Local Government Energy Audit Report

Luis Munoz Marin Elementary School

August 26, 2019

Prepared for:

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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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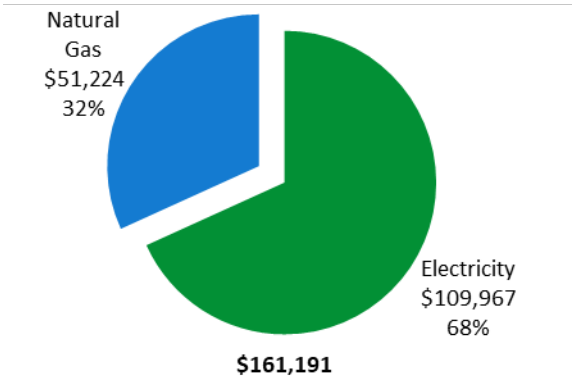
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Luis Munoz Marin 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 the school. 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: $161,191 Electricity: 1,052,908 kWh Natural Gas: 67,664 Therms	
ENERGY STAR® Benchmarking Score	53 *(1-100 scale)*	This building performs at about the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

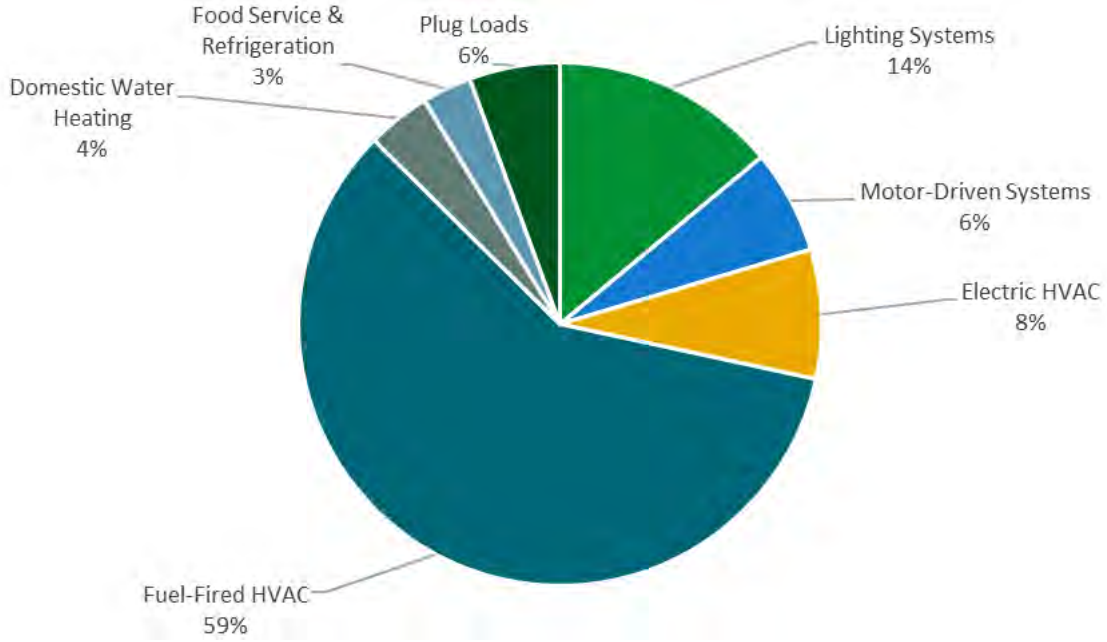


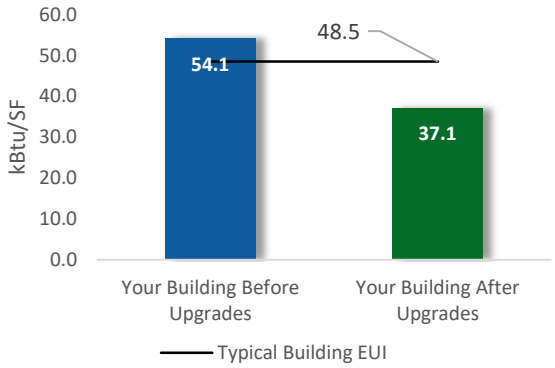
Figure 1 - Energy Use by System

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.

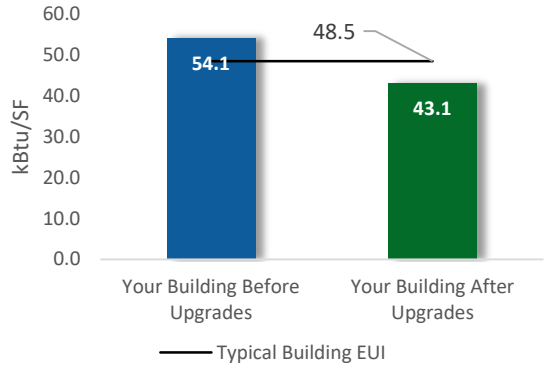
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$708,319
Potential Rebates & Incentives[1]	$38,802
Annual Cost Savings	$54,198
Annual Energy Savings	Electricity: 375,715 kWh Natural Gas: 19,759 Therms
Greenhouse Gas Emission Savings	305 Tons
Simple Payback	12.4 Years
Site Energy Savings (all utilities)	31%



Scenario 2: Cost Effective Package[2]

Installation Cost	$323,397
Potential Rebates & Incentives	$34,025
Annual Cost Savings	$41,997
Annual Energy Savings	Electricity: 331,279 kWh Natural Gas: 9,773 Therms
Greenhouse Gas Emission Savings	224 Tons
Simple Payback	6.9 Years
Site Energy Savings (all utilities)	20%



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		**232,201**	**48.3**	**-53**	**$23,852**	**$357,786**	**$118,317**	**$28,560**	**$89,757**	**3.8**	**227,653**
ECM 1	Install LED Fixtures	31,000	5.5	-7	$3,187	$47,801	$30,146	$6,000	$24,146	7.6	30,429
ECM 2	Retrofit Fixtures with LED Lamps	201,202	42.8	-46	$20,666	$309,985	$88,171	$22,560	$65,611	3.2	197,224
Lighting Control Measures		**47,676**	**9.1**	**-11**	**$4,896**	**$39,171**	**$49,162**	**$5,165**	**$43,997**	**9.0**	**46,726**
ECM 3	Install Occupancy Sensor Lighting Controls	37,825	7.9	-9	$3,885	$31,077	$39,112	$4,580	$34,532	8.9	37,070
ECM 4	Install Daylight Dimming Controls	603	0.1	0	$62	$496	$1,500	$585	$915	14.8	591
ECM 5	Install High/Low Lighting Controls	9,248	1.2	-2	$950	$7,598	$8,550	$0	$8,550	9.0	9,064
Motor Upgrades		**890**	**0.2**	**0**	**$93**	**$1,394**	**$2,721**	**$0**	**$2,721**	**29.3**	**896**
ECM 6	Premium Efficiency Motors	890	0.2	0	$93	$1,394	$2,721	$0	$2,721	29.3	896
Variable Frequency Drive (VFD) Measures		**23,541**	**9.4**	**0**	**$2,459**	**$36,881**	**$38,862**	**$1,600**	**$37,262**	**15.2**	**23,706**
ECM 7	Install VFDs on Constant Volume (CV) Fans	9,129	5.9	0	$953	$14,302	$16,788	$1,600	$15,188	15.9	9,193
ECM 8	Install VFDs on Heating Water Pumps	5,546	0.6	0	$579	$8,688	$10,637	$0	$10,637	18.4	5,584
ECM 9	Install Boiler Draft Fan VFDs	8,867	2.9	0	$926	$13,891	$11,437	$0	$11,437	12.4	8,929
Electric Unitary HVAC Measures		**15,719**	**11.8**	**0**	**$1,642**	**$24,626**	**$90,008**	**$2,427**	**$87,581**	**53.3**	**15,829**
ECM 10	Install High Efficiency Air Conditioning Units	15,719	11.8	0	$1,642	$24,626	$90,008	$2,427	$87,581	53.3	15,829
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**978**	**$7,405**	**$148,107**	**$238,146**	**$0**	**$238,146**	**32.2**	**114,536**
ECM 11	Install High Efficiency Hot Water Boilers	0	0.0	978	$7,405	$148,107	$238,146	$0	$238,146	32.2	114,536
HVAC System Improvements		**2,660**	**0.0**	**116**	**$1,156**	**$16,845**	**$5,613**	**$0**	**$5,613**	**4.9**	**16,262**
ECM 12	Implement Demand Control Ventilation (DCV)	2,660	0.0	100	$1,032	$15,481	$5,438	$0	$5,438	5.3	14,345
ECM 13	Install Pipe Insulation	0	0.0	16	$124	$1,364	$176	$0	$176	1.4	1,918
Domestic Water Heating Upgrade		**0**	**0.0**	**36**	**$269**	**$4,236**	**$5,330**	**$300**	**$5,030**	**18.7**	**4,164**
ECM 14	Install Tankless Water Heater	0	0.0	20	$154	$3,086	$5,215	$300	$4,915	31.9	2,387
ECM 15	Install Low-Flow DHW Devices	0	0.0	15	$115	$1,149	$115	$0	$115	1.0	1,778
Food Service & Refrigeration Measures		**13,955**	**1.6**	**0**	**$1,458**	**$10,420**	**$11,350**	**$750**	**$10,600**	**7.3**	**14,053**
ECM 16	Replace Refrigeration Equipment	4,284	0.5	0	$447	$5,370	$9,970	$450	$9,520	21.3	4,314
ECM 17	Vending Machine Control	9,671	1.1	0	$1,010	$5,050	$1,380	$300	$1,080	1.1	9,739
Custom Measures		**39,072**	**0.0**	**910**	**$10,968**	**$156,434**	**$148,810**	**$0**	**$148,810**	**13.6**	**145,863**
ECM 18	Computer Power Management Software	7,737	0.0	0	$808	$4,040	$4,810	$0	$4,810	6.0	7,791
ECM 19	Installation of an Energy Management System	31,334	0.0	910	$10,160	$152,394	$144,000	$0	$144,000	14.2	138,072
TOTALS (COST EFFECTIVE MEASURES)		**331,279**	**58.5**	**977**	**$41,997**	**$576,435**	**$323,397**	**$34,025**	**$289,372**	**6.9**	**448,020**
TOTALS (ALL MEASURES)		**375,715**	**80.4**	**1,976**	**$54,198**	**$795,899**	**$708,319**	**$38,802**	**$669,517**	**12.4**	**609,689**

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

** - 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 Daylight Dimming Controls			x
ECM 5	Install High/Low Lighting Controls			x
ECM 6	Premium Efficiency Motors			x
ECM 7	Install VFDs on Constant Volume (CV) HVAC	x		x
ECM 8	Install VFDs on Hot Water Pumps			x
ECM 9	Install Boiler Draft Fan VFDs			x
ECM 10	Install High Efficiency Electric AC	x		x
ECM 11	Install High Efficiency Hot Water Boilers			x
ECM 12	Implement Demand Control Ventilation			x
ECM 13	Install Pipe Insulation			x
ECM 14	Install Tankless Water Heater	x		x
ECM 15	Install Low-Flow Domestic Hot Water Devices			x
ECM 16	Replace Refrigeration Equipment	x		x
ECM 17	Vending Machine Control	x		x
ECM 18	Computer Power Management Software			x
ECM 19	Installation of an Energy Management System			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 Luis Munoz Marin 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 December 19, 2018, TRC performed an energy audit at Luis Munoz Marin Elementary School located in Newark, New Jersey. TRC met with Troy Soloman to review the Elementary School operations and help focus our investigation on specific energy-using systems.

