Local Government Energy Audit Report

Harry S. Truman Elementary School

February 8, 2019

Prepared for:

Sayreville Public Schools

1 Taft Place

Parlin, NJ 08859

Prepared by:

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Disclaimer

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

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

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

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

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

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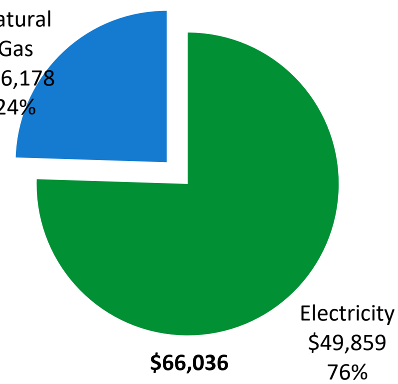
1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Harry S. Truman 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 Energy Services (TRC) conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $66,036 Electricity: 364,589 kWh Natural Gas: 17,710 Therms	
ENERGY STAR® Benchmarking Score	71 *(1-100 scale)*	Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance and lower your energy bills even more.

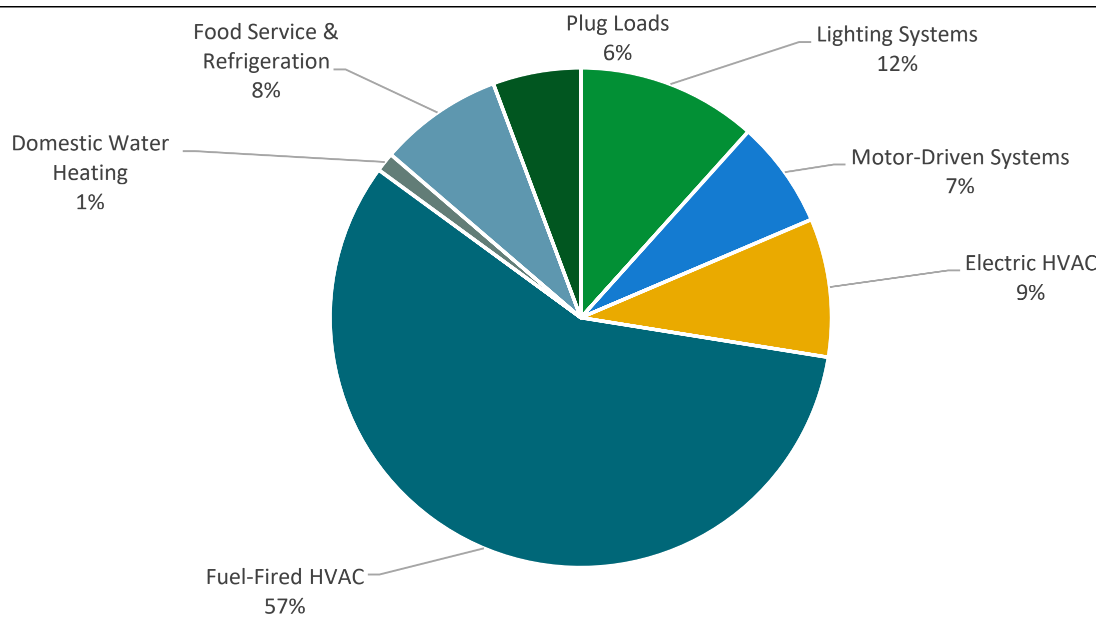


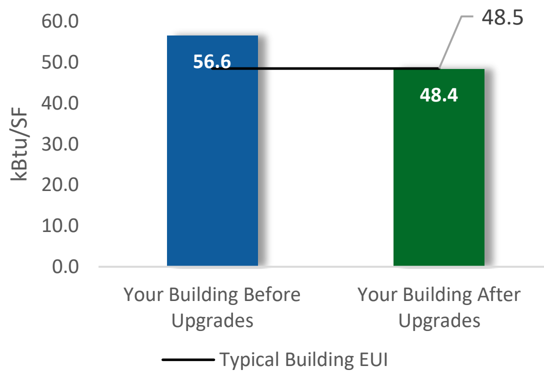
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

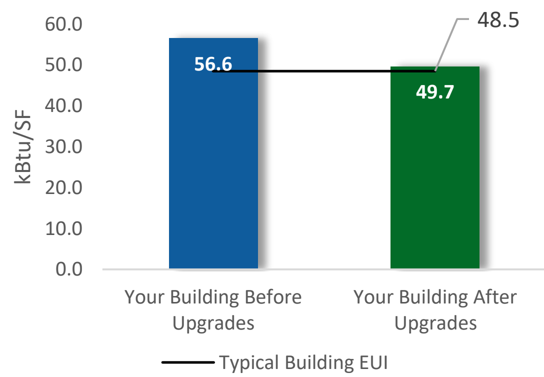
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$245,070
Potential Rebates & Incentives[1]	$27,409
Annual Cost Savings	$16,617
Annual Energy Savings	Electricity: 119,673 kWh Natural Gas: 275 Therms
Greenhouse Gas Emission Savings	62 Tons
Simple Payback	13.1 Years
Site Energy Savings (all utilities)	14%



Scenario 2: Cost Effective Package[2]

Installation Cost	$85,626
Potential Rebates & Incentives	$10,899
Annual Cost Savings	$13,937
Annual Energy Savings	Electricity: 100,078 kWh Natural Gas: 275 Therms
Greenhouse Gas Emission Savings	52 Tons
Simple Payback	5.4 Years
Site Energy Savings (all utilities)	12%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	Medium

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

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

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**64,385**	**17.6**	**-11**	**$8,709**	**$41,012**	**$7,699**	**$33,313**	**3.8**	**63,605**
ECM 1	Install LED Fixtures	25,251	4.4	-2	$3,432	$19,775	$2,215	$17,560	5.1	25,155
ECM 2	Retrofit Fixtures with LED Lamps	39,134	13.2	-8	$5,277	$21,237	$5,484	$15,753	3.0	38,450
Lighting Control Measures		**9,678**	**3.2**	**-2**	**$1,305**	**$14,004**	**$1,550**	**$12,454**	**9.5**	**9,508**
ECM 3	Install Occupancy Sensor Lighting Controls	7,804	2.7	-2	$1,052	$11,204	$1,550	$9,654	9.2	7,667
ECM 4	Install High/Low Lighting Controls	1,874	0.5	0	$253	$2,800	$0	$2,800	11.1	1,841
Motor Upgrades		**1,445**	**0.7**	**0**	**$198**	**$6,857**	**$0**	**$6,857**	**34.7**	**1,455**
ECM 5	Premium Efficiency Motors	1,445	0.7	0	$198	$6,857	$0	$6,857	34.7	1,455
Variable Frequency Drive (VFD) Measures		**22,230**	**9.5**	**0**	**$3,040**	**$22,106**	**$1,600**	**$20,506**	**6.7**	**22,385**
ECM 6	Install VFDs on Constant Volume (CV) Fans	8,678	5.7	0	$1,187	$10,360	$1,600	$8,760	7.4	8,739
ECM 7	Install VFDs on Chilled Water Pumps	8,131	2.8	0	$1,112	$5,194	$0	$5,194	4.7	8,188
ECM 8	Install VFDs on Heating Water Pumps	5,421	1.0	0	$741	$6,552	$0	$6,552	8.8	5,459
Electric Unitary HVAC Measures		**415**	**0.5**	**0**	**$57**	**$4,355**	**$0**	**$4,355**	**76.8**	**418**
	Install High Efficiency Air Conditioning Units	415	0.5	0	$57	$4,355	$0	$4,355	76.8	418
Electric Chiller Replacement		**18,198**	**27.4**	**0**	**$2,489**	**$153,573**	**$16,560**	**$137,013**	**55.1**	**18,325**
	Install High Efficiency Chillers	18,198	27.4	0	$2,489	$153,573	$16,560	$137,013	55.1	18,325
HVAC System Improvements		**728**	**0.0**	**17**	**$257**	**$1,359**	**$0**	**$1,359**	**5.3**	**2,750**
ECM 9	Implement Demand Control Ventilation (DCV)	728	0.0	17	$257	$1,359	$0	$1,359	5.3	2,750
Domestic Water Heating Upgrade		**0**	**0.0**	**23**	**$208**	**$57**	**$0**	**$57**	**0.3**	**2,667**
ECM 10	Install Low-Flow DHW Devices	0	0.0	23	$208	$57	$0	$57	0.3	2,667
Food Service & Refrigeration Measures		**2,595**	**0.3**	**0**	**$355**	**$1,747**	**$50**	**$1,697**	**4.8**	**2,613**
	Refrigerator/Freezer Case Electrically Commutated Motors	983	0.1	0	$134	$1,517	$0	$1,517	11.3	990
ECM 11	Vending Machine Control	1,612	0.2	0	$220	$230	$50	$180	0.8	1,623
TOTALS		**119,673**	**59.2**	**27**	**$16,617**	**$245,070**	**$27,459**	**$217,611**	**13.1**	**123,726**

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

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

Figure 2 – Evaluated Energy Improvements

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

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

Energy Conservation Measure		SmartStart	Direct Install	Pay For Performance
ECM 1	Install LED Fixtures	x	x	x
ECM 2	Retrofit Fixtures with LED Lamps	x	x	x
ECM 3	Install Occupancy Sensor Lighting Controls	x	x	x
ECM 4	Install High/Low Lighting Controls			x
ECM 5	Premium Efficiency Motors	x	x	x
ECM 6	Install VFDs on Constant Volume (CV) HVAC			x
ECM 7	Install VFDs on Chilled Water Pumps		x	x
ECM 8	Install VFDs on Hot Water Pumps		x	x
ECM 9	Implement Demand Control Ventilation		x	x
ECM 10	Install Low-Flow Domestic Hot Water Devices		x	x
ECM 11	Vending Machine Control	x	x	x

Figure 3 – Funding Options

New Jersey Clean Energy Programs At-A-Glance

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

Individual Measures with SmartStart

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

Turnkey Installation with Direct Install

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

Whole Building Approach with Pay for Performance

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

More Options from Around the State

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

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

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

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

Ongoing Electric Savings with Demand Response

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

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Harry S. Truman 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 August 28, 2018, TRC performed an energy audit at Harry S. Truman Elementary School located in Parlin, NJ. TRC met with Kenny to review the facility operations and help focus our investigation on specific energy-using systems.

