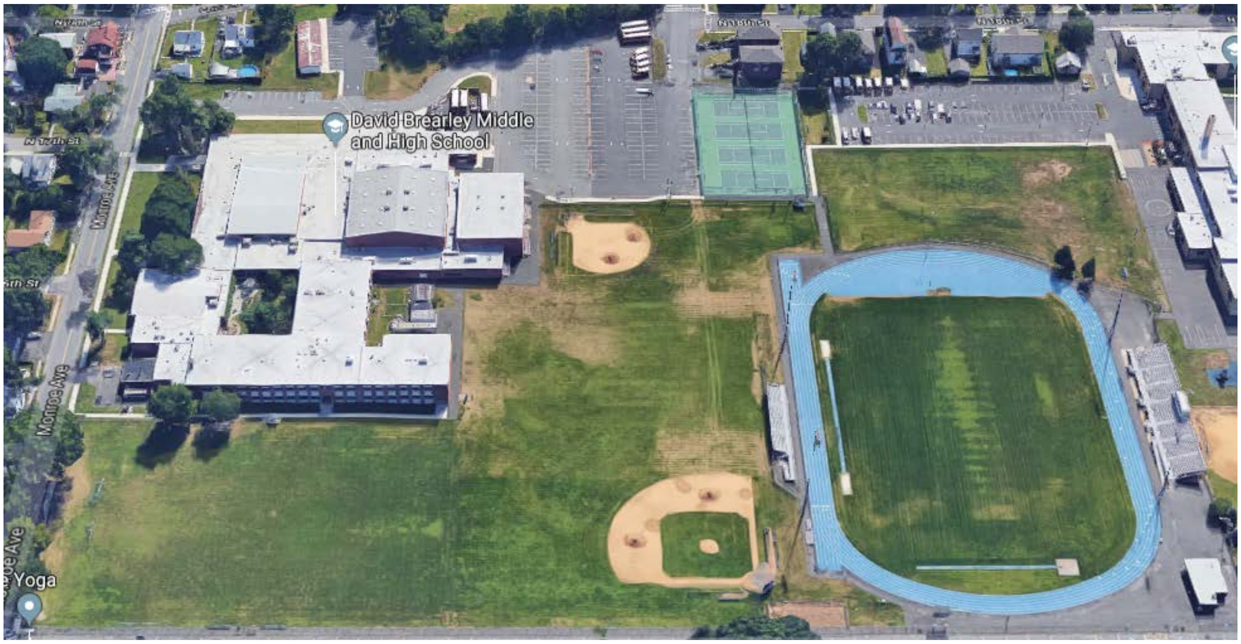

Local Government Energy Audit Report

David Brearley Middle/High School

August 15, 2019

Prepared for:
Kenilworth Board of Education
401 Monroe Avenue
Kenilworth, NJ 07033

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Disclaimer

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

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

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

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

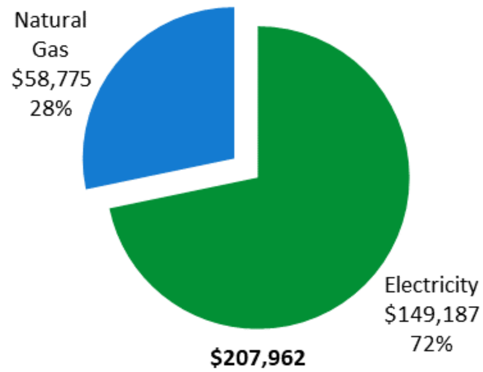
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

Table of Contents

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for David Brearley Middle/High 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 to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $207,962 Electricity: 1,150,102 kWh Natural Gas: 74,315 Therms	
ENERGY STAR® Benchmarking Score	57 *(1-100 scale)*	This building performs approximately at the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

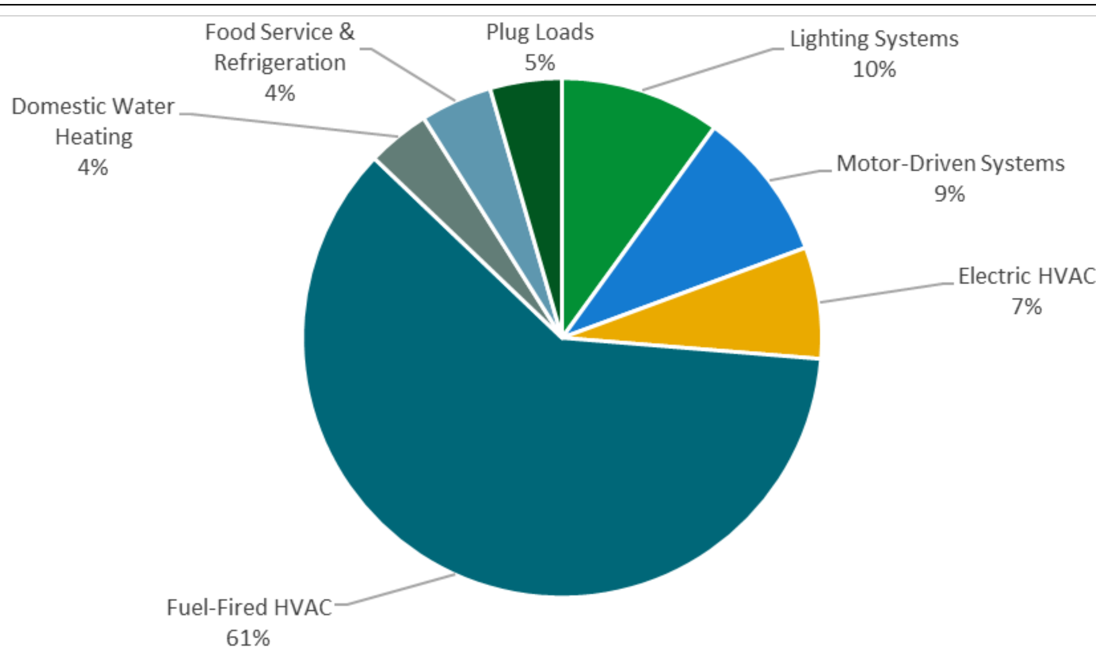


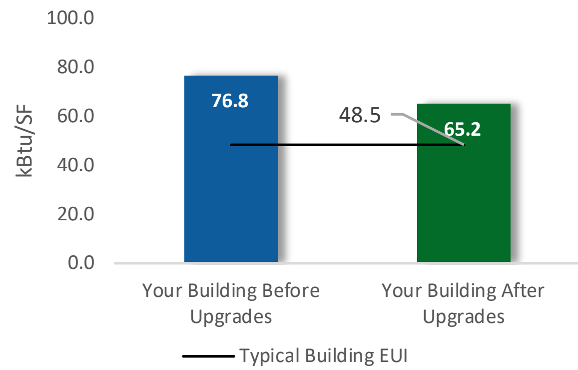
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

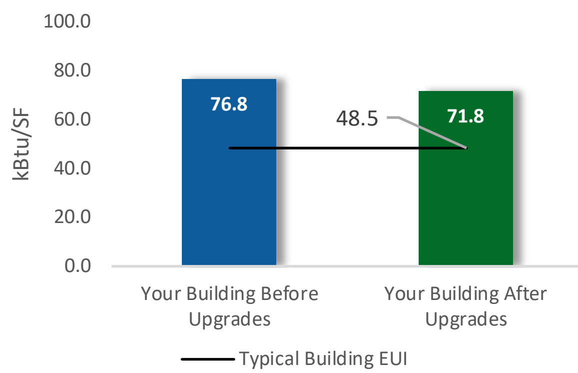
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$672,146
Potential Rebates & Incentives[1]	$49,594
Annual Cost Savings	$53,759
Annual Energy Savings	Electricity: 391,263 kWh Natural Gas: 3,800 Therms
Greenhouse Gas Emission Savings	219 Tons
Simple Payback	11.6 Years
Site Energy Savings (all utilities)	15%



Scenario 2: Cost Effective Package[2]

Installation Cost	$118,260
Potential Rebates & Incentives	$18,832
Annual Cost Savings	$31,912
Annual Energy Savings	Electricity: 254,414 kWh
Greenhouse Gas Emission Savings	120 Tons
Simple Payback	3.1 Years
Site Energy Savings (all utilities)	6%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	None

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

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

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Lifetime Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**160,770**	**51.0**	**-33**	**$20,592**	**$308,876**	**$72,097**	**$15,587**	**$56,510**	**2.7**	**158,003**
ECM 1	Install LED Fixtures	2,777	1.8	-1	$356	$5,334	$4,098	$135	$3,963	11.1	2,728
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,012	2.2	0	$130	$1,945	$3,077	$520	$2,557	19.7	995
ECM 3	Retrofit Fixtures with LED Lamps	156,981	47.0	-32	$20,106	$301,596	$64,922	$14,932	$49,990	2.5	154,280
Lighting Control Measures		**11,287**	**2.3**	**-2**	**$1,445**	**$11,563**	**$15,082**	**$670**	**$14,412**	**10.0**	**11,089**
ECM 4	Install Occupancy Sensor Lighting Controls	3,969	1.1	-1	$508	$4,066	$6,982	$670	$6,312	12.4	3,900
ECM 5	Install High/Low Lighting Controls	7,318	1.2	-2	$937	$7,497	$8,100	$0	$8,100	8.6	7,190
Motor Upgrades		**392**	**0.1**	**0**	**$51**	**$763**	**$1,547**	**$0**	**$1,547**	**30.4**	**395**
ECM 6	Premium Efficiency Motors	392	0.1	0	$51	$763	$1,547	$0	$1,547	30.4	395
Variable Frequency Drive (VFD) Measures		**119,359**	**27.5**	**0**	**$15,483**	**$232,243**	**$125,515**	**$6,320**	**$119,195**	**7.7**	**120,193**
ECM 7	Install VFDs on Constant Volume (CV) Fans	86,188	23.4	0	$11,180	$167,700	$109,390	$6,320	$103,070	9.2	86,791
ECM 8	Install VFDs on Chilled Water Pumps	11,057	1.9	0	$1,434	$21,514	$5,375	$0	$5,375	3.7	11,134
ECM 9	Install VFDs on Heating Water Pumps	22,114	2.1	0	$2,869	$43,028	$10,750	$0	$10,750	3.7	22,269
Electric Unitary HVAC Measures		**7,518**	**8.1**	**0**	**$975**	**$14,629**	**$44,802**	**$4,002**	**$40,800**	**41.8**	**7,571**
ECM 10	Install High Efficiency Air Conditioning Units	7,518	8.1	0	$975	$14,629	$44,802	$4,002	$40,800	41.8	7,571
Electric Chiller Replacement		**15,935**	**17.8**	**0**	**$2,067**	**$41,340**	**$145,041**	**$15,640**	**$129,401**	**62.6**	**16,046**
ECM 11	Install High Efficiency Chillers	15,935	17.8	0	$2,067	$41,340	$145,041	$15,640	$129,401	62.6	16,046
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**177**	**$1,398**	**$27,955**	**$31,240**	**$4,800**	**$26,440**	**18.9**	**20,693**
ECM 12	Install High Efficiency Furnaces	0	0.0	177	$1,398	$27,955	$31,240	$4,800	$26,440	18.9	20,693
Domestic Water Heating Upgrade		**36,000**	**10.8**	**-102**	**$3,861**	**$57,019**	**$9,632**	**$2,125**	**$7,507**	**1.9**	**24,282**
ECM 13	Install Gas-Fired Booster Water Heater	36,000	10.8	-125	$3,681	$55,218	$9,288	$2,125	$7,163	1.9	21,616
ECM 14	Install Low-Flow DHW Devices	0	0.0	23	$180	$1,801	$344	$0	$344	1.9	2,667
Food Service & Refrigeration Measures		**13,186**	**1.2**	**0**	**$1,710**	**$22,129**	**$5,325**	**$450**	**$4,875**	**2.8**	**13,278**
ECM 15	Refrigerator/Freezer Case Electrically Commutated Motors	4,915	0.6	0	$638	$9,563	$1,517	$200	$1,317	2.1	4,949
ECM 16	Refrigeration Controls	5,047	0.2	0	$655	$10,475	$3,348	$150	$3,198	4.9	5,082
ECM 17	Vending Machine Control	3,224	0.4	0	$418	$2,091	$460	$100	$360	0.9	3,246
Custom Measures		**26,817**	**0.0**	**341**	**$6,176**	**$92,642**	**$221,865**	**$0**	**$221,865**	**35.9**	**66,940**
ECM 18	Installation of an Energy Management System	26,817	0.0	341	$6,176	$92,641.81	$221,865	$0	$221,865	35.9	66,940
TOTALS (COST EFFECTIVE MEASURES)		**254,414**	**69.4**	**-138**	**$31,912**	**$464,130**	**$118,260**	**$18,832**	**$99,428**	**3.1**	**240,055**
TOTALS (ALL MEASURES)		**391,263**	**118.8**	**380**	**$53,759**	**$809,158**	**$672,146**	**$49,594**	**$622,552**	**11.6**	**438,491**