Luis Munoz Marin Elementary School is a four-story, 191,351 square foot building built in 1955. Spaces include: classrooms, two gymnasiums, a multipurpose room, a library, an auditorium, offices, a cafeteria, a kitchen, corridors, stairwells, offices, and mechanical space. The building is 100% heated and approximately 30% cooled. The space heating system includes gas-fired steam boilers. The building is also partially cooled by roof top units with DX coils and window AC units.

Facility concerns include: The lack of control over the HVAC systems and equipment. The boilers are reportedly in poor condition and in need of replacement. There are no controls for the HVAC systems that would modulate dampers, coils, or maintain specific space temperatures. Facility staff reported exhaust fans need to be replaced as well. Based on conversations with facility personnel, the original pneumatic control system is inoperable. There is a great interest in the installation of a building Energy Management System (EMS).

2.2 Building Occupancy

The Elementary School is occupied year-round. Typical weekday occupancy is 130 staff and 907 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	6:30AM - 3:30PM
	Weekend (Saturday)	7:00AM - 3:30PM
After Hours Cleaning	Weekday	3:30PM - 11:00PM
	Weekend (Saturday)	3:30PM - 11:00PM
Summer School	Weekday	6:30AM - 3:30PM
	Weekend (Saturday)	7:00AM - 3:30PM

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 flat and covered with a rubber membrane, and it is in fair condition. The current level of exterior wall and roof insulation is unknown. Windows are double-pane, operable with metal frames. Windows are in good condition, and the glass-to-frame seals are in fair condition. The operable window weather seals are also in fair condition, showing little evidence of excessive wear. Exterior doors are metal with metal frames and in fair condition with worn door seals. Degraded window and door seals increase drafts and outside air infiltration.

Building Facade

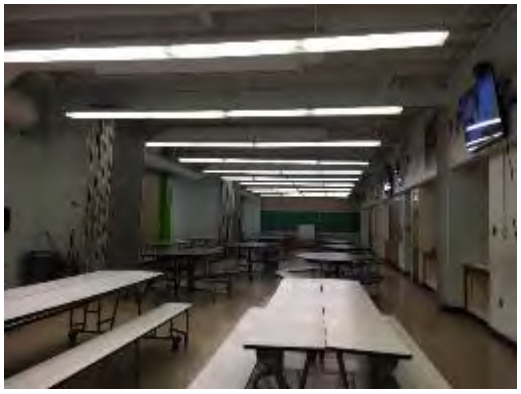
Building Facade

Door with Missing Weather Stripping

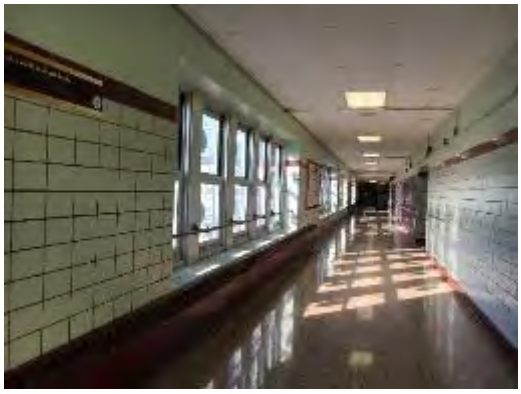
2.4 Lighting Systems

The primary interior lighting system uses 2-foot 17-Watt and 4-foot 32-Watt linear fluorescent T8 lamps. There are also several U-lamp T8 fixtures and high output compact fluorescent lamp (CFL) fixtures in hallway areas. There are metal halide lamp fixtures in the boiler room, both gymnasiums and in the auditorium, used as specialty spot light fixtures. Additionally, there are some incandescent and compact fluorescent general purpose lamps. All fluorescent lamp fixtures use electronic ballasts. Fixtures throughout the building include wrap fixtures, recessed troffer fixtures, and pendant fixtures. Most fixtures are in fair to good condition. However, some fixtures were noted to have lamps burnt out, had yellowed lenses, or were missing lenses. There were several areas where light fixtures were on while the space was unoccupied.

All exit signs throughout the building are LED. All interior lighting levels were generally sufficient; however, the library is currently over lit. Interior light fixtures are manually controlled via wall switches. Exterior fixtures include wall pack fixtures with metal halide lamps or CFLs. These fixtures are controlled by a timeclock.



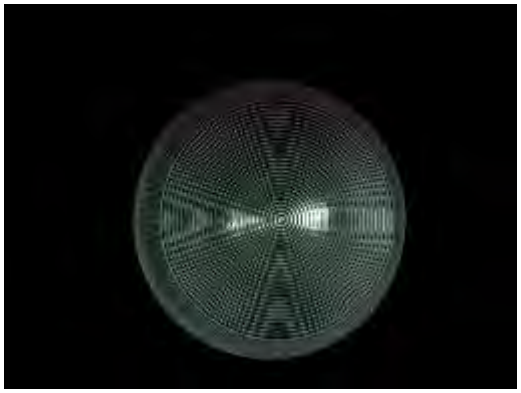
Linear Fluorescent T8 Wrap Fixtures



Linear Fluorescent T8 Recessed Troffer Fixtures

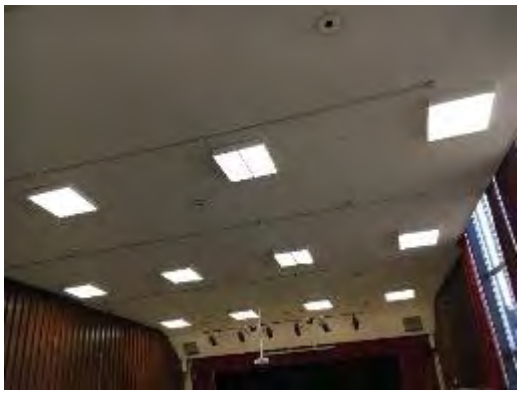
Linear Fluorescent T8 Recessed Troffer Fixtures

Linear Fluorescent T8 Fixtures in Library



HID Fixture in Boiler Room

Incandescent Lamp Fixtures



Linear Fluorescent T8 Fixtures in Auditorium

HID Fixtures in Gymnasium

Linear Fluorescent T8 Fixtures in Cafeteria

Key Switch and Wall Switches

Wall Pack Fixtures

Time Clock

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators include supply fan motors, which are manually controlled at the unit. Equipment is in fair to poor condition and originally had pneumatically controlled outside air dampers and valves. However, as the control system is no longer operable, the operation of the outside air dampers and coil valves is unknown and should be investigated further.

Unit Ventilator

Manual Dial Thermostat

Packaged Units

The cafeterias, some classrooms, and the auditorium are served by packaged roof top units (RTUs). There are five packaged units with DX coils and electric duct heaters, which range in size between 4.5 and 30 tons. The largest unit is located in the courtyard, and the associated ductwork was noted to be in poor condition. The remainder are located on the roof, and are beyond their useful life and in poor condition. These units may not be equipped with economizers.

Unit	Area Served	Size (Cooling / Heating)	Efficiency (Cooling)	Installation Year
RTU-1	Classrooms/Cafeteria	30 tons / 41kW	9.5 EER	2006
RTU-2	Auditorium	15 tons / 27kW	9.0 EER	1995
RTU-4,5,6	Basement Cafeteria	4.5 tons / 15kW	8.4 EER	1998

Roof Top Unit

AC Units to be Installed

Air Handling Unit

Ductwork Insulation in Poor Condition

HVAC Systems and Equipment

There are also four heating only air-handling units (AHUs) that serve the gym, library, and some classrooms. These units were inaccessible at the time of the audit and assumed to be in fair condition, equipped with 5 hp constant speed supply fan motors. These AHUs were installed in 2002 and have steam coils. At the time of the audit, there were new RTUs stored in the courtyard, which were to be installed for replacing existing RTUs. General building exhaust and kitchen hood exhaust are provided by exhaust fans.

Air Conditioners

Classrooms, offices, conference rooms, the library, and a cafeteria use window air conditioning (AC) units. These vary in capacity between 0.8 and 2.3 tons. The units vary in condition: some are new, most are within their effective useful life, and some are beyond effective useful life. They range in efficiency between 8.5 EER to 11 EER. Window AC units are manually turned on and off as needed.

Window AC Unit

Window AC Unit in Poor Condition

2.6 Heating Hot Water/Steam Systems

Three 125 HP Cleaver Brooks 4,333 MBh steam boilers serve the building heating load. The burners are fully-modulating with nominal efficiency of about 78%. The boilers are configured in a lead-lag control scheme. Two boilers are required under high load conditions. Installed in 1995, they are in poor condition and beyond their effective useful life. There appears to be basic set of heat timer controls for the boiler operation, although their current functionality is unknown.

The majority of the building is heated by the steam system. There is a shell and tube steam to hot water heat exchanger located in the boiler room, which converts a portion of the steam to hot water for the hot water heating loop. This hot water system serves some of the basement areas via two 2 hp constant speed pump motors. This two-pipe hydronic distribution system serves finned tube radiators that are in poor condition and, additionally, some cabinet heaters in the basement.

Steam is delivered throughout the building's two-pipe steam distribution system, which serves classroom unit ventilators, air handling units, cabinet heaters in entranceways, and finned tube radiators in some offices, restrooms, and storage areas. Condensate is cycled back to the boilers by a pumped condensate return system served by 5 hp constant speed pump motors.

There is an opportunity for energy savings in upgrading the existing heating system to use high-efficiency condensing boilers, which are equipped with optimization controls. This would, however, require converting the existing steam system to hot water; there would be significant initial installation costs associated with this upgrade. This effort would require further investigation beyond the scope of this audit.

Steam Boilers

Heat Timer Controls

Condensate Return Pumps

Hot Water Pumps

Condensate Return Pump

Steam to Hot Water Heat Exchanger

2.7 HVAC Controls

The building was originally controlled by a pneumatic system, which included pneumatically actuated dampers, valves, and thermostats. These HVAC controls are in poor condition and reportedly no longer functioning. This lack of control results in overheating, as well as simultaneous heating and cooling. For example, staff reported that occupants open windows during the heating season and expressed strong interest in installing an EMS.