Harry S. Truman Elementary School is a single-story, 53,275 square foot building built in 1971. Spaces include: classrooms, gymnasium/cafeteria, kitchen, media center, offices, corridors, stairwells and mechanical space. Interior lighting is primarily linear fluorescent T8 fixtures. Exterior lighting on the building are between 35-Watt and 400-Watt high pressure sodium lamp fixtures. Timeclocks are set for 7:00 PM – 7:00 AM. Parking lot lighting and basketball lighting is not on the main electric meter.

The building's HVAC control system is Johnson Controls energy management system (EMS), that schedules temperature set backs that are in place for both heating and cooling seasons. The building is 100% heated and 100% cooled. The hydronic heating system includes the use of high efficiency condensing hot water boilers. The chilled water system includes the use of a packaged chiller that is 15 years old and is the central cooling system which is original to the building. The HVAC system is a 2-pipe system. There is a total of five zones - gym/kitchen, office suite, A & B Wing, C Wing, D Wing & media center.

Recent improvements include: Over the last five years the facility has replaced a total of four unit ventilators.

Facility concerns include: Lighting is reported as under lit in some areas. Boilers are reported to be undersized which contributes to heating issues. Air conditioning equipment and systems are not very efficient. Unit ventilators are original to the building and not operating well.

2.2 Building Occupancy

The facility is occupied year-round, with peak occupancy from September through June. Peak occupancy includes about 510 students and 70 staff members. The building is used 10 months of the year with a gymnastics summer program. Summer occupancy includes a summer day camp and continuing maintenance and custodial activities. There are no weekend activities.

Building Name	Weekday/Weekend	Operating Schedule
Normal School Day	Weekday	7:00AM - 3:00PM
	Weekend	No Use
After Hours Cleaning	Weekday	3:00PM - 11:00PM
	Weekend	No Use

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block with a brick facade. The roof is flat and appears in fair condition. The walls are made of concrete masonry units (CMUs) with a brick veneer. Most of the windows are double pane, operable with clear glass, metal frames and internal shading. Exterior doors are mostly metal with metal frames. The window frames are in fair condition and exterior doors have worn or missing weather-stripping materials. There is evidence of excessive wear. Degraded window and door seals increase drafts and outside air infiltration.

Building façade

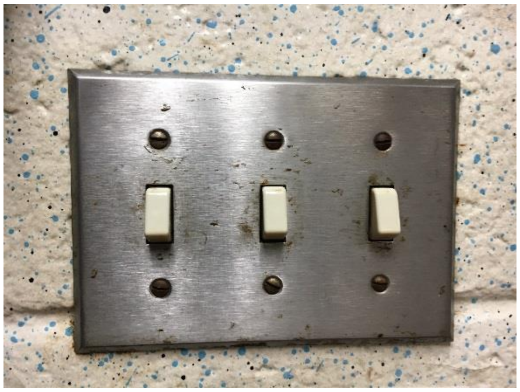
Exterior Door with worn weather-stripping

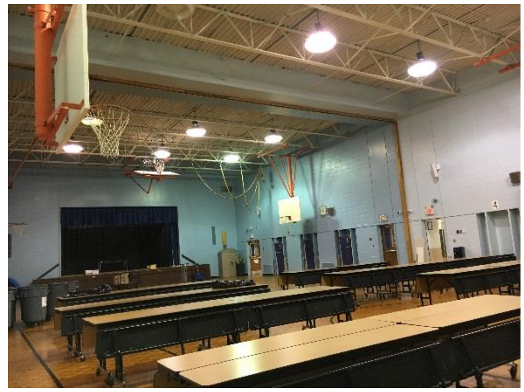
2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are some incandescent general purpose lamps. Fixture types include 2- 3- or 4-lamp, 2- or 4-foot long recessed troffer and surface mounted wrap fixtures. There are also 2-foot fixtures with U-bend T8 tube lamps. Most fixtures are in fair condition. Gymnasium fixtures have high bay, high intensity discharge (HID) lamps and are manually controlled. All exit signs are LED. Interior lighting levels were generally sufficient, with the exception of the gymnasium/cafeteria which is insufficiently lit. Lighting fixtures throughout the building are controlled by manual switches.

2-lamp 4-foot T8 fixtures

Recessed troffer fixtures





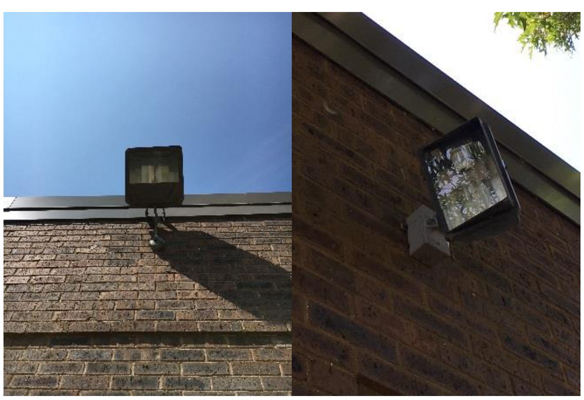
Manual wall switches

HID high bay fixtures

Exterior fixtures include wall-mounted flood lights, canopy lights and pole-mounted area lights. These HID fixtures include high pressure sodium lamps which range between 35-Watt and 400-Watt. Some of these fixture lenses are in poor condition. Exterior light fixtures are controlled by time clocks which are set for 7:00 PM to 7:00 AM operation.

Surface mounted HID Canopy fixture

Pole mounted HID Shoebox fixture



Wall mounted HID Flood fixtures

Timeclocks

2.5 Air Handling Systems

Unit Ventilators

The older unit ventilators have 1/6 HP supply fan motors. The newer unit ventilators have 1/4 HP supply fan motors. They have pneumatically controlled outside air dampers and zone valves that operate with a pneumatic control system. This system is original to the building and appears to be in poor operating condition. There are AHUs which have 5 HP or 10 HP supply fan motors and heating/cooling coil.

Original Unit Ventilator

AHU with Hot/Chilled Water Coil

Air Conditioners

There is an office and classroom that use window air conditioning (AC) units. These are about 2-tons in capacity, standard efficiency and in fair condition.

Window AC unit

2.6 Heating Hot Water System

The building's hydronic heating system consists of three Patterson Kelley (Model: N-700) 595 MBH, high efficiency condensing hot water boilers which serve the building heating load. The burners are fully modulating with a nominal efficiency of about 85%. The boilers are configured in an automated control scheme. These were installed in 2006 and are in good condition. The hydronic distribution system is a 2-pipe heating and cooling system.

Seasonal changeover begins when outdoor air temperature (OAT) is at or below 50°F for the heating season. The boilers are configured in a constant flow primary distribution with two 5 HP constant speed hot water pumps operating with a lead-lag control scheme. The boilers provide hot water to fin tube radiators, unit ventilators, fan coil units and AHUs throughout the building. The heating system is controlled by the EMS.

Condensing hot water boilers

Boiler nameplate

Hot water pumps and motors

Boiler vs. chiller control switch

2.7 Chilled Water Systems

A 180-ton, Carrier, R-22, air-cooled reciprocating liquid chiller is located on the roof. The chiller is 15 years old and in fair condition. The chiller is configured in a primary distribution loop with a constant flow primary pump. Chilled water is supplied by a dedicated 15 HP primary pump. The chilled water piping on the roof shows signs of deteriorated insulation at the bend. The cooling system is controlled by the EMS.

