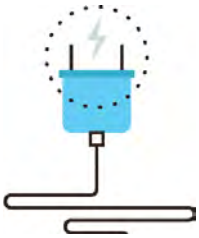
Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is 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.

Water Conservation

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

For more information regarding water conservation go to the EPA's WaterSense™ website[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 Elementary School 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.

[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

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

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

6 On-site Generation

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

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

6.1 Solar Photovoltaic

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

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

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

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

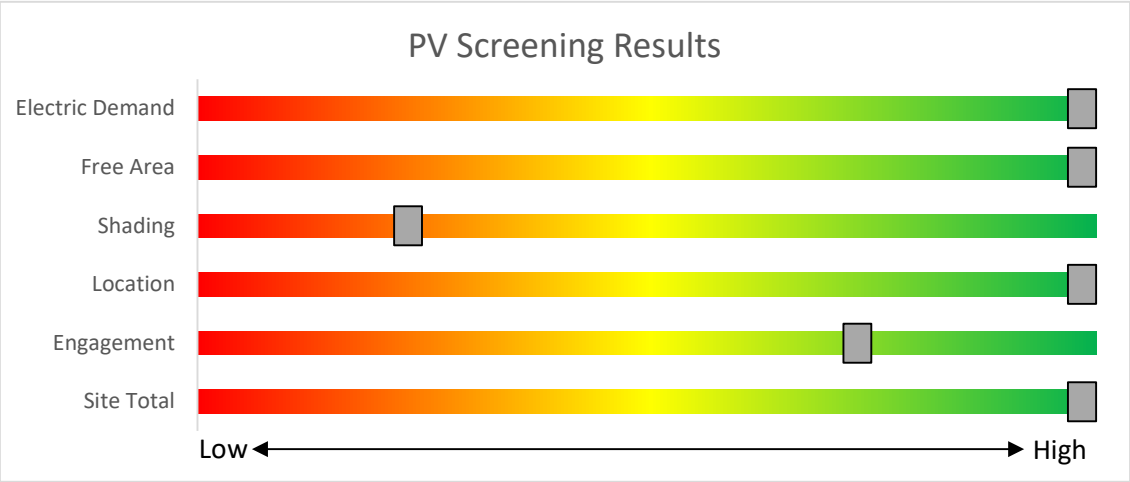


Figure 9 - Photovoltaic Screening

Solar Renewable Energy Credit (SREC) Registration Program

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 New Jersey**: www.njcleanenergy.com/whysolar
- **New Jersey Solar Market FAQs**: www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the New Jersey 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 Elementary School and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

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

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

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

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

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

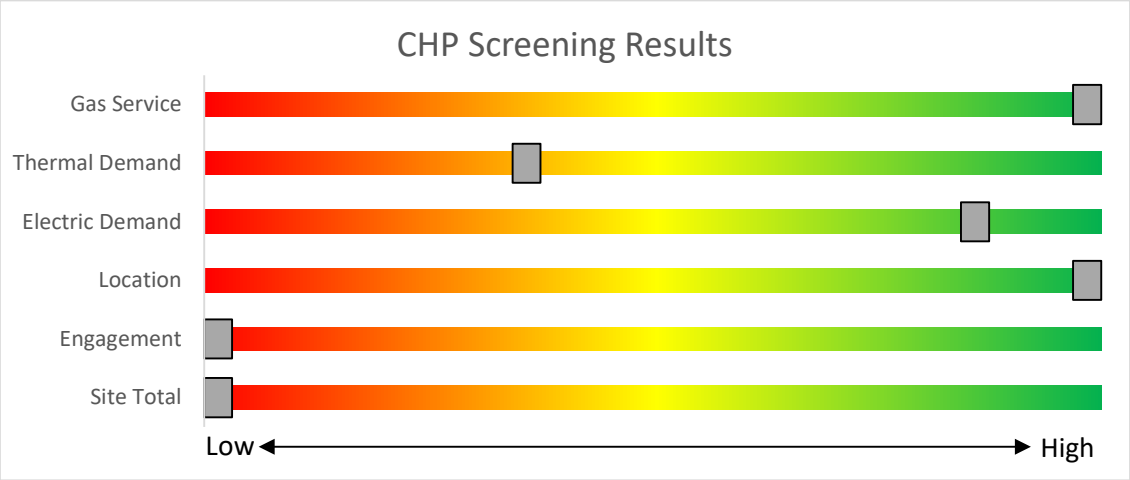


Figure 10 - Combined Heat and Power Screening

7 PROJECT FUNDING AND INCENTIVES

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

Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures that results in at least 15% source energy savings, and lighting cannot make up the majority of the savings. P4P is a generally a good option for medium-to-large sized facilities looking to implement as many measures as possible under a single project to achieve deep energy savings. This program has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program.

The scope of work presented in this audit report does not quite meet the requirements of the current P4P program. However, due to the size of the facility and existing conditions, should additional measures be identified at a later point in time, for example through further evaluation or the Energy Savings Improvement Program process, this facility could potentially meet the requirements necessary to participate in the P4P program.

Incentives

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

How to Participate

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

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

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

7.3 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.

7.4 SREC Registration Program

The SREC Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects *must* register their projects prior to the start of construction to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number, which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar Renewable Portfolio Standard. Purchasing SRECs can help them meet those requirements. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period fluctuates depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec.

