Local Government Energy Audit Report

Village Elementary School

July 1, 2020

Prepared for:

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. Cost estimates include material and labor pricing associated with installation of primary recommended equipment only. Cost estimates do not include demolition or removal of hazardous waste. 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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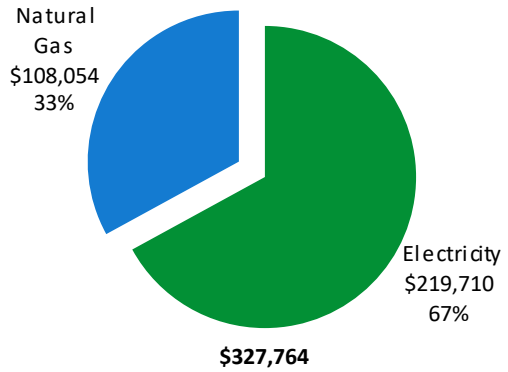
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Village Elementary School. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $327,764 Electricity: 1,690,074 kWh Natural Gas: 147,542 Therms	
ENERGY STAR® Benchmarking Score	**1** *(1-100 scale)*	This building performs much below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

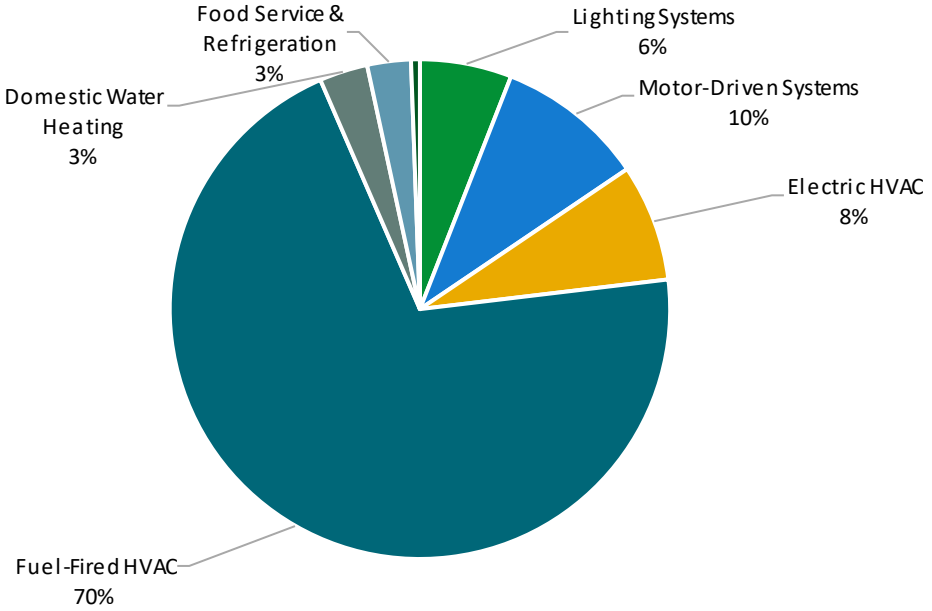


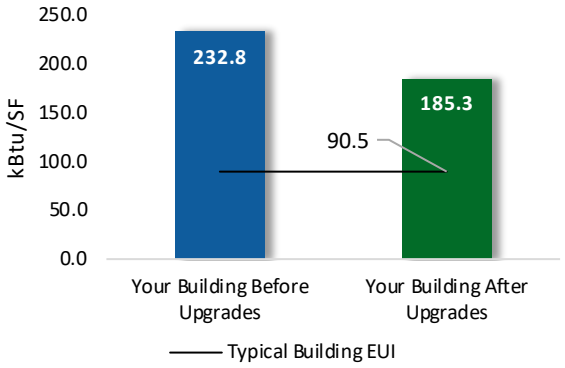
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

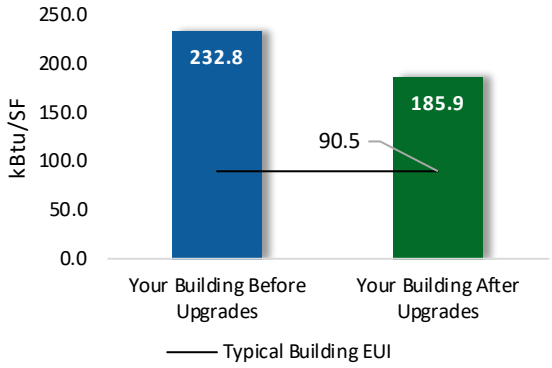
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$304,911
Potential Rebates & Incentives[1]	$69,746
Annual Cost Savings	$81,021
Annual Energy Savings	Electricity: 479,584 kWh Natural Gas: 25,500 Therms
Greenhouse Gas Emission Savings	391 Tons
Simple Payback	2.9 Years
Site Energy Savings (all utilities)	20%



Scenario 2: Cost Effective Package[2]

Installation Cost	$270,731
Potential Rebates & Incentives	$66,146
Annual Cost Savings	$79,009
Annual Energy Savings	Electricity: 464,104 kWh Natural Gas: 25,500 Therms
Greenhouse Gas Emission Savings	383 Tons
Simple Payback	2.6 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	Cost Effective?	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			**177,443**	**30.4**	**-36**	**$22,807**	**$55,711**	**$24,860**	**$30,851**	**1.4**	**174,515**
ECM 1	Install LED Fixtures	Yes	6,926	0.0	0	$900	$8,625	$0	$8,625	9.6	6,974
ECM 2	Retrofit Fixtures with LED Lamps	Yes	170,517	30.4	-36	$21,907	$47,086	$24,860	$22,226	1.0	167,541
Lighting Control Measures			**18,466**	**2.8**	**-4**	**$2,372**	**$14,499**	**$6,825**	**$7,674**	**3.2**	**18,143**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	10,579	1.9	-2	$1,359	$8,874	$1,470	$7,404	5.4	10,394
ECM 4	Install High/Low Lighting Controls	Yes	7,887	0.9	-2	$1,013	$5,625	$5,355	$270	0.3	7,749
Variable Frequency Drive (VFD) Measures			**201,651**	**31.4**	**0**	**$26,215**	**$117,842**	**$21,150**	**$96,692**	**3.7**	**203,061**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	186,171	30.5	0	$24,202	$83,661	$17,550	$66,111	2.7	187,473
ECM 6	Install VFDs on Heating Water Pumps	No	15,480	1.0	0	$2,012	$34,180	$3,600	$30,580	15.2	15,588
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**1,338**	**$9,797**	**$87,115**	**$14,640**	**$72,475**	**7.4**	**156,634**
ECM 7	Install High Efficiency Hot Water Boilers	Yes	0	0.0	1,338	$9,797	$87,115	$14,640	$72,475	7.4	156,634
Domestic Water Heating Upgrade			**0**	**0.0**	**10**	**$73**	**$151**	**$151**	**$0**	**0.0**	**1,167**
ECM 8	Install Low-Flow DHW Devices	Yes	0	0.0	10	$73	$151	$151	$0	0.0	1,167
Food Service & Refrigeration Measures			**20,016**	**1.9**	**129**	**$3,546**	**$25,186**	**$2,120**	**$23,066**	**6.5**	**35,241**
ECM 9	Dishwasher Replacement	Yes	8,110	0.9	129	$1,998	$18,859	$1,400	$17,459	8.7	23,251
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	1,311	0.2	0	$170	$1,213	$320	$893	5.2	1,320
ECM 11	Refrigeration Controls	Yes	3,507	0.0	0	$456	$504	$300	$204	0.4	3,531
ECM 12	Replace Refrigeration Equipment	Yes	5,477	0.6	0	$712	$4,380	$0	$4,380	6.2	5,516
ECM 13	Vending Machine Control	Yes	1,612	0.2	0	$210	$230	$100	$130	0.6	1,623
Custom Measures			**62,009**	**0.0**	**1,113**	**$16,212**	**$4,407**	**$0**	**$4,407**	**0.3**	**192,750**
ECM 14	Optimize EMS Settings	Yes	62,009	0.0	1,113	$16,212	$4,407	$0	$4,407	0.3	192,750
TOTALS (COST EFFECTIVE MEASURES)			**464,104**	**65.6**	**2,550**	**$79,009**	**$270,731**	**$66,146**	**$204,585**	**2.6**	**765,922**
TOTALS (ALL MEASURES)			**479,584**	**66.5**	**2,550**	**$81,021**	**$304,911**	**$69,746**	**$235,165**	**2.9**	**781,510**

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

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

Figure 2 – Evaluated Energy Improvements

For more detail on each evaluated energy improvement and a break out of cost-effective improvements, see **Section 4: Energy Conservation Measures**.

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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
ECM 2	Retrofit Fixtures with LED Lamps	x		x
ECM 3	Install Occupancy Sensor Lighting Controls	x		x
ECM 4	Install High/Low Lighting Controls	x		x
ECM 5	Install VFDs on Constant Volume (CV) Fans	x		x
ECM 6	Install VFDs on Heating Water Pumps	x		x
ECM 7	Install High Efficiency Hot Water Boilers	x		x
ECM 8	Install Low-Flow DHW Devices	x		x
ECM 9	Dishwasher Replacement	x		x
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	x		x
ECM 11	Refrigeration Controls	x		x
ECM 12	Replace Refrigeration Equipment			x
ECM 13	Vending Machine Control	x		x
ECM 14	Optimize EMS Settings			

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 percent of the cost of selected measures. Direct Install contractors will assess and verify individual measure eligibility and, in most cases, they perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Whole Building Approach with Pay for Performance

Pay for Performance can be a good option for medium to large sized facilities to achieve deep energy savings. Pay for Performance allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also use this program. Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures resulting in at least 15 percent 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 Village Elementary School. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs. This report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

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

2.1 Site Overview

On February 11, 2020, TRC performed an energy audit at Village Elementary School located in Skillman, New Jersey. TRC met with Ken Vaccaro to review the facility operations and help focus our investigation on specific energy-using systems.

Village Elementary School is a one story, 88,131 square foot building with an original section built in 1980 and altered in 1999. This original section has the main office, classrooms, nurse's office, the boiler room, and the gymnasium. A major addition to the original section was completed in 2000, and it faces north. This wing has classrooms, a cafeteria and kitchen, a music room, computer lab, and the media center (library).

Between June 2018 and October 2018, several T8 fixtures in the music room and main office were replaced with LED fixtures. An area of concern for the school is very annual high electricity and natural gas usage, especially during summer. More details on this are discussed in Sections 3.1 and 3.2.

Another concern expressed by the heating, ventilation, and air conditioning (HVAC) staff is the need for standardization of room temperature setpoints in all schools. HVAC staff receive multiple requests from occupants to raise the temperature setpoints during winter and lower the setpoints during summer. HVAC staff mentioned that state buildings (including public schools), have standard temperature setpoints, and they recommend occupants wear clothing accordingly. Standardizing temperatures can lead to energy savings without additional cost. The table below summarizes the temperatures requested by occupants and the standard temperature recommendations by the HVAC staff:

Season	Occupant Preferred	Standard Temp. Recommended by HVAC staff
Summer	68°F - 72°F	74°F - 76°F
Winter	74°F - 75°F	68°F - 70°F

2.2 Building Occupancy

The school is occupied year-round. School year begins in the first week of September and ends in June. Teachers start their school year in mid-August. On weekends during school year, the gymnasium is occupied on almost all Saturdays. On Sundays, the gymnasium or cafeteria are occupied as needed. Typical weekday occupancy is approximately 100 staff and 700 students.

Summer break for students begins in the last week of May and ends in the first week of September. School occupancy varies depending on the activities scheduled during summer. Some classrooms, the media center and gymnasium are occupied on weekdays and weekends for 10-15 days. The school also rents its space to external parties during summer. The custodial staff is present during summer and performs a thorough cleaning/maintenance of the entire school.