2.8 Domestic Hot Water

Hot water is produced by three AO Smith 399 Mbh gas-fired storage tank water heaters. They each have a 100-gallon storage capacity with a nominal 80% efficiency. One of the hot water heaters is beyond its useful life, and the other two are in fair condition. These hot water heaters feed a 2,000-gallon remote storage tank. From there, hot water circulates in a loop via a fractional horsepower pump, serving the building's hand washing sinks, kitchen, and slop sinks. The pipes appear to be adequately insulated, although the remote storage tank level of insulation is unknown.

There is an opportunity for energy savings in upgrading the existing system to use high-efficiency condensing hot water heaters and eliminate the need for the 2,000-gallon storage tank. However, this would require further investigation beyond the scope of this audit.

Domestic Storage Tank Water Heaters

Storage Tank

High Flow Sink Aerator

Circulation Pump Motor

2.9 Food Service Equipment

The kitchen has mixture of gas and electric equipment that is used to prepare meals for students. Most cooking is done using a combination gas-fired oven. Bulk prepared foods are held in several electric holding cabinets. Equipment is high-efficiency and is in good condition. The dishwasher is not used.

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

Cooking Equipment

Cooking Equipment

2.10 Refrigeration

The kitchen and cafeteria have several stand-up refrigerators and freezers with solid doors. There are also several refrigerator chests. The majority of equipment is high-efficiency and in good condition.

Two walk-in coolers located in the kitchen area each have an estimated 2-ton compressor and a single fan evaporator. These appear to have both evaporator fan and electric defrost controls.

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

Refrigerator Chest

Stand-up Refrigeration Equipment

Walk-in Cooler Evaporator

Walk-in Cooler Evaporator

2.11 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 6% 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 154 computer work stations throughout the Elementary School and 907 Chromebooks/laptops on site. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as Smart Boards, small office printers, and projectors.

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

General Café Equipment

Vending Machines

Laptop Cart

Vending Machines

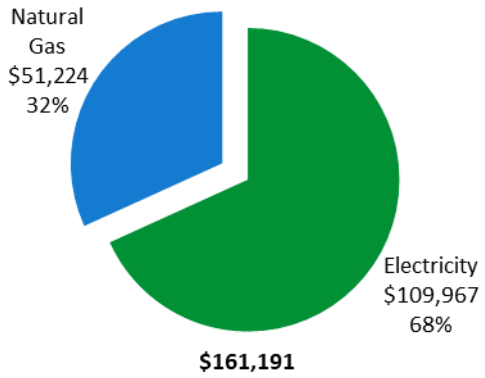
2.12 Water-Using Systems

There are restrooms with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gallons per minute (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	1,052,908 kWh	$109,967
Natural Gas	67,664 Therms	$51,224
Total		**$161,191**



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.

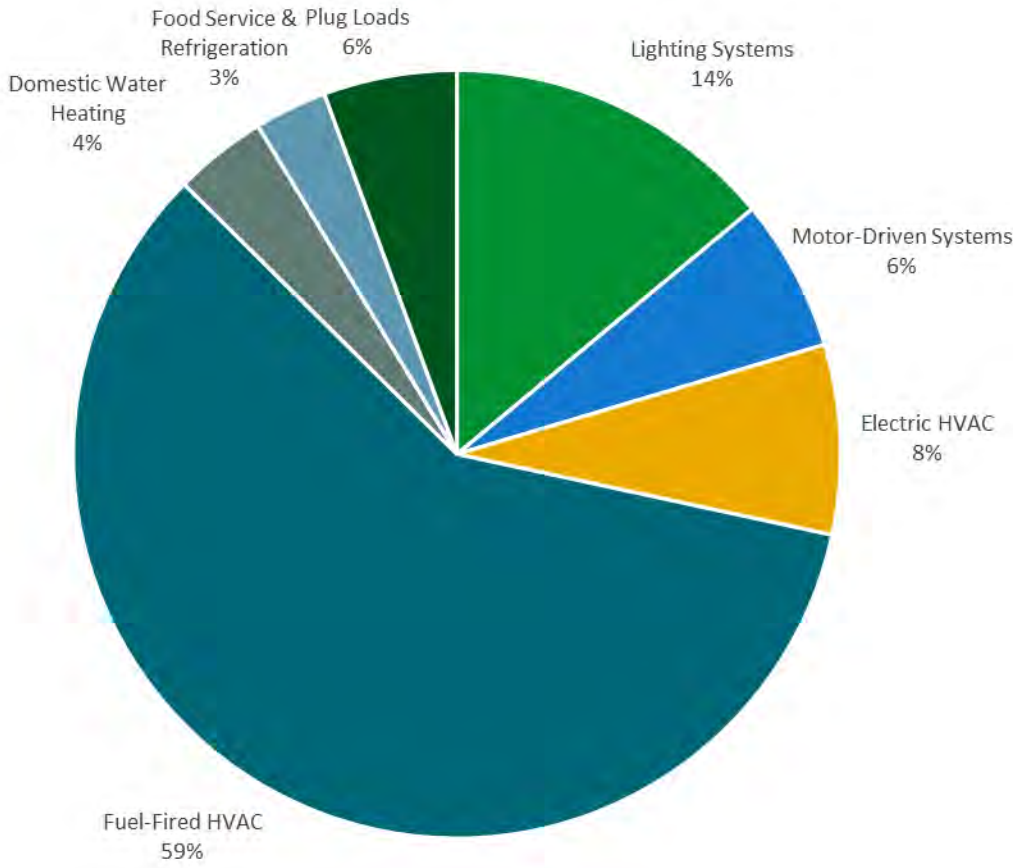
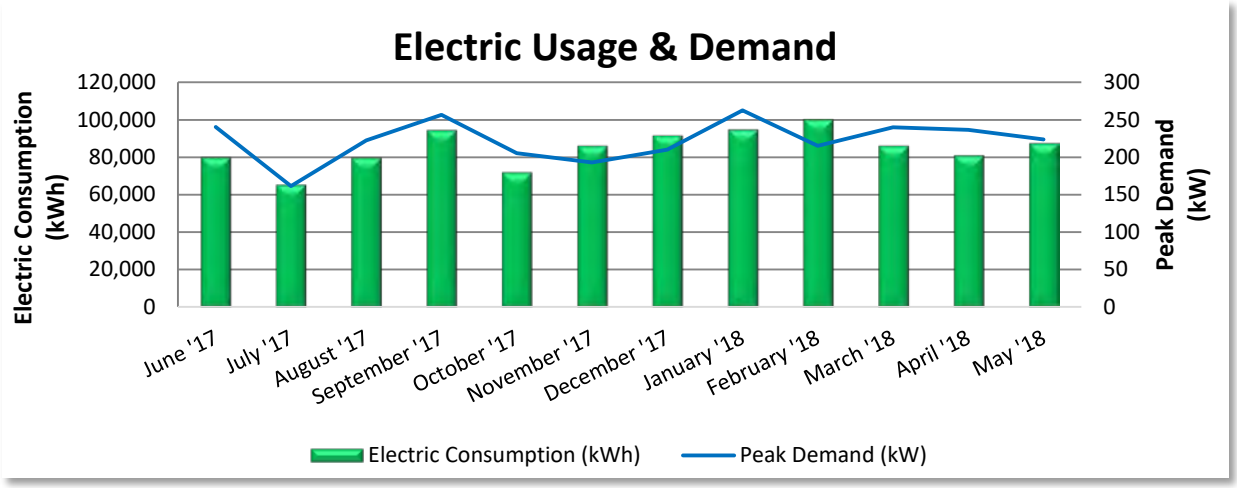


Figure 5 - Energy Balance

3.1 Electricity

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



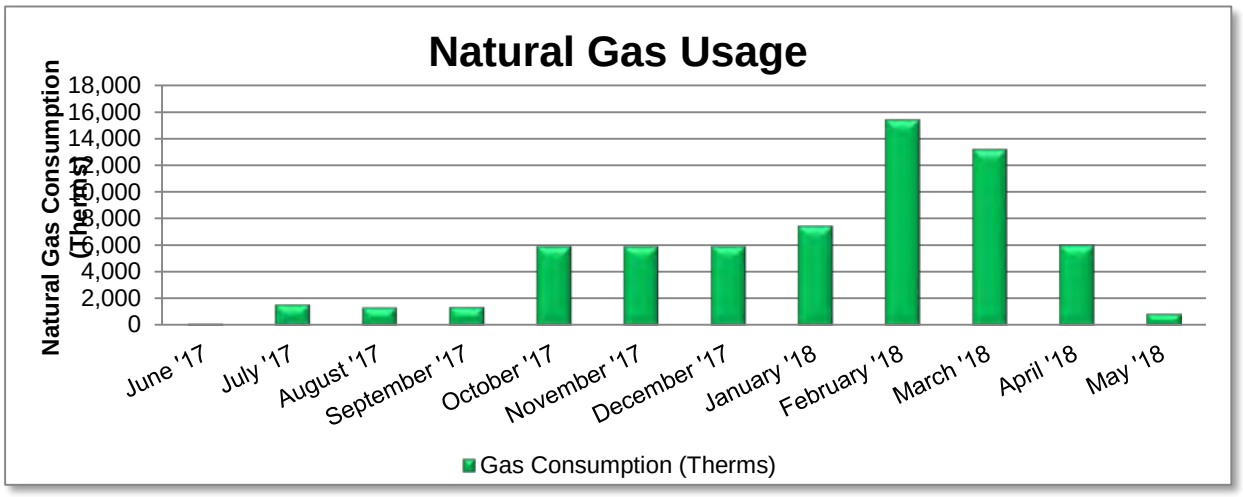
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
7/12/17	29	80,144	240	$906	$10,802
8/10/17	28	65,610	162	$609	$8,641
9/11/17	31	79,946	223	$838	$9,926
10/10/17	28	94,711	257	$967	$8,834
11/8/17	28	72,155	206	$774	$903
12/11/17	32	86,284	193	$727	$8,537
1/11/18	31	91,714	210	$792	$9,692
2/9/18	28	94,987	263	$990	$9,985
3/13/18	31	100,484	215	$811	$10,298
4/12/18	29	86,313	240	$905	$8,965
5/11/18	28	81,107	237	$892	$8,613
6/12/18	31	87,722	224	$843	$11,457
Totals	**354**	**1,021,177**	**263**	**$10,053**	**$106,653**
Annual	**365**	**1,052,908**	**263**	**$10,365**	**$109,967**

Notes:

- Peak demand of 263 kW occurred in February '18.
- The average electric cost over the past 12 months was $0.104/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 222 kW.
- The annual electrical usage of the facility has increased by 14% 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?**
7/4/17	29	119	$185	No
8/3/17	29	1,594	$1,119	No
9/3/17	30	1,381	$971	No
10/2/17	28	1,398	$981	No
10/31/17	28	5,979	$4,352	Yes
12/3/17	32	5,979	$4,352	Yes
1/3/18	30	5,979	$4,352	Yes
2/1/18	28	7,509	$7,565	No
3/5/18	31	15,483	$13,443	No
4/4/18	29	13,245	$7,969	No
5/3/18	28	6,058	$3,731	No
6/5/18	32	903	$660	No
Totals	**354**	**65,625**	**$49,680**	
Annual	**365**	**67,664**	**$51,224**	

Notes:

- The average gas cost for the past 12 months is $0.757/therm, which is the blended rate used throughout the analysis.
- The annual natural gas usage of the facility has decreased by 4% since 2014.