Chiller

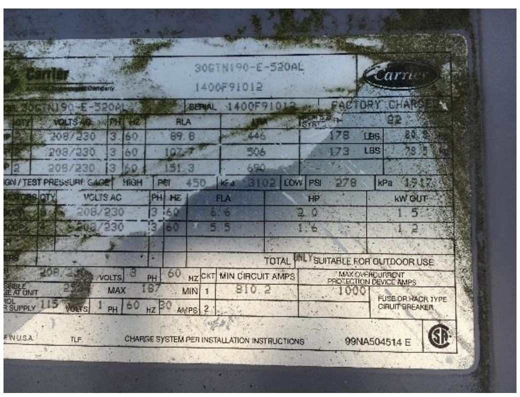
Performance data

ARI* STANDARD RATINGS — 60 Hz

UNIT 30GTN,GTR	CAPACITY		COMPRESSOR POWER INPUT (kW)	FAN POWER (kW)	COOLER WATER PRESSURE DROP		EER	COP	IPLV
	Tons	kW			ft water	kPa			
040	36.2	127.3	38.7	6.2	5.7	17.0	9.7	2.84	11.9
045	42.0	147.6	46.7	6.2	8.5	25.3	9.5	2.79	11.9
050	50.9	179.1	56.4	6.2	12.2	36.5	9.8	2.86	12.4
060	63.9	224.8	71.3	9.3	12.6	37.5	9.5	2.79	11.9
070	73.2	257.5	82.8	9.3	16.3	48.5	9.5	2.79	11.7
080	82.6	290.5	94.1	9.4	11.7	34.9	9.6	2.81	12.8
090	88.2	310.4	99.0	9.4	13.3	39.6	9.8	2.86	14.7
100	100.5	353.5	108.4	12.7	9.5	28.5	10.0	2.92	14.1
110	108.7	382.3	123.7	12.7	11.1	33.1	9.6	2.80	13.7
130	121.9	428.9	138.0	15.5	6.7	19.9	9.5	2.79	12.8
150	141.4	497.3	162.5	15.4	8.8	26.4	9.5	2.80	13.5
170	158.4	557.1	181.8	15.4	11.9	35.6	9.6	2.82	14.4
190	173.9	611.5	200.2	18.6	14.3	42.8	9.5	2.80	14.4
210	202.6	712.6	236.5	18.6	14.8	44.1	9.5	2.79	14.2
230	224.0	787.9	256.6	24.8	11.7	34.9	9.6	2.80	13.0
245	229.7	807.7	261.4	24.9	13.3	39.6	9.6	2.82	13.7
255	242.1	851.3	270.9	28.2	9.6	28.5	9.7	2.85	13.5
270	259.0	911.0	290.2	28.2	11.9	35.6	9.8	2.86	14.0
290	282.6	993.8	323.9	31.2	14.3	42.8	9.5	2.80	13.9
315	311.3	1094.9	360.2	31.2	14.8	44.1	9.5	2.80	13.8
330	316.8	1114.0	363.5	31.0	11.9	35.6	9.6	2.82	14.4
360	347.8	1223.0	400.4	37.1	14.3	42.8	9.5	2.80	14.4
390	376.8	1325.3	436.9	37.1	14.8	44.1	9.5	2.80	14.1
420	405.4	1425.7	473.1	37.1	14.8	44.2	9.5	2.79	14.2

See notes on page 55.

Performance data from specification sheet



Nameplate

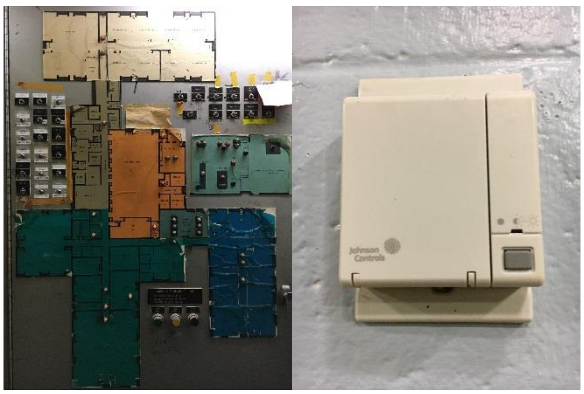
Chilled water piping in poor condition

2.8 Building Energy Management Systems (EMS)

A Johnson Controls Metasys system provides EMS controls for the HVAC equipment, the boiler(s), the chillers, the air handlers and unit ventilators. The EMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, humidity, heating water loop temperatures and chilled water loop temperatures.

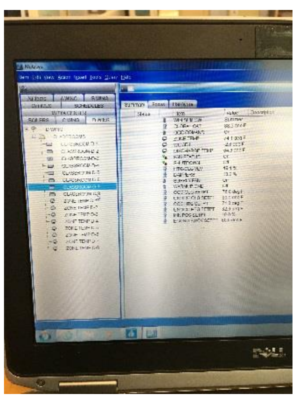
The classroom schedule is Monday through Friday between 5:00 AM and 5:00 PM. The media room and office schedule is Monday through Friday between 6:00 AM and 5:00 PM. The temperature set points and schedules vary depending on the area or zone. Temperature ranges are as follows.

- Occupied Cooling Temperature Set point is 69°F -76°F
- Unoccupied Cooling Temperature Set point is 80°F
- Occupied Heating Temperature Set point is 68°F -75°F
- Unoccupied Heating Temperature Set point is 62°F

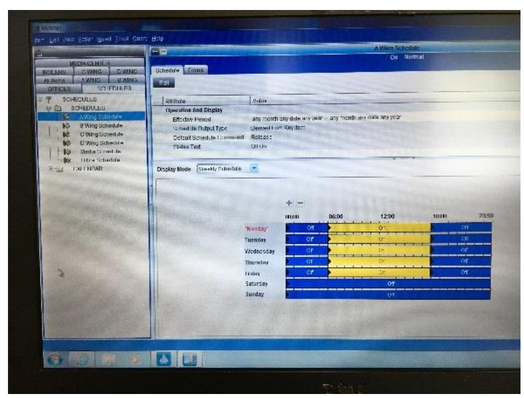


Zone layout and temperature sensor

EMS graphic interface



Boiler and chiller control interface



Classroom schedule

2.9 Domestic Hot Water

Hot water is produced with a 75-gallon Bradford White (Model: MI75S6BN) 76 MBH gas-fired storage tank water heater with an 80% efficiency. The water heater is in good condition and within its remaining useful life. A fractional HP circulation pump distribute water to end uses. These end uses include restroom and classroom hand washing sinks as well as the kitchen.

Storage Tank Water Heater

Classroom Sink

2.10 Food Service Equipment

The kitchen has all-electric equipment that is used to prepare lunches for students. Most cooking is done using a convection electric oven. Bulk prepared foods are held in several electric holding cabinets. Equipment is standard to high efficiency and is in good condition. The dishwasher is a high temperature, tank type unit.

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

Buffet table

Oven

Food service Equipment

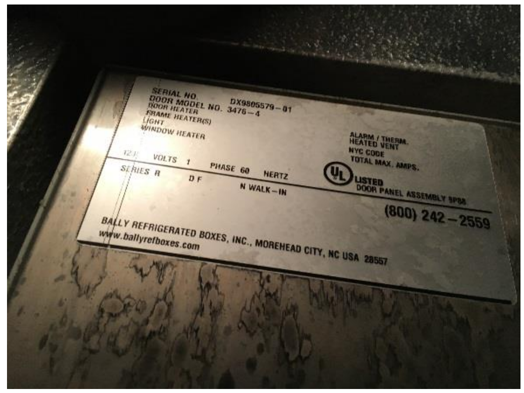
Dishwasher

2.11 Refrigeration

The kitchen has a walk-in cooler and a walk-in low temperature freezer. The indoor units are Bally units with 2 and 3 evaporator fans, respectively. The outdoor unit that serves them both is located on the roof of the building and has an estimated 3.5-ton compressor. There are evaporator fan controls and electric door defrost controls. Equipment is in good condition.

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

Walk-in freezer evaporator



Door heater nameplate

Walk-in cooler evaporator

Walk-in equipment compressors

2.12 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 5.68% percent of total building energy use. This is higher than a typical building. You may wish to consider paying particular attention to minimizing your plug load usage. This report makes suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 70 desktop computer work stations throughout the facility with about 480 laptops and other personal tablets. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as smart boards, projectors, and fans. There are several residential style refrigerators throughout the building. These vary in condition and efficiency. There is a refrigerated beverage vending machine in the faculty lounge which is not equipped with occupancy-based controls.

Laptop cart

Vending machine

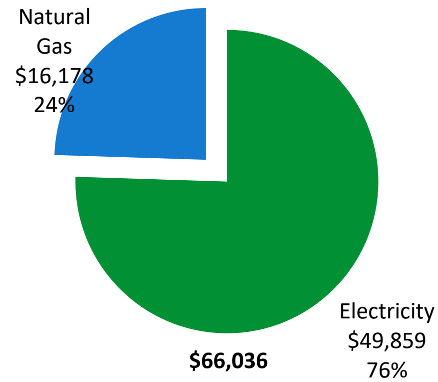
2.13 Water-Using Systems

There are restrooms with toilets, urinals, and sinks. Restroom faucet flow rates are at 0.5 gallons per minute (gpm) or higher. The classroom sinks are fitted with high flow 2.2 gpm aerators.

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	364,589 kWh	$49,859
Natural Gas	17,710 Therms	$16,178
Total		**$66,036**