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
Roof	2	Metal Halide: (1) 70W Lamp	Timeclock		95	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Other	Timeclock	29	4,380	0.1	583	0	$71	$397	$10	5.5
Exterior	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Timeclock		32	4,380	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Timeclock	15	4,380	0.0	307	0	$37	$73	$20	1.4
Exterior	10	High-Pressure Sodium: (1) 200W Lamp	Timeclock		250	4,380	1	Fixture Replacement	No	10	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	75	4,380	0.9	7,665	0	$929	$9,660	$1,000	9.3
Exterior	8	Compact Fluorescent: Screw in Lamp	Timeclock		23	4,380	2	Relamp	No	8	LED Lamps: Screw in Lamp	Timeclock	16	4,380	0.0	245	0	$30	$138	$8	4.4
Parking Garage	39	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Breaker Panel	S	62	8,760	2, 4	Relamp	Yes	39	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	6,044	0.8	13,403	0	$1,624	$4,626	$390	2.6
Main Office	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	O	93	4,368	2, 3	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.7	4,842	-1	$579	$1,146	$275	1.5
Main Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	O	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$489	$95	2.7
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Principals Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,513	0	$181	$544	$110	2.4
Conference Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$489	$95	2.7
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,368	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,368	0.0	139	0	$17	$72	$10	3.7
Child Study Office Hall	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	3,014	0.1	605	0	$72	$335	$30	4.2
Child Study Office Hall	6	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	4,368	2	Relamp	No	6	LED Lamps: Screw in Lamp	Wall Switch	16	4,368	0.0	202	0	$24	$103	$6	4.0
Conference Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$335	$80	1.8
Office 102A	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Office 102B	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Office 102C	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	908	0	$109	$280	$65	2.0
Office 102C	6	Compact Fluorescent: Plug in Lamp	Wall Switch	S	32	4,368	2, 3	Relamp	Yes	6	LED Lamps: Plug in Lamp	Occupancy Sensor	18	3,014	0.1	564	0	$68	$267	$26	3.6
Office 102D	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$335	$80	1.8
Office 102E	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$335	$80	1.8
Office 102F	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$335	$80	1.8
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,368	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,368	0.0	139	0	$17	$72	$10	3.7
Classroom 104	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	2,400	2	Relamp	No	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,400	0.1	277	0	$33	$110	$30	2.4

	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
Classroom 104	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,400	2	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,400	0.3	1,045	0	$125	$438	$120	2.5
Classroom 106	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	2,400	2	Relamp	No	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,400	0.1	277	0	$33	$110	$30	2.4
Classroom 106	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,400	2	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,400	0.3	1,045	0	$125	$438	$120	2.5
Classroom 110	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	2,400	2	Relamp	No	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,400	0.1	277	0	$33	$110	$30	2.4
Classroom 110	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,400	2	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,400	0.3	1,045	0	$125	$438	$120	2.5
Classroom 112	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	2,400	2	Relamp	No	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,400	0.1	277	0	$33	$110	$30	2.4
Classroom 112	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,400	2	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,400	0.3	1,045	0	$125	$438	$120	2.5
Classroom 108	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,400	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,400	0.0	139	0	$17	$55	$15	2.4
Classroom 108	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,400	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,656	0.3	998	0	$119	$599	$125	4.0
Classroom 109	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,400	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,400	0.0	139	0	$17	$55	$15	2.4
Classroom 109	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,400	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,656	0.3	998	0	$119	$599	$125	4.0
Classroom 105	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,400	2	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,400	0.3	1,220	0	$146	$511	$140	2.5
Classroom 107	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,400	2	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,400	0.3	1,220	0	$146	$511	$140	2.5
Classroom 111	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,400	2	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,400	0.3	1,220	0	$146	$511	$140	2.5
Classroom 113	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,400	2	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,400	0.3	1,220	0	$146	$511	$140	2.5
Restrooms (4 Total)	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.1	438	0	$52	$146	$40	2.0
Closets	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	317	0	$38	$73	$20	1.4
Restroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	845	0	$101	$416	$75	3.4
Restroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	845	0	$101	$416	$75	3.4
Child Study Room 116	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$489	$95	2.7
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$30	2.7
Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	908	0	$109	$280	$65	2.0
Conference Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4

	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
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$335	$80	1.8
Nurse's Office 117	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.1	951	0	$114	$219	$60	1.4
Nurse's Office 117	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,368	2	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,368	0.1	557	0	$67	$290	$40	3.7
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$335	$80	1.8
Exam Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.1	476	0	$57	$110	$30	1.4
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.0	238	0	$28	$55	$15	1.4
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6
Kitchenette	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6
Lounge	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,513	0	$181	$544	$110	2.4
Hallway	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	8,760	2, 4	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	6,044	0.1	756	0	$90	$370	$20	3.9
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.0	238	0	$28	$55	$15	1.4
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.0	238	0	$28	$55	$15	1.4
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	8,760	2, 4	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	6,044	0.1	1,214	0	$145	$335	$30	2.1
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$30	2.7
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$30	2.7
Art Classroom 120	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.5	3,228	-1	$386	$854	$195	1.7
Art Classroom 120	11	Compact Fluorescent: Plug in Lamp	Wall Switch	S	32	4,368	2, 3	Relamp	Yes	11	LED Lamps: Plug in Lamp	Occupancy Sensor	18	3,014	0.2	1,035	0	$124	$548	$46	4.1
Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2, 3	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,014	0.2	1,066	0	$128	$335	$60	2.2
Classroom 122	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	2,018	0	$241	$635	$135	2.1
Classroom 122	12	Compact Fluorescent: (2) 13W Plug-In Lamps	Wall Switch	S	26	4,368	2, 3	Relamp	Yes	12	LED Lamps: Plug in Lamp	Occupancy Sensor	14	3,014	0.1	942	0	$113	$573	$47	4.7
Classroom 122	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	423	0	$51	$73	$20	1.0
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,014	0.1	711	0	$85	$262	$40	2.6