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	53

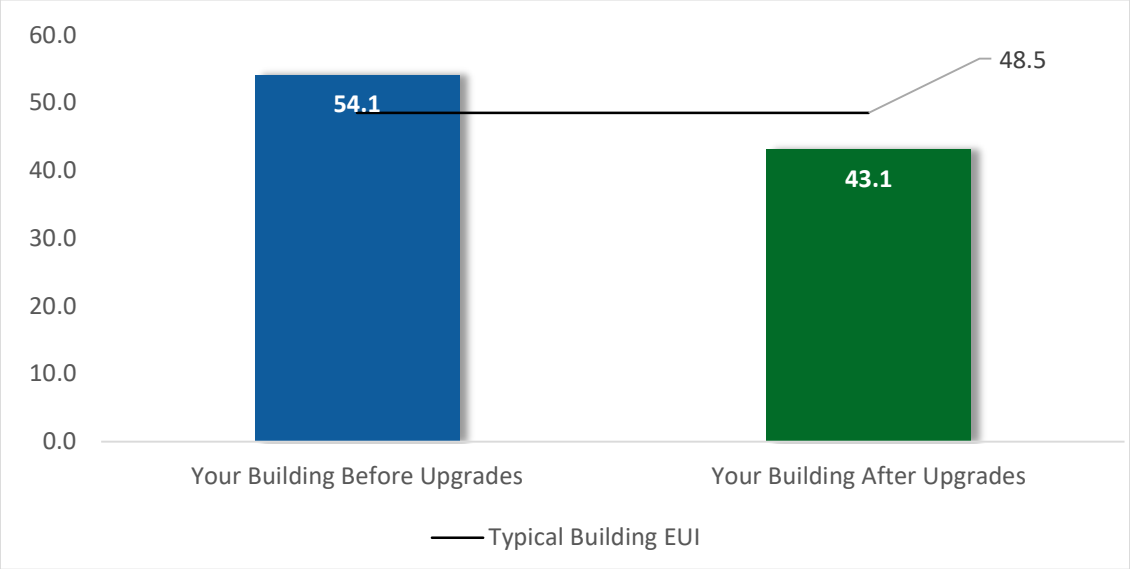


Figure 6 - Energy Use Intensity Comparison

This building performs at about 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		**232,201**	**48.3**	**-53**	**$23,852**	**$118,317**	**$28,560**	**$89,757**	**3.8**	**227,653**
ECM 1	Install LED Fixtures	31,000	5.5	-7	$3,187	$30,146	$6,000	$24,146	7.6	30,429
ECM 2	Retrofit Fixtures with LED Lamps	201,202	42.8	-46	$20,666	$88,171	$22,560	$65,611	3.2	197,224
Lighting Control Measures		**47,676**	**9.1**	**-11**	**$4,896**	**$49,162**	**$5,165**	**$43,997**	**9.0**	**46,726**
ECM 3	Install Occupancy Sensor Lighting Controls	37,825	7.9	-9	$3,885	$39,112	$4,580	$34,532	8.9	37,070
ECM 4	Install Daylight Dimming Controls	603	0.1	0	$62	$1,500	$585	$915	14.8	591
ECM 5	Install High/Low Lighting Controls	9,248	1.2	-2	$950	$8,550	$0	$8,550	9.0	9,064
Motor Upgrades		**890**	**0.2**	**0**	**$93**	**$2,721**	**$0**	**$2,721**	**29.3**	**896**
ECM 6	Premium Efficiency Motors	890	0.2	0	$93	$2,721	$0	$2,721	29.3	896
Variable Frequency Drive (VFD) Measures		**23,541**	**9.4**	**0**	**$2,459**	**$38,862**	**$1,600**	**$37,262**	**15.2**	**23,706**
ECM 7	Install VFDs on Constant Volume (CV) Fans	9,129	5.9	0	$953	$16,788	$1,600	$15,188	15.9	9,193
ECM 8	Install VFDs on Heating Water Pumps	5,546	0.6	0	$579	$10,637	$0	$10,637	18.4	5,584
ECM 9	Install Boiler Draft Fan VFDs	8,867	2.9	0	$926	$11,437	$0	$11,437	12.4	8,929
Electric Unitary HVAC Measures		**15,719**	**11.8**	**0**	**$1,642**	**$90,008**	**$2,427**	**$87,581**	**53.3**	**15,829**
ECM 10	Install High Efficiency Air Conditioning Units	15,719	11.8	0	$1,642	$90,008	$2,427	$87,581	53.3	15,829
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**978**	**$7,405**	**$238,146**	**$0**	**$238,146**	**32.2**	**114,536**
ECM 11	Install High Efficiency Hot Water Boilers	0	0.0	978	$7,405	$238,146	$0	$238,146	32.2	114,536
HVAC System Improvements		**2,660**	**0.0**	**116**	**$1,156**	**$5,613**	**$0**	**$5,613**	**4.9**	**16,262**
ECM 12	Implement Demand Control Ventilation (DCV)	2,660	0.0	100	$1,032	$5,438	$0	$5,438	5.3	14,345
ECM 13	Install Pipe Insulation	0	0.0	16	$124	$176	$0	$176	1.4	1,918
Domestic Water Heating Upgrade		**0**	**0.0**	**36**	**$269**	**$5,330**	**$300**	**$5,030**	**18.7**	**4,164**
ECM 14	Install Tankless Water Heater	0	0.0	20	$154	$5,215	$300	$4,915	31.9	2,387
ECM 15	Install Low-Flow DHW Devices	0	0.0	15	$115	$115	$0	$115	1.0	1,778
Food Service & Refrigeration Measures		**13,955**	**1.6**	**0**	**$1,458**	**$11,350**	**$750**	**$10,600**	**7.3**	**14,053**
ECM 16	Replace Refrigeration Equipment	4,284	0.5	0	$447	$9,970	$450	$9,520	21.3	4,314
ECM 17	Vending Machine Control	9,671	1.1	0	$1,010	$1,380	$300	$1,080	1.1	9,739
Custom Measures		**39,072**	**0.0**	**910**	**$10,968**	**$148,810**	**$0**	**$148,810**	**13.6**	**145,863**
ECM 18	Computer Power Management Software	7,737	0.0	0	$808	$4,810	$0	$4,810	6.0	7,791
ECM 19	Installation of an Energy Management System	31,334	0.0	910	$10,160	$144,000	$0	$144,000	14.2	138,072
TOTALS		**375,715**	**80.4**	**1,976**	**$54,198**	**$708,319**	**$38,802**	**$669,517**	**12.4**	**609,689**

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

** - 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		**232,201**	**48.3**	**-53**	**$23,852**	**$118,317**	**$28,560**	**$89,757**	**3.8**	**227,653**
ECM 1	Install LED Fixtures	31,000	5.5	-7	$3,187	$30,146	$6,000	$24,146	7.6	30,429
ECM 2	Retrofit Fixtures with LED Lamps	201,202	42.8	-46	$20,666	$88,171	$22,560	$65,611	3.2	197,224
Lighting Control Measures		**47,676**	**9.1**	**-11**	**$4,896**	**$49,162**	**$5,165**	**$43,997**	**9.0**	**46,726**
ECM 3	Install Occupancy Sensor Lighting Controls	37,825	7.9	-9	$3,885	$39,112	$4,580	$34,532	8.9	37,070
ECM 4	Install Daylight Dimming Controls	603	0.1	0	$62	$1,500	$585	$915	14.8	591
ECM 5	Install High/Low Lighting Controls	9,248	1.2	-2	$950	$8,550	$0	$8,550	9.0	9,064
HVAC System Improvements		**2,660**	**0.0**	**116**	**$1,156**	**$5,613**	**$0**	**$5,613**	**4.9**	**16,262**
ECM 12	Implement Demand Control Ventilation (DCV)	2,660	0.0	100	$1,032	$5,438	$0	$5,438	5.3	14,345
ECM 13	Install Pipe Insulation	0	0.0	16	$124	$176	$0	$176	1.4	1,918
Domestic Water Heating Upgrade		**0**	**0.0**	**15**	**$115**	**$115**	**$0**	**$115**	**1.0**	**1,778**
ECM 15	Install Low-Flow DHW Devices	0	0.0	15	$115	$115	$0	$115	1.0	1,778
Food Service & Refrigeration Measures		**9,671**	**1.1**	**0**	**$1,010**	**$1,380**	**$300**	**$1,080**	**1.1**	**9,739**
ECM 17	Vending Machine Control	9,671	1.1	0	$1,010	$1,380	$300	$1,080	1.1	9,739
Custom Measures		**39,072**	**0.0**	**910**	**$10,968**	**$148,810**	**$0**	**$148,810**	**13.6**	**145,863**
ECM 18	Computer Power Management Software	7,737	0.0	0	$808	$4,810	$0	$4,810	6.0	7,791
ECM 19	Installation of an Energy Management System	31,334	0.0	910	$10,160	$144,000	$0	$144,000	14.2	138,072
TOTALS		**331,279**	**58.5**	**977**	**$41,997**	**$323,397**	**$34,025**	**$289,372**	**6.9**	**448,020**

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

** - 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		**232,201**	**48.3**	**-53**	**$23,852**	**$118,317**	**$28,560**	**$89,757**	**3.8**	**227,653**
ECM 1	Install LED Fixtures	31,000	5.5	-7	$3,187	$30,146	$6,000	$24,146	7.6	30,429
ECM 2	Retrofit Fixtures with LED Lamps	201,202	42.8	-46	$20,666	$88,171	$22,560	$65,611	3.2	197,224

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 HID lamps with new LED light fixtures. This measure saves energy by installing LEDs, which use less power than other technologies with a comparable light output.

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

ECM 2: Retrofit Fixtures with LED Lamps

Replace fluorescent, compact fluorescent, 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 with fluorescent fixtures with T8 tubes, compact fluorescent or incandescent lamps.

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		**47,676**	**9.1**	**-11**	**$4,896**	**$49,162**	**$5,165**	**$43,997**	**9.0**	**46,726**
ECM 3	Install Occupancy Sensor Lighting Controls	37,825	7.9	-9	$3,885	$39,112	$4,580	$34,532	8.9	37,070
ECM 4	Install Daylight Dimming Controls	603	0.1	0	$62	$1,500	$585	$915	14.8	591
ECM 5	Install High/Low Lighting Controls	9,248	1.2	-2	$950	$8,550	$0	$8,550	9.0	9,064

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, lounges, classrooms, multipurpose room, cafeteria, gymnasium, library, restrooms, locker rooms, and storage rooms.