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

Figure 2 – Evaluated Energy Improvements

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

1.1 Planning Your Project

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

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

Pick Your Installation Approach

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

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

Energy Conservation Measure		SmartStart	Direct Install	Pay For Performance
ECM 1	Install LED Fixtures	x		
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x		
ECM 3	Retrofit Fixtures with LED Lamps	x		
ECM 4	Install Occupancy Sensor Lighting Controls	x		
ECM 5	Install High/Low Lighting Controls			
ECM 6	Premium Efficiency Motors			
ECM 7	Install VFDs on Constant Volume (CV) HVAC	x		
ECM 8	Install VFDs on Chilled Water Pumps	x		
ECM 9	Install VFDs on Hot Water Pumps			
ECM 10	Install High Efficiency Electric AC	x		
ECM 11	Install High Efficiency Chillers	x		
ECM 12	Install High Efficiency Furnaces	x		
ECM 13	Install Gas-Fired Booster Water Heater	x		
ECM 14	Install Low-Flow Domestic Hot Water Devices			
ECM 15	Installation of an Energy Management System	x		
ECM 16	Refrigeration Controls	x		
ECM 17	Vending Machine Control	x		
ECM 18	Installation of an Energy Management System			

Figure 3 – Funding Options

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

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

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

Individual Measures with SmartStart

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

Turnkey Installation with Direct Install

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

Whole Building Approach with Pay for Performance

Pay for Performance can be a good option for medium to large sized facilities to achieve deep energy savings. Pay for Performance allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program (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 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 David Brearley Middle/High 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 May 7, 2019, TRC performed an energy audit at David Brearley Middle/High School located in Kenilworth, New Jersey. TRC met with Christopher Caponegro to review the facility operations and help focus our investigation on specific energy-using systems.

David Brearley Middle/High School is a 2-story, 147,910 square foot building built in 1966. Spaces include: classrooms, media center, gymnasium, auxiliary gymnasium, locker rooms, weight room, auditorium, offices, cafeteria, kitchen, corridors, stairwells and mechanical space. The building is 100% heated and cooled. The school building has an electric meter and two gas meters. The school is part of a larger complex and includes athletic fields, a snack stand, and an ancillary classroom building known as the "TC building."

The exterior lighting throughout the facility, including the parking lot lighting, are on two electric meters. One meter is located at the school and the other one is located at the TC building. The athletic field has stadium lighting which operate for six evening football games a year. There is a dedicated electric meter for this lighting load located at the snack stand. The snack stand is located at the corner of the football field and is only in operation six nights during the football season. The building is unconditioned and has both an electric meter and gas meter. The TC building is a trailer structure and includes storage and classroom space. This building is not used much. There is only an electric meter for this building.

Over the last five years the facility has replaced the auditorium lamps with dimmable LED lamps, installed LED low bay fixtures on the stage to eliminate the use of the incandescent lamp track lighting, and installed ambient 2x2 recessed troffer fixtures in restrooms.

The primary concern at the facility is the functionality and sustainability of the existing building energy management system (EMS). Facility staff reported that the EMS is in poor condition and does not effectively provide temperature setbacks. The control boards are said to be out of date with parts no longer available and apparently not upgradable. Replacing the existing EMS is of great interest to the facility. Another concern of the facility staff is the age of HVAC equipment. The majority of HVAC equipment is over 20 years old and there is an interest for replacing major mechanical equipment and lighting fixture retrofits.

2.2 Building Occupancy

The facility is occupied year-round. The main school year is from September through June with a summer camp program from July to August. Typical weekday occupancy is approximately 100 staff and 735 students. The building is occupied after hours for continuing custodial and maintenance activities. There are sports team practices on Saturdays throughout the year. There are a few times a year where the auditorium is rented out to community dance companies which utilize the space on Saturday evenings.

Building Name	Weekday/Weekend	Operating Schedule
Student School Day	Weekday	8:00 AM - 3:00 PM
	Weekend	No Use
Staff School Day	Weekday	7:00 AM - 5:00 PM
	Weekend	No Use
Custodial Staff Day	Weekday	7:00 AM - 11:30 PM
	Weekend	No Use
Sports Team Practice	Weekday	No Use
	Weekend (Saturday)	8:00 AM - 3:00 PM
Summer School	Weekday	8:00 AM - 12:00 PM
	Weekend	No Use

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are made of concrete masonry units (CMUs) with a brick facade. The roof is flat, covered with stones, and in fair. Most of the windows are double pane and operable with metal frames. The glass-to-frame seals and operable window weather seals are in good condition. Exterior doors are metal with metal frames and have undamaged door seals.

Building Facade

Building Facade

The snack stand is a small brick building located at the corner of the football field and is only in operation approximately six nights during the football season. The snack stand building has sectional steel roll up walls and metal doors. There are no windows.

Snack Stand

The TC building is a trailer structure made mostly of metal with a pitched roof and appears to have limited insulation. The doors are metal with metal frames. The windows are located on the back side of the building, are single pane, and operable with metal frames. The building envelope is in fair condition.

TC Building

TC Building

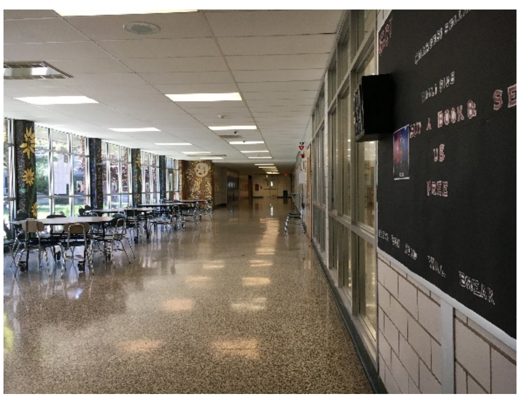
2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also several 40-Watt T12 fixtures. The media center, a computer lab, office space, and two restrooms were recently upgraded with linear fluorescent fixtures with 28-Watt T5 lamps. Additionally, there are some compact fluorescent lamps (CFL), incandescent, and LED general purpose lamps. There are still some halogen incandescent lamps in the auditorium area. Typically, T8 and T5 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts. Most fixtures are recessed troffers or wrap fixtures and are in fair condition. Gymnasium fixtures have linear fluorescent T5 high output lamps and are controlled by fixture mounted occupancy sensors. All exit signs throughout the building are LED.

Interior lighting levels were generally sufficient. Most light fixtures are controlled by occupancy sensors, such as in the offices, classrooms, cafeteria, media center, gymnasiums, and in some restrooms. The remainder of light fixtures are manually controlled via wall switches.

Linear Fluorescent T8 Recessed Troffer Fixtures

Linear Fluorescent T8 Pendant Mounted Continuous Row Wrap Fixtures



Linear Fluorescent T8 Recessed Troffer Fixtures

Recessed Can Fixtures with LED lamps in Auditorium

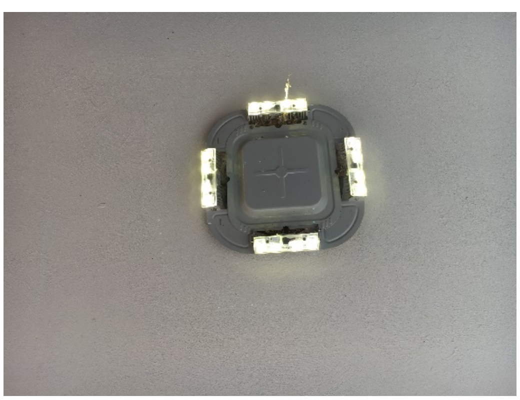
Linear Fluorescent T5HO lamp Fixtures in Gym

Key Switch

Occupancy Sensors

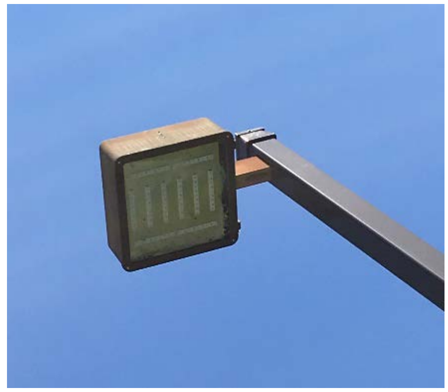
Wall Switches

Exterior fixtures include surface mounted under canopy fixtures, wall pack fixtures and pole mounted area light fixtures. All are LED technology. They are controlled by a timeclock.



LED Surface Mounted Under Canopy Fixture

Timeclock



LED Wall Pack Fixtures

Pole Mounted Area Light Fixture Retrofitted to LED

The athletic field is illuminated with pole mounted metal halide lamp stadium lights. These operate for approximately six evening football games a year. Although they are equipped with high wattage lamps, they have a low energy use is due to the limited annual run hours. While there are LED stadium light fixtures on the market today, costs to install cannot currently be justified by the potential utility cost reduction.

Stadium Lighting

Stadium Lighting

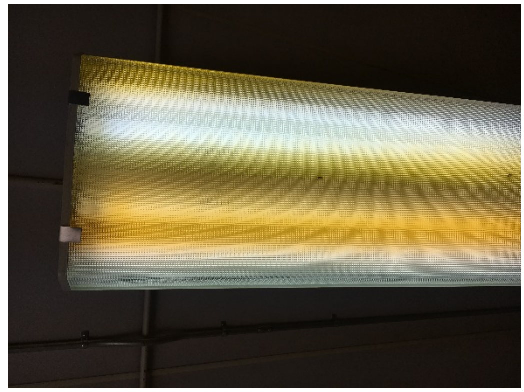
The snack stand is lit by linear fluorescent T8 wrap fixtures which are manually controlled by wall switches. The exterior of the stand is lit by halogen incandescent lamp flood and recessed can fixtures.

Snack Stand Exterior Lighting

Snack Stand Interior Lighting

The TC building is lit by linear fluorescent T8 and T12 wrap fixtures which are manually controlled by wall switches. The exterior of the TC building is lit by halogen incandescent flood lamps and compact fluorescent lamp wall pack fixtures.

TC Building Interior Lighting



TC Building Interior Lighting

2.5 Air Handling Systems

Unit Ventilators

Most classrooms and offices are conditioned by unit ventilators that supply heating and cooling to the zones. These unit ventilators have supply fan motors, outside air dampers, and 3-way valves on the heating hot water and chilled water coils. Facility staff reported that the control board on unit ventilators are out of date and no longer upgradeable. Therefore, over nights and weekends, the valves open to 100% unoccupied mode and the boiler will cycle on and off for freezer protection during the colder seasons.

Large Classroom Unit Ventilator

Small Classroom Unit Ventilator

Heating-Ventilation Units

The gymnasium, auxiliary gym, and kitchen area are conditioned by heating-ventilation units. They are gas fired units, are standard efficiency, and have supply fan motors. They are controlled by the building energy management system (EMS).

HV Unit in Auxiliary Gym

Air Handling Units

The hallways and locker room areas are conditioned by make-up air units. These are gas fired. The other large areas are conditioned by air handling units (AHUs) and have a supply fan motor, a hot water coil, and a direct expansion (DX) outdoor condensing unit. These AHUs are summarized in the table that follows.