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Work Room 119	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	908	0	$109	$434	$80	3.3
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.0	238	0	$28	$55	$15	1.4
Classroom 121	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	1,532	0	$183	$511	$140	2.0
Classroom 124	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	3,014	2	Relamp	No	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	348	0	$42	$110	$30	1.9
Classroom 124	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	1,313	0	$157	$438	$120	2.0
Classroom 126	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	3,014	2	Relamp	No	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	348	0	$42	$110	$30	1.9
Classroom 126	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	1,313	0	$157	$438	$120	2.0
Classroom 130	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	3,014	2	Relamp	No	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	348	0	$42	$110	$30	1.9
Classroom 130	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	1,313	0	$157	$438	$120	2.0
Classroom 132	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	3,014	2	Relamp	No	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	348	0	$42	$110	$30	1.9
Classroom 132	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	1,313	0	$157	$438	$120	2.0
Classroom 127	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,368	0.0	252	0	$30	$55	$15	1.3
Classroom 127	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.3	1,816	0	$217	$599	$125	2.2
Classroom 128	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,368	0.0	252	0	$30	$55	$15	1.3
Classroom 128	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.3	1,816	0	$217	$599	$125	2.2
Classroom 123	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	1,532	0	$183	$511	$140	2.0
Classroom 125	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	1,532	0	$183	$511	$140	2.0
Classroom 129	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	1,532	0	$183	$511	$140	2.0
Classroom 131	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	1,532	0	$183	$511	$140	2.0
Restrooms (4 Total)	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.1	438	0	$52	$146	$40	2.0
Security Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$380	$65	4.3
Faculty Lounge	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.3	2,118	0	$253	$653	$140	2.0
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.0	238	0	$28	$55	$15	1.4
Restroom	2	Compact Fluorescent: Plug in Lamp	Wall Switch	S	32	4,368	2	Relamp	No	2	LED Lamps: Plug in Lamp	Wall Switch	18	4,368	0.0	135	0	$16	$50	$2	3.0
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.0	238	0	$28	$55	$15	1.4