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

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

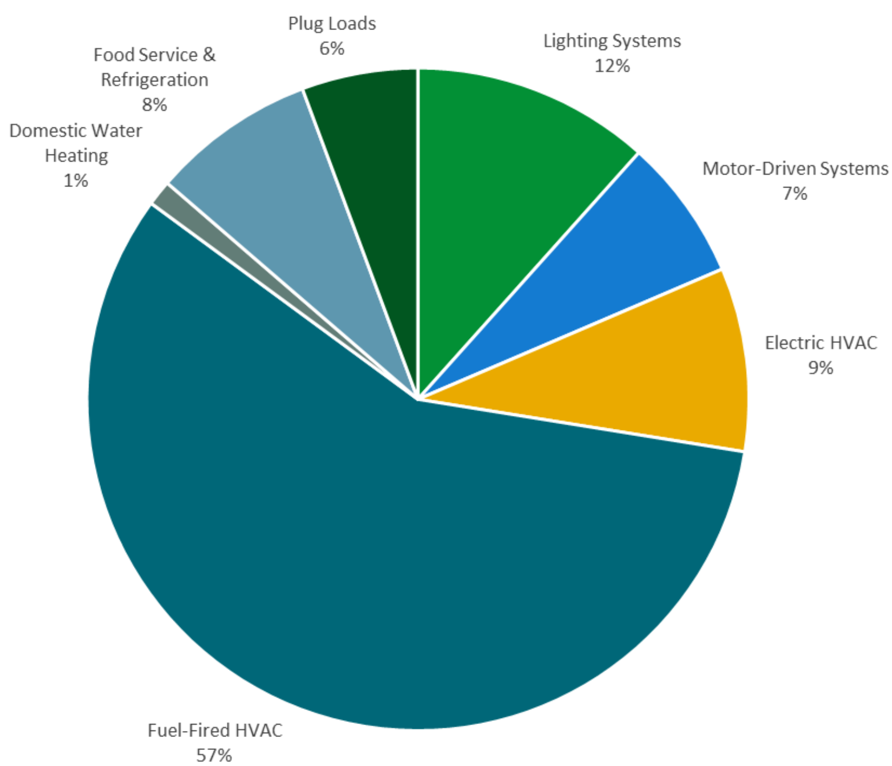
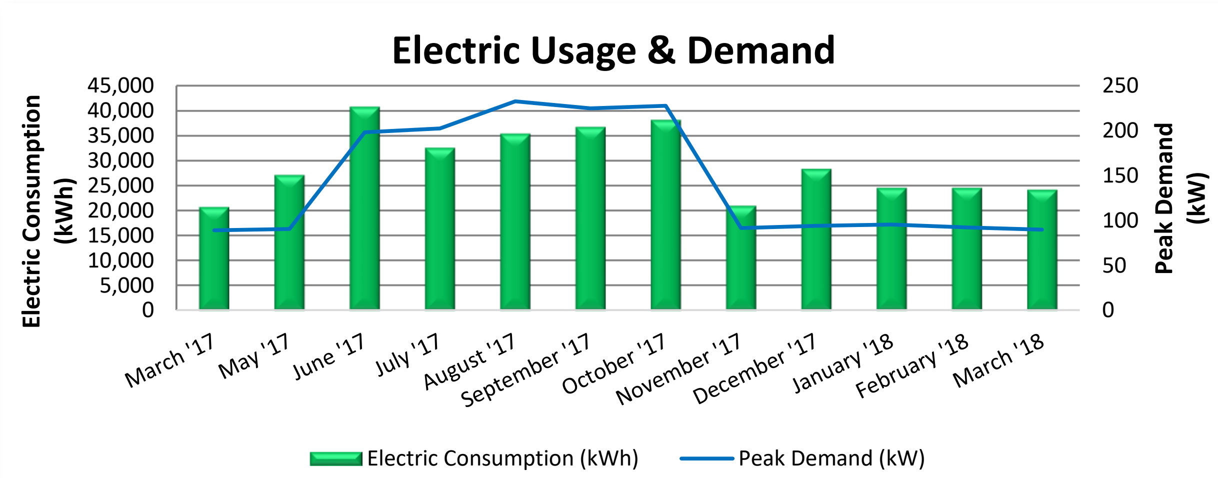


Figure 5 - Energy Balance

3.1 Electricity

JCP&L supplies and delivers electricity under rate class General Service Secondary 3 Phase.



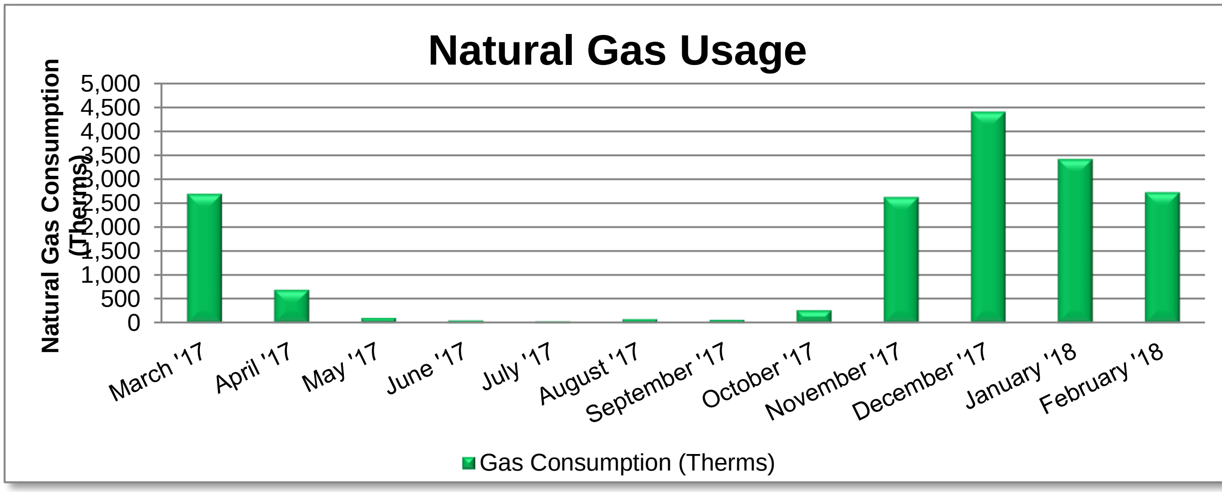
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
4/14/17	27	20,800	89	$738	$2,949
5/17/17	32	27,200	90	$736	$3,610
6/19/17	32	40,800	198	$1,336	$5,574
7/19/17	29	32,600	202	$1,366	$4,725
8/18/17	29	35,400	233	$1,580	$5,217
9/19/17	31	36,800	225	$1,525	$5,306
10/18/17	28	38,200	228	$1,442	$5,339
11/15/17	27	21,000	92	$717	$2,902
12/19/17	33	28,400	94	$717	$3,638
1/18/18	29	24,600	95	$714	$3,092
2/16/18	28	24,600	92	$715	$3,090
3/19/18	30	24,200	90	$715	$3,051
Totals	**355**	**354,600**	**233**	**$12,301**	**$48,493**
Annual	**365**	**364,589**	**233**	**$12,647**	**$49,859**

Notes:

- Peak demand of 233 kW occurred in June 2017.
- The average electric cost over the past 12 months was $0.137/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

PSE&G delivers natural gas under rate class LVG, with natural gas supply provided by Direct Energy, a third-party supplier.



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
4/6/17	29	2,697	$1,796
5/5/17	28	699	$547
6/6/17	31	111	$177
7/6/17	29	56	$143
8/4/17	28	37	$94
9/5/17	31	82	$207
10/4/17	28	68	$171
11/2/17	28	272	$432
12/5/17	32	2,636	$2,328
1/8/18	33	4,411	$3,938
2/5/18	27	3,424	$3,206
3/9/18	31	2,734	$2,695
Totals	**355**	**17,225**	**$15,735**
Annual	**365**	**17,710**	**$16,178**

Notes:

- The average gas cost for the past 12 months is $0.913/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) Portfolio Manager® software. Benchmarking compares your building's energy use to that of similar buildings across the 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	71

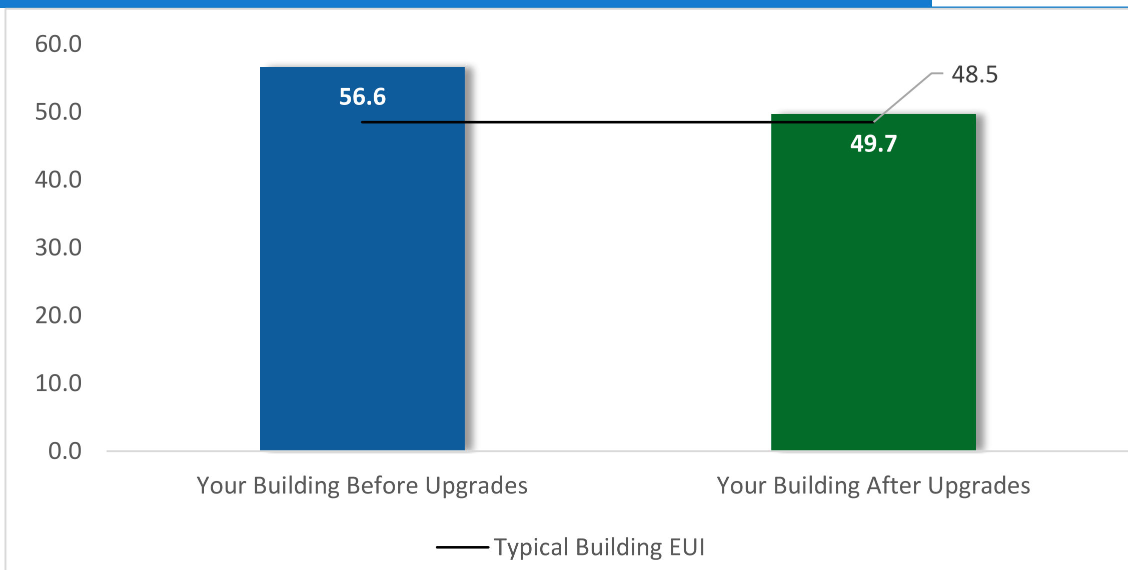


Figure 6 - Energy Use Intensity Comparison

Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance, and lower your energy bills even more.