Make Up Air Units

Make Up Air Units

Unit	Area Served	Heating Capacity (Mbh)	Heating Mode Efficiency (%)	Cooling Capacity of Outdoor Condensing Unit (Tons)	Estimated Cooling Mode Efficiency (EER)
MUAs	Hallways	160 Mbh	80%	4.5	10.0
MUAs	Locker Room Areas	121-283 Mbh	80.7%	4.5	10.0
AHU-1	Guidance Office			4	9.0
AHU-2	Drama Area Hallway			7.5	11.3
AHU-3	Vocal Music Offices			10	10.3
AHU-4	Band Room			8.5	10.3
AHU-5 & 6	Auditorium	Fed by Boilers		35	10.0
AHU-7	Library			20	10.0
AHU-8 & 9	Cafeteria			20	10.0
AHU-10	Teacher's Lounge			6	11.0

Air Handling Unit (AHU)

Outdoor Condensing Unit

Air Conditioners

There are several split AC systems throughout the building. These serve offices, the board room, summer classroom unit ventilators, and a server room. These range between1.5 and 4.0 tons in cooling efficiency. The older units are beyond their useful life, in poor condition, and of standard efficiency. The newer units are in good condition and are high efficiency.

Outdoor Condensing Units

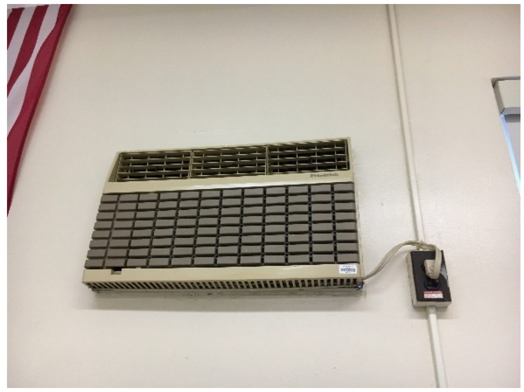
Outdoor Condensing Units

Outdoor Condensing Unit

Outdoor Condensing Unit

The school is conditioned during the normal school year by the chilled water system, however, during the summer this system is disabled and unitary air conditioning (AC) equipment and systems are used as needed based on occupancy. These units vary in capacity between 0.8 and 2.0 tons, and range in condition and efficiency.

Window AC Unit



Window AC Unit

Electric HVAC

The TC Building is cooled by packaged terminal air conditioning (PTAC) units and heated by electric baseboard radiators. This equipment is in fair condition and standard efficiency. They are estimated to be 2 tons in cooling capacity and rated for 10 EER. The baseboard units are assumed to have a 24 Mbh heating capacity. These are manually turned on and off as needed. The TC Building has low operating hours and therefore it is currently not cost effective to upgrade this equipment.

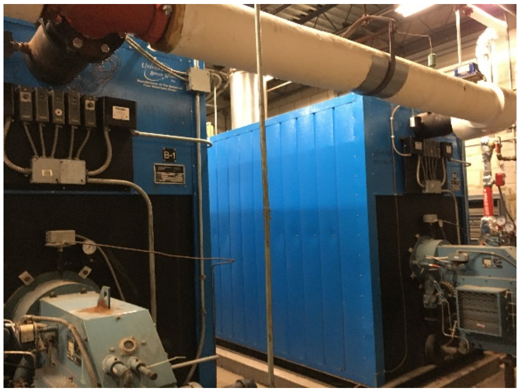
TC Building PTAC

TC Building Electric Baseboard Heat

2.6 Heating Hot Water System

Two 5,390 Mbh Universal Boiler Works BF-175W hot water boilers serve most of the building's heating load. The burners are fully-modulating with a nominal efficiency of 78%. These units were installed in 1999 and are in fair condition. The boilers are configured in an automated control scheme. Both operate during high load conditions. The hydronic distribution system is a 2-pipe, heating and cooling system.

The constant flow primary distribution is served by three 10 hp constant speed pumps operating with an automated control scheme. The boilers provide hot water to radiators, unit ventilators, and air handling units throughout the building. Pipe insulation is in good condition. The hot water supply temperature is reset based on the outside air temperature. The exact control logic is unknown. This system is controlled by the building energy management system (EMS).



Hot Water Boilers

Primary Pumps and Motors

2.7 Chilled Water Systems

One 170-ton McQuay ALR170ES27ER10 air-cooled reciprocating chiller serves most of the building cooling load. The chiller was installed in 1999 and is in fair condition and standard efficiency. The distribution system is a 2-pipe, heating and cooling system. The system is configured in a constant flow with three 10 hp constant speed pumps. Pipe insulation is in good condition. The system chilled water temperature is reset based on the outside air temperature. The exact control logic is unknown. This system is controlled by the building energy management system (EMS).

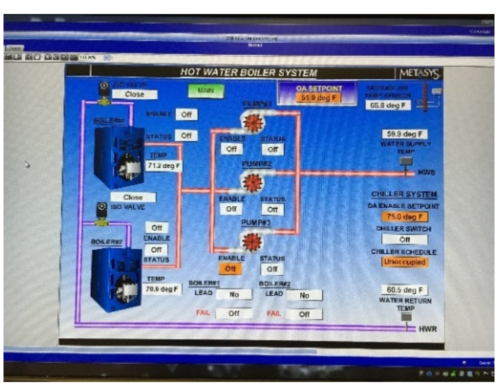
Chiller

Chilled Water Pumps

2.8 Building Energy Management Systems (EMS)

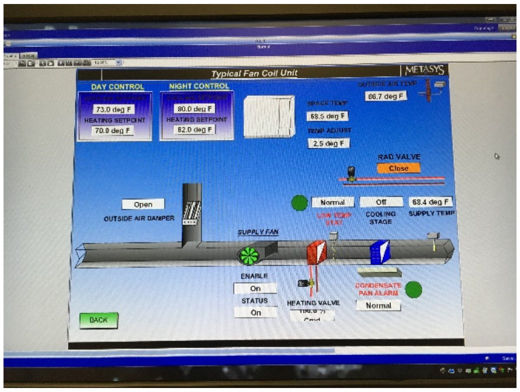
A Johnson Controls Metasys EMS controls the HVAC systems and other equipment including the boilers, the chiller, the air handlers, exhaust fans, and most of the unit ventilators. The EMS provides equipment scheduling control and monitors space temperatures, supply air temperatures, humidity, and hydronic water temperatures. The site staff expressed an interest in replacing the EMS. The following summarize the temperature set points as read from the Metasys user interface:

Heating Occupied	Heating Unoccupied	Cooling Occupied	Cooling Unoccupied
68°F - 75°F	60°F - 65°F	70°F -73°F	80°F- 85°F

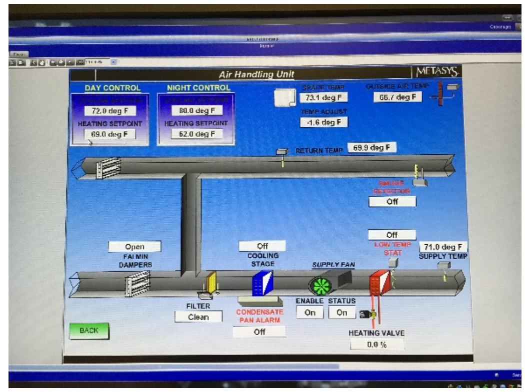


Hot Water System Graphic

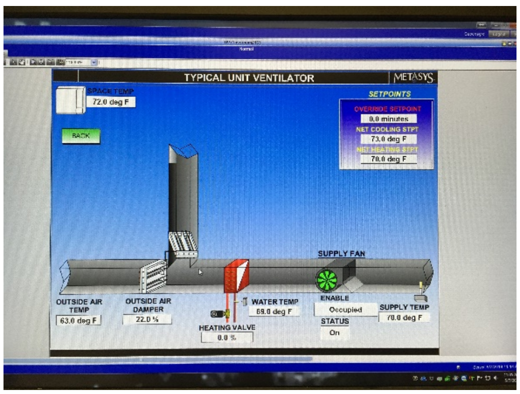
Heating-Ventilation Unit Graphic



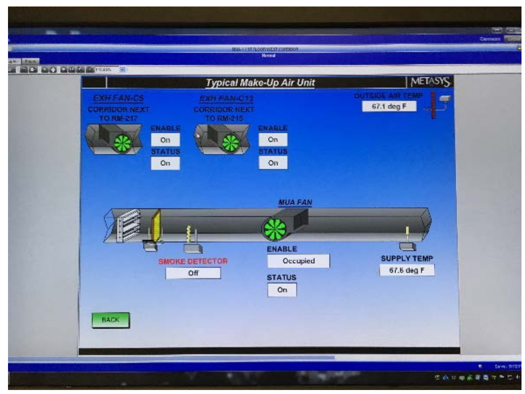
Fan Coil Unit Graphic



Air Handling Unit Graphic



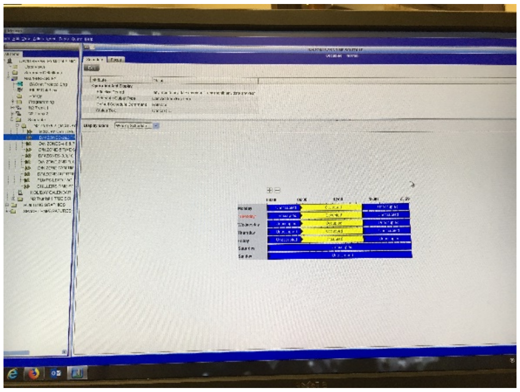
Unit Ventilator Graphic



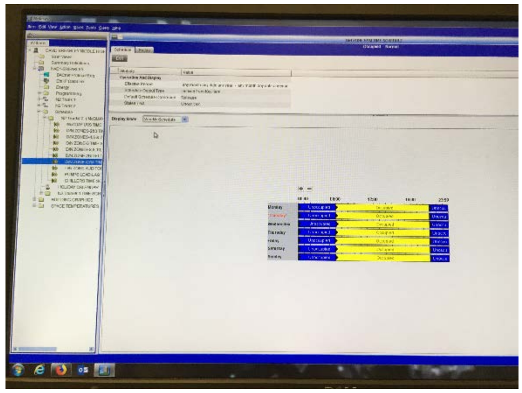
Make up Air Unit Graphic

There are several sensors which were currently off-line or mis-calibrated. In addition, it appears that the occupied schedule for some days within some zones was manually adjusted at some point and never returned to actual operation. Per discussions with facility personnel, there has never been a retro-commissioning of the control system and the system is over 20 years old. The following summarize the occupied schedules:

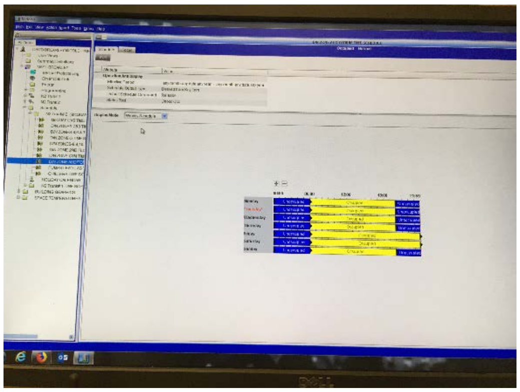
- Zones 2-3 — 6:00 AM – 4:00 PM
- Zones 4-6 — 6:00 AM – 3:00 PM
- Zone 8-12 — 6:00 AM – 4:00 PM (Monday, Tuesday, Thursday & Friday)
  6:00 AM – 12:00 AM (Wednesday)
  6:00 AM – 9:00 PM (Saturday)
- Gym Zone — 6:00 AM – 9:00 PM
- Auditorium Zone — 6:00 AM – 8:00 PM (Sunday through Thursday)
  6:00 AM – 12:00 AM (Friday & Saturday)
- Chillers — 6:00 AM – 7:00 PM
- McQuay UVs — 6:00 AM – 7:00 PM (Monday, Tuesday, Friday)
  6:00 AM – 8:00 PM (Wednesday & Thursday)
  6:00 AM – 10:00 PM (Saturday & Sunday)