Building Name	Weekday/Weekend	Operating Schedule
Village Elementary School (School Season)	Weekday	7:00 AM - 11:00 PM
	Weekend	8:00 AM - 7:00 PM
Village Elementary School (Summer Break)	Weekday	7:00 AM - 7:00 PM
	Weekend	7:00 AM - 7:00 PM

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a brick façade on almost all exterior walls.

The building area with computer lab, media center, cafeteria, kitchen and classrooms has a flat roof covered with gray membrane and is supported with steel trusses. The remaining building area (gymnasium, staff offices, main office, music room and classrooms) has a pitched roof with clay tiles, with a flat section above the gymnasium.

Windows are double glazed and in good condition. They have aluminum frames, and the glass-to-frame seals are in good condition as well. Exterior doors have aluminum frames and are in good condition with undamaged seals.

Site staff did not report any issues with the building envelope.

Windows in cafeteria

Flat roof with gray membrane

Pitched roof section

Exterior walls with brick facade

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps in classrooms, hallways, restrooms, gymnasium, library, cafeteria, computer room, and some offices. There are also several LED fixtures and some LED lamps in music and band rooms and the main office. Additionally, there are compact fluorescent lamps (CFL) in some classrooms, offices, restrooms and some hallway areas. Renovated restrooms in the hallways have 2'x 2' LED fixtures. All exit signs use LED sources.

T8 fixtures in all spaces and hallways are recessed troffers with prismatic lenses, each with three or four 4' T8 lamps. Most fixtures are in good condition.

Lights are controlled by occupancy sensors in approximately 30 classrooms, the main office, art room, music room, computer lab and cafeteria. In the gymnasium, hallways and rest of the classrooms and offices, lights are controlled by manual wall switches.

Interior light levels were measured in classrooms and offices and were found adequate in most spaces. Some spaces, namely the gym office and the main office and the adjoining conference room were found to be over lit.

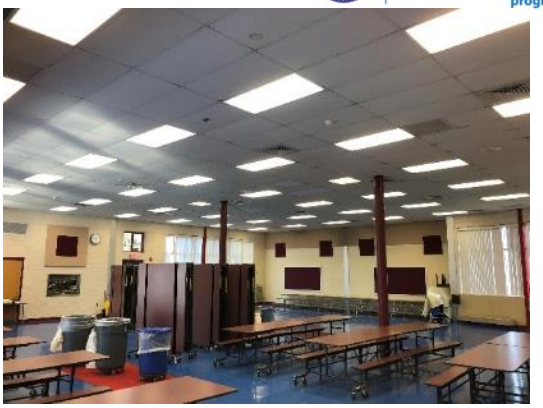
2' x 4' T8 fixture in classroom

2' x 4' T8 fixture in hallway

2' x 2' fixture with CFL Biax lamps

2' x 4' LED fixtures in band room

CFL lamps in recessed can fixtures

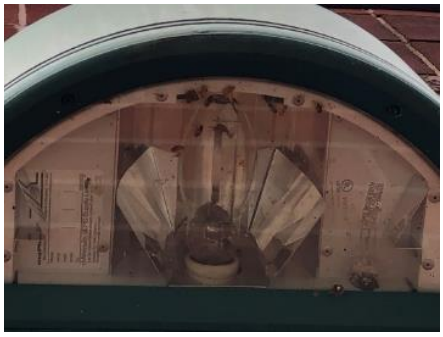


2' x 4' T8 fixtures in the cafeteria

2' x 4'T8 fixtures in a classroom

Occupancy Sensor

Pole-mounted LED fixture



Wall-mounted metal halide fixture

Exterior fixtures include wall mounted metal halide wall packs, canopy fluorescent and LED lamps in recessed cans, and pole-mounted LED fixtures. The pole mounted LED fixtures provide lighting for the parking areas and area surrounding around the school building.

All exterior light fixtures are controlled by a time clock.

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators provide cooling to classrooms of the original section. These are self-contained units with direct expansion coils for cooling, hot water coils for heating served by the boiler, and supply fans for air flow. These unit ventilators appear to be in fair operating condition. Thermostats installed in the classrooms allow a six degree Fahrenheit range (±3°F from 72°F) of control.

Air Conditioning Units

Five 1.5-ton packaged terminal AC units serve selected offices in the main office area of the original section of the school. These units appear to be in fair working condition. An IT equipment room in the north facing section of the school is served by a 1.5-ton mini-split AC. The gymnasium is served by a split AC system with a 30-ton condensing unit on the top of the gymnasium roof and an air handling unit located in the boiler room as described below.

Air Handling Units

There are five air handling units (AHUs) in the school. One large AHU for the gymnasium and four small units for the nurse's office, faculty work room, front entrance lobby, and guidance and conference rooms. Each AHU has hot water coils for heating, a supply fan, and no return or exhaust fan. The AHUs could not be accessed during the audit. Per conversation with HVAC staff, the supply fan motor for the gymnasium AHU is estimated to be 15 hp and the remaining four AHUs have supply fan motors of 0.5 hp.

Packaged Units

Cooling for the north facing section of the school (added in 2000) is served by packaged rooftop units. These units are equipped with direct expansion coils for cooling and have supply fans. These units only provide cooling. While thermostats installed in the classrooms allow a six degree Fahrenheit range (±3°F from 72°F) of control, these units are mainly controlled by the energy management system (EMS).

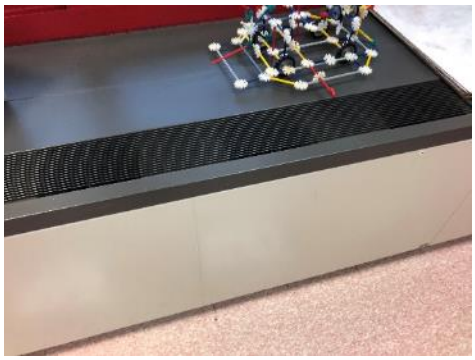
The table below lists the several spaces in the north facing section served by the packaged units:

Unit	Area Served	Size	Efficiency (EER)
RTU V-1	Wing 200	30-ton	12.0
RTU V-2	Wing 200	30-ton	12.0
RTU V-3	Wing 300 Hallways	25-ton	12.0
RTU V-4	Wing 300 Hallways	30-ton	12.0
RTU V-5	Media Center	25-ton	12.0
RTU V-6	Cafeteria	30-ton	12.0
RTU V-7	Computer Room	8.5-ton	12.0
RTU V-8	Music Room	10-ton	10.6
RTU V-9	Hallways	7.5-ton	11.3
RTU V-10	Kitchen	7.5-ton	11.3
Room 316 RTU	Room 316	4-ton	10.7
Room 317 RTU	Room 317	4-ton	10.7

Exhaust Fans

There are approximately 20 exhaust fans with fan motors ranging from 0.5 to 3.0 hp. They serve the gymnasium, kitchen, cafeteria, hallways restrooms, and classrooms. All exhaust fans are controlled by input from CO_2 sensors and operate as needed to maintain CO_2 levels below 1000 parts per million (ppm). Most exhaust fans are in good condition, while some are old and in fair condition.

RTU V-6 for cafeteria



Unit Ventilator in classroom of wing 100

AHU-2N for gymnasium

Exhaust fan on the roof

2.6 Heating Hot Water Systems

Two Hydro-Therm, 2440 Mbh non-condensing hot water boilers serve the building heating load. The boilers and heating hot water pumps together provide hot water to the hot water coils in AHUs, the hot water coils in the ducts in ceiling of North facing section of the school, and to unit ventilators in the original section of the building.

The boilers are modular design with eight individually fired boiler units in each of the two boilers. The nameplate efficiency of the boilers is 76.8 percent. Two constant speed, 5 hp hot water pumps supply hot water to the entire school. Three-way valves control the flow to the hot water coils.

The HVAC staff emphasized on the need to replace these boilers due to their low efficiency when compared to standard (80 percent) efficient non-condensing boilers. On the day of audit in mid-February, the EMS showed an outside temperature of 33°F, hot water supply temperature of 172°F, and return water temperature of 156°F.

Analysis of utility data provided for this report (June 2018 to May 2019) revealed extremely high consumption of natural gas at Village Elementary School throughout the year as compared to a typical school in New Jersey. The table below compares the natural gas consumption at Village Elementary School with other schools under Montgomery School district:

School	Natural Gas Consumption (Therms per sq. ft.)
High School	0.5
Upper Middle School	0.5
Lower Middle School	0.5
Orchard Hill Elementary School	0.9
Village Elementary School	1.7

As evident from the above table, natural gas consumption at Village Elementary school is more than three times that of three other schools on a per sq. ft basis.

In addition to very high consumption throughout the year, utility analysis also revealed that there is very high natural gas consumption even during summer months. Two possible operational practices were identified which could lead to such consumption patterns:

(1) Not utilizing outside air temperature reset to lower the hot water supply temperature during milder weather (reset)
(2) Not disabling the boilers during summer based on an upper limit for outside air temperature (lockout)

Upon examination of the EMS, TRC found that the EMS had been programmed to stop the boilers when outside air temperature reaches 100°F, a high lockout temperature that effectively leads to continuous operation of the boilers during summer. Section 4.7 discusses the operational best practices to reduce gas consumption to a level that is typical for a school in New Jersey.

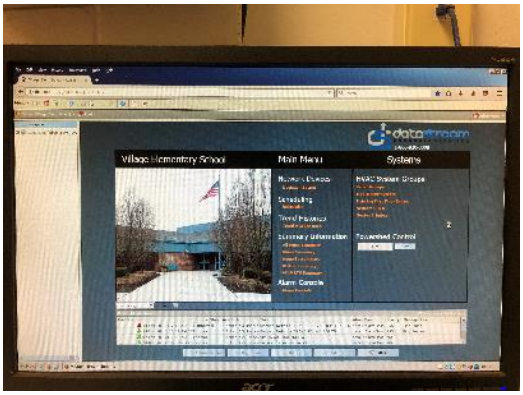
Hydro-Therm Boiler with 8 modules

Hydro-Therm boiler with 4 modules

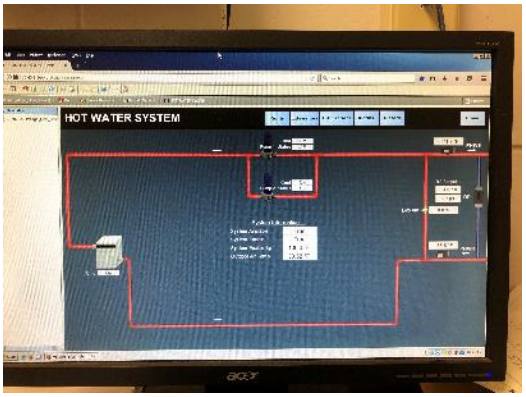
5 hp heating hot water pumps

2.7 Building Energy Management Systems

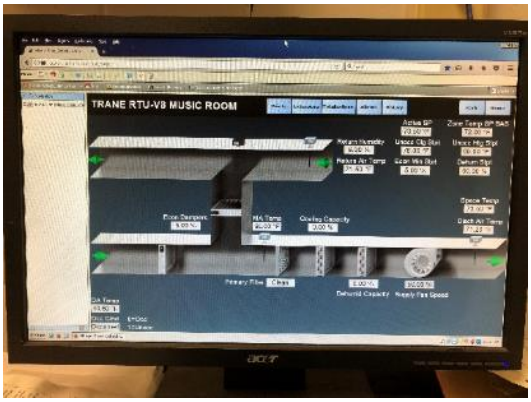
A Metasys EMS is wired to control all HVAC equipment, namely the unit ventilators, AHUs, fan coil units, exhaust fans, hot water pumps, and boilers. The EMS has equipment scheduling capabilities that can optimize run hours of HVAC equipment and avoid running equipment when not necessary. It also monitors and controls space temperatures, supply air temperatures, ventilation (maintains CO_2 levels per setpoint), and heating water loop temperature.