ECM 4: Install Daylight Dimming Controls

Install daylight dimming controls that use photosensors to reduce electric lighting in areas when ample daylight lighting is present. Use photosensor controls for fixtures serving areas that are lit by sunlight. As sunlight levels increase in the room, artificial lighting decreases or turns off.

This measure reduces energy use in spaces where ambient daylight provides sufficient lighting levels. Optimum light levels and the method of dimming should be determined during lighting design.

Affected building areas: hallway lined with windows.

ECM 5: 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.

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.

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		**890**	**0.2**	**0**	**$93**	**$2,721**	**$0**	**$2,721**	**29.3**	**896**
ECM 6	Premium Efficiency Motors	890	0.2	0	$93	$2,721	$0	$2,721	29.3	896

ECM 6: Premium Efficiency Motors

Replace 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.

Premium efficiency motors have been proposed to be installed in conjunction with proposed variable frequency drive (VFD) motor measures, and the associated costs for those replacement motors have been included in the costs for ECM 7 and ECM 8.

Premium efficiency motors have additionally been proposed for the two following large roof top units.

Affected motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor
Roof	RTU-1	1	Supply Fan	10.0
Roof	RTU-2	1	Supply Fan	7.5

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*.

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		**23,541**	**9.4**	**0**	**$2,459**	**$38,862**	**$1,600**	**$37,262**	**15.2**	**23,706**
ECM 7	Install VFDs on Constant Volume (CV) Fans	9,129	5.9	0	$953	$16,788	$1,600	$15,188	15.9	9,193
ECM 8	Install VFDs on Heating Water Pumps	5,546	0.6	0	$579	$10,637	$0	$10,637	18.4	5,584
ECM 9	Install Boiler Draft Fan VFDs	8,867	2.9	0	$926	$11,437	$0	$11,437	12.4	8,929

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. If the proposed VFD measure is not selected for implementation, the motor replacement should be reevaluated.

ECM 7: Install VFDs on Constant Volume (CV) Fans

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

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

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

Affected air handlers: AHU, AHU-1A, AHU-1B, and AHU-1C.

ECM 8: Install VFDs on Heating Water Pumps

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

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

Affected pumps: heating hot water pumps.

ECM 9: Install Boiler Draft Fan VFDs

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

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

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

4.5 Electric Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**15,719**	**11.8**	**0**	**$1,642**	**$90,008**	**$2,427**	**$87,581**	**53.3**	**15,829**
ECM 10	Install High Efficiency Air Conditioning Units	15,719	11.8	0	$1,642	$90,008	$2,427	$87,581	53.3	15,829

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

ECM 10: Install High-Efficiency Air Conditioning Units

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

Affected Equipment: “RTU-2, “RTU-4”, “RTU-5”, “RTU-6” and older inefficient Window AC Units.

4.6 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**978**	**$7,405**	**$238,146**	**$0**	**$238,146**	**32.2**	**114,536**
ECM 11	Install High Efficiency Hot Water Boilers	0	0.0	978	$7,405	$238,146	$0	$238,146	32.2	114,536

ECM 11: Install High-Efficiency Hot Water Boilers

Facility personnel showed interest in replacing of older inefficient steam boilers and heat exchangers with natural gas-fired, high-efficiency condensing hot water boilers. The heating system upgrade was evaluated at a high level. Energy savings results from improved combustion efficiency and reduced standby losses at low loads. Further analysis should be conducted for the feasibility of this measure.

For the purposes of this analysis, we evaluated a one-for-one replacement assessment for removing the steam boilers and installing hot water boilers. This measure is not recommended based solely on basis of energy and economic results. It should be considered as a capital improvement measure for future implementation. Further analysis should be conducted for the feasibility of this measure. This measure does not include the costs for demolition, distribution piping, heat exchanger removal, gas piping upgrades, commissioning, engineering design, asbestos abatement, replacement of steam terminal units throughout the building, etc.

The most notable efficiency improvement is an upgrade to condensing hydronic boilers, which can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high-efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F. Therefore, project design should evaluate whether the system return water temperature can be reduced from current levels in the new boiler configuration.

This measure is not recommended due to the long simple payback of replacing the existing boilers. Replacing the space heating boilers may not be justifiable based solely on energy considerations. When the boilers are replaced, we recommend working with an HVAC design engineer or experienced implementation contractor to size the boilers to the school's current heating requirements. We also recommend that you consider installing multiple modular boilers to improve the heating water system part load performance and redundancy. These approaches may also improve the cost effectiveness of the boiler replacement.

If the overall boiler plant capacity could be reduced, this measure may be cost effective. Modular boilers with input ratings of 1,000 to 2,000 kBtu/hr are readily available. Configuring a boiler plant around several modular boilers provides several advantages. The first is that the overall system operates better at low load conditions as only one or two modular boilers are operating at full load rather than one large boiler operating inefficiently at low load. A typical modular boiler plant for a school of this size will generally use an array of boilers, which provides better redundancy than a plant with two or three larger boilers. Finally, several modular boilers will often take less space than two or three large boilers.

As the existing boilers are approaching the end of their useful life, it is the recommended that reconfiguring the boiler plant be further evaluated. This is not an investment grade analysis, nor should be used as a basis for design and construction.

Additional Considerations: If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program (ESIP), we would recommend including this measure. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load at this facility.

4.7 HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**2,660**	**0.0**	**116**	**$1,156**	**$5,613**	**$0**	**$5,613**	**4.9**	**16,262**
ECM 12	Implement Demand Control Ventilation (DCV)	2,660	0.0	100	$1,032	$5,438	$0	$5,438	5.3	14,345
ECM 13	Install Pipe Insulation	0	0.0	16	$124	$176	$0	$176	1.4	1,918

ECM 12: Implement Demand Control Ventilation (DCV)

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

Standard ventilation systems often provide outside air based on a space's estimated maximum occupancy rather than actual occupancy. During low occupancy periods, the space may then be overventilated. This wastes energy through heating and cooling the excess outside air flow. DCV reduces unnecessary outdoor air intake by regulating ventilation based on actual occupancy level and is most suited for facilities where occupancy levels vary significantly from hour to hour and day to day.

Energy savings associated with DCV are based on hours of operation, space occupancy, outside air reduction, and other factors. Energy savings results from eliminating unnecessary ventilation and space conditioning.

Affected building areas: gymnasium and auditorium.

ECM 13: Install Pipe Insulation

Install insulation on heating water 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. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

4.8 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**36**	**$269**	**$5,330**	**$300**	**$5,030**	**18.7**	**4,164**
ECM 14	Install Tankless Water Heater	0	0.0	20	$154	$5,215	$300	$4,915	31.9	2,387
ECM 15	Install Low-Flow DHW Devices	0	0.0	15	$115	$115	$0	$115	1.0	1,778

ECM 14: Install Tankless Water Heater

Replace the existing storage tank water heater that is beyond effective useful life with a tankless water heating system. Tankless water heaters (a.k.a. "on-demand water heaters") only heat water when hot water is needed. Water is heated as it flows through the pipe to the hot water tap. Energy savings from a tankless water heater are based on eliminating heat losses associated with maintaining unnecessary standby hot water capacity.

ECM 15: 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.

4.9 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**13,955**	**1.6**	**0**	**$1,458**	**$11,350**	**$750**	**$10,600**	**7.3**	**14,053**
ECM 16	Replace Refrigeration Equipment	4,284	0.5	0	$447	$9,970	$450	$9,520	21.3	4,314
ECM 17	Vending Machine Control	9,671	1.1	0	$1,010	$1,380	$300	$1,080	1.1	9,739

ECM 16: Replace Refrigeration Equipment

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

ECM 17: 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.

4.10 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		**39,072**	**0.0**	**910**	**$10,968**	**$148,810**	**$0**	**$148,810**	**13.6**	**145,863**
ECM 18	Computer Power Management Software	7,737	0.0	0	$808	$4,810	$0	$4,810	6.0	7,791
ECM 19	Installation of an Energy Management System	31,334	0.0	910	$10,160	$144,000	$0	$144,000	14.2	138,072

ECM 18: 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 19: Installation of an Energy Management System

The installation of an 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.

Upgrade of controls to optimize the start/stop of all key HVAC equipment and tying in all space temperature controls will minimize the amount of wasted energy. Schedules may be put in place to limit system operation when the building is closed. Temperature set back controls may be applied to operate systems only to the point necessary. Ventilation and economizer controls and programming would allow air handling units to operate according to room schedules, occupancy, and availability for “free cooling” or “free heating”.

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

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.

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.

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

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.

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.

Water Conservation

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

For more information regarding water conservation go to the EPA's WaterSense™ website[5] or download a copy of EPA's "WaterSense™ at Work: Best Management Practices for Commercial and Institutional Facilities"[6] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

If the facility has detached buildings with a master water meter for the entire campus, check for unnatural wet areas in the lawn or water seeping in the foundation at water pipe penetrations through the foundation. Periodically check overnight meter readings when the 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.

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

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

Procurement Strategies

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

6 On-site Generation

You don't have to look far in New Jersey to see one of the thousands of solar electric systems providing clean power to homes, businesses, schools, and government buildings. On-site generation includes both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) technologies that generate power to meet all or a portion of the Elementary School'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.

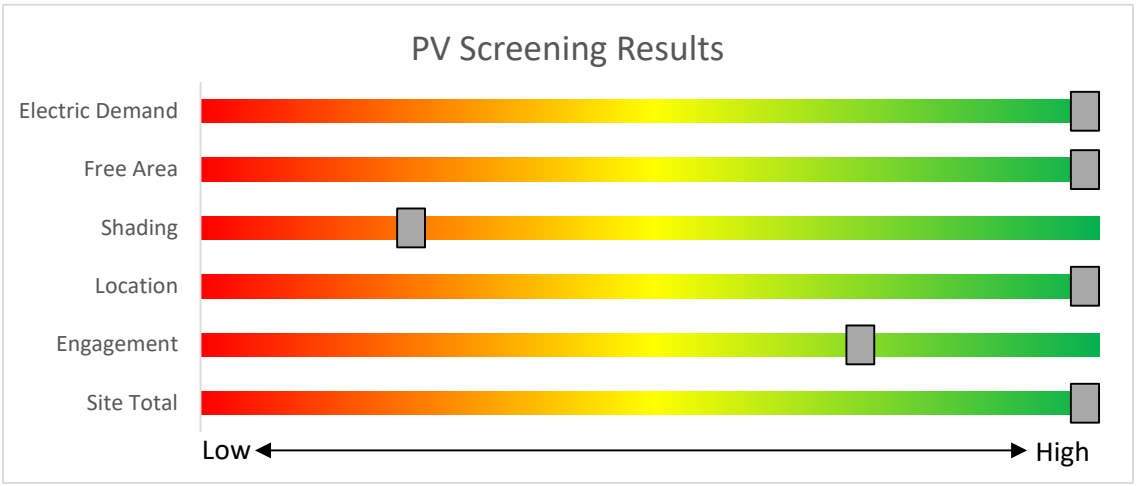


Figure 9 - Photovoltaic Screening

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 Elementary School'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.