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restroom	2	Compact Fluorescent: Plug in Lamp	Wall Switch	S	32	4,368	2	Relamp	No	2	LED Lamps: Plug in Lamp	Wall Switch	18	4,368	0.0	135	0	$16	$50	$2	3.0
Hallway	68	Compact Fluorescent: Plug in Lamps	Wall Switch	S	36	8,760	2, 4	Relamp	Yes	68	LED Lamps: Plug in Lamps	High/Low Control	25	6,044	0.9	12,195	-3	$1,459	$5,908	$136	4.0
Cafeteria	44	Metal Halide: (1) 50W Lamp	Wall Switch	S	72	4,368	1, 3	Fixture Replacement	Yes	44	LED - Fixtures: Other	Occupancy Sensor	22	3,014	1.8	12,071	-3	$1,444	$9,554	$325	6.4
Cafeteria	15	Compact Fluorescent: Plug in Lamp	Wall Switch	S	42	4,368	2, 3	Relamp	Yes	15	LED Lamps: Plug in Lamp	Occupancy Sensor	29	3,014	0.2	1,565	0	$187	$649	$50	3.2
Cafeteria	24	Compact Fluorescent: Plug in Lamp	Wall Switch	S	36	4,368	2, 3	Relamp	Yes	24	LED Lamps: Plug in Lamp	Occupancy Sensor	25	3,014	0.3	2,146	0	$257	$1,146	$94	4.1
Kitchen	17	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	17	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.7	4,574	-1	$547	$1,242	$340	1.6
Locker Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6
Locker Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6
Loading Dock	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.2	1,076	0	$129	$292	$80	1.6
Garage	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	16	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.6	4,305	-1	$515	$1,168	$320	1.6
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,014	0.1	711	0	$85	$416	$40	4.4
Restroom	3	Compact Fluorescent: Plug in Lamp	Wall Switch	S	32	4,368	2	Relamp	No	3	LED Lamps: Plug in Lamp	Wall Switch	18	4,368	0.0	202	0	$24	$76	$3	3.0
Restroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	845	0	$101	$416	$75	3.4
Restroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	845	0	$101	$416	$75	3.4
Dance Room 139	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.4	2,854	-1	$341	$657	$180	1.4
Control Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.1	476	0	$57	$110	$30	1.4
Auditorium	48	Halogen Incandescent: PAR38	Wall Switch	S	100	4,368	2	Relamp	No	48	LED Lamps: Flood Lamp	Wall Switch	15	4,368	2.9	19,604	-4	$2,345	$1,450	$48	0.6
Auditorium	15	Halogen Incandescent: PAR38	Wall Switch	S	100	4,368	2	Relamp	No	15	LED Lamps: Flood Lamp	Wall Switch	15	4,368	0.9	6,126	-1	$733	$453	$15	0.6
Auditorium	30	Halogen Incandescent: MR16	Wall Switch	S	50	4,368	2	Relamp	No	30	LED Lamps: Spot Lamp	Wall Switch	7	4,368	0.9	6,198	-1	$741	$815	$30	1.1
Gym	24	Metal Halide: (1) 400W Lamp	Breaker Panel	S	458	4,368	1, 3	Fixture Replacement	Yes	24	LED - Fixtures: High-Bay	Occupancy Sensor	137	3,014	6.3	41,882	-9	$5,009	$23,877	$4,440	3.9
Gym Storage	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.4	2,421	-1	$290	$708	$120	2.0
Gym Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$380	$30	4.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Locker Room	17	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2, 3	Relamp	Yes	17	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,014	0.9	6,043	-1	$723	$1,782	$410	1.9
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,368	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,368	0.0	139	0	$17	$72	$10	3.7
Locker Room	17	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2, 3	Relamp	Yes	17	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,014	0.9	6,043	-1	$723	$1,782	$410	1.9
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$226	$50	2.4
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,368	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,368	0.0	139	0	$17	$72	$10	3.7
Hallway	87	Compact Fluorescent: Plug in Lamps	Wall Switch	S	36	8,760	2, 4	Relamp	Yes	87	LED Lamps: Plug in Lamps	High/Low Control	25	6,044	1.2	15,719	-3	$1,880	$7,767	$174	4.0
Chorus Room 148	25	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	25	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.8	5,044	-1	$603	$1,453	$320	1.9
Closets	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	159	0	$19	$37	$10	1.4
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	8,760	2, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	6,044	0.1	1,214	0	$145	$335	$30	2.1
Band Room 146	25	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	25	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.8	5,044	-1	$603	$1,453	$320	1.9
Music Suite 147	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.1	605	0	$72	$380	$65	4.3
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6
Hallway	4	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	8,760	2, 4	Relamp	Yes	4	LED Lamps: Screw in Lamp	High/Low Control	16	6,044	0.0	458	0	$55	$294	$4	5.3
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	8,760	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	8,760	0.0	169	0	$20	$18	$5	0.7
Basement MER	42	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	42	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	1.3	8,474	-2	$1,013	$2,344	$525	1.8
Basement MER	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6
Water Service Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.3	2,018	0	$241	$635	$135	2.1
MER Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2, 3	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,014	0.2	1,066	0	$128	$489	$95	3.1
Hallway	7	Incandescent: Screw in Lamp	Wall Switch	S	100	8,760	2, 4	Relamp	Yes	7	LED Lamps: Screw in Lamp	High/Low Control	15	6,044	0.5	6,047	-1	$723	$696	$7	1.0
Roof MER 1	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.1	845	0	$101	$416	$75	3.4
Roof MER 2	16	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	2, 3	Relamp	Yes	16	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,014	0.3	1,691	0	$202	$562	$115	2.2
Hallway	40	Compact Fluorescent: Plug in Lamps	Wall Switch	S	36	8,760	2, 4	Relamp	Yes	40	LED Lamps: Plug in Lamps	High/Low Control	25	6,044	0.5	7,227	-2	$864	$3,594	$80	4.1
Classroom 238	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 238	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9

	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
Classroom 241	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 241	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 243	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 243	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 244	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 244	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 247	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 247	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 248	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 248	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 250	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 250	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 249	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 249	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 254	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 254	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 239	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.3	1,247	0	$149	$599	$125	3.2
Classroom 240	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.5	2,079	0	$249	$818	$185	2.5
Classroom 245	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 245	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 252	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.4	1,663	0	$199	$708	$155	2.8
Men's Bathroom	2	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	4,368	2	Relamp	No	2	LED Lamps: Screw in Lamp	Wall Switch	16	4,368	0.0	66	0	$8	$70	$2	8.6
Men's Bathroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.2	1,614	0	$193	$562	$115	2.3
Women's Bathroom	2	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	4,368	2	Relamp	No	2	LED Lamps: Screw in Lamp	Wall Switch	16	4,368	0.0	67	0	$8	$70	$2	8.5
Women's Bathroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.2	1,614	0	$193	$562	$115	2.3

	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
Men's Bathroom	2	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	4,368	2	Relamp	No	2	LED Lamps: Screw in Lamp	Wall Switch	16	4,368	0.0	67	0	$8	$70	$2	8.5
Men's Bathroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.2	1,614	0	$193	$562	$115	2.3
Women's Bathroom	2	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	4,368	2	Relamp	No	2	LED Lamps: Screw in Lamp	Wall Switch	16	4,368	0.0	67	0	$8	$70	$2	8.5
Women's Bathroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.2	1,614	0	$193	$562	$115	2.3
Classroom 229	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 229	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 228	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 228	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 230	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 230	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 231	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 231	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 235	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 235	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 234	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 234	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 236	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 236	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 251	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 232	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 232	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 233	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 233	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 237	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.5	2,494	-1	$298	$927	$215	2.4
Classroom 237	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.1	231	0	$28	$73	$20	1.9