EMS main screen



Heating hot water system and pumps



Rooftop unit for music room

2.8 Domestic Hot Water

Hot water for use in the restrooms and break rooms is provided by a 100-gal, 200 MBh State storage tank gas-fired water heater. Hot water for the kitchen is provided by an 86-gal, 140 MBh A.O Smith storage tank, gas-fired water heater. Both water heaters have 80 percent nominal efficiency and are within their useful life.

The domestic hot water pipes are insulated, and the insulation is in good condition.

100-gal State hot water heater

86-gal A.O. Smith hot water heater

2.9 Food Service Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare lunches for students. Cooking is done using a gas-fired and electric ovens and steamers. Most equipment is in good condition. The kitchen also has two hot serving tables.

One Champion dishwasher is a high temperature, conveyer type unit with electric booster heater.

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

Commercial food warming table

Full-sized gas convection oven

Electric steamer

Single tank Champion dishwasher

2.10 Refrigeration

The kitchen has three refrigerator chests and one freezer chest. There is also one walk-in freezer and one walk-in cooler in the kitchen. All equipment is fair condition. The walk-in cooler and freezer are located outside the kitchen in the back area of the school. The staff keeps the kitchen back door open during kitchen working hours since the staff needs frequent access to the walk-in cooler and freezer. This leads to outside air infiltration and can lead to excessive load on the HVAC system at times.

The walk-in refrigerator has an estimated 1.5-ton compressor located on the roof and two evaporator fans. The walk-in medium temperature freezer has an estimated 2.3-ton compressor located on the roof and two evaporator fans.

The kitchen also has two cooled/chilled serving tables.

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

Refrigerator Chest

Cooled serving table

Walk-in cooler outside the kitchen

Kitchen door kept open to access walk-in cooler & freezer

2.11 Plug Load & Vending Machines

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

There are approximately 120 desktop computers and laptops throughout the facility. Plug loads throughout the building include general café and office equipment (large and medium copier/printers). There are typical classroom plug loads such as smart boards and projectors.

There are two residential style refrigerators, four microwave ovens, two coffee machines and two hot/cold water dispensers throughout the building.

There is one refrigerated beverage vending machine in the break room. The vending machine is not equipped with occupancy-based controls.

Large Copier/Printer

Hot/Cold water dispensers

Refrigerated vending machine

Microwave oven and coffee machine

2.12 Water-Using Systems

There are 10 restrooms with toilets, urinals, and sinks. Faucet flow rates in renovated restrooms are at 0.5 gallons per minute (gpm). Toilets in renovated restrooms are rated at 1.0 gallon per flush (gpf) while urinals are rated at 0.125 gpf.

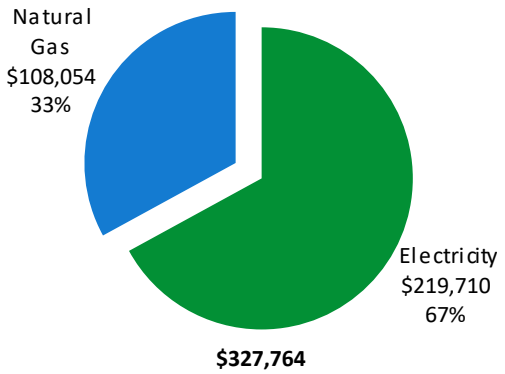
0.5 gpm faucet

0.125 gpf urinal flush

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	1,690,074 kWh	$219,710
Natural Gas	147,542 Therms	$108,054
Total		**$327,764**



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.

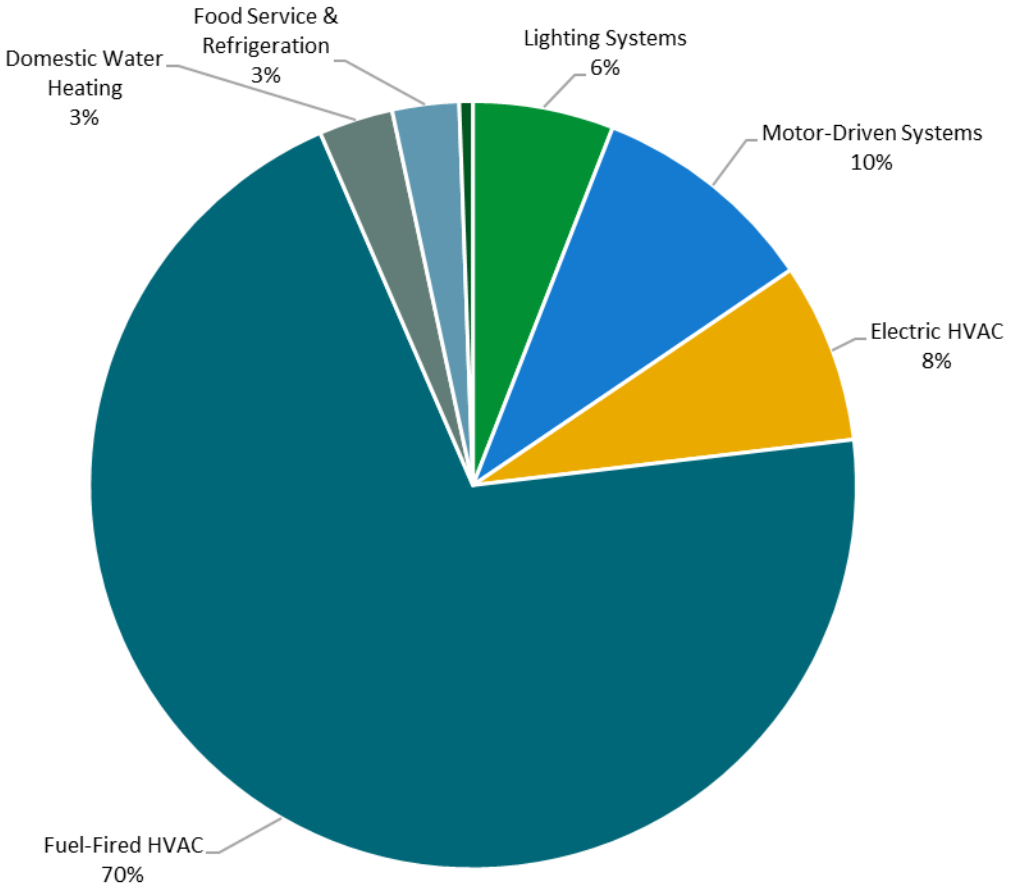
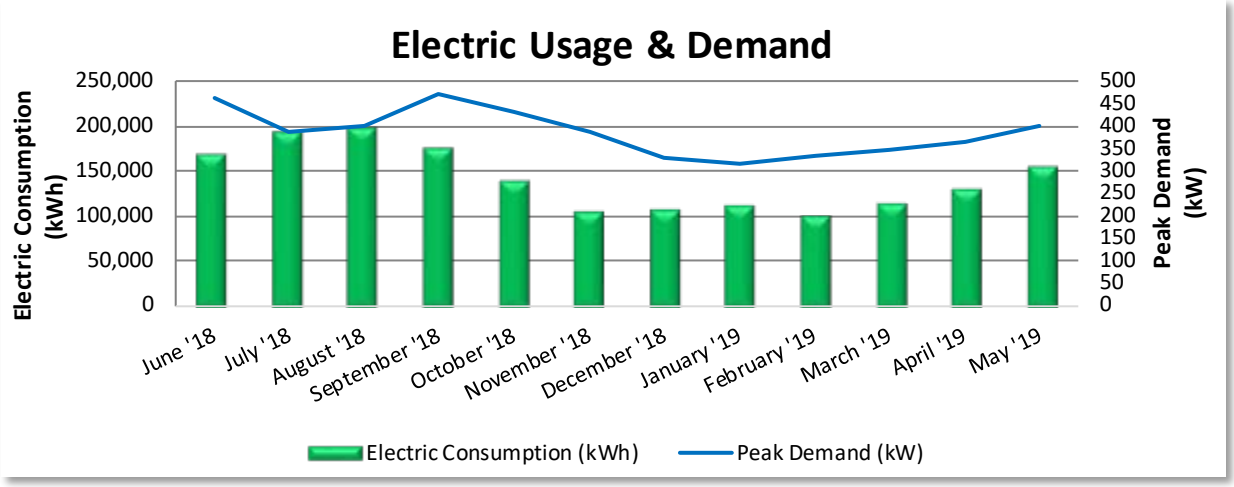


Figure 5 - Energy Balance

3.1 Electricity

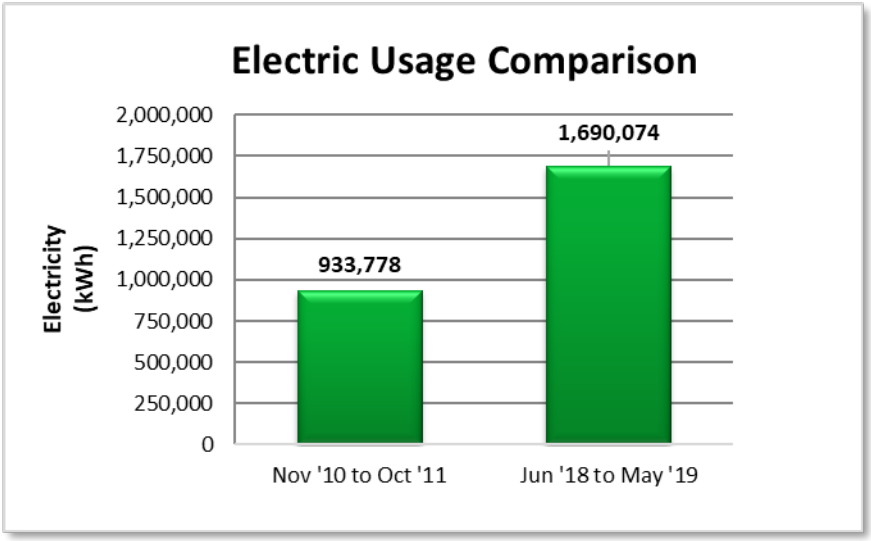
PSE&G delivers electricity under rate class Large Power and Lighting Secondary (LPLS), with electric production provided by East Coast Power and Gas, a third-party supplier.



Electric Billing Data						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
06/30/18	29	166,883	460.5	$5,563.07	$22,127.10	No
07/31/18	31	191,243	384.9	$4,649.79	$23,577.52	No
08/31/18	31	195,802	398.3	$4,811.66	$34,355.60	No
09/30/18	30	173,947	471.7	$5,701.96	$32,468.46	No
10/31/18	31	139,018	430	$1,573.19	$22,348.53	Yes
11/30/18	30	104,088	389.2	$1,458.92	$12,228.59	No
12/31/18	31	106,933	329.6	$1,235.51	$14,840.79	No
01/31/19	31	110,934	316.2	$1,185.28	$6,990.84	No
02/28/19	28	99,611	334.8	$1,255.00	$10,122.65	No
03/31/19	31	112,956	348.8	$1,307.48	$11,313.44	No
04/30/19	30	129,416	365.0	$1,368.20	$13,006.47	No
05/31/19	31	154,613	401.1	$1,503.52	$15,728.27	No
Totals	**364**	**1,685,444**	**472**	**$31,614**	**$219,108**	No
Annual	**365**	**1,690,074**	**472**	**$31,700**	**$219,710**	

Site Historical Energy Comparison - Electricity

The below graph provides a comparison between recent electric usage consumption, and usage from a previous period. The prior data was taken from an energy audit that was completed in March 2012.