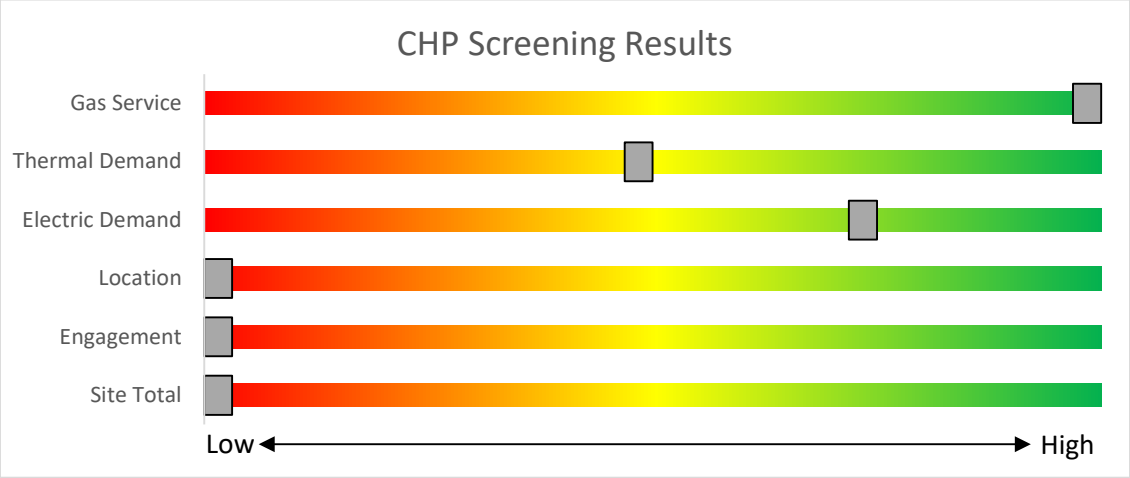


Figure 10 - Combined Heat and Power Screening

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

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

Equipment with Prescriptive Incentives Currently Available:

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

Incentives

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

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

How to Participate

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

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

7.2 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[7].

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[8].

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	12	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	2,782	1	Fixture Replacement	No	12	LED - Fixtures: High-Bay	Wall Switch	137	2,782	1.9	10,703	-2	$1,099	$9,299	$1,800	6.8
Kitchen	22	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2	Relamp	No	22	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,782	0.5	3,030	-1	$311	$1,205	$330	2.8
Locker Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,800	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,800	0.0	119	0	$12	$73	$20	4.3
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,800	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,242	0.0	151	0	$16	$189	$20	10.9
Hallway	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,782	2	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,782	0.0	89	0	$9	$65	$12	5.8
Slop Sink	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,782	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,782	0.0	45	0	$5	$33	$6	5.8
Elevator Machine Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,800	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,800	0.0	32	0	$3	$18	$5	4.1
Walk-in Refrigeration	2	Incandescent: Screw in Lamp	Wall Switch	S	100	2,782	2	Relamp	No	2	LED Lamps: Screw in Lamp	Wall Switch	15	2,782	0.1	473	0	$49	$34	$2	0.7
Basement Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,782	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,782	0.0	195	0	$20	$73	$20	2.7
Pantry Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,800	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,800	0.0	126	0	$13	$73	$20	4.1
Storage Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,800	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,800	0.0	126	0	$13	$73	$20	4.1
Lounge	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,800	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,800	0.0	63	0	$6	$37	$10	4.1
Storage Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,800	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,800	0.0	32	0	$3	$18	$5	4.1
Hallway	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2, 5	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	0.4	2,855	-1	$293	$1,296	$170	3.8
Custodial Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,782	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,782	0.0	195	0	$20	$73	$20	2.7
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,800	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,800	0.0	29	0	$3	$33	$6	9.0
Closets	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,800	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,800	0.0	63	0	$6	$37	$10	4.1
Storage Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,800	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,800	0.0	126	0	$13	$73	$20	4.1
Storage Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,800	2, 3	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,242	0.1	238	0	$24	$380	$30	14.3
Kitchen	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,782	0.1	459	0	$47	$183	$50	2.8
Cafeteria	48	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	O	32	2,782	2, 3	Relamp	Yes	48	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,920	0.5	2,937	-1	$302	$2,226	$415	6.0
Classsroom 101	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.5	2,318	-1	$238	$1,146	$275	3.7
Classsroom 102	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.5	2,318	-1	$238	$1,146	$275	3.7
Classsroom 103	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.5	2,173	0	$223	$1,092	$260	3.7
Classsroom 104	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.5	2,318	-1	$238	$1,146	$275	3.7

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classsroom 108	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.5	2,173	0	$223	$1,092	$260	3.7
Library	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	2,782	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.1	701	0	$72	$489	$95	5.5
Library	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	2,782	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.3	1,869	0	$192	$854	$195	3.4
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.1	467	0	$48	$262	$60	4.2
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.0	234	0	$24	$343	$20	13.5
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,782	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,782	0.0	49	0	$5	$18	$5	2.7
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.0	234	0	$24	$343	$20	13.5
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,782	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,782	0.0	49	0	$5	$18	$5	2.7
Stairwells	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,000	0.0	396	0	$41	$110	$30	2.0
Stairwells	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,000	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,000	0.0	210	0	$22	$55	$15	1.8
Stairwells	6	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	4,000	2	Relamp	No	6	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	4,000	0.0	384	0	$39	$195	$36	4.0
Hallway	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,000	2, 5	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,760	0.8	6,047	-1	$621	$2,215	$360	3.0
Hallway	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2, 5	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	0.5	4,367	-1	$448	$2,074	$260	4.0
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,000	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,000	0.0	140	0	$14	$37	$10	1.8
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,000	2, 5	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,760	0.4	2,959	-1	$304	$1,180	$200	3.2
Nurse's Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,782	0.1	459	0	$47	$183	$50	2.8
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,782	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,782	0.0	45	0	$5	$33	$6	5.8
Main Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.1	701	0	$72	$489	$95	5.5
Hallway	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,782	2	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,782	0.0	89	0	$9	$65	$12	5.8
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,782	0.0	92	0	$9	$37	$10	2.8
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.0	234	0	$24	$189	$20	7.0
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,920	0.0	234	0	$24	$298	$20	11.6
Open Office/Work Area	48	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	48	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	1.0	5,607	-1	$576	$3,373	$690	4.7
Chilid Study Team	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.3	1,869	0	$192	$854	$195	3.4
Assembly	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2, 5	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	0.3	2,687	-1	$276	$1,259	$160	4.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	0.1	350	0	$36	$380	$65	8.7
Storage Wing	30	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	50	2	Relamp	No	30	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	50	0.2	24	0	$2	$975	$180	322.7
Storage Wing	64	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	50	2	Relamp	No	64	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	50	1.1	106	0	$11	$2,337	$640	156.5
Classroom 217	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 218	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 219	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Storage Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,000	0.0	70	0	$7	$73	$20	7.4
Storage Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,000	0.0	70	0	$7	$73	$20	7.4
Storage Room	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,000	2, 3	Relamp	Yes	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	690	0.2	308	0	$32	$526	$70	14.4
Classroom 206	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 207	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 208	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 209	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 210	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 212	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Multipurpose Room	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.3	1,869	0	$192	$854	$195	3.4
Faculty Lounge	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.1	467	0	$48	$416	$75	7.1
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,782	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,782	0.0	45	0	$5	$33	$6	5.8
Work Room 213A	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.1	701	0	$72	$489	$95	5.5
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.0	33	0	$3	$73	$20	15.6
Classroom 213	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,159	0	$119	$708	$155	4.6
Classroom 214	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,159	0	$119	$708	$155	4.6
Classroom 215	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,159	0	$119	$708	$155	4.6
Restrooms	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,300	2	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,300	0.0	110	0	$11	$98	$18	7.0
Classroom 205	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 204	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 203	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Art Classroom	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.6	2,897	-1	$298	$1,365	$335	3.5
Art Classroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,300	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,300	0.0	37	0	$4	$33	$6	7.0
Art Supply Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,000	2, 3	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	690	0.1	189	0	$19	$434	$45	20.1
Classroom 201A	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 201B	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 201B	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.1	483	0	$50	$453	$85	7.4
Classroom 201B	3	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	2,300	2	Relamp	No	3	LED Lamps: Screw in Lamp	Wall Switch	16	2,300	0.0	48	0	$5	$52	$3	10.0
Gymnasium	9	Metal Halide: (1) 250W Lamp	Wall Switch	S	295	2,782	1, 3	Fixture Replacement	Yes	9	LED - Fixtures: High-Bay	Occupancy Sensor	89	1,920	1.1	5,857	-1	$602	$8,954	$1,665	12.1
Locker Rooms - Empty	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	100	2	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	100	0.1	26	0	$3	$292	$80	78.2
Locker Rooms - Empty	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	100	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	100	0.0	7	0	$1	$73	$20	73.8
Stairwells	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,000	0.3	2,376	-1	$244	$657	$180	2.0
Hallway	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,000	2, 5	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,760	0.0	314	0	$32	$370	$20	10.9
Hallway	60	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2, 5	Relamp	Yes	60	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	1.3	10,078	-2	$1,035	$4,441	$600	3.7
Hallway	28	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,000	2, 5	Relamp	Yes	28	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,760	1.0	8,286	-2	$851	$3,170	$560	3.1
Main Entrance	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2, 5	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	0.1	1,008	0	$103	$444	$60	3.7
Main Entrance	6	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	4,000	2, 5	Relamp	Yes	6	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	2,760	0.1	510	0	$52	$420	$36	7.3
Main Entrance	2	Incandescent: Screw in Lamp	Wall Switch	S	100	4,000	2	Relamp	No	2	LED Lamps: Screw in Lamp	Wall Switch	15	4,000	0.1	680	0	$70	$34	$2	0.5
Auditorium Entrance	6	Incandescent: (2) Screw in Lamps	Wall Switch	S	400	4,000	2	Relamp	No	6	LED Lamps: (2) Screw in Lamps	Wall Switch	60	4,000	1.0	8,160	-2	$838	$207	$12	0.2
Auditorium Entrance	8	Compact Fluorescent: High Output Screw in Lamp	Wall Switch	S	65	4,000	2	Relamp	No	8	LED Lamps: High Output Screw in Lamp	Wall Switch	46	4,000	0.1	624	0	$64	$138	$8	2.0
Display Cases	6	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	4,000	2	Relamp	No	6	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	4,000	0.0	120	0	$12	$195	$36	12.9
Auditorium	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2	Relamp	No	32	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,782	0.8	4,407	-1	$453	$1,753	$480	2.8
Stage	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,782	2	Relamp	No	12	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,782	0.1	584	0	$60	$219	$60	2.7
Stage	108	Incandescent: Screw in Lamp	Wall Switch	S	100	500	2	Relamp	No	108	LED Lamps: Screw in Lamp (Dimmable)	Wall Switch	15	500	4.6	4,590	-1	$471	$3,721	$108	7.7