	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
Classroom 229	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.5	2,286	0	$273	$872	$200	2.5
Classroom 229	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Bathroom	1	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	4,368	2	Relamp	No	1	LED Lamps: Screw in Lamp	Wall Switch	16	4,368	0.0	34	0	$4	$35	$1	8.5
Media Center	30	Compact Fluorescent: Plug in Lamps	Wall Switch	S	36	4,368	2, 3	Relamp	Yes	30	LED Lamps: Plug in Lamps	Occupancy Sensor	25	3,014	0.4	2,703	-1	$323	$2,054	$130	6.0
Media Center	44	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	44	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	1.3	8,877	-2	$1,062	$2,417	$545	1.8
Classroom 225	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.5	2,079	0	$249	$818	$185	2.5
Classroom 225	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,070	0.1	290	0	$35	$73	$20	1.5
Computer Lab 226	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.5	2,494	-1	$298	$927	$215	2.4
Computer Lab 226	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.1	231	0	$28	$73	$20	1.9
Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	159	0	$19	$37	$10	1.4
Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	159	0	$19	$37	$10	1.4
Classroom 224	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.2	831	0	$99	$489	$95	4.0
Hallway	53	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	8,760	2, 4	Relamp	Yes	53	LED Lamps: Screw in Lamp	High/Low Control	16	6,044	0.5	6,108	-1	$731	$3,890	$53	5.3
Classroom 233	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.5	2,494	-1	$298	$927	$215	2.4
Classroom 233	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.1	231	0	$28	$73	$20	1.9
Classroom 218	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.5	2,494	-1	$298	$927	$215	2.4
Classroom 218	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.1	231	0	$28	$73	$20	1.9
Classroom 217	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.5	2,494	-1	$298	$927	$215	2.4
Classroom 217	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.1	231	0	$28	$73	$20	1.9
Classroom 215	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.5	2,494	-1	$298	$927	$215	2.4
Classroom 215	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.1	231	0	$28	$73	$20	1.9
Classroom 216	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.5	2,494	-1	$298	$927	$215	2.4
Classroom 216	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.1	231	0	$28	$73	$20	1.9
Classroom 222	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.5	2,494	-1	$298	$927	$215	2.4
Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,368	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,368	0.0	269	0	$32	$73	$20	1.6
Closet 220	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	159	0	$19	$37	$10	1.4
Office 221	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,368	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,368	0.0	168	0	$20	$37	$10	1.3
Classroom 214	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 214	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Classroom 213	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.4	1,663	0	$199	$708	$155	2.8
Classroom 213	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	173	0	$21	$55	$15	1.9
Computer Lab 212	33	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,000	2	Relamp	No	33	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,000	0.8	3,594	-1	$430	$1,205	$330	2.0
Computer Lab 212	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	3,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,000	0.1	231	0	$28	$73	$20	1.9
Tech Lab 211	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,000	2	Relamp	No	30	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,000	0.7	3,267	-1	$391	$1,095	$300	2.0
Tech Lab 211	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,000	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,000	0.0	163	0	$20	$55	$15	2.0
Science Classroom 210	16	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2, 3	Relamp	Yes	16	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,070	0.3	1,161	0	$139	$562	$115	3.2
Science Classroom 209	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.7	3,326	-1	$398	$1,416	$310	2.8
Science Classroom 209	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.1	231	0	$28	$73	$20	1.9
Science Classroom 207	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.7	3,326	-1	$398	$1,416	$310	2.8
Science Classroom 207	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.1	231	0	$28	$73	$20	1.9
Prep Room 208	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,070	0.2	1,109	0	$133	$562	$115	3.4
Closets	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,000	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,000	0.0	116	0	$14	$37	$10	1.9
Mechanical Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,000	2	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,000	0.2	762	0	$91	$256	$70	2.0
Conference Room 201	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,000	2, 3	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,070	0.3	1,455	0	$174	$653	$140	3.0
Office 202	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$489	$95	2.7
Office 203	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$489	$95	2.7
Hallway	24	Compact Fluorescent: Plug in Lamps	Wall Switch	S	36	8,760	2, 4	Relamp	Yes	24	LED Lamps: Plug in Lamps	High/Low Control	25	6,044	0.3	4,336	-1	$519	$2,112	$48	4.0
Hallway	5	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	8,760	2	Relamp	No	5	LED Lamps: Screw in Lamp	Wall Switch	16	8,760	0.0	337	0	$40	$176	$5	4.2
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	8,760	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.0	318	0	$38	$37	$10	0.7

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Office 201B	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$489	$95	2.7
Office 201C	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$72	$380	$65	4.3
Office 201D	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,211	0	$145	$489	$95	2.7
Hallway	4	Compact Fluorescent: Plug in Lamps	Wall Switch	S	13	8,760	2	Relamp	No	4	LED Lamps: Plug in Lamp	Wall Switch	7	8,760	0.0	231	0	$28	$101	$4	3.5
Restroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.2	1,614	0	$193	$562	$115	2.3
Restroom	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.2	1,614	0	$193	$562	$115	2.3
Transition Spaces	38	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	38	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