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

Tracking Your Energy Performance

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

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

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

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

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

4 Energy Conservation Measures

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

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

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

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

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

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**64,385**	**17.6**	**-11**	**$8,709**	**$41,012**	**$7,699**	**$33,313**	**3.8**	**63,605**
ECM 1	Install LED Fixtures	25,251	4.4	-2	$3,432	$19,775	$2,215	$17,560	5.1	25,155
ECM 2	Retrofit Fixtures with LED Lamps	39,134	13.2	-8	$5,277	$21,237	$5,484	$15,753	3.0	38,450
Lighting Control Measures		**9,678**	**3.2**	**-2**	**$1,305**	**$14,004**	**$1,550**	**$12,454**	**9.5**	**9,508**
ECM 3	Install Occupancy Sensor Lighting Controls	7,804	2.7	-2	$1,052	$11,204	$1,550	$9,654	9.2	7,667
ECM 4	Install High/Low Lighting Controls	1,874	0.5	0	$253	$2,800	$0	$2,800	11.1	1,841
Motor Upgrades		**1,445**	**0.7**	**0**	**$198**	**$6,857**	**$0**	**$6,857**	**34.7**	**1,455**
ECM 5	Premium Efficiency Motors	1,445	0.7	0	$198	$6,857	$0	$6,857	34.7	1,455
Variable Frequency Drive (VFD) Measures		**22,230**	**9.5**	**0**	**$3,040**	**$22,106**	**$1,600**	**$20,506**	**6.7**	**22,385**
ECM 6	Install VFDs on Constant Volume (CV) Fans	8,678	5.7	0	$1,187	$10,360	$1,600	$8,760	7.4	8,739
ECM 7	Install VFDs on Chilled Water Pumps	8,131	2.8	0	$1,112	$5,194	$0	$5,194	4.7	8,188
ECM 8	Install VFDs on Heating Water Pumps	5,421	1.0	0	$741	$6,552	$0	$6,552	8.8	5,459
Electric Unitary HVAC Measures		**415**	**0.5**	**0**	**$57**	**$4,355**	**$0**	**$4,355**	**76.8**	**418**
	Install High Efficiency Air Conditioning Units	415	0.5	0	$57	$4,355	$0	$4,355	76.8	418
Electric Chiller Replacement		**18,198**	**27.4**	**0**	**$2,489**	**$153,573**	**$16,560**	**$137,013**	**55.1**	**18,325**
	Install High Efficiency Chillers	18,198	27.4	0	$2,489	$153,573	$16,560	$137,013	55.1	18,325
HVAC System Improvements		**728**	**0.0**	**17**	**$257**	**$1,359**	**$0**	**$1,359**	**5.3**	**2,750**
ECM 9	Implement Demand Control Ventilation (DCV)	728	0.0	17	$257	$1,359	$0	$1,359	5.3	2,750
Domestic Water Heating Upgrade		**0**	**0.0**	**23**	**$208**	**$57**	**$0**	**$57**	**0.3**	**2,667**
ECM 10	Install Low-Flow DHW Devices	0	0.0	23	$208	$57	$0	$57	0.3	2,667
Food Service & Refrigeration Measures		**2,595**	**0.3**	**0**	**$355**	**$1,747**	**$50**	**$1,697**	**4.8**	**2,613**
	Refrigerator/Freezer Case Electrically Commutated Motors	983	0.1	0	$134	$1,517	$0	$1,517	11.3	990
ECM 11	Vending Machine Control	1,612	0.2	0	$220	$230	$50	$180	0.8	1,623
	TOTALS	**119,673**	**59.2**	**27**	**$16,617**	**$245,070**	**$27,459**	**$217,611**	**13.1**	**123,726**

* - 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		**64,385**	**17.6**	**-11**	**$8,709**	**$41,012**	**$7,699**	**$33,313**	**3.8**	**63,605**
ECM 1	Install LED Fixtures	25,251	4.4	-2	$3,432	$19,775	$2,215	$17,560	5.1	25,155
ECM 2	Retrofit Fixtures with LED Lamps	39,134	13.2	-8	$5,277	$21,237	$5,484	$15,753	3.0	38,450
Lighting Control Measures		**9,678**	**3.2**	**-2**	**$1,305**	**$14,004**	**$1,550**	**$12,454**	**9.5**	**9,508**
ECM 3	Install Occupancy Sensor Lighting Controls	7,804	2.7	-2	$1,052	$11,204	$1,550	$9,654	9.2	7,667
ECM 4	Install High/Low Lighting Controls	1,874	0.5	0	$253	$2,800	$0	$2,800	11.1	1,841
Motor Upgrades		**1,445**	**0.7**	**0**	**$198**	**$6,857**	**$0**	**$6,857**	**34.7**	**1,455**
ECM 5	Premium Efficiency Motors	1,445	0.7	0	$198	$6,857	$0	$6,857	34.7	1,455
Variable Frequency Drive (VFD) Measures		**22,230**	**9.5**	**0**	**$3,040**	**$22,106**	**$1,600**	**$20,506**	**6.7**	**22,385**
ECM 6	Install VFDs on Constant Volume (CV) Fans	8,678	5.7	0	$1,187	$10,360	$1,600	$8,760	7.4	8,739
ECM 7	Install VFDs on Chilled Water Pumps	8,131	2.8	0	$1,112	$5,194	$0	$5,194	4.7	8,188
ECM 8	Install VFDs on Heating Water Pumps	5,421	1.0	0	$741	$6,552	$0	$6,552	8.8	5,459
HVAC System Improvements		**728**	**0.0**	**17**	**$257**	**$1,359**	**$0**	**$1,359**	**5.3**	**2,750**
ECM 9	Implement Demand Control Ventilation (DCV)	728	0.0	17	$257	$1,359	$0	$1,359	5.3	2,750
Domestic Water Heating Upgrade		**0**	**0.0**	**23**	**$208**	**$57**	**$0**	**$57**	**0.3**	**2,667**
ECM 10	Install Low-Flow DHW Devices	0	0.0	23	$208	$57	$0	$57	0.3	2,667
Food Service & Refrigeration Measures		**1,612**	**0.2**	**0**	**$220**	**$230**	**$50**	**$180**	**0.8**	**1,623**
ECM 11	Vending Machine Control	1,612	0.2	0	$220	$230	$50	$180	0.8	1,623
TOTALS		**100,078**	**31.1**	**27**	**$13,937**	**$85,626**	**$10,899**	**$74,727**	**5.4**	**103,994**

* - 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		**64,385**	**17.6**	**-11**	**$8,709**	**$41,012**	**$7,699**	**$33,313**	**3.8**	**63,605**
ECM 1	Install LED Fixtures	25,251	4.4	-2	$3,432	$19,775	$2,215	$17,560	5.1	25,155
ECM 2	Retrofit Fixtures with LED Lamps	39,134	13.2	-8	$5,277	$21,237	$5,484	$15,753	3.0	38,450

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 includes the gymnasium/cafeteria high bay fixtures and the exterior 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: gymnasium/cafeteria, exterior fixtures

Considerations/Sensitivities: light level in the gymnasium/cafeteria was under lit.

The gymnasium/cafeteria light level was read as 15-20 footcandles (FC). The minimum light levels required for elementary school gymnasium and lunch room by IES standards is 30 FC and 15 FC, respectively. However, additional considerations must be investigated during design to ensure proper light levels by proposed new LED fixtures. Increasing the light output would require a level of design, beyond the scope of this energy audit, to determine the feasibility. We recommend that this be investigated further by an electrical contractor if lighting upgrades move forward to implementation.

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

Considerations/Sensitivities: light levels were over lit in some classrooms. Over lit classrooms have 2-lamp fixtures and have bi-level switching. With both lamps lit, the classroom light level was read as 45 FC. The minimum light levels required for classroom space by IES standards is 30 FC. However, additional considerations must be investigated during design to determine the cost effectiveness of reducing the number of lamps. Reducing the light output would require a level of design, beyond the scope of this energy audit, to determine the feasibility. Options may include upgrading to 1-LED lamp fixtures, 2x4 LED retrofit kits, changing the number of fixtures, etc. The options range too much to provide an analysis and cost would vary drastically on the proposed approach. We recommend that this be investigated further by an electrical contractor if lighting upgrades move forward to implementation.

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		**9,678**	**3.2**	**-2**	**$1,305**	**$14,004**	**$1,550**	**$12,454**	**9.5**	**9,508**
ECM 3	Install Occupancy Sensor Lighting Controls	7,804	2.7	-2	$1,052	$11,204	$1,550	$9,654	9.2	7,667
ECM 4	Install High/Low Lighting Controls	1,874	0.5	0	$253	$2,800	$0	$2,800	11.1	1,841

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

ECM 3: Install Occupancy Sensor Lighting Controls

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

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

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

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

Affected building areas: offices, classrooms, gymnasium/cafeteria and media center

ECM 4: Install High/Low Lighting Controls

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

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low level after a predefined period of vacancy. This measure provides energy savings by reducing the light fixture power draw when reduced light output is appropriate.

Affected building areas: hallways

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

4.3 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**1,445**	**0.7**	**0**	**$198**	**$6,857**	**$0**	**$6,857**	**34.7**	**1,455**
ECM 5	Premium Efficiency Motors	1,445	0.7	0	$198	$6,857	$0	$6,857	34.7	1,455

ECM 5: Premium Efficiency Motors

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

Affected motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor
Boiler Room	Hot Water Supply	1	Heating Hot Water Pump	5.0
Boiler Room	Hot Water Supply	1	Heating Hot Water Pump	5.0
Boiler Room	Chilled Water Supply	1	Chilled Water Pump	15.0
Boiler Room	AHU	1	Supply Fan	10.0
Boiler Room	AHU	2	Supply Fan	5.0

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

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**22,230**	**9.5**	**0**	**$3,040**	**$22,106**	**$1,600**	**$20,506**	**6.7**	**22,385**
ECM 6	Install VFDs on Constant Volume (CV) Fans	8,678	5.7	0	$1,187	$10,360	$1,600	$8,760	7.4	8,739
ECM 7	Install VFDs on Chilled Water Pumps	8,131	2.8	0	$1,112	$5,194	$0	$5,194	4.7	8,188
ECM 8	Install VFDs on Heating Water Pumps	5,421	1.0	0	$741	$6,552	$0	$6,552	8.8	5,459

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

ECM 6: Install VFDs on Constant Volume (CV) Fans

Install VFDs to control constant volume fan motor speeds. This converts a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one. Zone thermostats signal the VFD to adjust fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings result from reducing the fan speed (and power) when conditions allow for reduced air flow.