	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
Spot Lights	6	Metal Halide: Specialty Fixtures 1000W	Other	S	1,000	500		None	No	6	Metal Halide: Specialty Fixtures 1000W	Other	1,000	500	0.0	0	0	$0	$0	$0	0.0
Hallway	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,782	2	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,782	0.0	89	0	$9	$65	$12	5.8
Restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,782	2	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,782	0.0	89	0	$9	$65	$12	5.8
Storage Rooms (5 Total)	5	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,000	2	Relamp	No	5	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,000	0.0	80	0	$8	$163	$30	16.1
Music Room	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	0.5	2,804	-1	$288	$1,146	$275	3.0
Storage Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,000	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,000	0.0	70	0	$7	$73	$20	7.4
Storage Rooms (10 Total)	10	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,000	2	Relamp	No	10	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,000	0.1	160	0	$16	$325	$60	16.1
Gymnasium	15	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	2,782	1, 3	Fixture Replacement	Yes	15	LED - Fixtures: High-Bay	Occupancy Sensor	137	1,920	2.7	15,156	-3	$1,557	$14,923	$2,775	7.8
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,800	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,242	0.0	151	0	$16	$189	$20	10.9
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,800	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,800	0.0	29	0	$3	$33	$6	9.0
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,800	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,800	0.0	29	0	$3	$33	$6	9.0
Locker Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,800	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,242	0.0	151	0	$16	$189	$20	10.9
Restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,800	2	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,800	0.0	58	0	$6	$65	$12	9.0
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,800	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,800	0.0	32	0	$3	$18	$5	4.1
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,800	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,242	0.0	151	0	$16	$189	$20	10.9
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,800	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,242	0.0	151	0	$16	$189	$20	10.9
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,800	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,800	0.0	29	0	$3	$33	$6	9.0
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,800	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,800	0.0	29	0	$3	$33	$6	9.0
Locker Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,800	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,242	0.0	151	0	$16	$189	$20	10.9
Restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,800	2	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,800	0.0	58	0	$6	$65	$12	9.0
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,800	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,800	0.0	32	0	$3	$18	$5	4.1
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,800	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,242	0.0	151	0	$16	$189	$20	10.9
Cafeteria	29	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	29	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.6	3,388	-1	$348	$1,599	$360	3.6
Cafeteria	35	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	35	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.7	4,089	-1	$420	$2,088	$455	3.9
Faculty Lounge	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	0.1	350	0	$36	$380	$65	8.7

	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
Faculty Lounge	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	0.1	350	0	$36	$380	$65	8.7
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,782	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,782	0.0	45	0	$5	$33	$6	5.8
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	0.1	350	0	$36	$226	$50	4.9
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.0	234	0	$24	$343	$20	13.5
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.0	234	0	$24	$343	$20	13.5
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.0	234	0	$24	$343	$20	13.5
Classroom 301	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 302	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 303	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 304	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 305	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 306	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 307	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 308	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 309	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 310	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 311	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 312	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.3	1,545	0	$159	$854	$195	4.2
Classroom 313	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 314	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.5	2,318	-1	$238	$1,146	$275	3.7
Classroom 315	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 316	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.5	2,318	-1	$238	$1,146	$275	3.7
Classroom 317	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Storage Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,000	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	690	0.1	252	0	$26	$489	$60	16.6
Classroom 319	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 320	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.0	234	0	$24	$343	$20	13.5
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.0	234	0	$24	$343	$20	13.5
Office Room 318	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	0.4	2,103	0	$216	$927	$215	3.3
Closets	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,782	2	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,782	0.0	89	0	$9	$65	$12	5.8
Library	34	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	34	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	1.1	5,958	-1	$612	$2,132	$545	2.6
Library	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.1	818	0	$84	$526	$105	5.0
Storage Rooms	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	500	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	345	0.2	168	0	$17	$756	$80	39.2
Art Classroom 322	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,300	2, 3	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,587	0.4	1,932	0	$198	$1,000	$235	3.9
Classroom 323	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 325	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 327	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 330	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.5	2,318	-1	$238	$1,146	$275	3.7
Classroom 332	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Parent Resource Room	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.6	2,608	-1	$268	$1,256	$305	3.6
Lounge/Office	11	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,300	2, 3	Relamp	Yes	11	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,587	0.1	556	0	$57	$471	$90	6.7
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,782	0.0	92	0	$9	$37	$10	2.8
Conference Room	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.4	2,336	-1	$240	$1,000	$235	3.2
Nurse's Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,782	0.0	138	0	$14	$55	$15	2.8
Nurse's Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,782	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,782	0.0	49	0	$5	$18	$5	2.7
Nurse's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,782	0.1	367	0	$38	$146	$40	2.8
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.1	467	0	$48	$416	$75	7.1
Main Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	0.1	701	0	$72	$489	$95	5.5
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,782	0.0	92	0	$9	$37	$10	2.8
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	0.1	350	0	$36	$226	$50	4.9

	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
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,782	2	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,782	0.0	45	0	$5	$33	$6	5.8
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,782	0.0	92	0	$9	$37	$10	2.8
Offices (4 Total)	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,782	0.1	551	0	$57	$219	$60	2.8
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,782	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,782	0.0	195	0	$20	$73	$20	2.7
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	0.1	701	0	$72	$335	$80	3.5
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,782	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,782	0.0	97	0	$10	$37	$10	2.7
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,782	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,920	0.1	701	0	$72	$335	$80	3.5
Stairwells	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,000	0.3	2,376	-1	$244	$657	$180	2.0
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2, 4	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Daylight Dimming	29	2,400	0.3	2,319	-1	$238	$1,975	$715	5.3
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2, 5	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	0.3	2,183	-1	$224	$925	$130	3.5
Classroom 401	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 402	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 403	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.5	2,318	-1	$238	$1,146	$275	3.7
Classroom 404	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Closets (4 Total)	4	Incandescent: (2) Screw in Lamps	Wall Switch	S	120	1,000	2	Relamp	No	4	LED Lamps: (2) Screw in Lamps	Wall Switch	18	1,000	0.2	408	0	$42	$138	$8	3.1
Classroom 405	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 406	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 407	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 408A	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.1	579	0	$60	$489	$95	6.6
Classroom 408B	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.1	579	0	$60	$489	$95	6.6
Classroom 409	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 410	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 411	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 412	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 413	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 414	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 415	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 416	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.3	1,159	0	$119	$708	$155	4.6
Classroom 417	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Classroom 418	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.4	1,738	0	$179	$927	$215	4.0
Work Room 213A	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,300	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,587	0.1	579	0	$60	$489	$95	6.6
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.0	234	0	$24	$343	$20	13.5
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,782	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,920	0.0	234	0	$24	$343	$20	13.5
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,000	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	690	0.0	84	0	$9	$343	$20	37.5
Stairwells	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	2	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,000	0.2	1,320	0	$136	$365	$100	2.0
Transition Spaces	60	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	60	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Exterior	12	Compact Fluorescent: (2) 13W Plug-In Lamps	Timeclock	S	26	4,380	2	Relamp	No	12	LED Lamps: (2) 5W Plug-In Lamps	Timeclock	10	4,380	0.1	841	0	$88	$724	$24	8.0
Exterior	6	Compact Fluorescent: (2) 13W Plug-In Lamps	Timeclock	S	26	4,380	2	Relamp	No	6	LED Lamps: (2) 5W Plug-In Lamps	Timeclock	10	4,380	0.0	420	0	$44	$362	$12	8.0
Exterior	6	Metal Halide: (1) 70W Lamp	Timeclock	S	95	4,380	1	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	29	4,380	0.2	1,748	0	$183	$2,250	$600	9.0

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
Boiler Room	Space Heating	1	Heating Hot Water Pump	2.0	84.0%	No	W	2,745	8	No	86.5%	Yes	1	0.2	1,923	0	$201	$3,623	$0	18.0
Boiler Room	Space Heating	1	Heating Hot Water Pump	2.0	80.0%	No	W	2,745	8	No	86.5%	Yes	1	0.3	2,179	0	$228	$3,623	$0	15.9
Boiler Room	Domestic Hot Water	3	Water Supply Pump	0.2	74.0%	No	W	2,745		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Condensate Return	2	Condensate Pump	5.0	87.5%	No	W	2,745		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Condensate Return	1	Condensate Pump	5.0	85.5%	No	W	2,745		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Burners	1	Other	5.0	87.5%	No	W	2,745		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Burners	2	Other	7.5	87.5%	No	W	3,391		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Feed Water	3	Boiler Feed Water Pump	1.5	84.0%	No	W	2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Hot Water Return	1	Heating Hot Water Pump	1.5	84.0%	No	W	2,745	8	No	86.5%	Yes	1	0.2	1,443	0	$151	$3,391	$0	22.5
Boiler Room	Pneumatic Controls	2	Air Compressor	5.0	87.5%	No	W	1,163		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU-1	1	Supply Fan	10.0	89.5%	No	W	3,391	6	Yes	91.7%	No		0.1	509	0	$53	$1,567	$0	29.5
Roof	RTU-2	1	Supply Fan	7.5	89.5%	No	B	3,391	6	Yes	91.7%	No		0.1	381	0	$40	$1,154	$0	29.0
Elevator Machine Room	Elevator	1	Other	6.0	84.0%	No	W	146		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Kitchen Exhaust	1	Exhaust Fan	2.0	84.0%	No	W	2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Building Exhaust	15	Exhaust Fan	0.3	74.0%	No	B	2,745		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Exhaust	3	Exhaust Fan	3.0	85.0%	No	B	2,745	9	No	89.5%	Yes	3	2.9	8,867	0	$926	$11,437	$0	12.4
Mechanical Room	AHU-1B	1	Supply Fan	5.0	87.5%	No	W	1,373	7	No	89.5%	Yes	1	1.5	2,282	0	$238	$4,197	$400	15.9
Mechanical Room	AHU-2B	1	Supply Fan	5.0	87.5%	No	W	1,373	7	No	89.5%	Yes	1	1.5	2,282	0	$238	$4,197	$400	15.9
Mechanical Room	AHU-3B	1	Supply Fan	5.0	87.5%	No	W	1,373	7	No	89.5%	Yes	1	1.5	2,282	0	$238	$4,197	$400	15.9
Mechanical Room	AHU	1	Supply Fan	5.0	87.5%	No	W	1,373	7	No	89.5%	Yes	1	1.5	2,282	0	$238	$4,197	$400	15.9