Motor Inventory & Recommendations

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	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
Mechanical Room	Heating Hot Water Supply	1	Heating Hot Water Pump	40.0	94.1%	Yes	W	4,067		No	94.1%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Heating Hot Water Supply	1	Heating Hot Water Pump	40.0	94.1%	Yes	W	3,000		No	94.1%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Ground Source Water Return	1	Water-Source Heat Pump Circulation Pump	50.0	94.1%	Yes	W	4,067	5	Yes	94.5%	No		0.1	409	0	$50	$4,607	$0	92.9
Mechanical Room	Ground Source Water Return	1	Water-Source Heat Pump Circulation Pump	50.0	94.1%	Yes	W	3,000	5	Yes	94.5%	No		0.1	302	0	$37	$4,607	$0	125.9
Mechanical Room	Chilled Water Supply	1	Chilled Water Pump	75.0	94.1%	Yes	W	3,000	5	Yes	95.4%	No		0.4	1,458	0	$177	$7,928	$0	44.9
Mechanical Room	Chilled Water Supply	1	Chilled Water Pump	75.0	94.1%	Yes	W	3,000		No	94.1%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Chilled Water Supply	1	Chilled Water Pump	75.0	94.1%	Yes	W	3,000	5	Yes	95.4%	No		0.4	1,458	0	$177	$7,928	$0	44.9
Mechanical Room	Chilled Water Supply	1	Chilled Water Pump	75.0	94.1%	Yes	W	3,000		No	94.1%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Domestic Water Burners	2	Combustion Air Fan	0.8	74.0%	No	W	2,745		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Condenser Water Pump	1	Condenser Water Pump	50.0	92.4%	Yes	W	3,000		No	92.4%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Condenser Water Pump	1	Condenser Water Pump	50.0	92.4%	Yes	W	3,000		No	92.4%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Make Up Air Units	3	Supply Fan	10.0	91.7%	Yes	W	8,760		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Glycol Management	4	Process Pump	0.5	74.0%	Yes	W	686		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU-1	1	Supply Fan	20.0	91.0%	Yes	W	3,391	5	Yes	93.0%	No		0.2	717	0	$87	$2,248	$0	25.9
Roof	RTU-1	1	Exhaust Fan	10.0	89.5%	Yes	W	3,391	5	Yes	91.7%	No		0.1	407	0	$49	$1,344	$0	27.3
Roof	RTU-2	1	Supply Fan	15.0	91.0%	Yes	W	3,391	5	Yes	93.0%	No		0.1	538	0	$65	$1,847	$0	28.3
Roof	RTU-2	1	Exhaust Fan	7.5	88.5%	Yes	W	3,391	5	Yes	91.0%	No		0.1	353	0	$43	$1,131	$0	26.4
Roof	RTU-6	1	Supply Fan	7.5	88.5%	Yes	W	3,391	5	Yes	91.0%	No		0.1	353	0	$43	$1,131	$0	26.4
Roof	RTU-6	1	Exhaust Fan	5.0	87.5%	Yes	W	2,745	5	Yes	89.5%	No		0.0	157	0	$19	$800	$0	42.1
Roof	RTU-5	1	Supply Fan	7.5	88.5%	Yes	W	3,391	5	Yes	91.0%	No		0.1	353	0	$43	$1,131	$0	26.4

		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-5	1	Exhaust Fan	2.0	84.0%	Yes	W	2,745	5	Yes	86.5%	No		0.0	85	0	$10	$532	$0	51.9
Roof	RTU-3,4	2	Supply Fan	20.0	91.0%	Yes	W	3,391	5	Yes	93.0%	No		0.3	1,435	0	$174	$4,495	$0	25.9
Roof	RTU-3,4	2	Exhaust Fan	10.0	89.5%	Yes	W	3,391	5	Yes	91.7%	No		0.2	814	0	$99	$2,687	$0	27.3
Roof	RTU-7,8	2	Supply Fan	15.0	91.0%	Yes	W	3,391	5	Yes	93.0%	No		0.2	1,076	0	$130	$3,693	$0	28.3
Roof	RTU-7,8	2	Exhaust Fan	7.5	88.5%	Yes	W	3,391	5	Yes	91.0%	No		0.2	707	0	$86	$2,263	$0	26.4
Roof	RTU-9,10	2	Supply Fan	7.5	88.5%	Yes	W	3,391	5	Yes	91.0%	No		0.2	707	0	$86	$2,263	$0	26.4
Roof	RTU-9,10	2	Exhaust Fan	5.0	87.5%	Yes	W	2,745	5	Yes	89.5%	No		0.1	314	0	$38	$1,601	$0	42.1
Roof	RTU-11	1	Supply Fan	7.5	88.5%	Yes	W	3,391	5	Yes	91.0%	No		0.1	353	0	$43	$1,131	$0	26.4
Roof	RTU-11	1	Exhaust Fan	2.0	84.0%	Yes	W	2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Kitchen	Exhaust Hood	1	Exhaust Fan	1.5	84.0%	No	W	8,760	6	No	84.0%	Yes	1	0.4	2,682	0	$325	$3,236	$450	8.6
Various	Exhaust Fans	4	Exhaust Fan	0.8	74.0%	No	W	5,490		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Various	Exhaust Fans	7	Exhaust Fan	0.3	74.0%	No	W	5,490		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Various	Exhaust Fans	12	Exhaust Fan	0.1	74.0%	No	W	5,490		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Make Up Air Units	3	Exhaust Fan	5.0	87.5%	Yes	W	8,760		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Various	Various	68	Ground Source HP	2.00	50.00	W		No							0.0	0	0	$0	$0	$0	0.0
Electric Unit Heaters	Stairwells, Vestibules, Storage Rooms	12	Electric Resistance Heat		17.07	W		No							0.0	0	0	$0	$0	$0	0.0