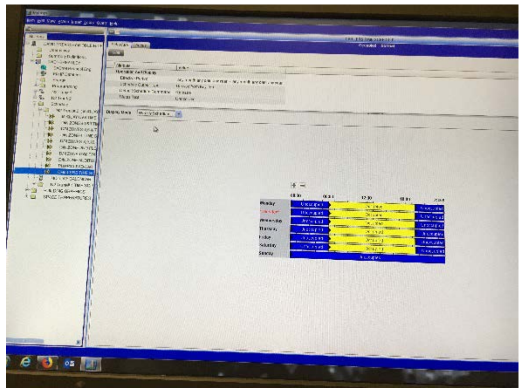
Zones 2-7 Schedule



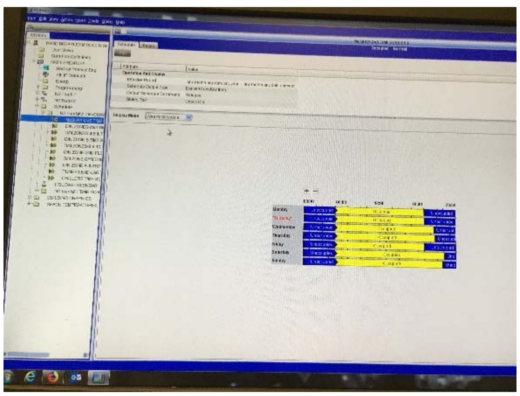
Gym Schedule



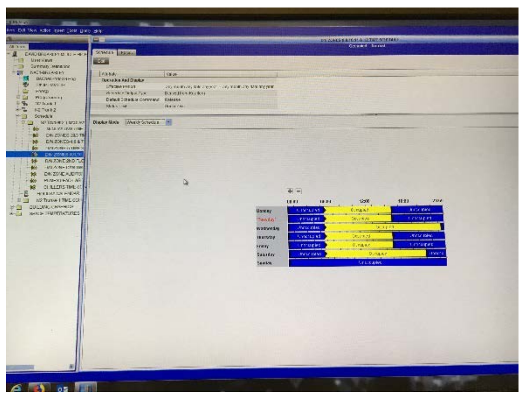
Auditorium Schedule



Chiller Schedule



McQuay Unit Schedule



Zone 8- 12 Schedule

2.9 Domestic Hot Water

Hot water is produced with a 999 Mbh Raypak hot water boiler WH7-1003 and stored in a 115 gallon storage tank. The system has an efficiency of about 86%. This system was installed in 2010 and is in good condition. The water temperature was set at 125°F at the time of the audit. There are two 200 gallon storage tanks which are also supplied by this boiler. They're located in the gym storage rooms and serve the locker rooms. Fractional horsepower circulation pumps distribute water to end uses. The domestic hot water pipes are partially insulated, which appears to be good condition. Hot water for the kitchen dishwasher is produced with a 36kW Hatco C-36 electric booster water heater. Per discussions with facility personnel, the dishwasher is rarely used.

Hot Water Boiler & Storage Tank - School

Hot Water Boiler - School

Storage Tank – School Locker Rooms

Electric Booster Water Heater for Dishwasher - School

Hot water is produced in the snack stand by a 5.5kW GE SE40M12AA01 electric storage tank water heater. This is in fair condition. Staff reported that the snack stand is "winterized" and this is turned off the majority of the year. The piping is not insulated, and with low use it is likely not cost effective to insulate.

Snack Stand Electric Storage Tank Water Heater

Uninsulated Piping

2.10 Food Service Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare meals for students. Most cooking is done using gas ovens, a gas fryer, and a gas steamer. Bulk prepared foods are held in an electric holding cabinet. The dishwasher is a high temperature, rack type, unit and is rarely used. The equipment is high efficiency and in good condition.

The snack stand has a gas oven, gas griddle and two gas fryers. The equipment is high efficiency and is in good condition.

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

Cooking Equipment in the School Kitchen

Cooking Equipment in the School Kitchen

Dishwasher in the School Kitchen

Cooking Equipment in the Snack Stand

2.11 Refrigeration

The school has several stand-up refrigerators and freezers with either solid or glass doors. There is also an energy efficient freezer chest. Majority of equipment is of high efficiency and in good condition. There are ice makers in the maintenance office and life skills classroom.

The walk-in cooler has an estimated 0.5 ton compressor located in the neighboring storage room and a one fan evaporator. This system has no know controls and is in poor condition. The walk-in medium temperature freezer has an estimated 1.5 ton compressor located on the roof and a four fan evaporator. This system also has no known controls and is in fair conditions.

Stand Up Refrigerators

Icemaker

Glass Door Fridge and Freezer Chest

Refrigerator

Walk-in Refrigeration Equipment, Compressors

Walk-in Refrigeration Equipment, Evaporators

Walk-in Refrigeration Equipment, Compressor

Walk-in Refrigeration Equipment, Evaporator

The snack stand has several pieces of refrigerator and freezer equipment. Facility staff reported that the snack stand is "winterized." However, based on the utility profile, it appears that this equipment is not unplugged during the winter months. If unplugging equipment is not currently practiced, we recommend consolidating contents of equipment and removing some from use as a way to reduce electricity costs.

Snack Stand Refrigerator

Snack Stand Refrigerator

Snack Stand Freezers

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

2.12 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 5% percent of total building energy use. This report makes suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 231 computer work stations and approximately 474 laptops/chrome-books throughout the facility. There are also 25 desktop computers in the TC building classroom. Plug loads throughout the school also include general café and office equipment. There are classroom typical loads such as smart boards/projectors, small office printers, and fans. There are several residential style refrigerators throughout the building that vary in condition and efficiency. There are two refrigerated beverage vending machines and one non-refrigerated snack machine which are not currently equipped with occupancy-based controls. The snack stand plug loads include fans, hot lamps, hot dog cookers, and coffee machines.

Clothes Washer & Dryer

Vending Machine and Café Equipment

Vending Machines

Classroom Smart Board / Projector

TC Building Plug Load Equipment

Snack Stand Heat Lamps

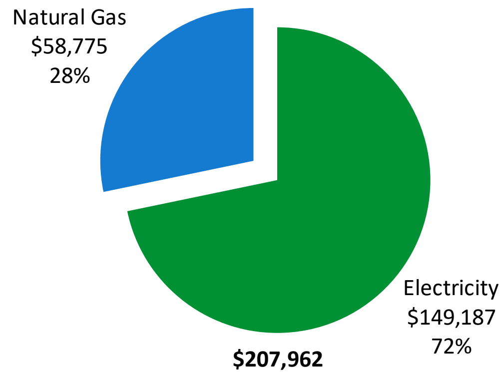
2.13 Water-Using Systems

There are restrooms with toilets, urinals, and sinks. Faucets are mostly high flow and rated for 2.2 gallons per minute (gpm). Toilets and urinals vary in flow rated for a range of gallons per flush (gpf). Locker rooms showerheads are infrequently used.

3 ENERGY USE AND COSTS

Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	1,150,102 kWh	$149,187
Natural Gas	74,315 Therms	$58,775
Total		**$207,962**



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

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

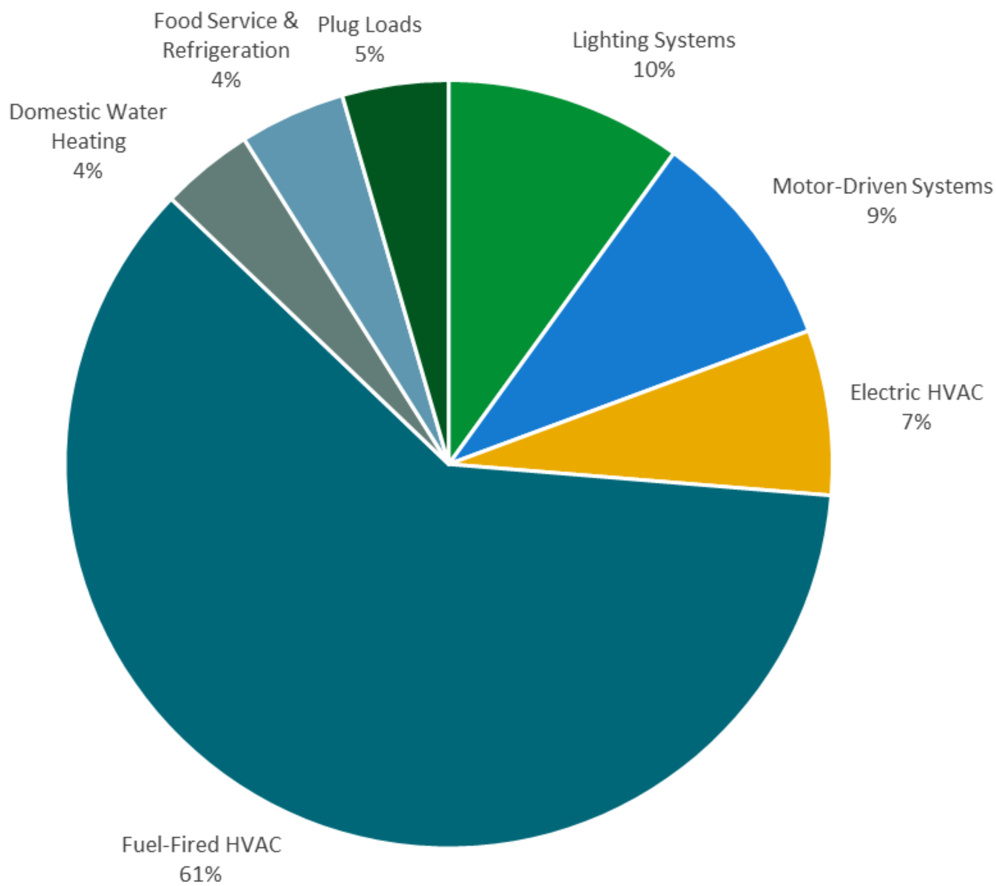
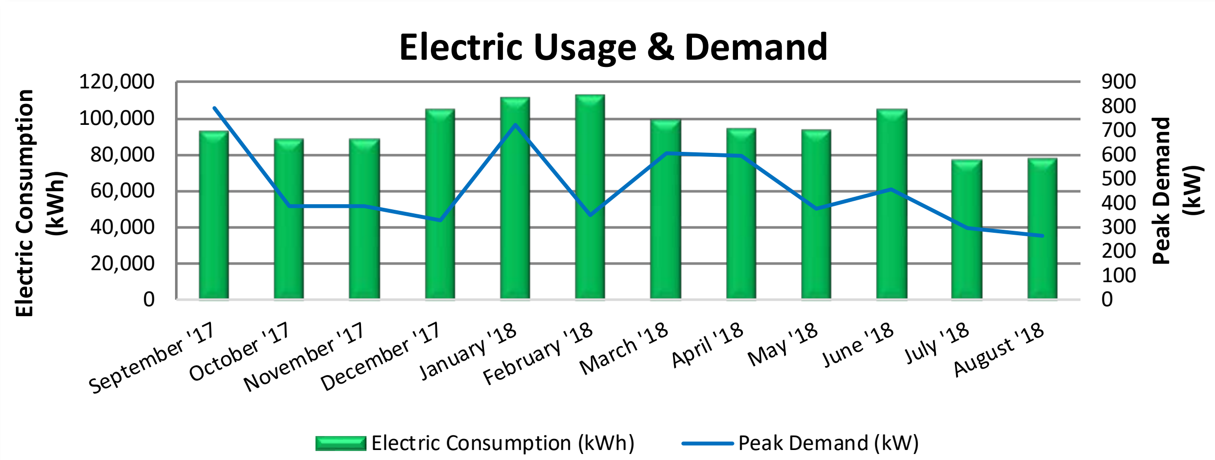


Figure 5 - Energy Balance

3.1 Electricity

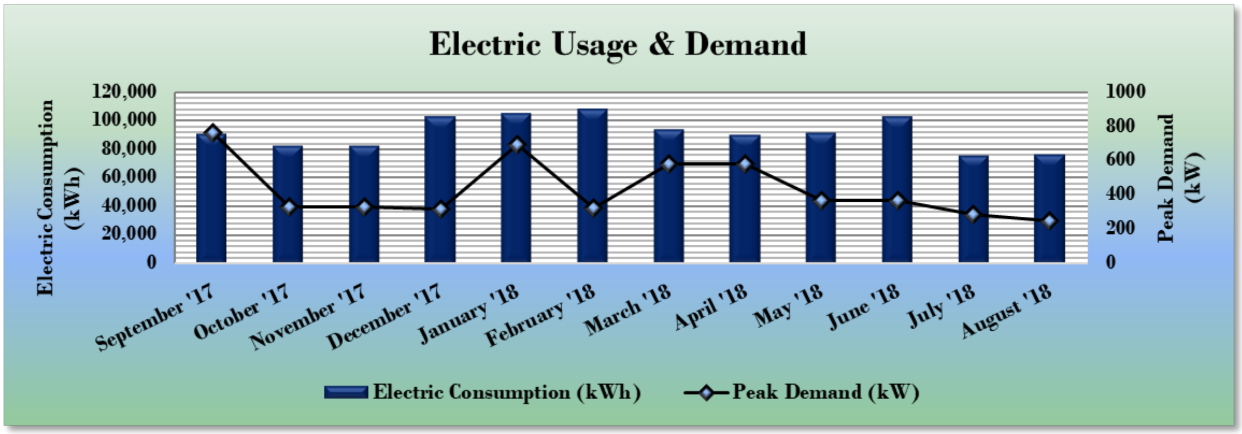
PSE&G delivers electricity under various rate classes, with electric production provided by Direct Energy Business, LLC & SFE Energy NJ, Inc., third-party suppliers. There are a total of six electric meters for this facility.