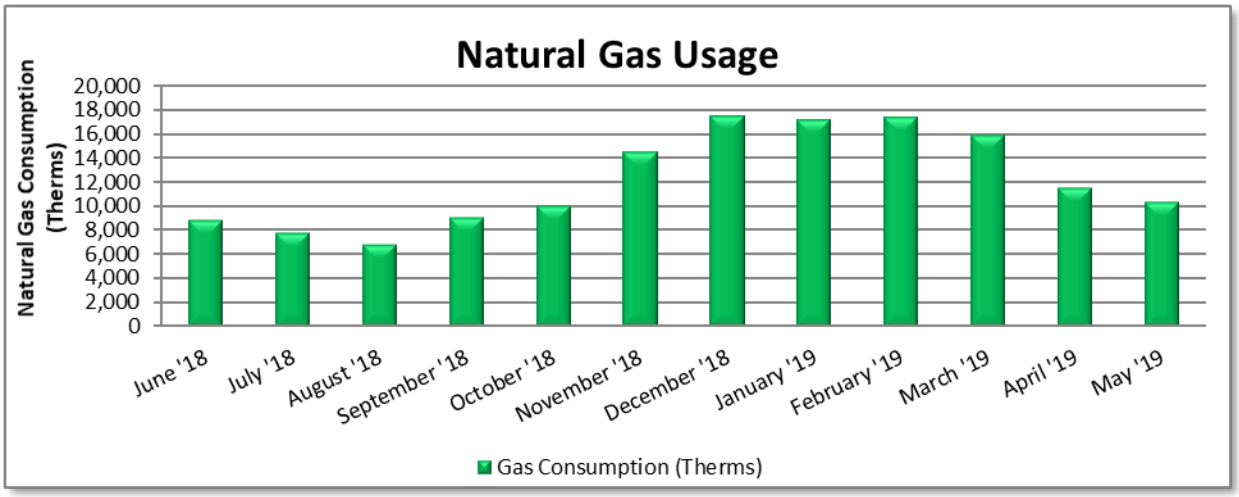


Notes:

- Peak demand of 472 kW occurred in September '18.
- Average demand over the past 12 months was 386 kW.
- The average electric cost over the past 12 months was $0.130/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 baseline electric usage of approximately 100,000 kWh per month is very high.
- Note: An energy audit had been completed in March 2012 which indicates 933,778 kWh of electricity use for the 12-month period November 2010 through October 2011. In contrast, the annual electricity use for the 12-month period reviewed in this audit was 1,690,074 kWh, occurring during the period June 2018 through May 2019. This represents increased use of 81 percent.
- The total cost of the electricity consumed during the recent 12-month period was 48 percent more than the total cost of electricity during the 2010-2011 period, even though the unit cost of electricity has dropped by 18 percent since then.
- Specifically, summer use is higher. Monthly electric usage increased by 71 percent in June, 151 percent in July and 288 percent in August as compared to the 2010-2011 period. This matches with increased summer natural gas use to implicate a condition of simultaneous heating and cooling due to boilers and electric cooling systems both being operated during the summer.

3.2 Natural Gas

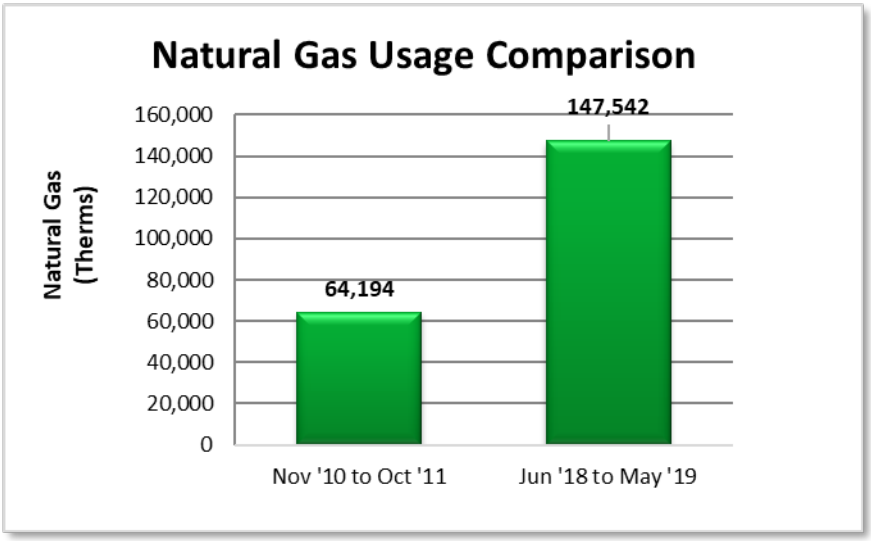
PSE&G delivers natural gas under rate class Large Volume Gas (LVG), with natural gas supply provided by East Coast Power and Gas, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
07/09/18	32	8,855.2	$5,028.70
08/07/18	29	7,849.2	$4,469.75
09/06/18	30	6,894.2	$4,101.22
10/08/18	32	9,132.2	$5,615.64
11/05/18	28	10,077.6	$9,018.86
12/06/18	31	14,588.7	$12,744.54
01/08/19	33	17,510.6	$17,022.02
02/06/19	29	17,260.5	$15,188.76
03/08/19	30	17,450.3	$14,269.96
04/08/19	31	15,940.7	$8,621.74
05/08/19	30	11,614.7	$6,318.24
06/07/19	30	10,368.3	$5,654.55
Totals	**365**	**147,542**	**$108,054**
Annual	**365**	**147,542**	**$108,054**

Site Historical Energy Comparison – Natural Gas

The below graph provides a comparison between recent natural gas usage consumption, and usage from a previous period. The prior data was taken from an energy audit that was completed in March 2012.



Notes:

- The average gas cost for the past 12 months is $0.732/therm, which is the blended rate used throughout the analysis.
- The baseline usage of approx. 6,500 Therms/month is extremely high for a school in New Jersey.
- As noted in Section 3.1, an energy audit had been completed in March 2012. It indicates 64,194 therms of natural gas use for the 12-month period November 2010 through October 2011. In contrast, the annual natural gas use for the 12-month period reviewed in this audit was 147,542 Therms, occurring during the period June 2018 through May 2019. This represents increased use of 130 percent.
- The total cost of the natural gas consumed during the recent 12-month period was 95 percent more than the total cost of natural gas during the 2010-2011 period, even though the unit cost of natural gas has dropped by 15 percent since then.
- Specifically, summer use is higher. Monthly gas usage increased by approximately 220 percent in May, 160 percent in June, 8000 percent in July, and 7000 percent in August as compared to the 2010-2011 period. This matches with increased summer electricity use to implicate a condition of simultaneous heating and cooling due to boilers and electric cooling systems both being operated during the summer.

3.3 Benchmarking

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

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

Benchmarking Score	1

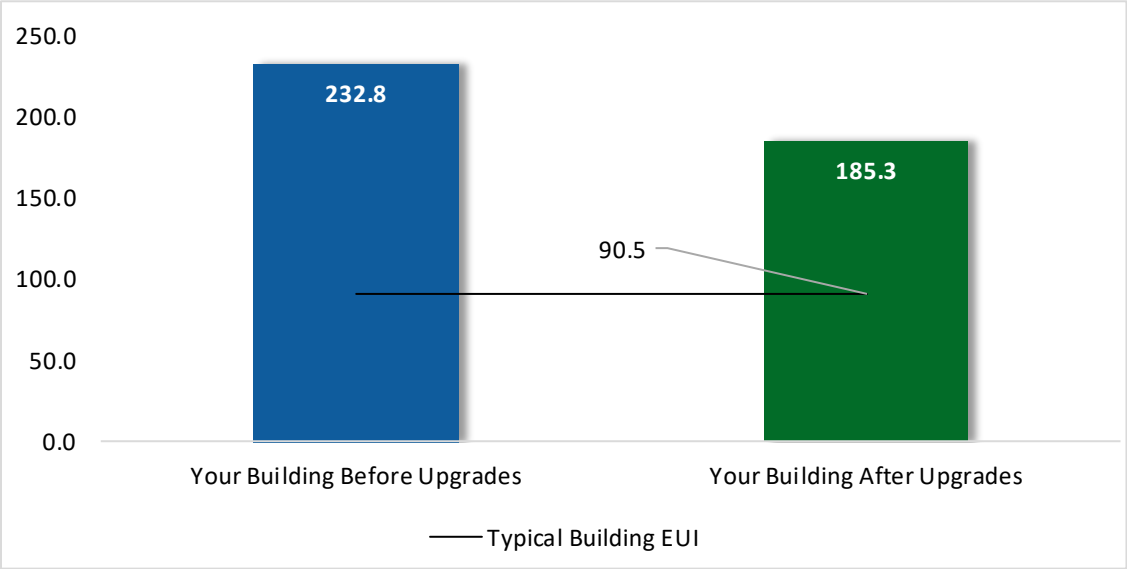


Figure 6 - Energy Use Intensity Comparison[3]

At 232.8 kBTU/ft^2, this building exceeds the national average of 90.5 kBTU/ft^2 for schools, meaning building performance is much below the national average. A benchmarking score of 1 indicates this building is among the worst performing buildings with respect to the amount of energy it consumes, relative to its size.

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

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

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

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

4 Energy Conservation Measures

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

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

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

Financial incentives are based on 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.

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**177,443**	**30.4**	**-36**	**$22,807**	**$55,711**	**$24,860**	**$30,851**	**1.4**	**174,515**
ECM 1	Install LED Fixtures	Yes	6,926	0.0	0	$900	$8,625	$0	$8,625	9.6	6,974
ECM 2	Retrofit Fixtures with LED Lamps	Yes	170,517	30.4	-36	$21,907	$47,086	$24,860	$22,226	1.0	167,541
Lighting Control Measures			**18,466**	**2.8**	**-4**	**$2,372**	**$14,499**	**$6,825**	**$7,674**	**3.2**	**18,143**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	10,579	1.9	-2	$1,359	$8,874	$1,470	$7,404	5.4	10,394
ECM 4	Install High/Low Lighting Controls	Yes	7,887	0.9	-2	$1,013	$5,625	$5,355	$270	0.3	7,749
Variable Frequency Drive (VFD) Measures			**201,651**	**31.4**	**0**	**$26,215**	**$117,842**	**$21,150**	**$96,692**	**3.7**	**203,061**
ECM 5	Install VFDs on Constant Volume (CV) Fans	Yes	186,171	30.5	0	$24,202	$83,661	$17,550	$66,111	2.7	187,473
ECM 6	Install VFDs on Heating Water Pumps	No	15,480	1.0	0	$2,012	$34,180	$3,600	$30,580	15.2	15,588
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**1,338**	**$9,797**	**$87,115**	**$14,640**	**$72,475**	**7.4**	**156,634**
ECM 7	Install High Efficiency Hot Water Boilers	Yes	0	0.0	1,338	$9,797	$87,115	$14,640	$72,475	7.4	156,634
Domestic Water Heating Upgrade			**0**	**0.0**	**10**	**$73**	**$151**	**$151**	**$0**	**0.0**	**1,167**
ECM 8	Install Low-Flow DHW Devices	Yes	0	0.0	10	$73	$151	$151	$0	0.0	1,167
Food Service & Refrigeration Measures			**20,016**	**1.9**	**129**	**$3,546**	**$25,186**	**$2,120**	**$23,066**	**6.5**	**35,241**
ECM 9	Dishwasher Replacement	Yes	8,110	0.9	129	$1,998	$18,859	$1,400	$17,459	8.7	23,251
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	1,311	0.2	0	$170	$1,213	$320	$893	5.2	1,320
ECM 11	Refrigeration Controls	Yes	3,507	0.0	0	$456	$504	$300	$204	0.4	3,531
ECM 12	Replace Refrigeration Equipment	Yes	5,477	0.6	0	$712	$4,380	$0	$4,380	6.2	5,516
ECM 13	Vending Machine Control	Yes	1,612	0.2	0	$210	$230	$100	$130	0.6	1,623
Custom Measures			**62,009**	**0.0**	**1,113**	**$16,212**	**$4,407**	**$0**	**$4,407**	**0.3**	**192,750**
ECM 14	Optimize EMS Settings	Yes	62,009	0.0	1,113	$16,212	$4,407	$0	$4,407	0.3	192,750
TOTALS			**479,584**	**66.5**	**2,550**	**$81,021**	**$304,911**	**$69,746**	**$235,165**	**2.9**	**781,510**