Electric Chiller Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Remaining Useful Life	ECM #	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	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	Chilled Water System	1	Air-Cooled Scroll Chiller	120.00	W	7	Yes	1	Air-Cooled Centrifugal Chiller	Variable	120.00	1.24	0.74	9.3	23,437	0	$2,840	$102,382	$10,800	32.2
Roof	Chilled Water System	1	Air-Cooled Scroll Chiller	120.00	W	7	Yes	1	Air-Cooled Centrifugal Chiller	Variable	120.00	1.24	0.74	9.3	23,437	0	$2,840	$102,382	$10,800	32.2

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	Space Heating	1	Condensing Hot Water Boiler	######	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler Room	Space Heating	1	Condensing Hot Water Boiler	######	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler Room	Space Heating	1	Condensing Hot Water Boiler	######	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler Room	Space Heating	1	Condensing Hot Water Boiler	######	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler Room	Space Heating	1	Condensing Hot Water Boiler	######	W		No						0.0	0	0	$0	$0	$0	0.0

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	Domestic Hot Water	8	10	1.25	0.0	1,397	0	$169	$88	$0	0.5
Mechanical Room	Domestic Hot Water	8	20	3.00	0.0	6,105	0	$740	$176	$0	0.2

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	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	W	9	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	92.00%	Et	16.2	19,328	-66	$1,847	$10,651	$369	5.6
Boiler Room	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	W	9	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	92.00%	Et	16.2	19,328	-66	$1,847	$10,651	$369	5.6
Boiler Room	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	W	9	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	92.00%	Et	16.2	19,328	-66	$1,847	$10,651	$369	5.6
Boiler Room	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	W	9	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	92.00%	Et	16.2	19,328	-66	$1,847	$10,651	$369	5.6
Boiler Room	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	B		No						0.0	0	0	$0	$0	$0	0.0
Boiler Room	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	B		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	10	10	Faucet Aerator (Lavatory)	2.20	0.50	0.0	8,341	0	$1,011	$72	$0	0.1
Restrooms	10	12	Faucet Aerator (Lavatory)	2.20	0.50	0.0	10,009	0	$1,213	$86	$0	0.1

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions				Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	ECM #	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Medium Temp Freezer (0F to 30F)	11, 12	Yes	No	Yes	0.5	5,954	0	$721	$2,584	$75	3.5
Kitchen	1	Cooler (35F to 55F)	11, 12	Yes	No	Yes	0.5	5,755	0	$697	$2,281	$75	3.2

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
Cafeteria	2	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	2	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	2	Refrigerator Chest	Yes		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	3	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	1	Stand-Up Freezer, Solid Door (>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
Cafeteria	3	Insulated Food Holding Cabinet (Full Size)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Cafeteria	1	Gas Rack Oven (Single)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Cafeteria	1	Gas Steamer	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Cafeteria	1	Electric Griddle (3 Feet Width)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Cafeteria	1	Gas Rack Oven (Single)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
School	324	Computers	120.0	
School	420	Laptops	90.0	
School	27	Fan	100.0	
School	2	TV	150.0	
School	66	Smart Board / Projector	300.0	
School	90	Small Office Printers	50.0	
School	3	Large Xerox- Type Printers	515.0	
School	5	Coffee Maker	400.0	
School	11	Microwave	1,100.0	
School	2	Speakers	100.0	
School	6	Large Speakers	500.0	
School	10	Mini Fridge	260.0	
School	5	Water Dispenser	300.0	
School	3	Buffett Tables (Heat/Cool)	4,800.0	
School	3	Buffett Tables (Heat/Cool)	6,400.0	
School	1	Misc. Sound Equipment	3,500.0	
School	1	Misc. IT Equipment	4,500.0	

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	1	Non-Refrigerated	N/A	No	0.0	0	0	$0	$0	$0	0.0
Lounge	1	Refrigerated	13	Yes	0.2	1,612	0	$195	$230	$50	0.9

Custom Measures (High Level Screening)

Computer Power Management Software

# of Desktops	Normal Running Mode					Idle Running Mode					Suspended/Off Mode				
324	*Mon - Fri 8AM-5PM*	*Mon - Fri 5PM-8AM*	*Weekends & Holidays*	Energy Rate (W)*	Weekly Run Hours	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	*Weekends & Holidays*	*Energy Rate (W)**	*Weekly Run Hours*	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	Weekends & Holidays	Energy Rate (W)*	*Weekly Run Hours*
Existing Conditions	40%	10%	0%	120	26	15%	15%	10%	80	23	45%	75%	90%	5	120
Proposed Conditions	40%	5%	0%	120	22	10%	5%	0%	80	8	50%	90%	100%	5	138

	Usage per Device			Energy Impact & Financial Analysis					
	Weeks of Use	Annual kWh Usage	*Diversity Factor***	Total Annual kWh Savings	Total Annual Energy Cost Savings	*Cost per Desktop*	*Add'l Hardware Cost*	Total Installation Cost	Simple Payback Period (Years)
Existing Conditions	44	241	75%	16,279	$1,973	$15.00	$2,500	$7,360	3.7
Proposed Conditions	44	191							

Note: Diversity Factor is a conservative estimate of how many devices will operate with power management software and will not be manually overridden by users