This measure is part of a measure to replace motors and as such must be considered in combination with ECM 5: Premium Efficiency Motors.

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

ECM 7: Install VFDs on Chilled Water Pumps

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

For systems with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping off will need to be determined during the final project design. The control system should be programmed to maintain the minimum flow through the chiller and to prevent pump cavitation.

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

This measure is part of a measure to replace motors and as such must be considered in combination with ECM 5: Premium Efficiency Motors.

Considerations/Sensitives: The CHW pump distributes water to the fan coil units and the AHUs in the building. There may be a significant number of 3-way valves that need to be converted as part of this measure. There are additional considerations which must be investigated to determine the cost effectiveness of converting from constant flow to variable flow. This depth of analysis is beyond the scope of this audit. We recommend that this be investigated further by an electrical contractor if variable frequency drive installations move forward to implementation.

ECM 8: Install VFDs on Heating Water Pumps

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

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

This measure is part of a measure to replace motors and as such must be considered in combination with ECM 5: Premium Efficiency Motors.

4.5 Electric Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**415**	**0.5**	**0**	**$57**	**$4,355**	**$0**	**$4,355**	**76.8**	**418**
	Install High Efficiency Air Conditioning Units	415	0.5	0	$57	$4,355	$0	$4,355	76.8	418

Replacing the unitary HVAC units has a long payback period and may not be justifiable based simply on energy considerations. However, most of the units at this facility are nearing or have reached the end of their normal useful life. Typically, the marginal cost of purchasing a high efficiency unit can be justified by the marginal savings from the improved efficiency. When the AC units are eventually replaced, consider ENERGY STAR® rated units.

Install High Efficiency Air Conditioning Units

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

Reasons for not Recommending as a High Priority Measure: The projected payback period for this measure based on the energy savings exceeds the expected useful life of the replacement equipment. The upgrade to high efficiency is not justified by energy savings alone.

Considerations: If the school district moves forward toward implementation of a comprehensive project under the ESIP, we would recommend including this measure.

4.6 Electric Chillers

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Chiller Replacement		**18,198**	**27.4**	**0**	**$2,489**	**$153,573**	**$16,560**	**$137,013**	**55.1**	**18,325**
	Install High Efficiency Chillers	18,198	27.4	0	$2,489	$153,573	$16,560	$137,013	55.1	18,325

Install High Efficiency Chillers

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

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

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

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

Reasons for not Recommending as a High Priority Measure: Replacing the chiller has a long payback based on energy savings and may not be justifiable based simply on energy considerations. However, the chiller is nearing the end of its normal useful life. Typically, the marginal cost of purchasing a high efficiency chiller can be justified by the marginal savings from the improved efficiency. When the chiller is eventually replaced, consider purchasing equipment that exceed the minimum efficiency required by building codes.

Considerations: If the school district moves forward toward implementation of a comprehensive project under the ESIP, we would recommend including this measure.

4.7 HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**728**	**0.0**	**17**	**$257**	**$1,359**	**$0**	**$1,359**	**5.3**	**2,750**
ECM 9	Implement Demand Control Ventilation (DCV)	728	0.0	17	$257	$1,359	$0	$1,359	5.3	2,750

ECM 9: Implement Demand Control Ventilation (DCV)

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

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

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

Affected building areas: gymnasium/cafeteria

4.8 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**23**	**$208**	**$57**	**$0**	**$57**	**0.3**	**2,667**
ECM 10	Install Low-Flow DHW Devices	0	0.0	23	$208	$57	$0	$57	0.3	2,667

ECM 10: Install Low-Flow DHW Devices

Install low-flow devices to reduce overall hot water demand. The faucet aerators (lavatory) rated at 0.5 gpm are low flow devices that are recommended to reduce hot water usage. 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: all faucets within facility

4.9 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**2,595**	**0.3**	**0**	**$355**	**$1,747**	**$0**	**$1,747**	**4.9**	**2,613**
	Refrigerator/Freezer Case Electrically Commutated Motors	983	0.1	0	$134	$1,517	$0	$1,517	11.3	990
ECM 11	Vending Machine Control	1,612	0.2	0	$220	$230	$50	$180	0.8	1,623

Refrigerator/Freezer Case Electrically Commutated Motors

Replace shaded pole or permanent split capacitor (PSC) motors with electronically commutated (EC) motors in the walk-in cooler and freezer. Fractional horsepower EC motors are significantly more efficient than mechanically commutated, brushed motors, particularly at low speeds or partial load. By using variable-speed technology, EC motors can optimize fan usage. 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.

Reasons for not Recommending as a High Priority Measure: This measure has an unattractive payback and cannot be justified based on energy savings alone.

Considerations: If the school district moves forward toward implementation of a comprehensive project under the ESIP, we would recommend including this measure.

ECM 11: 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.

5 ENERGY EFFICIENT BEST PRACTICES

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs. You may already be doing some of these things— see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR® Portfolio Manager®

You've heard it before - you can't manage what you don't measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions.[4] Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Weatherization

Caulk or weather strip leaky doors and windows to reduce drafts and loss of heated or cooled air. Sealing cracks and openings can reduce heating and cooling costs, improve building durability, and create a healthier indoor environment.

Doors and Windows

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

Window Treatments/Coverings

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

Lighting 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.

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

Motor Maintenance

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

Fans to Reduce Cooling Load

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

Destratification Fans

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

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

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.

Chiller Maintenance

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

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Duct Sealing

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

Boiler Maintenance

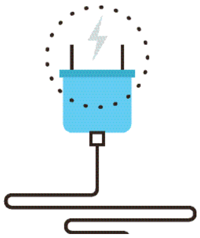
Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is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

Water Heater Maintenance

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

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

Plug Load Controls



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

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 gallons per flush (gpf) and for flush valve toilets is 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

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

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

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

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

[5] For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

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

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

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 reduction, which results in improved electric grid reliability through better use of transmission and distribution systems.

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

6.1 Solar Photovoltaic

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

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

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

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

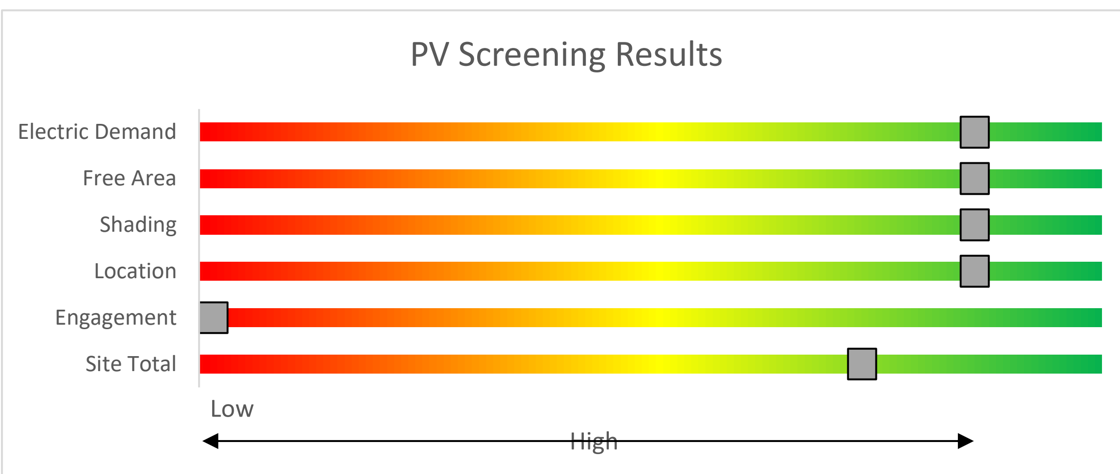


Figure 9 - Photovoltaic Screening

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

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

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

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

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

6.2 Combined Heat and Power

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

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

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

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has **medium** potential for installing a cost-effective CHP system.

The magnitude, type, and duration of the thermal demand, the coincident electric load, and the ease of interconnection contribute to the potential for CHP at the site. Based on the amount of hot water used throughout the year and the concurrent electric demand a Microturbine may be feasible. If you are interested in pursuing combined heat and power, we recommend performing a detailed feasibility study, which will provide a thorough understanding of the costs and savings associated with this technology.

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.