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

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

Figure 7 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**177,443**	**30.4**	**-36**	**$22,807**	**$55,711**	**$24,860**	**$30,851**	**1.4**	**174,515**
ECM 1	Install LED Fixtures	6,926	0.0	0	$900	$8,625	$0	$8,625	9.6	6,974
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ECM 3	Install Occupancy Sensor Lighting Controls	10,579	1.9	-2	$1,359	$8,874	$1,470	$7,404	5.4	10,394
ECM 4	Install High/Low Lighting Controls	7,887	0.9	-2	$1,013	$5,625	$5,355	$270	0.3	7,749
Variable Frequency Drive (VFD) Measures		**186,171**	**30.5**	**0**	**$24,202**	**$83,661**	**$17,550**	**$66,111**	**2.7**	**187,473**
ECM 5	Install VFDs on Constant Volume (CV) Fans	186,171	30.5	0	$24,202	$83,661	$17,550	$66,111	2.7	187,473
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**1,338**	**$9,797**	**$87,115**	**$14,640**	**$72,475**	**7.4**	**156,634**
ECM 7	Install High Efficiency Hot Water Boilers	0	0.0	1,338	$9,797	$87,115	$14,640	$72,475	7.4	156,634
Domestic Water Heating Upgrade		**0**	**0.0**	**10**	**$73**	**$151**	**$151**	**$0**	**0.0**	**1,167**
ECM 8	Install Low-Flow DHW Devices	0	0.0	10	$73	$151	$151	$0	0.0	1,167
Food Service & Refrigeration Measures		**20,016**	**1.9**	**129**	**$3,546**	**$25,186**	**$2,120**	**$23,066**	**6.5**	**35,241**
ECM 9	Dishwasher Replacement	8,110	0.9	129	$1,998	$18,859	$1,400	$17,459	8.7	23,251
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	1,311	0.2	0	$170	$1,213	$320	$893	5.2	1,320
ECM 11	Refrigeration Controls	3,507	0.0	0	$456	$504	$300	$204	0.4	3,531
ECM 12	Replace Refrigeration Equipment	5,477	0.6	0	$712	$4,380	$0	$4,380	6.2	5,516
ECM 13	Vending Machine Control	1,612	0.2	0	$210	$230	$100	$130	0.6	1,623
Custom Measures		**62,009**	**0.0**	**1,113**	**$16,212**	**$4,407**	**$0**	**$4,407**	**0.3**	**192,750**
ECM 14	Optimize EMS Settings	62,009	0.0	1,113	$16,212	$4,407	$0	$4,407	0.3	192,750
TOTALS		**464,104**	**65.6**	**2,550**	**$79,009**	**$270,731**	**$66,146**	**$204,585**	**2.6**	**765,922**

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

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

Figure 8 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**177,443**	**30.4**	**-36**	**$22,807**	**$55,711**	**$24,860**	**$30,851**	**1.4**	**174,515**
ECM 1	Install LED Fixtures	6,926	0.0	0	$900	$8,625	$0	$8,625	9.6	6,974
ECM 2	Retrofit Fixtures with LED Lamps	170,517	30.4	-36	$21,907	$47,086	$24,860	$22,226	1.0	167,541

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

ECM 1: Install LED Fixtures

Replace existing fixtures containing 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 since LED lamps last longer than other light sources and therefore do not need to be replaced as often.

Affected building areas: exterior wall-mounted metal halide fixtures.

ECM 2: Retrofit Fixtures with LED Lamps

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

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

Affected building areas: all areas with fluorescent fixtures with T8 tubes, compact fluorescent and incandescent lamps in recessed can fixtures.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**18,466**	**2.8**	**-4**	**$2,372**	**$14,499**	**$6,825**	**$7,674**	**3.2**	**18,143**
ECM 3	Install Occupancy Sensor Lighting Controls	10,579	1.9	-2	$1,359	$8,874	$1,470	$7,404	5.4	10,394
ECM 4	Install High/Low Lighting Controls	7,887	0.9	-2	$1,013	$5,625	$5,355	$270	0.3	7,749

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

ECM 3: Install Occupancy Sensor Lighting Controls

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

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

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

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

Affected building areas: offices, kitchen, gymnasium, music/band rooms and library.

ECM 4: Install High/Low Lighting Controls

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

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

The controller lowers the light level by dimming the fixture output. Therefore, the controlled fixtures need to have a dimmable ballast or driver. This will need to be 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: all 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 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		**201,651**	**31.4**	**0**	**$26,215**	**$117,842**	**$21,150**	**$96,692**	**3.7**	**203,061**
ECM 5	Install VFDs on Constant Volume (CV) Fans	186,171	30.5	0	$24,202	$83,661	$17,550	$66,111	2.7	187,473
ECM 6	Install VFDs on Heating Water Pumps	15,480	1.0	0	$2,012	$34,180	$3,600	$30,580	15.2	15,588

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

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

Install VFDs to control constant volume fan motor speeds. This converts a constant-volume, single-zone air handling system into a 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.

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing must be determined during the final project design. The control system programming should maintain the minimum air flow whenever the compressor is operating. Prior to implementation, verify minimum fan speed in cooling mode with the manufacturer. Note that savings will vary depending on the operating characteristics of each AHU. Energy savings result from reducing the fan speed (and power) when conditions allow for reduced air flow.

Affected air handlers: RTU V-1, RTU V-2, RTU V-3, RTU V-5, RTU V-6, RTU V-7, RTU V-8, RTU V-10, Room 316 RTU, Room 317 RTU, and AHU-2N.

ECM 6: Install VFDs on Heating Water Pumps

TRC evaluated installing variable frequency drives (VFD) to control heating water pumps. Two-way valves must serve the hot water coils and the hot water loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the hot water distribution they will need to be modified when this measure is implemented. As the hot water valves close, the differential pressure increases and the VFD modulates the pump speed to maintain a differential pressure setpoint. Energy savings result from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

Affected pumps: two 5 hp heating hot water pumps in the boiler room.

4.4 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**1,338**	**$9,797**	**$87,115**	**$14,640**	**$72,475**	**7.4**	**156,634**
ECM 7	Install High Efficiency Hot Water Boilers	0	0.0	1,338	$9,797	$87,115	$14,640	$72,475	7.4	156,634

ECM 7: Install High Efficiency Hot Water Boilers

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

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

Replacing the boilers has a long payback and may not be justifiable based simply on energy considerations. However, the existing Hydro-Therm boilers have lower efficiency than available high-performance non-condensing boilers. Also, the current HVAC staff also emphasized on the need to replace the existing boilers. Typically, the marginal cost of purchasing high efficiency boilers can be justified by the marginal savings from the improved efficiency. When the boiler is eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes. We also recommend working with your mechanical design team to determine whether the heating system can operate with return water temperatures below 130°F, which would allow the use of condensing boilers.

4.5 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**	**10**	**$73**	**$151**	**$151**	**$0**	**0.0**	**1,167**
ECM 8	Install Low-Flow DHW Devices	0	0.0	10	$73	$151	$151	$0	0.0	1,167

ECM 8: Install Low-Flow DHW Devices

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

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

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

Affected building areas: restrooms and break room sinks.

4.6 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		**20,016**	**1.9**	**129**	**$3,546**	**$25,186**	**$2,120**	**$23,066**	**6.5**	**35,241**
ECM 9	Dishwasher Replacement	8,110	0.9	129	$1,998	$18,859	$1,400	$17,459	8.7	23,251
ECM 10	Refrigerator/Freezer Case Electrically Commutated Motors	1,311	0.2	0	$170	$1,213	$320	$893	5.2	1,320
ECM 11	Refrigeration Controls	3,507	0.0	0	$456	$504	$300	$204	0.4	3,531
ECM 12	Replace Refrigeration Equipment	5,477	0.6	0	$712	$4,380	$0	$4,380	6.2	5,516
ECM 13	Vending Machine Control	1,612	0.2	0	$210	$230	$100	$130	0.6	1,623

ECM 9: Dishwasher Replacement

Replace existing dishwashers with new energy efficient single-rack conveyor dishwashers. New high efficiency models often use an average of 40 percent less energy and water, compared to current standard efficiency equipment.

ECM 10: Refrigerator/Freezer Case Electrically Commutated Motors

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

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

ECM 11: Refrigeration Controls

Cooled serving tables often run continuously. This measure adds a control system feature to automatically shut off the cooled serving tables based on pre-set store operating hours. Based on programmed hours, the control mechanism shuts off the cooler at the end of business and then begins operation on reduced cycles. Regular compressor operation begins the following day an hour before the start of business.

Energy savings for each of the control measures account for reduction in compressor and fan operating hours as well as reduction in the refrigeration heat load as appropriate.

ECM 12: Replace Refrigeration Equipment

Replace existing refrigerators and freezer 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 13: Vending Machine Control

Vending machines operate continuously, even during unoccupied hours. Install occupancy sensor controls to reduce energy use. These controls power down vending machines when the vending machine area has been vacant for some time, and they 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.

4.7 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		**62,009**	**0.0**	**1,113**	**$16,212**	**$4,407**	**$0**	**$4,407**	**0.3**	**192,750**
ECM 14	Optimize EMS Settings	62,009	0.0	1,113	$16,212	$4,407	$0	$4,407	0.3	192,750

ECM 14: Optimize EMS Settings

Energy Management Systems (EMS) typically provide advanced controls for building HVAC systems, including chillers, boilers, air handling units, rooftop units and exhaust fans. The EMS monitors and reports operational status, schedules equipment 'start' and 'stop' times, locks out equipment operation based on outside air or space temperature, and often optimizes damper and valve operation based on complex algorithms. These EMS features, when in proper adjustment, can improve comfort for building occupants and save substantial energy.

Know your EMS scheduling capabilities. Regularly monitor HVAC equipment operating schedules and match them to building operating hours in order to eliminate unnecessary equipment operation and save energy. Monitoring should be performed often at sites with frequently changing usage patterns – daily in some cases. We recommend using the 'Optimal Start' feature of the EMS, if available, to optimize the building warmup sequence. Most EMS scheduling programs provide for "Holiday" schedules which can be used during reduced use or shutdown periods. Finally, many systems are equipped with a one-time override function which can be used to provide additional space conditioning due to a one-time, special event. When available this override feature should be used rather than changing the base operating schedule.

A high-level evaluation of potential savings and costs is provided for demonstration purposes only. Depending on how close the HVAC equipment is scheduled to the actual building schedule, the potential energy savings may be up to 15 – 20 percent of existing HVAC energy use. The estimated cost considered for this measure is just a placeholder and could be zero if the school has HVAC staff adjust the HVAC equipment scheduled in the EMS. For the purposes of this report, we have conservatively estimated savings to be 7 percent of the HVAC energy consumption baseline.

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

Weatherization

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

Doors and Windows

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

Lighting Maintenance

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

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

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

Lighting Controls

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

Motor Controls

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Whenever possible, use automatic devices such as twist timers or occupancy sensors to turn off motors when they are not needed.

Motor Maintenance

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

Thermostat Schedules and Temperature Resets

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

Economizer Maintenance

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

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

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

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. Check ductwork for leakage. Distribution system losses are dependent on air system temperature, the size of the distribution system, and the level of insulation of the ductwork. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is missing or worn, the system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system. 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 and efficiently. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the boiler tubes to improve heat transfer.