		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-4, 5, 6	3	Supply Fan	0.5	74.0%	No	W	1,373		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Various	Unit Ventilators	76	Exhaust Fan	0.1	74.0%	No	W	2,745		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU-1	1	Packaged AC	30.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU-1	1	Electric Forced Air Furnace		139.93	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU-2	1	Packaged AC	15.00		B	10	Yes	1	Packaged AC	15.00		11.50		2.2	2,890	0	$302	$20,908	$1,185	65.3
Roof	RTU-2	1	Electric Forced Air Furnace		92.15	B		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU-4, 5, 6	3	Packaged AC	4.50		B	10	Yes	3	Packaged AC	4.50		14.00		3.9	5,128	0	$536	$30,631	$1,242	54.9
Roof	RTU-4, 5, 6	3	Electric Forced Air Furnace		53.00	B		No							0.0	0	0	$0	$0	$0	0.0
Various	Classrooms/Offices	4	Window AC	0.83		B	10	Yes	4	Window AC	0.83		12.00		0.6	739	0	$77	$3,629	$0	47.0
Various	Classrooms/Offices	9	Window AC	0.83		W		No							0.0	0	0	$0	$0	$0	0.0
Various	Classrooms/Offices	5	Window AC	0.83		N		No							0.0	0	0	$0	$0	$0	0.0
Various	Conference Room	3	Window AC	1.17		W		No							0.0	0	0	$0	$0	$0	0.0
Various	Classrooms/Offices	3	Window AC	2.00		W		No							0.0	0	0	$0	$0	$0	0.0
Various	Cafeteria/Library	10	Window AC	2.00		W	10	Yes	10	Window AC	2.00		12.00		2.8	3,677	0	$384	$21,775	$0	56.7
Various	Cafetreia/Classrooms	6	Window AC	2.00		B	10	Yes	6	Window AC	2.00		12.00		2.5	3,285	0	$343	$13,065	$0	38.1
Various	Classrooms/Offices	5	Window AC	2.33		W		No							0.0	0	0	$0	$0	$0	0.0

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Space Heating	1	Forced Draft Steam Boiler	######	B	11	Yes	1	Condensing Hot Water Boiler	######	93.00%	Ec	0.0	0	534	$4,039	$79,382	$0	19.7
Boiler Room	Space Heating	1	Forced Draft Steam Boiler	######	B	11	Yes	1	Condensing Hot Water Boiler	######	93.00%	Ec	0.0	0	356	$2,693	$79,382	$0	29.5
Boiler Room	Space Heating	1	Forced Draft Steam Boiler	######	B	11	Yes	1	Condensing Hot Water Boiler	######	93.00%	Ec	0.0	0	89	$673	$79,382	$0	117.9

Demand Control Ventilation Recommendations

		Recommendation Inputs					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Number of Zones	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
AHU	Gymnasium	12	2.00	0.00		1,082.50	0.0	0	41	$313	$2,719	$0	8.7
RTU	Auditorium	12	2.00	15.00		1,082.50	0.0	2,660	58	$719	$2,719	$0	3.8

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
Boiler Room	Heating System	13	20	2.00	0.0	0	16	$124	$176	$0	1.4

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)	B	14	Yes	1	Tankless Water Heater	Natural Gas	92.00%	EF	0.0	0	20	$154	$5,215	$300	31.9
Boiler Room	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler Room	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	15	16	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	15	$115	$115	$0	1.0

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	2	Cooler (35F to 55F)		No	No	No	0.0	0	0	$0	$0	$0	0.0

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	3	Refrigerator Chest	No	16	Yes	0.4	3,066	0	$320	$4,434	$0	13.8
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Cafeteria	2	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	16	Yes	0.1	941	0	$98	$2,752	$150	26.5
Cafeteria	2	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	No	16	Yes	0.0	277	0	$29	$2,784	$300	85.7
Kitchen	1	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Combination Oven/Steam Cooker (15 - 28 Pans)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Kitchen	2	Insulated Food Holding Cabinet (Full Size)	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	154	Computers	120.0	
School	907	Laptops/Chromebooks	90.0	
School	2	Fan	100.0	
School	6	TV	150.0	
School	72	Smart Board / Projector	300.0	
School	83	Small Office Printers	50.0	
School	5	Medium Sized Printers	200.0	
School	6	Large Xerox- Type Printers	515.0	
School	7	Coffee Maker	400.0	
School	15	Microwave	1,100.0	
School	1	Residential Freezer	1,260.0	
School	2	Residential Refrigerator	690.0	
School	2	Medium Sized Refrigerator	450.0	
School	9	Mini Fridge	260.0	
School	3	Water Dispenser	300.0	
School	6	Large Speakers	500.0	
School	2	Large Floor Fans	185.0	
School	1	Electric Stove	1,500.0	
School	1	Misc. Sound Equipment	3,500.0	
School	1	Misc. IT Equipment	4,500.0	
School	1	Misc Shop Equipment	5,500.0	

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
Lounge	1	Refrigerated	17	Yes	0.2	1,612	0	$168	$230	$50	1.1
Conference Room	1	Non-Refrigerated	N/A	No	0.0	0	0	$0	$0	$0	0.0
Conference Room	2	Refrigerated	17	Yes	0.4	3,224	0	$337	$460	$100	1.1
Cafeteria	2	Refrigerated	17	Yes	0.4	3,224	0	$337	$460	$100	1.1
Lounge	1	Refrigerated	17	Yes	0.2	1,612	0	$168	$230	$50	1.1

Custom Measures (High Level Screening)

Computer Power Management Software

# of Desktops	Normal Running Mode					Idle Running Mode					Suspended/Off Mode				
154	*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%	7,737	$808	$15.00	$2,500	$4,810	6.0
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

Installation of an Energy Management System

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)
240,399	6,064.9	0.0	193,142	5%	15%	10%	31,334	910	0	$10,160	$144,000	14.2

Equations: (Based on Industry Standards)

Average Cost for EMS installation is $1.50/sqft. For the purposes of this report an average cost of $0.75/sqft was assumed due to minimal cooling equipment.

Based on a comprehensive study by the Environmental Protection Agency, Energy savings range between 10% and 30%.

The HVAC systems should have proper temperature set backs and operate according to occupancy schedules.

Air-handling units should be equipped with outdoor air damper controls and CO2 sensors to provide demand control ventilation.

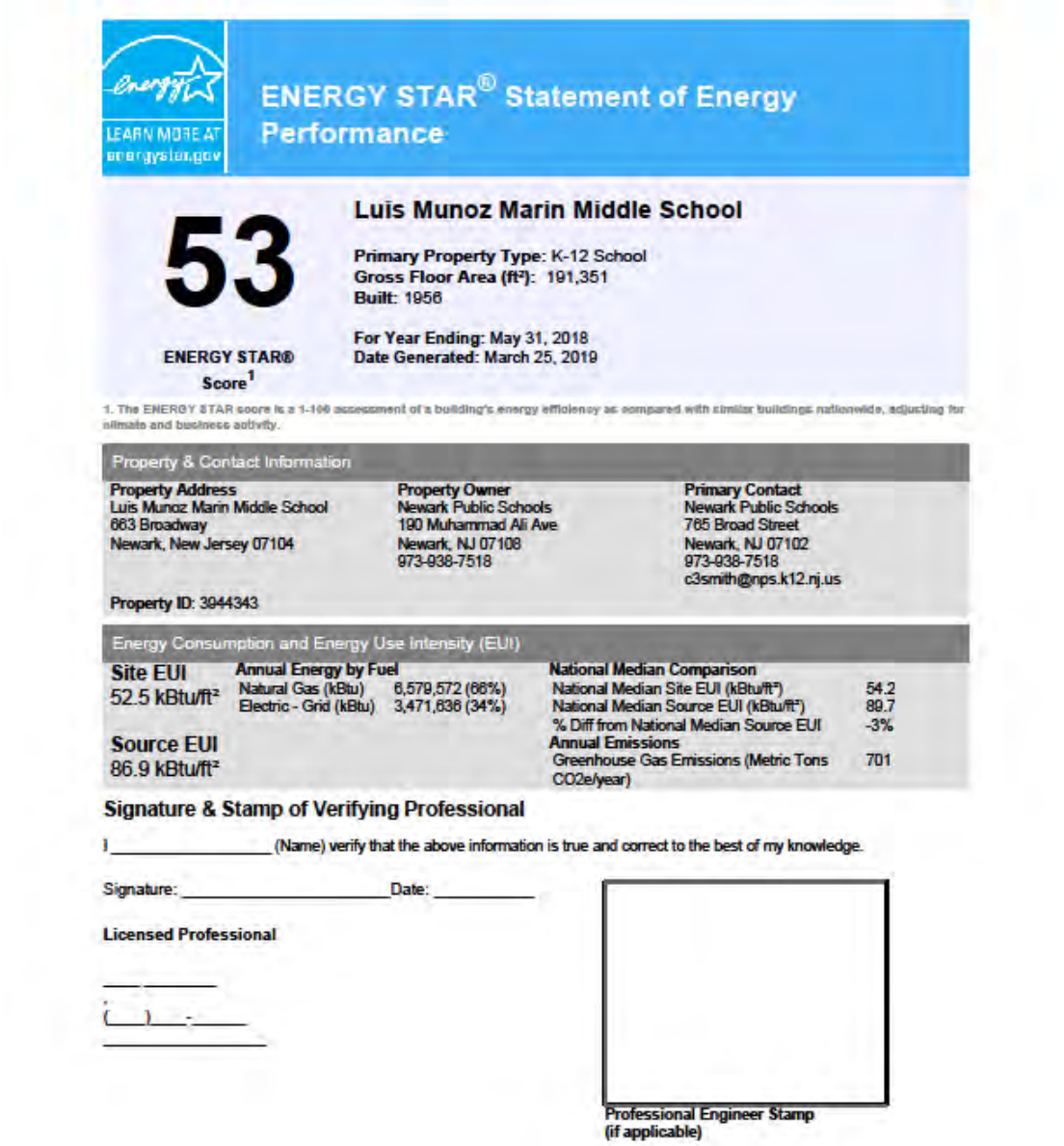
HVAC Improvements revealed through a RCx study should be included within this measure.

Examples are as follows: Check Valve and Damper Operation, Economizer Controls, Temperature and Humidity Sensors, CO2 Sensors, etc.

Simultaneous heating and cooling was a significant issues

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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



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ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Luis Munoz Marin Middle School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 191,351
Built: 1956

For Year Ending: May 31, 2018
Date Generated: March 25, 2019

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
Luis Munoz Marin Middle School 663 Broadway Newark, New Jersey 07104	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: 3944343

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
52.5 kBtu/ft²

Source EUI
86.9 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	6,579,572 (66%)
Electric - Grid (kBtu)	3,471,636 (34%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	54.2
National Median Source EUI (kBtu/ft²)	89.7
% Diff from National Median Source EUI	-3%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	701

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.