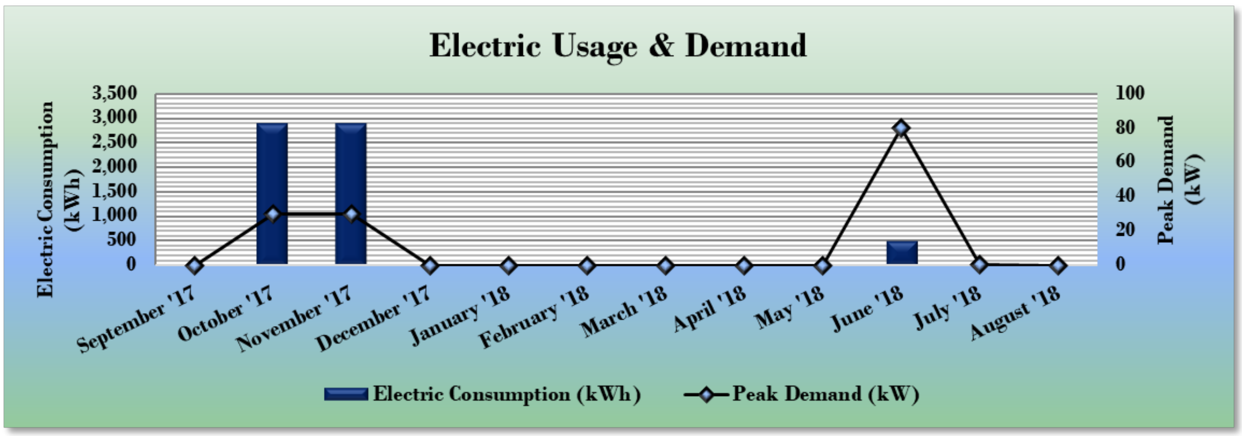
Electric Billing Data						
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**	**TRC Estimated Usage?**
9/25/17	30	93,298	794	$1,623	$14,613	No
10/26/17	31	88,634	389	$1,121	$13,687	Yes
11/22/17	27	88,634	389	$1,121	$13,687	Yes
12/26/17	34	105,471	331	$1,277	$11,126	No
1/25/18	30	111,937	721	$1,387	$12,388	No
2/26/18	32	112,894	348	$1,294	$12,273	No
3/27/18	29	99,741	608	$1,180	$10,996	No
4/26/18	30	94,420	595	$1,103	$10,650	No
5/25/18	29	93,837	375	$1,343	$10,705	No
6/26/18	32	105,658	458	$1,701	$16,102	No
7/26/18	30	77,610	296	$1,059	$11,626	No
8/26/18	31	77,968	263	$958	$11,334	No
Totals	**365**	**1,150,102**	**794**	**$15,167**	**$149,187**	
Annual	**365**	**1,150,102**	**794**	**$15,167**	**$149,187**	

Notes:

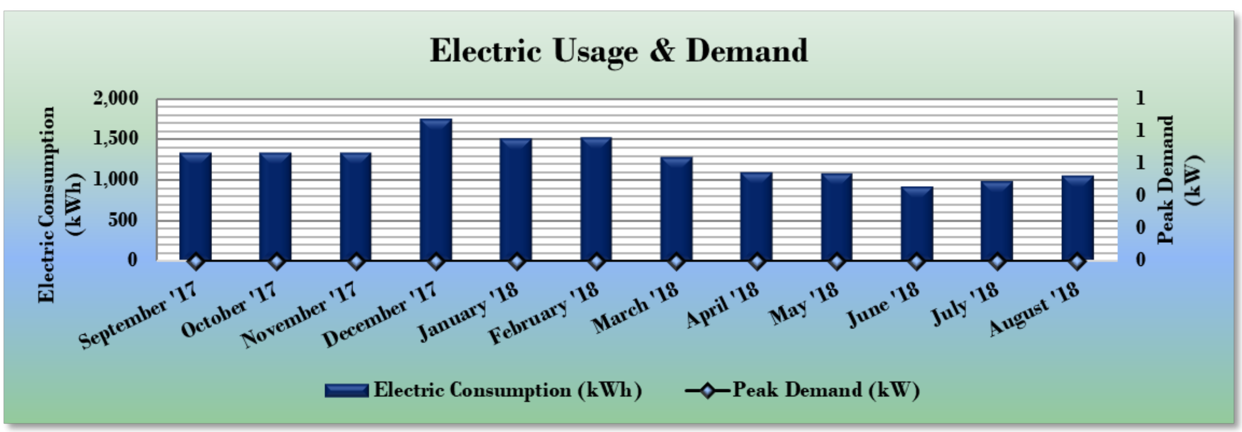
- Peak demand of 794 kW occurred in September '17.
- The average electric cost over the past 12 months was $0.130/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.
- The average demand of over these twelve months of data is 464 kW.
- The following graphs demonstrate these separate meters;
  - School main electric meter is under the LPLS rate class
  - Exterior lighting is set up on two unmetered electric accounts
  - Stadium lighting, snack stand and TC building electric meters are under the GLP rate class