Retro-Commissioning Study & HVAC Improvements

Existing Conditions				Proposed Conditions			Energy Impact & Financial Analysis					
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Gas Use (mmBtu)*	*Annual Heating Oil Use (mmBtu)*	*Annual Motor HVAC Energy Use (kWh)*	Assumed % Cooling Savings	Assumed % Heating Savings	Assumed % Motor Savings	Total Annual kWh Savings	Total Annual Gas mmBtu Savings	Total Annual Fuel mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
736,795	5,192.9	0.0	1,182,044	5%	5%	5%	95,942	260	0	$13,573	$57,000	4.2

Equations: (Based on Industry Standards)

Average Cost for retro-commissioining studies and control improvements is $0.30/sqft

Energy savings range between 5% and 20% with a typical payback of two years or less

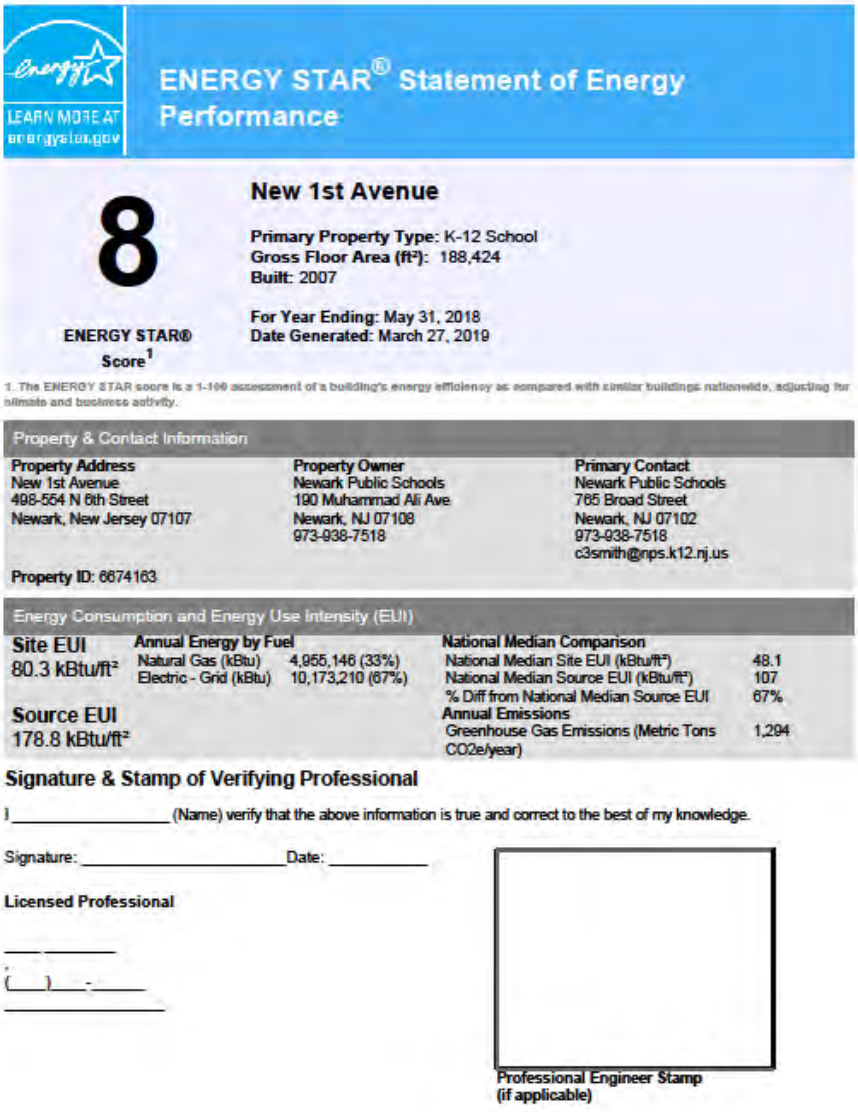
Based on a comprehensive study by the Environmental Protection Agency, the value of energy savings range from $0.11 and $0.72/sqft

This should include the following; Check Valve and Damper Operation, Economizer Controls, Temperature and Humidity Sensors, etc.

This should include the CO2 Sensor installations and implementation of demand control ventilation for the Gym and Cafeteria

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.



ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

New 1st Avenue

Primary Property Type: K-12 School
Gross Floor Area (ft²): 188,424
Built: 2007

For Year Ending: May 31, 2018
Date Generated: March 27, 2019

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ENERGY STAR® Score[1]

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
New 1st Avenue 498-554 N 6th Street Newark, New Jersey 07107	Newark Public Schools 190 Muhammad Ali Ave Newark, NJ 07108 973-938-7518	Newark Public Schools 765 Broad Street Newark, NJ 07102 973-938-7518 c3smith@nps.k12.nj.us

Property ID: 6674163

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
80.3 kBtu/ft²

Source EUI
178.8 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	4,955,146 (33%)
Electric - Grid (kBtu)	10,173,210 (67%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	48.1
National Median Source EUI (kBtu/ft²)	107
% Diff from National Median Source EUI	67%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	1,294

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's Clean Energy Program:* NJCEP is a statewide program that offers financial incentives, programs and services for New Jersey residents, business owners and local governments to help them save energy, money and the environment.
psig	Pounds per square inch gauge
Plug Load	Refers to the amount of power used in a space by products that are powered by means of an ordinary AC plug.
PV	*Photovoltaic:* refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR® Portfolio Manager®.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
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.