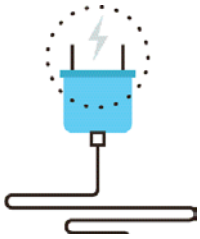
Water Heater Maintenance

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

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

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

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips[6]. Your local utility may offer incentives or rebates for this equipment.

Computer Power Management Software

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

Water Conservation

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

For more information regarding water conservation go to the EPA's WaterSense® website[7] or download a copy of EPA's "WaterSense® at Work: Best Management Practices for Commercial and Institutional Facilities"[8] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

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

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

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

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

[8] 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 facility's electric energy needs. Also referred to as distributed generation, these systems contribute to greenhouse gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, which results in improved electric grid reliability through better use of transmission and distribution systems.

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

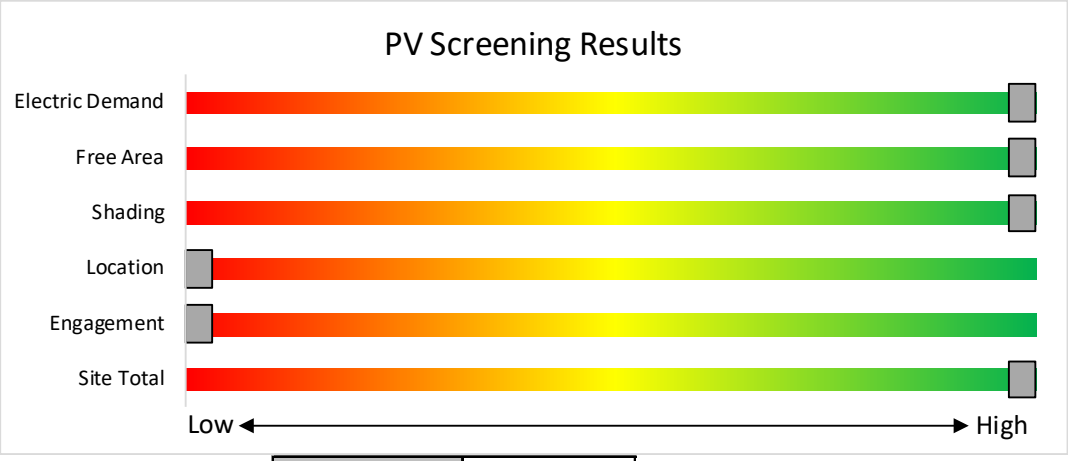
6.1 Solar Photovoltaic

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

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

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential. A PV array located on the roof and in the parking lot 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.



Potential	High	
System Potential	332	kW DC STC
Electric Generation	395,535	kWh/yr
Displaced Cost	$51,420	/yr
Installed Cost	$1,122,200	

Figure 9 - Photovoltaic Screening

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

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

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

Get more information about solar power in New Jersey or find a qualified solar installer who can help you decide if solar is right for your building:

- **Basic Info on Solar PV in 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 facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

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

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

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

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

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

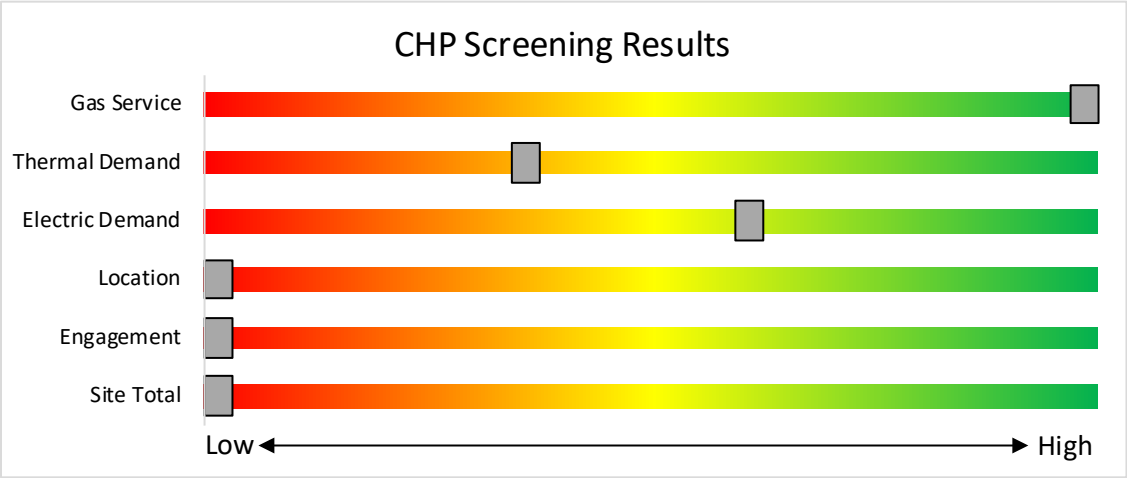


Figure 10 - Combined Heat and Power Screening

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

7 Project Funding and Incentives

Ready to improve your building's performance? New Jersey's Clean Energy Programs can help. Pick the program that works best for you. Incentive programs that may apply to this facility are identified in the Executive Summary. This section provides an overview of currently available 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 efficient equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

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

Incentives

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

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

How to Participate

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

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

7.2 Direct Install

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

Based on the site building and utility data provided, the facility does not meet the requirements of the current Direct Install program.

Incentives

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

How to Participate

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

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

7.3 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 percent 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 meets the requirements of the current P4P program. Therefore, we recommend this facility 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 percent 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.

7.4 Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

7.5 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.

7.6 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) 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[9].

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[10].

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

[10] 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
105 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
105 Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	936	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	936	0.0	51	0	$7	$55	$30	3.8
104 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
104 Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	936	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	936	0.0	51	0	$7	$55	$30	3.8
103 Classroom	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,519	2	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,519	0.3	1,533	0	$197	$438	$240	1.0
103 Classroom	5	Compact Fluorescent: (2) 40W Biax Lamps	Occupancy Sensor	S	80	3,519	2	Relamp	No	5	LED Lamps: (2) 26W Plug-in Lamp	Occupancy Sensor	52	3,519	0.1	542	0	$70	$125	$20	1.5
102 Music Band	10	LED - Fixtures: Wrapped Lens	Wall Switch	S	37	4,416	3	None	Yes	10	LED - Fixtures: Wrapped Lens	Occupancy Sensor	37	3,047	0.1	557	0	$72	$270	$70	2.8
102 Music Band	2	LED - Fixtures: Wrapped Lens	Wall Switch	S	37	8,760	3	None	Yes	2	LED - Fixtures: Wrapped Lens	Occupancy Sensor	37	6,044	0.0	221	0	$28	$270	$70	7.0
102 Stage	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	4,416	3	None	Yes	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	3,047	0.0	90	0	$12	$270	$70	17.2
102 Music Room	11	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	4,416	3	None	Yes	11	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	3,047	0.1	497	0	$64	$270	$70	3.1
102 Elec Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	68	0	$9	$73	$40	3.8
101B Classroom	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.6	3,257	-1	$418	$931	$510	1.0
101B Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
101B Small Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	646	0.1	86	0	$11	$343	$40	27.3
Nurse's Office	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.3	1,724	0	$222	$493	$270	1.0
Nurse Storage	1	Compact Fluorescent: (1) 42W Plug-In Lamp	Wall Switch	S	42	936	2	Relamp	No	1	LED Lamps: (1) 26W Plug-in Lamp	Wall Switch	26	936	0.0	16	0	$2	$13	$2	5.0
Nurse Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
Nurse Exam Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,416	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,047	0.1	612	0	$79	$380	$130	3.2
Hallway - Nurse Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,945	0.2	1,585	0	$204	$894	$540	1.7
Hallway - Display Case	8	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	8,760	4	None	Yes	8	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	6,044	0.0	347	0	$45	$0	$0	0.0
100 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
100 Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
100 Classroom	2	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	3,519	2	Relamp	No	2	LED Lamps: (3) 26W Plug-in Lamp	Occupancy Sensor	78	3,519	0.1	325	0	$42	$75	$12	1.5
Gymnasium	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	5,718	2, 3	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,945	0.9	7,923	-2	$1,018	$1,635	$740	0.9
Gymnasium	4	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	5,718	2, 3	Relamp	Yes	4	LED Lamps: (3) 26W Plug-in Lamp	Occupancy Sensor	78	3,945	0.2	1,665	0	$214	$420	$94	1.5

	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
Gym Mech Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	68	0	$9	$73	$40	3.8
Gym Platform	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,718	0.0	208	0	$27	$37	$20	0.6
Gym Storage	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	646	0.2	259	0	$33	$489	$120	11.1
Gym Backstage	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	646	0.2	259	0	$33	$489	$190	9.0
Gym Backstage Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
Gym Stage	5	Incandescent: (1) 250W Incandescent Bulb	Wall Switch	S	250	936	2, 3	Relamp	Yes	5	LED Lamps: (1) 38W LED Recessed Downlight	Occupancy Sensor	38	646	0.8	1,152	0	$148	$386	$100	1.9
Gym Stage	6	LED - Fixtures: (54) 7W RGB LED Bulbs	Wall Switch	S	378	936	3	None	Yes	6	LED - Fixtures: (54) 7W RGB LED Bulbs	Occupancy Sensor	378	646	0.5	724	0	$93	$270	$70	2.2
Boiler Rm 1	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.2	340	0	$44	$365	$200	3.8
Boiler Rm 2	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.1	170	0	$22	$183	$100	3.8
115 Art Room	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.7	3,832	-1	$492	$1,095	$600	1.0
115 Art Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.1	766	0	$98	$219	$120	1.0
115 Kiln Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	646	0.1	86	0	$11	$343	$40	27.3
115 Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
115 Mezzanine	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,945	0.1	792	0	$102	$380	$130	2.5
115 AHU Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	68	0	$9	$73	$40	3.8
O.T/P.T Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	5,718	2, 3	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,945	0.4	3,722	-1	$478	$854	$390	1.0
P.T/ Rm small restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
Gym Office	8	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	O	120	8,000	2, 3	Relamp	Yes	8	LED Lamps: (3) 26W Plug-in Lamp	Occupancy Sensor	78	5,520	0.4	4,659	-1	$599	$570	$118	0.8
G. Office small restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	646	0.1	86	0	$11	$189	$40	13.4
Gym Office Storage	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	646	0.2	346	0	$44	$562	$160	9.1
Gym Office Mezzanine	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	646	0.2	216	0	$28	$453	$170	10.2
Main Office Front	15	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	O	30	3,519		None	No	15	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	3,519	0.0	0	0	$0	$0	$0	0.0
Main Office Conf. Rm	9	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	O	30	3,519		None	No	9	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	3,519	0.0	0	0	$0	$0	$0	0.0
Main office hallways	3	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	4,416	4	None	Yes	3	LED - Fixtures: Ambient 2x2 Fixture	High/Low Control	30	3,047	0.0	136	0	$17	$0	$0	0.0
Main Office Men Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	646	0.1	86	0	$11	$189	$40	13.4