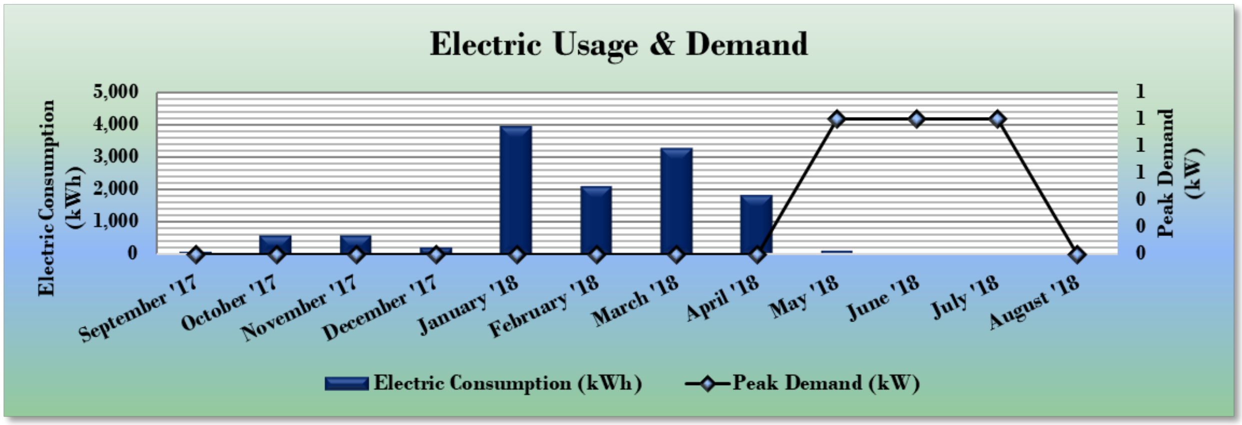
School Main Electric Meter #1



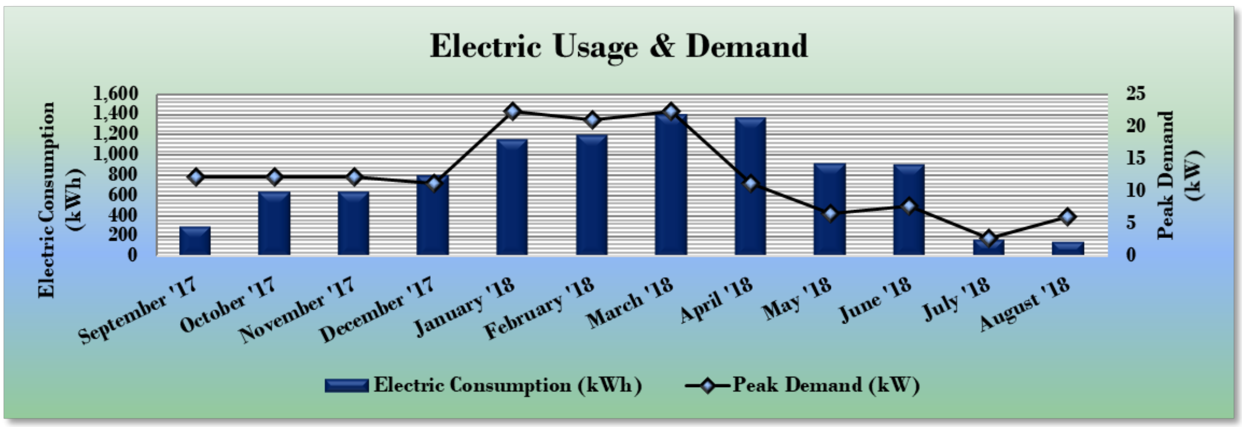
Stadium Lights Electric Meter #2



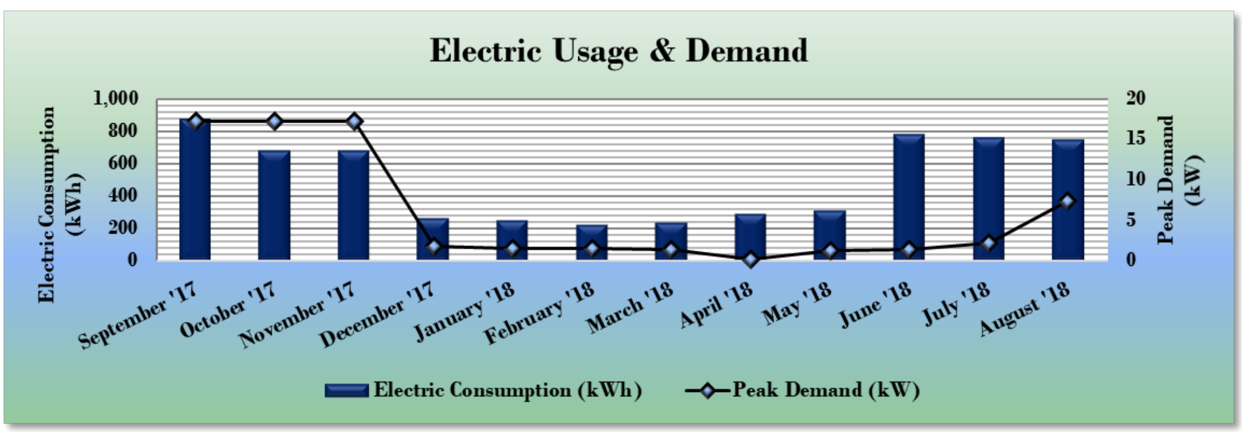
Unmetered Area Lights Meter #3



Unmetered Area Lights Meter #4



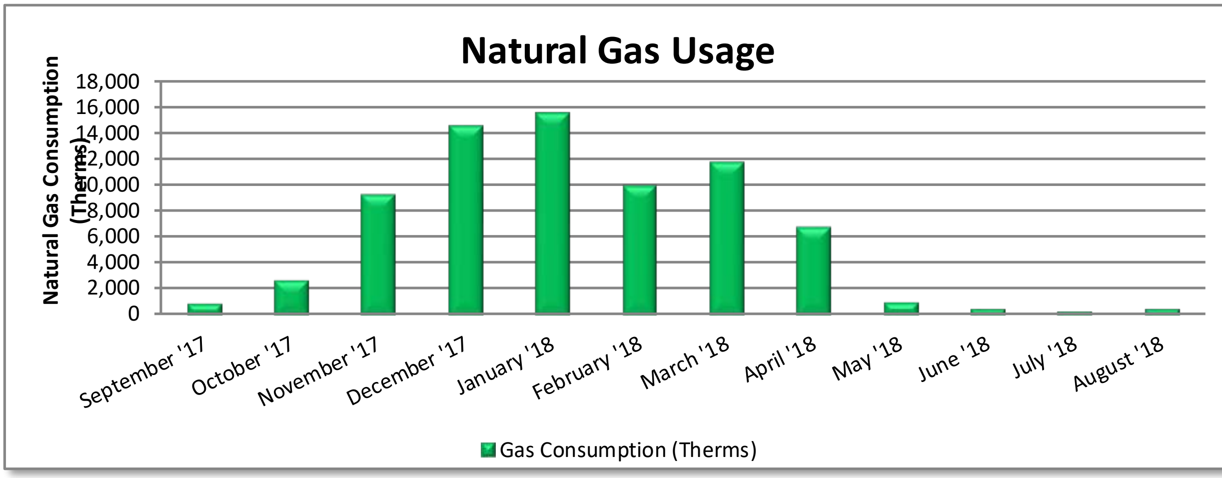
TC Building Electric Meter #5



Snack Stand Electric Meter #6

3.2 Natural Gas

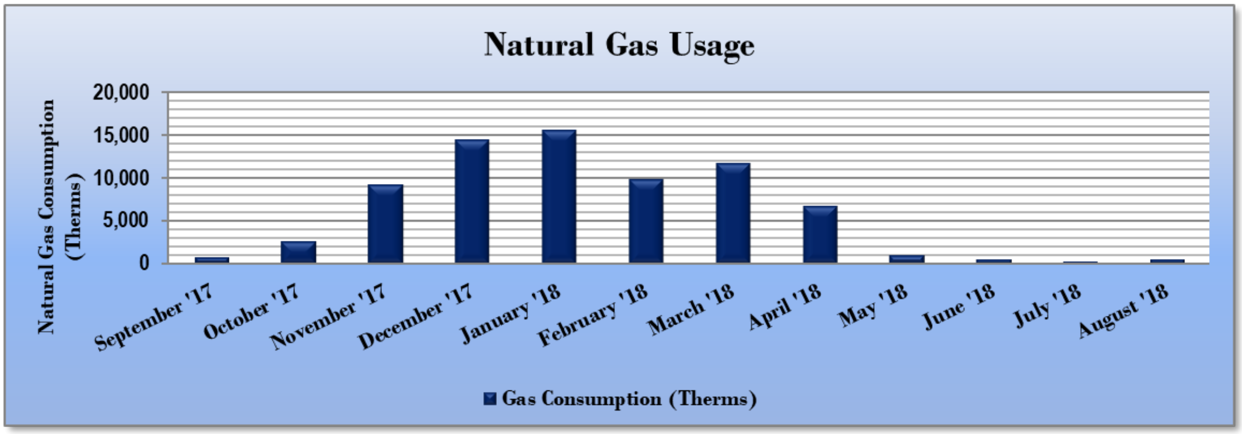
Elizabethtown Gas delivers natural gas under various rate classes, with natural gas supply provided by UGI, a third-party supplier. The following graph and table are a total of natural gas for the facility including two meters at the school and one meter at the snack stand.



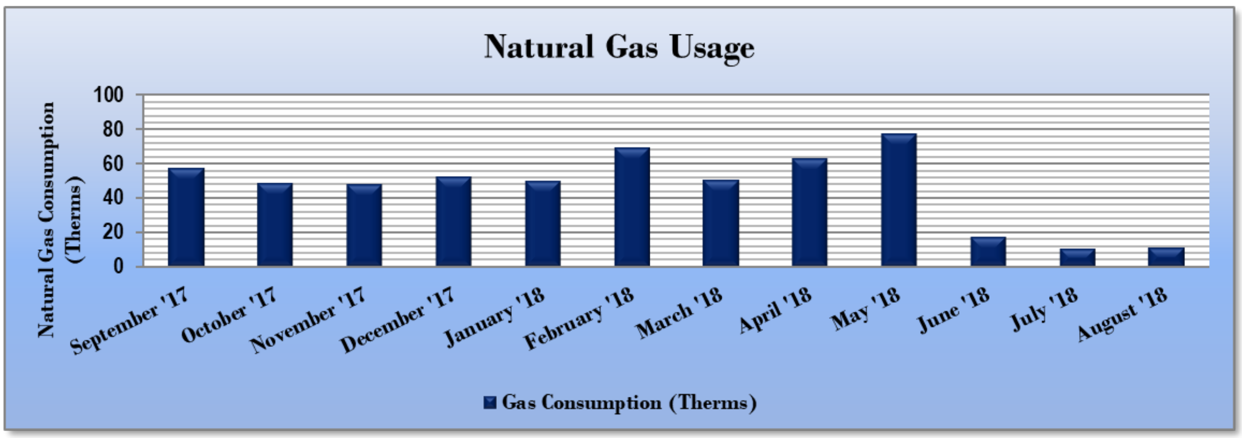
Gas Billing Data				
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**	**TRC Estimated Usage?**
10/1/17	30	895	$1,353	No
11/1/17	31	2,747	$2,557	No
12/1/17	30	9,353	$7,626	No
1/1/18	31	14,641	$10,346	No
2/1/18	31	15,670	$10,675	No
3/1/18	28	10,023	$7,200	No
4/1/18	31	11,781	$7,930	No
5/1/18	30	6,818	$5,206	No
6/1/18	31	1,051	$1,526	No
7/1/18	30	546	$2,272	No
8/1/18	31	293	$1,027	No
9/1/18	31	499	$1,055	Yes
Totals	**365**	**74,315**	**$58,775**	
Annual	**365**	**74,315**	**$58,775**	

Notes:

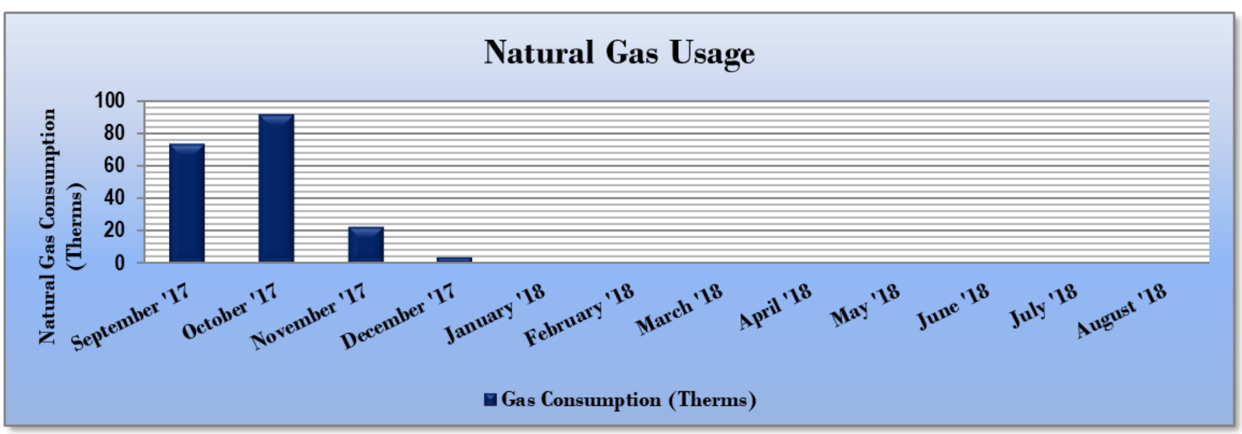
- The average gas cost for the past 12 months is $0.791/therm, which is the blended rate used throughout the analysis.
- The school gas accounts are under the General Delivery ADDQ and ET-GDS Utility Commercial Heat rate classes
- The snack stand account is under ETG-GDS (Small General Service) rate class
- The following graphs demonstrate these separate meters, the first being the main gas account associated with the school only, the second also for the school and the third for the snack stand.