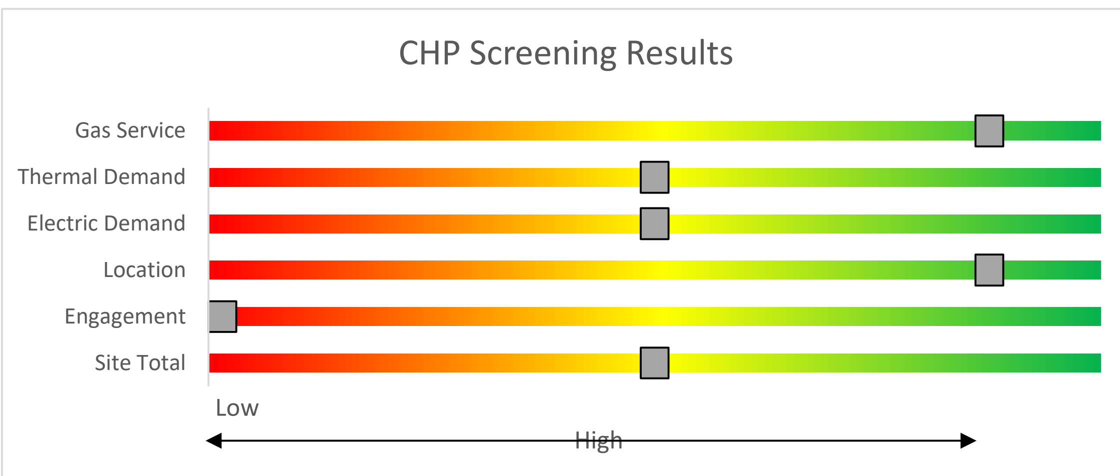


Figure 10 - Combined Heat and Power Screening

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

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

7.1 SmartStart

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

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

Equipment with Prescriptive Incentives Currently Available:

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

Incentives

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

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

How to Participate

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

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

7.2 Direct Install

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

Incentives

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

How to Participate

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

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

7.3 Pay for Performance - Existing Buildings

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

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

Incentives

Incentives are based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.15/square foot is also available to offset the cost of developing the Energy Reduction Plan (ERP) (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 ERP, 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% (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.](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[8].

8.2 Retail Natural Gas Supply Options

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

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

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

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

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	16	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	8,760	2	Relamp	No	16	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	8,760	0.2	2,698	-1	$364	$292	$80	0.6
Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.1	256	0	$34	$146	$40	3.1
Gym/Café	12	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	2,640	1, 3	Fixture Replacement	Yes	12	LED - Fixtures: High-Bay	Occupancy Sensor	139	1,822	3.1	12,618	-3	$1,701	$11,939	$2,220	5.7
Kitchen Hallway	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,640	2	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,640	0.0	39	0	$5	$16	$3	2.5
Kitchen	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.2	639	0	$86	$365	$100	3.1
Walk in Coolers	2	Incandescent: Screw in Lamp	Wall Switch	S	100	1,760	2	Relamp	No	2	LED Screw-In Lamps: Screw in Lamp	Wall Switch	15	1,760	0.1	329	0	$44	$34	$2	0.7
Pantry	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,760	2	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,760	0.0	102	0	$14	$55	$15	2.9
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,760	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,760	0.0	34	0	$5	$18	$5	2.9
Stage	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.1	319	0	$43	$183	$50	3.1
Stage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	64	0	$9	$37	$10	3.1
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,640	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.0	96	0	$13	$37	$10	2.1
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,640	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.0	192	0	$26	$73	$20	2.1
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,760	2	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,760	0.0	34	0	$5	$18	$5	2.9
Garage	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,760	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,760	0.0	68	0	$9	$37	$10	2.9
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,640	2, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,822	0.1	366	0	$49	$310	$30	5.7
Hallway	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,640	2, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,822	0.4	1,463	0	$197	$838	$120	3.6
Media Center D13	32	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	32	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	1.0	2,601	-1	$351	$1,708	$390	3.8
Media Center D13	13	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,760	2, 3	Relamp	Yes	13	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,214	0.2	535	0	$72	$693	$113	8.0
Copy Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	128	0	$17	$73	$20	3.1
Copy Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,760	2	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,760	0.1	136	0	$18	$73	$20	2.9
Classroom D1	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	732	0	$99	$599	$125	4.8
Classroom D1	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,214	0.0	41	0	$6	$33	$6	4.8
Classroom D2	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	732	0	$99	$599	$125	4.8
Classroom D2	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,214	0.0	41	0	$6	$33	$6	4.8
Classroom D3	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	732	0	$99	$599	$125	4.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom D3	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,214	0.0	41	0	$6	$33	$6	4.8
Classroom D4	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	732	0	$99	$599	$125	4.8
Classroom D4	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,214	0.0	41	0	$6	$33	$6	4.8
Classroom D5	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	732	0	$99	$599	$125	4.8
Classroom D5	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,214	0.0	41	0	$6	$33	$6	4.8
Classroom D6	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	732	0	$99	$599	$125	4.8
Classroom D6	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,214	0.0	41	0	$6	$33	$6	4.8
Classroom D7	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	732	0	$99	$599	$125	4.8
Classroom D7	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,214	0.0	41	0	$6	$33	$6	4.8
Classroom D8	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	732	0	$99	$599	$125	4.8
Classroom D8	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,214	0.0	41	0	$6	$33	$6	4.8
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,640	2, 4	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,822	0.4	1,585	0	$214	$875	$130	3.5
Hallway	3	Incandescent: Screw in Lamp	Wall Switch	S	100	2,640	2	Relamp	No	3	LED Screw-In Lamps: Screw in Lamp	Wall Switch	15	2,640	0.2	741	0	$100	$52	$3	0.5
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	1,760	2	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,760	0.0	26	0	$4	$16	$3	3.8
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	128	0	$17	$73	$20	3.1
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	1,760	2	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,760	0.0	26	0	$4	$16	$3	3.8
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	128	0	$17	$73	$20	3.1
Work Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	128	0	$17	$73	$20	3.1
Conference Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.2	406	0	$55	$299	$70	4.2
Faculty Hallway	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	1,760	2	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,760	0.0	26	0	$4	$16	$3	3.8
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	1,760	2	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,760	0.0	26	0	$4	$16	$3	3.8
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	1,760	2	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,760	0.0	26	0	$4	$16	$3	3.8
Faculty Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.1	325	0	$44	$262	$60	4.6
Nurse's Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	128	0	$17	$73	$20	3.1
Nurse's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.1	256	0	$34	$146	$40	3.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Copy Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	128	0	$17	$73	$20	3.1
Copy Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	64	0	$9	$37	$10	3.1
Copy Room	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	1,760	2	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,760	0.0	26	0	$4	$16	$3	3.8
Main Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.1	325	0	$44	$262	$60	4.6
Principal's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.1	325	0	$44	$262	$60	4.6
Entrance Lobby	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,214	0.4	976	0	$132	$838	$120	5.5
Hallway	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,214	0.2	406	0	$55	$383	$50	6.1
Group Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	128	0	$17	$73	$20	3.1
Group Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	128	0	$17	$73	$20	3.1
Group Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	64	0	$9	$37	$10	3.1
Group Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	64	0	$9	$37	$10	3.1
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,640	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,822	0.1	488	0	$66	$346	$40	4.7
Hallway	5	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,640	2, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	1,822	0.1	309	0	$42	$363	$30	8.0
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,640	2, 4	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,822	0.0	122	0	$16	$37	$10	1.6
Hallway	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,640	2, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,822	0.4	1,463	0	$197	$838	$120	3.6
Hallway	6	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,640	2, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	1,822	0.1	371	0	$50	$395	$36	7.2
Classroom B1	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.2	569	0	$77	$526	$105	5.5
Classroom B1	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,214	0.0	76	0	$10	$72	$10	6.1
Classroom B1	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	1,760	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.1	137	0	$18	$98	$18	4.3
Classroom B3	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.2	569	0	$77	$526	$105	5.5
Classroom B3	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,214	0.0	76	0	$10	$72	$10	6.1
Classroom B3	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	1,760	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.1	137	0	$18	$98	$18	4.3
Classroom B2	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	813	0	$110	$635	$135	4.6
Classroom B2	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,214	0.0	76	0	$10	$72	$10	6.1
Classroom B2	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	1,760	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.1	137	0	$18	$98	$18	4.3