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Office Wmen Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	646	0.1	86	0	$11	$189	$40	13.4
Office File Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,519	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,519	0.0	255	0	$33	$73	$40	1.0
Principal's Office	6	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	4,416	3	None	Yes	6	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	3,047	0.0	271	0	$35	$270	$70	5.7
Vice Principal	4	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	4,416	3	None	Yes	4	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	30	3,047	0.0	181	0	$23	$270	$70	8.6
106 Classroom	10	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	3,519	2	Relamp	No	10	LED Lamps: (3) 26W Plug-in Lamp	Occupancy Sensor	78	3,519	0.3	1,626	0	$209	$375	$60	1.5
Classrooms	29	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	29	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Hallways	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
115 Mezzanine	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	8,760	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.0	318	0	$41	$37	$20	0.4
Main office hallways	3	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	30	8,760	4	None	Yes	3	LED - Fixtures: Ambient 2x2 Fixture	High/Low Control	30	6,044	0.0	269	0	$35	$225	$210	0.4
106 Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,519	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,519	0.1	511	0	$66	$146	$80	1.0
106 Office 2	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,519	2	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,519	0.1	383	0	$49	$110	$60	1.0
106 Office 3	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,519	2	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,519	0.1	383	0	$49	$110	$60	1.0
106 Office 4	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	3,519	2	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,519	0.1	650	0	$84	$219	$120	1.2
113 Classroom	6	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	3,519	2	Relamp	No	6	LED Lamps: (3) 26W Plug-in Lamp	Occupancy Sensor	78	3,519	0.2	975	0	$125	$225	$36	1.5
109 Classroom	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.6	3,257	-1	$418	$931	$510	1.0
109 Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
Copy Rm	8	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	3,519	2	Relamp	No	8	LED Lamps: (3) 26W Plug-in Lamp	Occupancy Sensor	78	3,519	0.2	1,301	0	$167	$300	$48	1.5
Facility Staff Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,519	2	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,519	0.1	766	0	$98	$219	$120	1.0
111 Classroom	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.7	3,641	-1	$468	$1,041	$570	1.0
111 small Restroom	1	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	936	2	Relamp	No	1	LED Lamps: (3) 26W Plug-in Lamp	Wall Switch	78	936	0.0	43	0	$6	$38	$6	5.7
108 Classroom	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.7	3,641	-1	$468	$1,041	$570	1.0
108 Small Restroom	1	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	936	2	Relamp	No	1	LED Lamps: (3) 26W Plug-in Lamp	Wall Switch	78	936	0.0	43	0	$6	$38	$6	5.7
113 Clasroom	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.7	3,641	-1	$468	$1,041	$570	1.0
113 Small Restroom	1	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	936	2	Relamp	No	1	LED Lamps: (3) 26W Plug-in Lamp	Wall Switch	78	936	0.0	43	0	$6	$38	$6	5.7
110 Clasroom	19	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	19	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.7	3,641	-1	$468	$1,041	$570	1.0

	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
110 Small Restroom	1	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	936	2	Relamp	No	1	LED Lamps: (3) 26W Plug-in Lamp	Wall Switch	78	936	0.0	43	0	$6	$38	$6	5.7
200 Music Rm	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
Computer Lab	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,519	2	Relamp	No	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,519	0.5	2,683	-1	$345	$767	$420	1.0
Comp. Lab Store Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	936	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	646	0.1	130	0	$17	$226	$60	9.9
Comp. Lab Closet	1	Compact Fluorescent: (1) 18W Plug-In Lamp	Wall Switch	S	18	936	2	Relamp	No	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	12	936	0.0	6	0	$1	$13	$2	13.2
Library	17	Compact Fluorescent: (1) 26W Plug-In Lamp	Occupancy Sensor	S	26	3,519	2	Relamp	No	17	LED Lamps: (1) 18.5W Plug-In Lamp	Occupancy Sensor	19	3,519	0.1	494	0	$63	$213	$34	2.8
Library	35	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	3,519	2	Relamp	No	35	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,519	1.4	7,587	-2	$975	$2,556	$1,400	1.2
Classrooms/Rooms	16	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	16	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Hallways	8	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Librarian Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,416	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,047	0.1	612	0	$79	$380	$130	3.2
Instruction Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	U	62	4,416	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,047	0.1	408	0	$52	$343	$40	5.8
Hub Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	O	114	4,416	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,047	0.1	719	0	$92	$416	$150	2.9
Elec Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
Cafeteria entrance	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	3,519	2	Relamp	No	18	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,519	0.7	3,902	-1	$501	$1,315	$720	1.2
Cafeteria Dining Area	43	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	3,519	2	Relamp	No	43	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,519	1.7	9,321	-2	$1,197	$3,140	$1,720	1.2
Cafeteria Dining Area	3	Compact Fluorescent: (1) 42W Plug-In Lamp	Occupancy Sensor	S	42	3,519	2	Relamp	No	3	LED Lamps: (1) 26W Plug-in Lamp	Occupancy Sensor	26	3,519	0.0	186	0	$24	$38	$6	1.3
Kitchen	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,416	2, 3	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,047	0.7	4,589	-1	$590	$1,092	$520	1.0
Kitchen Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	936	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	936	0.0	51	0	$7	$55	$30	3.8
Kitchen Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	936	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	646	0.1	130	0	$17	$226	$60	9.9
Kitchen Janitor Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	936	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	936	0.0	51	0	$7	$55	$30	3.8
Kitchen Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,416	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,047	0.1	408	0	$52	$343	$40	5.8
Faculty Dining Area	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	3,519	2	Relamp	No	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,519	0.4	1,951	0	$251	$657	$360	1.2
ESL Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,416	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,047	0.1	612	0	$79	$380	$130	3.2
Teacher Copy Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,416	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,416	0.0	272	0	$35	$73	$40	0.9
300 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0

	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
301 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
302 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
303 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
304 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
305 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
306 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
307 Classroom	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.2	1,150	0	$148	$329	$180	1.0
308 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
309 Classroom	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.2	1,150	0	$148	$329	$180	1.0
310 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
311 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
313 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
315 Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,519	2	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,519	0.5	2,874	-1	$369	$822	$450	1.0
316 Classroom	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	3,519	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,519	0.5	2,601	-1	$334	$876	$480	1.2
317 Classroom	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	3,519	2	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,519	0.5	2,601	-1	$334	$876	$480	1.2
Hallway - Office to Caféteria	38	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 4	Relamp	Yes	38	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,945	1.1	10,035	-2	$1,289	$2,738	$2,110	0.5
Main Entrance Hall	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,945	0.2	1,585	0	$204	$444	$345	0.5
Hallway - 100 to 105	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,945	0.4	3,169	-1	$407	$888	$690	0.5
Boys Restroom - 300	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,945	0.1	528	0	$68	$189	$40	2.2
Girls Restroom - 300	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,945	0.1	528	0	$68	$189	$40	2.2
Hallways	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classrooms/Rooms	25	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	25	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Main Entrance Vestb.	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,945	0.1	528	0	$68	$73	$40	0.5
Nurse Office Vestb.	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,945	0.1	528	0	$68	$343	$40	4.5
ESL/Copy Rm Vestb.	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,945	0.1	528	0	$68	$343	$40	4.5

	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
Hallway - Main Office to 110	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 4	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,945	0.6	5,282	-1	$679	$1,405	$1,075	0.5
Vestibule near 110	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,718	0.0	208	0	$27	$37	$20	0.6
Hallway - 202 to 216	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 4	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,945	0.6	5,282	-1	$679	$1,405	$1,075	0.5
Hallway - 202 to 216	4	Compact Fluorescent: (1) 26W Plug-In Lamp	Wall Switch	S	26	5,718	2, 4	Relamp	Yes	4	LED Lamps: (1) 18.5W Plug-In Lamp	High/Low Control	19	3,945	0.0	333	0	$43	$275	$233	1.0
Hallway - 202 to 216	4	Compact Fluorescent: (1) 26W Plug-In Lamp	Wall Switch	S	26	5,718	2, 4	Relamp	Yes	4	LED Lamps: (1) 18.5W Plug-In Lamp	High/Low Control	19	3,945	0.0	333	0	$43	$275	$233	1.0
Hallway - 202 to 216	1	Compact Fluorescent: (1) 26W Plug-In Lamp	Wall Switch	S	26	5,718	2	Relamp	No	1	LED Lamps: (1) 18.5W Plug-In Lamp	Wall Switch	19	5,718	0.0	47	0	$6	$13	$2	1.7
12 Storage - 202 to 216	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
002 Elec Rm - 202 to 216	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
11 Storage - 202 to 216	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
10 Storage - 202 to 216	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
Faculty Restroom Men	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,718	0.0	208	0	$27	$37	$20	0.6
Faculty Restroom Women	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,718	0.0	208	0	$27	$37	$20	0.6
001 Tech Closet - 202 to 216	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
Custodian Closet - 202 to 216	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
Hallway - 300 to 316	4	Compact Fluorescent: (1) 26W Plug-In Lamp	Wall Switch	S	26	5,718	2, 4	Relamp	Yes	4	LED Lamps: (1) 18.5W Plug-In Lamp	High/Low Control	19	3,945	0.0	333	0	$43	$275	$233	1.0
Hallway - 300 to 316	4	Compact Fluorescent: (1) 26W Plug-In Lamp	Wall Switch	S	26	5,718	2, 4	Relamp	Yes	4	LED Lamps: (1) 18.5W Plug-In Lamp	High/Low Control	19	3,945	0.0	333	0	$43	$275	$233	1.0
Hallway - 300 to 316	1	Compact Fluorescent: (1) 26W Plug-In Lamp	Wall Switch	S	26	5,718	2	Relamp	No	1	LED Lamps: (1) 18.5W Plug-In Lamp	Wall Switch	19	5,718	0.0	47	0	$6	$13	$2	1.7
12 Storage - 300 to 316	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
002 Elec Rm - 300 to 316	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
11 Storage - 300 to 316	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
10 Storage - 300 to 316	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
Faculty Restroom Men	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,718	0.0	208	0	$27	$37	$20	0.6
Faculty Restroom Women	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,718	0.0	208	0	$27	$37	$20	0.6
001 Tech Closet - 300 to 316	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8
Custodian Closet - 300 to 316	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	936	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	936	0.0	34	0	$4	$37	$20	3.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boys Restroom - 200	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,945	0.1	528	0	$68	$189	$40	2.2
Girls Restroom - 200	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,945	0.1	528	0	$68	$189	$40	2.2
Hallways - Across 200 & 300	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,718	2, 4	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,945	0.4	3,697	-1	$475	$961	$730	0.5
Hallway - 300-317	23	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	23	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Hallways	15	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	15	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Parking Lot 1	13	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		120	4,015		None	No	13	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	120	4,015	0.0	0	0	$0	$0	$0	0.0
Around the School	18	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		50	4,015		None	No	18	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	50	4,015	0.0	0	0	$0	$0	$0	0.0
Budiling Walls	23	Metal Halide: (1) 70W Lamp	Timeclock		95	4,015	1	Fixture Replacement	No	23	LED - Fixtures: (1) 20W Outdoor Wall-Mounted Area Fixture	Timeclock	20	4,015	0.0	6,926	0	$900	$8,625	$0	9.6
Budiling Walls	7	Compact Fluorescent: (1) 32W Plug-In Lamp	Timeclock		32	4,015	2	Relamp	No	7	LED Lamps: (1) 23W Plug-in Lamp	Timeclock	23	4,015	0.0	253	0	$33	$88	$14	2.2
Budiling Walls	6	LED Lamps: (1) 12W Plug-In Lamp	Timeclock		12	4,015		None	No	6	LED Lamps: (1) 12W Plug-In Lamp	Timeclock	12	4,015	0.0	0	0	$0	$0	$0	0.0
Walk-in Cooler	1	Compact Fluorescent: (1) 26W Plug-In Lamp	Wall Switch	S	26	8,760	2	Relamp	No	1	LED Lamps: (1) 18.5W Plug-In Lamp	Wall Switch	19	8,760	0.0	72	0	$9	$13	$2	1.1
Walk-in Freezer	1	Compact Fluorescent: (1) 26W Plug-In Lamp	Wall Switch	S	26	8,760	2	Relamp	No	1	LED Lamps: (1) 18.5W Plug-In Lamp	Wall Switch	19	8,760	0.0	72	0	$9	$13	$2	1.1