School Gas Meter #1



School Gas Meter #2



Snack Stand Gas Meter #3

3.3 Benchmarking

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

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

Benchmarking Score	**57**

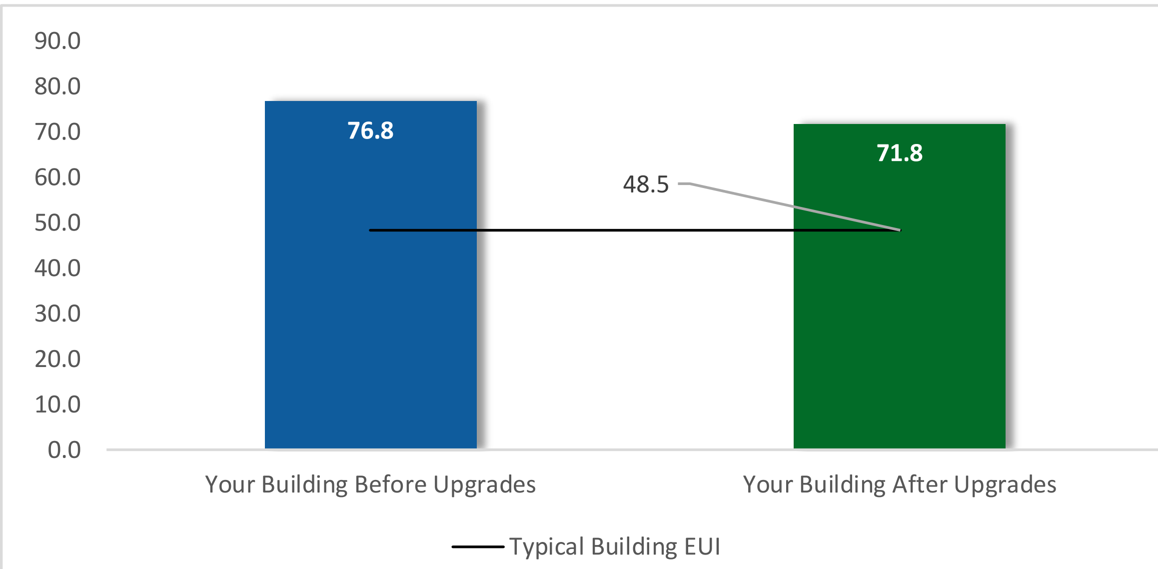


Figure 6 - Energy Use Intensity Comparison

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

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

Tracking Your Energy Performance

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

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

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

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

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

4 ENERGY CONSERVATION MEASURES

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

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

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

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

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

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#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**160,770**	**51.0**	**-33**	**$20,592**	**$72,097**	**$15,587**	**$56,510**	**2.7**	**158,003**
ECM 1	Install LED Fixtures	2,777	1.8	-1	$356	$4,098	$135	$3,963	11.1	2,728
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,012	2.2	0	$130	$3,077	$520	$2,557	19.7	995
ECM 3	Retrofit Fixtures with LED Lamps	156,981	47.0	-32	$20,106	$64,922	$14,932	$49,990	2.5	154,280
Lighting Control Measures		**11,287**	**2.3**	**-2**	**$1,445**	**$15,082**	**$670**	**$14,412**	**10.0**	**11,089**
ECM 4	Install Occupancy Sensor Lighting Controls	3,969	1.1	-1	$508	$6,982	$670	$6,312	12.4	3,900
ECM 5	Install High/Low Lighting Controls	7,318	1.2	-2	$937	$8,100	$0	$8,100	8.6	7,190
Motor Upgrades		**392**	**0.1**	**0**	**$51**	**$1,547**	**$0**	**$1,547**	**30.4**	**395**
ECM 6	Premium Efficiency Motors	392	0.1	0	$51	$1,547	$0	$1,547	30.4	395
Variable Frequency Drive (VFD) Measures		**119,359**	**27.5**	**0**	**$15,483**	**$125,515**	**$6,320**	**$119,195**	**7.7**	**120,193**
ECM 7	Install VFDs on Constant Volume (CV) Fans	86,188	23.4	0	$11,180	$109,390	$6,320	$103,070	9.2	86,791
ECM 8	Install VFDs on Chilled Water Pumps	11,057	1.9	0	$1,434	$5,375	$0	$5,375	3.7	11,134
ECM 9	Install VFDs on Heating Water Pumps	22,114	2.1	0	$2,869	$10,750	$0	$10,750	3.7	22,269
Electric Unitary HVAC Measures		**7,518**	**8.1**	**0**	**$975**	**$44,802**	**$4,002**	**$40,800**	**41.8**	**7,571**
ECM 10	Install High Efficiency Air Conditioning Units	7,518	8.1	0	$975	$44,802	$4,002	$40,800	41.8	7,571
Electric Chiller Replacement		**15,935**	**17.8**	**0**	**$2,067**	**$145,041**	**$15,640**	**$129,401**	**62.6**	**16,046**
ECM 11	Install High Efficiency Chillers	15,935	17.8	0	$2,067	$145,041	$15,640	$129,401	62.6	16,046
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**177**	**$1,398**	**$31,240**	**$4,800**	**$26,440**	**18.9**	**20,693**
ECM 12	Install High Efficiency Furnaces	0	0.0	177	$1,398	$31,240	$4,800	$26,440	18.9	20,693
Domestic Water Heating Upgrade		**36,000**	**10.8**	**-102**	**$3,861**	**$9,632**	**$2,125**	**$7,507**	**1.9**	**24,282**
ECM 13	Install Gas-Fired Booster Water Heater	36,000	10.8	-125	$3,681	$9,288	$2,125	$7,163	1.9	21,616
ECM 14	Install Low-Flow DHW Devices	0	0.0	23	$180	$344	$0	$344	1.9	2,667
Food Service & Refrigeration Measures		**13,186**	**1.2**	**0**	**$1,710**	**$5,325**	**$450**	**$4,875**	**2.8**	**13,278**
ECM 15	Refrigerator/Freezer Case Electrically Commutated Motors	4,915	0.6	0	$638	$1,517	$200	$1,317	2.1	4,949
ECM 16	Refrigeration Controls	5,047	0.2	0	$655	$3,348	$150	$3,198	4.9	5,082
ECM 17	Vending Machine Control	3,224	0.4	0	$418	$460	$100	$360	0.9	3,246
Custom Measures		**26,817**	**0.0**	**341**	**$6,176**	**$221,865**	**$0**	**$221,865**	**35.9**	**66,940**
ECM 18	Installation of an Energy Management System	26,817	0.0	341	$6,176	$221,865	$0	$221,865	35.9	66,940
TOTALS		**391,263**	**118.8**	**380**	**$53,759**	**$672,146**	**$49,594**	**$622,552**	**11.6**	**438,491**

* - 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		**160,770**	**51.0**	**-33**	**$20,592**	**$72,097**	**$15,587**	**$56,510**	**2.7**	**158,003**
ECM 1	Install LED Fixtures	2,777	1.8	-1	$356	$4,098	$135	$3,963	11.1	2,728
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,012	2.2	0	$130	$3,077	$520	$2,557	19.7	995
ECM 3	Retrofit Fixtures with LED Lamps	156,981	47.0	-32	$20,106	$64,922	$14,932	$49,990	2.5	154,280
Lighting Control Measures		**11,287**	**2.3**	**-2**	**$1,445**	**$15,082**	**$670**	**$14,412**	**10.0**	**11,089**
ECM 4	Install Occupancy Sensor Lighting Controls	3,969	1.1	-1	$508	$6,982	$670	$6,312	12.4	3,900
ECM 5	Install High/Low Lighting Controls	7,318	1.2	-2	$937	$8,100	$0	$8,100	8.6	7,190
Variable Frequency Drive (VFD) Measures		**33,171**	**4.1**	**0**	**$4,303**	**$16,125**	**$0**	**$16,125**	**3.7**	**33,403**
ECM 8	Install VFDs on Chilled Water Pumps	11,057	1.9	0	$1,434	$5,375	$0	$5,375	3.7	11,134
ECM 9	Install VFDs on Heating Water Pumps	22,114	2.1	0	$2,869	$10,750	$0	$10,750	3.7	22,269
Domestic Water Heating Upgrade		**36,000**	**10.8**	**-102**	**$3,861**	**$9,632**	**$2,125**	**$7,507**	**1.9**	**24,282**
ECM 13	Install Gas-Fired Booster Water Heater	36,000	10.8	-125	$3,681	$9,288	$2,125	$7,163	1.9	21,616
ECM 14	Install Low-Flow DHW Devices	0	0.0	23	$180	$344	$0	$344	1.9	2,667
Food Service & Refrigeration Measures		**13,186**	**1.2**	**0**	**$1,710**	**$5,325**	**$450**	**$4,875**	**2.8**	**13,278**
ECM 15	Refrigerator/Freezer Case Electrically Commutated Motors	4,915	0.6	0	$638	$1,517	$200	$1,317	2.1	4,949
ECM 16	Refrigeration Controls	5,047	0.2	0	$655	$3,348	$150	$3,198	4.9	5,082
ECM 17	Vending Machine Control	3,224	0.4	0	$418	$460	$100	$360	0.9	3,246
TOTALS		**254,414**	**69.4**	**-138**	**$31,912**	**$118,260**	**$18,832**	**$99,428**	**3.1**	**240,055**

* - 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		**160,770**	**51.0**	**-33**	**$20,592**	**$72,097**	**$15,587**	**$56,510**	**2.7**	**158,003**
ECM 1	Install LED Fixtures	2,777	1.8	-1	$356	$4,098	$135	$3,963	11.1	2,728
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,012	2.2	0	$130	$3,077	$520	$2,557	19.7	995
ECM 3	Retrofit Fixtures with LED Lamps	156,981	47.0	-32	$20,106	$64,922	$14,932	$49,990	2.5	154,280

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

In some cases, fixtures can be retrofit with screw-based LED lamps. Replacing an existing fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing just the 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: auditorium.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit fluorescent fixtures by removing the fluorescent tubes and ballasts and replacing them with LED tubes and LED drivers (if necessary), which are designed to be used in retrofitted fluorescent fixtures.

The measure uses the existing fixture housing but replaces the electric components with more efficient lighting technology which use less power than other lighting technologies but provides equivalent lighting output. Maintenance savings may also be achieved since LED tubes last longer than fluorescent tubes and therefore do not need to be replaced as often.

Affected building areas: storage room, classroom and computer lab with fluorescent fixtures with T12 tubes.

ECM 3: Retrofit Fixtures with LED Lamps

Replace linear fluorescent T8, T5 high output, compact fluorescent, halogen 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 fixtures with T8, T5 high output (gymnasium), compact fluorescent, halogen, and incandescent lamps.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**11,287**	**2.3**	**-2**	**$1,445**	**$15,082**	**$670**	**$14,412**	**10.0**	**11,089**
ECM 4	Install Occupancy Sensor Lighting Controls	3,969	1.1	-1	$508	$6,982	$670	$6,312	12.4	3,900
ECM 5	Install High/Low Lighting Controls	7,318	1.2	-2	$937	$8,100	$0	$8,100	8.6	7,190

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 4: 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, conference rooms, restrooms, and storage rooms.

ECM 5: Install High/Low Lighting Controls

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

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low level after a predefined period of vacancy.

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

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

Affected building areas: hallways.

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

4.3 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**392**	**0.1**	**0**	**$51**	**$1,547**	**$0**	**$1,547**	**30.4**	**395**
ECM 6	Premium Efficiency Motors	392	0.1	0	$51	$1,547	$0	$1,547	30.4	395

ECM 6: Premium Efficiency Motors

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

Affected motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor
Boiler Room	Boiler Burners	2	Combustion Air Fan	3.0

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*.

This measure cannot be justified based on energy savings alone and should be considered in the future once the existing motors reach the end of their useful life.

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		**119,359**	**27.5**	**0**	**$15,483**	**$125,515**	**$6,320**	**$119,195**	**7.7**	**120,193**
ECM 7	Install VFDs on Constant Volume (CV) Fans	86,188	23.4	0	$11,180	$109,390	$6,320	$103,070	9.2	86,791
ECM 8	Install VFDs on Chilled Water Pumps	11,057	1.9	0	$1,434	$5,375	$0	$5,375	3.7	11,134
ECM 9	Install VFDs on Heating Water Pumps	22,114	2.1	0	$2,869	$10,750	$0	$10,750	3.7	22,269

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.

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

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

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

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

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

Affected air handlers: all MUAs, H&V-3 to 7, and AHU-1 to 10.

This measure cannot be justified based on energy savings alone and should be considered in the future once the existing motors reach the end of their useful life. Replacing the motor and installing the VFD at that time is the recommend course of action.

ECM 8: 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.

ECM 9: 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.

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		**7,518**	**8.1**	**0**	**$975**	**$44,802**	**$4,002**	**$40,800**	**41.8**	**7,571**
ECM 10	Install High Efficiency Air Conditioning Units	7,518	8.1	0	$975	$44,802	$4,002	$40,800	41.8	7,571

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 older split-system AC, packaged RTUs and unitary window AC units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 10: Install High Efficiency Air Conditioning Units

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

This measure is part of a measure to replace package units at this site and as such must be considered in combination with ECM 12 in cases with combined heating/cooling units.

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		**15,935**	**17.8**	**0**	**$2,067**	**$145,041**	**$15,640**	**$129,401**	**62.6**	**16,046**
ECM 11	Install High Efficiency Chillers	15,935	17.8	0	$2,067	$145,041	$15,640	$129,401	62.6	16,046

ECM 11: Install High Efficiency Chillers

We evaluated the replacement of the older inefficient electric chiller with a new high efficiency chiller. 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.

Replacing the chiller has a long payback period and may not be justifiable based simply on energy considerations. However, the chiller is nearing or has 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 chiller is eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

4.7 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**177**	**$1,398**	**$31,240**	**$4,800**	**$26,440**	**18.9**	**20,693**
ECM 12	Install High Efficiency Furnaces	0	0.0	177	$1,398	$31,240	$4,800	$26,440	18.9	20,693

ECM 12: Install High Efficiency Furnaces

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

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

This measure is part of a measure to replace package units at this site and as such must be considered in combination with ECM 10.

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		**36,000**	**10.8**	**-102**	**$3,861**	**$9,632**	**$2,125**	**$7,507**	**1.9**	**24,282**
ECM 13	Install Gas-Fired Booster Water Heater	36,000	10.8	-125	$3,681	$9,288	$2,125	$7,163	1.9	21,616
ECM 14	Install Low-Flow DHW Devices	0	0.0	23	$180	$344	$0	$344	1.9	2,667

ECM 13: Install Gas-Fired Booster Water Heater

Install a booster water heater to allow domestic water heater temperatures to be reduced. Many domestic hot water systems are maintained at a high temperature to meet the needs of a single end-use, such as dishwashing. Using a smaller booster water heater to provide the required water temperature for the critical end use allows the temperature at the primary water heater to be reduced.

Energy savings result from reducing the system hot water temperature which reduces fuel used to heat the water and heat loss from the domestic hot water storage tank and distribution system.

ECM 14: Install Low-Flow DHW Devices

Install low-flow devices to reduce overall hot water demand. We recommend replacing high flow sink aerators with low flow sink aerators as part of this measure.