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom B4	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	813	0	$110	$635	$135	4.6
Classroom B4	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,214	0.0	76	0	$10	$72	$10	6.1
Classroom B4	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	1,760	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.1	137	0	$18	$98	$18	4.3
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	1,760	2	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,760	0.0	26	0	$4	$16	$3	3.8
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	128	0	$17	$73	$20	3.1
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	1,760	2	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,760	0.0	26	0	$4	$16	$3	3.8
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	128	0	$17	$73	$20	3.1
Copy Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.0	64	0	$9	$37	$10	3.1
Music Room	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	732	0	$99	$599	$125	4.8
Art Room	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.5	1,219	0	$164	$818	$185	3.8
Classroom	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.2	488	0	$66	$489	$95	6.0
Classroom	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	732	0	$99	$599	$125	4.8
Classroom A5	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	O	62	1,214	2	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.1	264	0	$36	$219	$60	4.5
Classroom A5	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	O	62	1,214	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,214	0.0	39	0	$5	$72	$10	12.0
Classroom A5	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Occupancy Sensor	O	53	1,214	2	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.0	73	0	$10	$98	$18	8.0
Classroom A6	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	O	62	1,214	2	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.1	264	0	$36	$219	$60	4.5
Classroom A6	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	O	62	1,214	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,214	0.0	39	0	$5	$72	$10	12.0
Classroom A6	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Occupancy Sensor	O	53	1,214	2	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.0	73	0	$10	$98	$18	8.0
Classroom A7	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	1,760	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.2	650	0	$88	$562	$115	5.1
Classroom A7	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	O	62	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,214	0.0	76	0	$10	$72	$10	6.1
Classroom A7	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	O	53	1,760	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.1	137	0	$18	$98	$18	4.3
Classroom A8	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	1,760	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.2	650	0	$88	$562	$115	5.1
Classroom A8	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	O	62	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,214	0.0	76	0	$10	$72	$10	6.1
Classroom A8	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	O	53	1,760	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.1	137	0	$18	$98	$18	4.3
Classroom A9	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	O	62	1,214	2	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.2	397	0	$53	$329	$90	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
Classroom A9	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	O	62	1,214	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,214	0.0	39	0	$5	$72	$10	12.0
Classroom A9	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Occupancy Sensor	O	53	1,214	2	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.0	73	0	$10	$98	$18	8.0
Classroom A10	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	O	62	1,214	2	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.2	397	0	$53	$329	$90	4.5
Classroom A10	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	O	62	1,214	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,214	0.0	39	0	$5	$72	$10	12.0
Classroom A10	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Occupancy Sensor	O	53	1,214	2	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.0	73	0	$10	$98	$18	8.0
Faculty Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.1	244	0	$33	$380	$65	9.6
Classroom 3C7	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.4	976	0	$132	$708	$155	4.2
Classroom 2C8	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.4	976	0	$132	$708	$155	4.2
Classroom C-1	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	894	0	$121	$672	$145	4.4
Classroom C-2	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.3	894	0	$121	$672	$145	4.4
Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,640	2, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,822	0.3	1,097	0	$148	$529	$90	3.0
Classroom C-3	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.6	1,545	0	$208	$964	$225	3.5
Classroom C-3	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	1,760	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.1	137	0	$18	$98	$18	4.3
Classroom C-4	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.5	1,463	0	$197	$927	$215	3.6
Classroom C-4	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.0	69	0	$9	$49	$9	4.3
Classroom C-5	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.4	1,138	0	$153	$781	$175	4.0
Classroom C-5	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.0	69	0	$9	$49	$9	4.3
Classroom C-6	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,760	2, 3	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,214	0.5	1,463	0	$197	$927	$215	3.6
Classroom C-6	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	1,760	2, 3	Relamp	Yes	1	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	1,214	0.0	69	0	$9	$49	$9	4.3
Transition Spaces	20	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	20	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Exterior	30	High-Pressure Sodium: (1) 35W Lamp	Timeclock	S	46	4,380	1	Fixture Replacement	No	30	LED - Fixtures: Other	Timeclock	14	4,380	0.5	4,231	0	$579	$5,962	$150	10.0
Exterior	5	High-Pressure Sodium: (1) 70W Lamp	Timeclock	S	95	4,380	1	Fixture Replacement	No	5	LED - Fixtures: Other	Timeclock	29	4,380	0.2	1,456	0	$199	$994	$25	4.9
Exterior	5	High-Pressure Sodium: (1) 150W Lamp	Timeclock	S	188	4,380	1	Fixture Replacement	No	5	LED - Fixtures: Other	Timeclock	56	4,380	0.3	2,882	0	$394	$994	$25	2.5
Exterior	3	High-Pressure Sodium: (1) 250W Lamp	Timeclock	S	295	4,380	1	Fixture Replacement	No	3	LED - Fixtures: Other	Timeclock	89	4,380	0.3	2,713	0	$371	$596	$15	1.6
Exterior	2	High-Pressure Sodium: (1) 400W Lamp	Timeclock	S	465	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	140	4,380	0.3	2,851	0	$390	$1,932	$200	4.4

Motor Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions: Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	Proposed Conditions: ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Energy Impact & Financial Analysis: 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	Hot Water Supply	1	Heating Hot Water Pump	5.0	87.5%	No	W	1,696	5, 8	Yes	89.5%	Yes	1	0.5	2,819	0	$386	$4,076	$0	10.6
Boiler Room	Hot Water Supply	1	Heating Hot Water Pump	5.0	87.5%	No	W	1,696	5, 8	Yes	89.5%	Yes	1	0.5	2,819	0	$386	$4,076	$0	10.6
Boiler Room	Boiler Burners	3	Other	0.3	63.0%	No	W	1,696		No	63.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Circ Pumps	3	Boiler Feed Water Pump	1.0	85.5%	No	W	1,696		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Chilled Water Supply	1	Chilled Water Pump	15.0	87.5%	No	W	1,696	5, 7	Yes	93.0%	Yes	1	3.2	8,997	0	$1,230	$7,041	$0	5.7
Boiler Room	AHU	1	Supply Fan	10.0	89.5%	No	W	1,373	5, 6	Yes	91.7%	Yes	1	3.0	4,475	0	$612	$5,375	$800	7.5
Boiler Room	AHU	2	Supply Fan	5.0	87.5%	No	W	1,373	5, 6	Yes	89.5%	Yes	2	3.0	4,565	0	$624	$8,394	$800	12.2
Classrooms & Offices	Fan Coil Units	36	Supply Fan	0.3	74.0%	No	W	1,373		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Classrooms & Offices	New Unit Ventilators	4	Supply Fan	0.3	74.0%	No	W	1,373		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Classrooms & Offices	Old Unit Ventilators	6	Supply Fan	0.2	63.0%	No	B	1,373		No	63.0%	No		0.0	0	0	$0	$0	$0	0.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classrooms & Offices	Classrooms & Offices	2	Window AC	2.00		B	NR	Yes	2	Window AC	2.00		12.00		0.5	415	0	$57	$4,355	$0	76.8

Electric Chiller Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Remaining Useful Life	ECM #	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Chilled Water System	1	Air-Cooled Reciprocating Chiller	180.00	W	NR	Yes	1	Air-Cooled Centrifugal Chiller	Variable	180.00	1.24	0.73	27.4	18,198	0	$2,489	$153,573	$16,560	55.1

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	Hydronic Heating	1	Condensing Hot Water Boiler	595.00	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler Room	Hydronic Heating	1	Condensing Hot Water Boiler	595.00	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler Room	Hydronic Heating	1	Condensing Hot Water Boiler	595.00	W		No						0.0	0	0	$0	$0	$0	0.0

Demand Control Ventilation Recommendations

		Recommendation Inputs					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Number of Zones	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
AHU	Gym/Café	9	1.00	36.00		357.00	0.0	728	17	$257	$1,359	$0	5.3

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	Domestic Hot Water	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classrooms	10	8	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	23	$208	$57	$0	0.3

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions				Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	ECM #	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Cooler (35F to 55F)	NR	Yes	No	No	0.0	393	0	$54	$607	$0	11.3
Kitchen	1	Low Temp Freezer (-35F to -5F)	NR	Yes	No	No	0.1	590	0	$81	$910	$0	11.3

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	Electric Combination Oven/Steam Cooker (<15 Pans)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Electric Convection Oven (Full Size)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (1/2 Size)	Yes		No	0.0	0	0	$0	$0	$0	0.0

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Single Tank Conveyor (High Temp)	Natural Gas	Electric	No		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

Location	Existing Conditions			
	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Harry Truman School	70	Desktop Computer	120.0	
Harry Truman School	480	Laptops	90.0	
Harry Truman School	35	Fan	100.0	
Harry Truman School	38	TV	150.0	
Harry Truman School	32	Smart Board / Projector	300.0	
Harry Truman School	4	Small Office Printers	50.0	
Harry Truman School	3	Large Xerox- Type Printers	515.0	
Harry Truman School	3	Coffee Maker	400.0	
Harry Truman School	3	Microwave	1,100.0	
Harry Truman School	3	Residential Refrigerator	690.0	
Harry Truman School	3	Mini Fridge	260.0	
Harry Truman School	2	Water Dispenser	300.0	
Harry Truman School	3	Large Floor Fans	185.0	
Harry Truman School	1	Electric Stove	1,500.0	
Harry Truman School	4	Speakers	100.0	
Harry Truman School	1	Misc. Equipment	3,500.0	
Harry Truman School	1	Misc. IT Equipment	4,500.0	

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Faculty Lounge	1	Refrigerated	11	Yes	0.2	1,612	0	$220	$230	$50	0.8

Appendix B: ENERGY STAR® Statement of Energy Performance

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

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR® Score[1]

Harry S. Truman School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 53,275
Built: 1973

For Year Ending: February 28, 2018
Date Generated: October 02, 2018

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address
Harry S. Truman School
1 Taft Place
Parlin, New Jersey 08859

Property Owner
Sayreville Board of Education
3198 Washington Rd
Sayreville, NJ 08871
(___)____-______

Primary Contact
Erin Hill
3198 Washington Rd
Sayreville, NJ 08871
732-525-5204
Erin.Hill@sayrevillek12.net

Property ID: 6563194

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
54.7 kBtu/ft²

Source EUI
97.1 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	1,707,792 (59%)
Electric - Grid (kBtu)	1,207,291 (41%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	68.8
National Median Source EUI (kBtu/ft²)	122.1
% Diff from National Median Source EUI	-20%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	213

Signature & Stamp of Verifying Professional

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

Signature: ______________________ Date: ___________

Licensed Professional

____ ________

,

(____)____-______

____

Professional Engineer Stamp
(if applicable)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate financial savings. 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	A British thermal unit is the amount of heat required to increase the temperature of one pound water by one-degree Fahrenheit. Commonly used to measure natural gas consumption.
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.
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 energy management systems.
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
HVAC	Heating, ventilation, and air conditioning.
kW	Kilowatt. Equal to 1,000 Watts.
Load	The total amount of power used by a building system 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.
MMBtu	One million British thermal units.
psig	Pounds per square inch.
Plug Load	Refers to the amount of energy used in a space by products that are powered by means of an ordinary AC plug.
Simple Payback	The amount of time needed to recoup the funds expended in an investment, or to reach the break-even point.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
Turnkey	Provision of a complete product or service that is ready for immediate use
Watt (W)	Unit of power commonly used to measure electricity use.