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	Heating Hot Water System	1	Heating Hot Water Pump	5.0	86.5%	No	W	5,124	6	No	86.5%	Yes	1	0.5	7,740	0	$1,006	$17,090	$1,800	15.2
Boiler Room	Heating Hot Water System	1	Heating Hot Water Pump	5.0	86.5%	No	W	6,588	6	No	86.5%	Yes	1	0.5	7,740	0	$1,006	$17,090	$1,800	15.2
Classrooms Wing 100	Unit Ventilators	15	Supply Fan	0.5	69.5%	No	W	8,760		No	69.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Kitchen RTU-V-10	1	Other	0.8	81.1%	No	W	1,686		No	81.1%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Kitchen RTU-V-10	1	Supply Fan	3.6	89.5%	No	W	8,760	5	No	89.5%	Yes	1	1.0	7,319	0	$951	$3,884	$400	3.7
Roof	Kitchen Hood Exhaust	1	Exhaust Fan	0.8	81.1%	No	W	5,840		No	81.1%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Dishwasher Exhaust	1	Exhaust Fan	0.3	69.5%	No	W	5,840		No	69.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Cafeteria RTU-V-6	1	Supply Fan	15.0	93.0%	No	W	5,840	5	No	93.0%	Yes	1	4.3	26,351	0	$3,426	$7,041	$2,400	1.4
Roof	Cafeteria RTU-V-6	3	Other	1.0	85.5%	No	W	5,840		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Cafeteria RTU-V-6	1	Exhaust Fan	3.0	89.5%	No	W	5,840	5	No	89.5%	Yes	1	0.9	5,364	0	$697	$3,884	$400	5.0
Roof	Wing 300 RTU-V-3	1	Supply Fan	7.5	91.0%	No	W	5,840	5	No	91.0%	Yes	1	2.1	13,465	0	$1,750	$4,738	$2,000	1.6
Roof	Wing 300 RTU-V-3	1	Exhaust Fan	3.0	89.5%	No	W	5,840	5	No	89.5%	Yes	1	0.9	5,364	0	$697	$3,884	$400	5.0
Roof	Wing 300 RTU-V-3	3	Other	1.0	85.5%	No	W	5,840		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Girls Bathroom EF	4	Exhaust Fan	0.3	69.5%	No	W	5,840		No	69.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Boys Bathroom EF	4	Exhaust Fan	0.3	69.5%	No	W	5,840		No	69.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	EF Rm 316 & 317	1	Exhaust Fan	0.0	60.0%	No	W	5,840		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Room 316 RTU	1	Supply Fan	1.0	85.5%	No	W	5,840	5	No	85.5%	Yes	1	0.3	1,911	0	$248	$3,010	$150	11.5
Roof	Room 316 RTU	1	Other	0.4	73.4%	No	W	5,840		No	73.4%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Room 317 RTU	1	Supply Fan	1.0	85.5%	No	W	5,840	5	No	85.5%	Yes	1	0.3	1,911	0	$248	$3,010	$150	11.5
Roof	Room 317 RTU	1	Other	0.4	73.4%	No	W	5,840		No	73.4%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU V-1 Wing 200	1	Supply Fan	15.0	93.0%	No	W	5,840	5	No	93.0%	Yes	1	4.3	26,351	0	$3,426	$7,041	$2,400	1.4
Roof	RTU V-1 Wing 200	1	Exhaust Fan	3.0	89.5%	No	W	5,840	5	No	89.5%	Yes	1	0.9	5,364	0	$697	$3,884	$400	5.0
Roof	RTU V-1 Wing 200	3	Other	1.0	85.5%	No	W	5,840		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU V-5 Library	1	Supply Fan	7.5	91.0%	No	W	5,840	5	No	91.0%	Yes	1	2.1	13,465	0	$1,750	$4,738	$2,000	1.6
Roof	RTU V-5 Library	1	Exhaust Fan	3.0	89.5%	No	W	5,840	5	No	89.5%	Yes	1	0.9	5,364	0	$697	$3,884	$400	5.0
Roof	RTU V-5 Library	3	Other	1.0	85.5%	No	W	5,840		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU V-7 Computer Room	1	Supply Fan	3.6	89.5%	No	W	5,840	5	No	89.5%	Yes	1	1.0	5,257	0	$683	$3,884	$400	5.1
Roof	RTU V-7 Computer Room	1	Other	0.5	78.2%	No	W	5,840		No	78.2%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU V-8 Music Rm	1	Supply Fan	3.6	89.5%	No	W	5,840	5	No	89.5%	Yes	1	1.0	5,257	0	$683	$3,781	$400	4.9
Roof	RTU V-8 Music Rm	1	Other	0.8	81.1%	No	W	5,840		No	81.1%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	AHU 2N-Gymnasium	1	Supply Fan	15.0	93.0%	No	W	5,840	5	No	93.0%	Yes	1	4.3	26,351	0	$3,426	$7,041	$2,400	1.4
Wing 100 Offices/Lobby	AHU1 Guidance, Conf Rm	1	Supply Fan	0.5	78.2%	No	W	5,840		No	78.2%	No		0.0	0	0	$0	$0	$0	0.0
Wing 100 Offices/Lobby	AHU 3 Front Entrance Lobby	1	Supply Fan	0.5	78.2%	No	W	5,840		No	78.2%	No		0.0	0	0	$0	$0	$0	0.0
Wing 100 Offices/Lobby	AHU 4 Nurse, Gym Storage	1	Supply Fan	0.5	78.2%	No	W	5,840		No	78.2%	No		0.0	0	0	$0	$0	$0	0.0
Wing 100 Offices/Lobby	AHU 5 Faculty Wrk Rm, 106	1	Supply Fan	0.5	78.2%	No	W	5,840		No	78.2%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU V-2 Wing 200	1	Supply Fan	15.0	93.0%	No	W	5,840	5	No	93.0%	Yes	1	4.3	26,351	0	$3,426	$7,041	$2,400	1.4
Roof	RTU V-2 Wing 200	1	Exhaust Fan	3.0	89.5%	No	W	5,840	5	No	89.5%	Yes	1	0.9	5,364	0	$697	$3,884	$400	5.0
Roof	RTU V-2 Wing 200	3	Other	1.0	85.5%	No	W	5,840		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Gymnasium	3	Exhaust Fan	1.0	85.5%	No	W	5,840	5	No	85.5%	Yes	3	0.9	5,364	0	$697	$9,030	$450	12.3

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
-	IT Equp. Room	1	Ductless Mini-Split AC	1.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Kitchen (RTU-V-10)	1	Packaged AC	7.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Cafeteria (RTU-V-6)	1	Packaged AC	30.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Hallways (RTU-V-9)	1	Packaged AC	7.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Hallways (RTU-V-4) Wing 300	1	Packaged AC	30.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Hallways (RTU-V-3) Wing 300	1	Packaged AC	25.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Room 316 RTU	1	Packaged AC	4.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Room 317 RTU	1	Packaged AC	4.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU V-1 Wing 200 (Boys RM to 216)	1	Packaged AC	30.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU V-5 Library	1	Packaged AC	25.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU V-7 Computer Room	1	Packaged AC	8.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU V-8 Music Rm	1	Packaged AC	10.00		W		No							0.0	0	0	$0	$0	$0	0.0
Computer Room	Computer Room	1	Ductless Mini-Split AC	1.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU V-2 Wing 200 (Girls RM to 201)	1	Packaged AC	30.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Gymnasium	1	Split-System AC	30.00		W		No							0.0	0	0	$0	$0	$0	0.0
Main/Principal/Supervisor Offices	Main/Principal/Supervisor Offices	5	Packaged Terminal AC	1.50		-		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	Entire Building	1	Non-Condensing Hot Water Boiler	2,440	B	7	Yes	1	Non-Condensing Hot Water Boiler	2,440	85.00%	Et	0.0	0	806	$5,905	$43,558	$7,320	6.1
Boiler Room	Entire Building	1	Non-Condensing Hot Water Boiler	2,440	B	7	Yes	1	Non-Condensing Hot Water Boiler	2,440	85.00%	Et	0.0	0	531	$3,892	$43,558	$7,320	9.3

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	Entire building	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
Kitchen	Kitchen	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	8	21	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	10	$73	$151	$151	0.0

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
Outside Kitchen	1	Cooler (35F to 55F)	10	Yes	No	No	0.1	655	0	$85	$607	$160	5.2
Outside Kitchen	1	Medium Temp Freezer (0F to 30F)	10	Yes	No	No	0.1	655	0	$85	$607	$160	5.2

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	3	Refrigerator Chest	No	12	Yes	0.4	3,108	0	$404	$2,667	$0	6.6
Kitchen	1	Freezer Chest	No	12	Yes	0.3	2,369	0	$308	$1,713	$0	5.6

Novelty Cooler Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Cooler Description	ECM #	Install Automatic Shutoff 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	Commercial Serving Table (Cooled)	11	Yes	0.00	3,507	0	$456	$504	$300	0.4

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 Pans)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Electric Griddle (4 Feet Width)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Gas Convection Oven (Full Size)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Electric Steamer	No		No	0.0	0	0	$0	$0	$0	0.0

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Single Tank Conveyor (High Temp)	Natural Gas	Electric	No	9	Yes	0.9	8,110	129	$1,998	$18,859	$1,400	8.7

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Faculty Dining	4	Microwave Oven	1,000	Yes
Faculty Dining	2	Fridge	600	No
Faculty Dining	1	Dishwasher	1,500	No
Faculty Dining	2	Coffee Machines	400	No
Faculty Dining	2	Water Cooler/Heaters	500	No
Faculty Dining	1	Mini Fridge	100	No
Classrooms/Offices	7	Large Copier/Printer	515	Yes
Classrooms/Offices	2	LCD TV	120	Yes
Classrooms/Offices	45	Projectors	200	No
Classrooms/Offices	54	Desktop Computers	75	Yes
Classrooms/Offices	2	Medium/Small Printers	20	Yes
Classrooms/Offices	33	Laptops/Chromebooks	75	Yes
Classrooms/Offices	1	Refrigerators	600	No
Classrooms/Offices	1	Electric Kiln	11,000	No

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
Break Room	1	Refrigerated	13	Yes	0.2	1,612	0	$210	$230	$100	0.6

Custom (High Level) Measure Analysis

Optimize EMS Settings

Building Square Footage	88,131	Fuel Utility Rate	$7.324 MMBtu
Percent of Conditioned Area Impacted	100%	Blended Electric Utility Rate	$0.130 kWh

Existing Conditions						Proposed Conditions					Energy Impact & Financial Analysis						
Description	Area(s)/System(s) Served	Remaining Useful Life	Total HVAC Motor Usage kWh	Total HVAC Electric Usage kWh	Total HVAC Fuel Usage MMBtu	Description	% Savings HVAC Motor Usage kWh	% Savings HVAC Electric Usage kWh	% Savings HVAC Fuel Usage MMBtu	Estimated Cost per Sqft	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
HVAC Controls Not Currently Optimized	HVAC Equipment & Systems	W	555,752	438,715	13,911	Optimize EMS Settings	8%	4%	8%	$0.05	0.00	62,009	1,113	$16,212	$4,407	$0	0.27

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

1

ENERGY STAR® Score[1]

Village Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 88,131
Built: 1980

For Year Ending: May 31, 2019
Date Generated: May 08, 2020

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
Village Elementary School 244 Orchard Road Skillman, New Jersey 08558	Montgomery Township Board of Education 1014 Route 601 Skillman, NJ 08558 (609)-466-7601	Mark Kramer 1014 Route 601 Skillman, NJ 08558 (609)-466-7601 X 7001 mkramer@mtsd.us

Property ID: 8871335

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
232.2 kBtu/ft²

Source EUI
358 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	14,715,904 (72%)
Electric - Grid (kBtu)	5,750,733 (28%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	90.5
National Median Source EUI (kBtu/ft²)	139.5
% Diff from National Median Source EUI	157%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	1,364

Signature & Stamp of Verifying Professional

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

LP Signature: _____Date: _____

Licensed Professional

Professional Engineer or Registered Architect Stamp (if applicable)

APPENDIX C: GLOSSARY

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

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

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