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm

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

4.9 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**13,186**	**1.2**	**0**	**$1,710**	**$5,325**	**$450**	**$4,875**	**2.8**	**13,278**
ECM 15	Refrigerator/Freezer Case Electrically Commutated Motors	4,915	0.6	0	$638	$1,517	$200	$1,317	2.1	4,949
ECM 16	Refrigeration Controls	5,047	0.2	0	$655	$3,348	$150	$3,198	4.9	5,082
ECM 17	Vending Machine Control	3,224	0.4	0	$418	$460	$100	$360	0.9	3,246

ECM 15: 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.

ECM 16: Refrigeration Controls

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

ECM 17: Vending Machine Control

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

4.10 Custom Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures		**26,817**	**0.0**	**341**	**$6,176**	**$221,865**	**$0**	**$221,865**	**35.9**	**66,940**
ECM 18	Installation of an Energy Management System	26,817	0.0	341	$6,176	$221,865	$0	$221,865	35.9	66,940

ECM 18: Installation of an Energy Management System

We evaluated the replacement of the existing Energy Management Systems (EMS) would increase the efficiency of the building HVAC system operation. This evaluation is provided at a high level as it is of great interest to facility personnel.

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

This measure is not recommended based solely on basis of energy and economic results. It should be considered as a capital improvement measure for future implementation. As such, it is recommended that an HVAC engineer or contractor who specializes in energy management systems be contacted for a detailed evaluation and implementation costs. For the purposes of this report, the potential energy savings and measure costs were estimated based on industry standards and previous project experience. Further analysis should be conducted for the feasibility of this measure. This is not an investment grade analysis nor should be used as a basis for design and construction.

4.11 Additional Considerations

- Due to the low use, we did not evaluate the replacement of the electric storage tank water heater serving the snack stand. However, we do recommend that once this is replaced, a high efficiency heat pump water heater be considered for installation. This would save on utility costs as they can be two to three times more energy efficient than conventional electric resistance water heaters. When the existing water heater is eventually replaced, we recommend working with the potential contractor to the determine the overall cost effectiveness of this approach.

- Since the boilers are in fair operating condition and without the evidence that the return water temperature is below 130°F, we did not evaluate replacement with a condensing boiler. Replacing the boilers have a long payback and may not be justifiable based simply on energy considerations. However, the boilers are nearing the end of their normal useful life. Although the protocols state that the useful life is 20 years, it should be noted that well maintained boilers could last over 30 years. Typically, the marginal cost of purchasing high efficiency boilers can be justified by the marginal savings from the improved efficiency. When the boilers are eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes. We also recommend working with your mechanical design team to determine whether the heating system can operate with return water temperatures below 130°F, which would allow the use of condensing boilers at their highest efficiencies.

5 Energy Efficient Best Practices

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

Energy Tracking with ENERGY STAR® Portfolio Manager®

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

Weatherization

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

Doors and Windows

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

Window Treatments/Coverings

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

Lighting Maintenance

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

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

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

Motor Maintenance

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

Fans to Reduce Cooling Load

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

Destratification Fans

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

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

Thermostat Schedules and Temperature Resets

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

Economizer Maintenance

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

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

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.

Boiler Maintenance

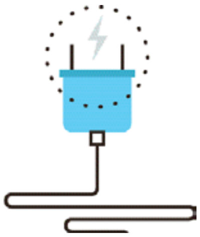
Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is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

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

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

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

Procurement Strategies

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

6 On-site Generation

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

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

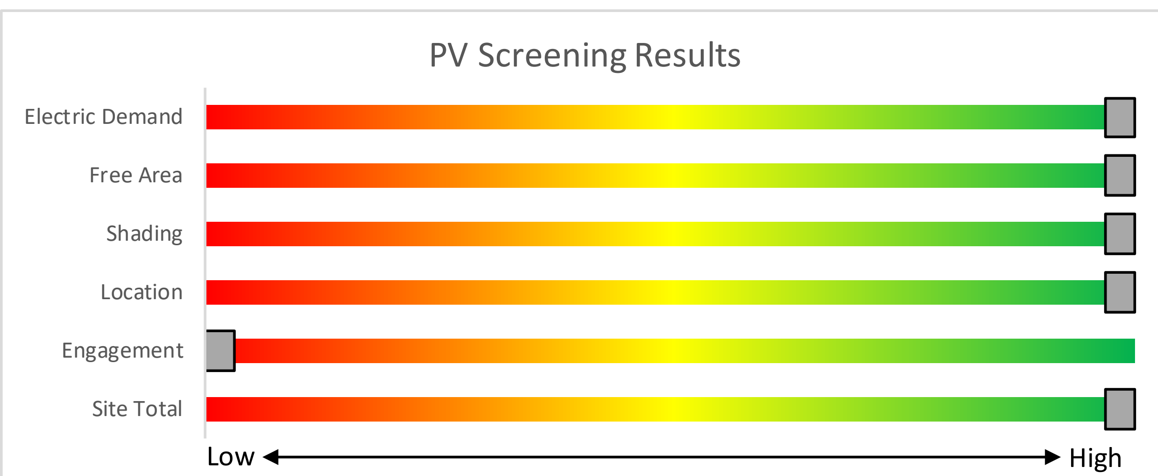
6.1 Solar Photovoltaic

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

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

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

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



Potential	High	
System Potential	464	kW DC STC
Electric Generation	552,796	kWh/yr
Displaced Cost	$71,710	/yr
Installed Cost	$1,206,400	

Figure 9 - Photovoltaic Screening

Solar Renewable Energy Credit (SREC) Registration Program

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

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

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

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

6.2 Combined Heat and Power

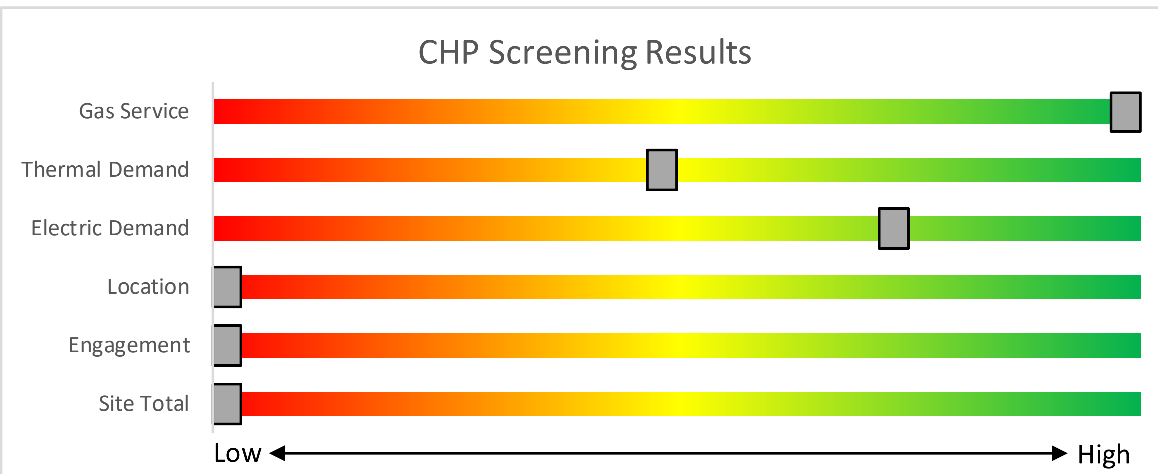
Combined heat and power (CHP) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

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

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

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has **no potential** for installing a cost-effective CHP system. Based on a preliminary analysis, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. The lack of gas service, low or infrequent thermal load, and lack of space for siting the equipment are the most significant factors contributing to the lack of CHP potential.

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



Potential	None	
System Type	None	
System Potential	250	kW
Electric Generation	2,031,660	kWh/yr
Thermal Generation	9,942,164	MBtu/yr
Displaced Cost	$171,278	/yr
Installed Cost	$755,000	

Figure 10 - Combined Heat and Power Screening

7 Project Funding and Incentives

Ready to improve your building's performance? Pick the program that works best for you. Incentive programs that may apply to this facility are identified in the Executive Summary. This section provides an overview of currently available New Jersey's Clean Energy Programs.

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

7.1 SmartStart

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

SmartStart routinely adds, removes, or modifies incentives from year-to-year for various energy 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.

The building in this audit report does not quite meet the requirements of the current DI program.

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 DI 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 Energy Savings Improvement Program (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 (see below) contingent on the project moving forward with measure installation.

How to Participate

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

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

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

7.4 Combined Heat and Power

The Combined Heat & Power (CHP) program provides incentives for eligible CHP or

waste heat to power (WHP) projects. Eligible CHP or WHP projects must achieve an annual system efficiency of at least 65% (lower heating value, or LHV), based on total energy input and total utilized energy output. Mechanical energy may be included in the efficiency evaluation.

Incentives

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

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

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

How to Participate

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

7.5 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. An ESIP is a type of performance contract, whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. Annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive for the life of the contract.

ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an energy services company or "ESCO."

(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.

(3) Use a hybrid approach of the two options described above where the ESCO is used for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the energy savings plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you can use NJCEP incentive programs to help further reduce costs when developing the energy savings plan. Refer to the ESIP guidelines at the link above for further information and guidance on next steps.

7.6 SREC Registration Program

The SREC 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.](http://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
Stadium Lighting	84	Metal Halide: (1) 1000W Lamp	Other		1,080	68		None	No	84	Metal Halide: (1) 1000W Lamp	Other	1,080	68	0.0	0	0	$0	$0	$0	0.0
Stadium Lighting	2	Metal Halide: (2) 400W Lamps	Other		916	68		None	No	2	Metal Halide: (2) 400W Lamps	Other	916	68	0.0	0	0	$0	$0	$0	0.0
Area Lighting	4	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		275	4,745		None	No	4	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	275	4,745	0.0	0	0	$0	$0	$0	0.0
Area Lighting	16	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		137	4,745		None	No	16	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	137	4,745	0.0	0	0	$0	$0	$0	0.0
Area Lighting	7	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		137	4,745		None	No	7	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	137	4,745	0.0	0	0	$0	$0	$0	0.0
Building Mounted Lighting	15	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		70	4,745		None	No	15	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	70	4,745	0.0	0	0	$0	$0	$0	0.0
Building Mounted Lighting	11	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		35	4,745		None	No	11	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	35	4,745	0.0	0	0	$0	$0	$0	0.0
Building Mounted Lighting	8	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		20	4,745		None	No	8	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	20	4,745	0.0	0	0	$0	$0	$0	0.0
Flood Light	3	Compact Fluorescent: Screw in Lamp	Timeclock		32	4,745	3	Relamp	No	3	LED Lamps: Screw in Lamp	Timeclock	22	4,745	0.0	137	0	$18	$52	$3	2.7
TC Building Exterior	2	Halogen Incandescent: Screw in Lamp	Timeclock		150	4,745	3	Relamp	No	2	LED Lamps: Screw in Lamp	Timeclock	23	4,745	0.1	1,210	0	$157	$34	$2	0.2
TC Building Exterior	2	Compact Fluorescent: Screw in Lamp	Timeclock		23	4,745	3	Relamp	No	2	LED Lamps: Screw in Lamp	Timeclock	16	4,745	0.0	65	0	$8	$34	$2	3.8
Storage Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	300	3	Relamp	No	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	300	0.2	111	0	$14	$438	$120	22.4
Storage Room	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	300	2	Relamp & Reballast	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	300	0.2	78	0	$10	$237	$40	19.7
Classroom	12	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	300	2	Relamp & Reballast	No	12	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	300	1.0	467	0	$60	$1,420	$240	19.7
Computer Lab	12	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	300	2	Relamp & Reballast	No	12	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	300	1.0	467	0	$60	$1,420	$240	19.7
Snack Stand Exterior	16	Halogen Incandescent: Screw in Lamp	Wall Switch		150	100	3	Relamp	No	16	LED Lamps: Screw in Lamp	Wall Switch	23	100	1.0	204	0	$26	$276	$16	9.8
Snack Stand Exterior	16	Halogen Incandescent: Screw in Lamp	Occupancy Sensor		150	100	3	Relamp	No	16	LED Lamps: Screw in Lamp	Occupancy Sensor	23	100	1.0	204	0	$26	$276	$16	9.8
Snack Stand	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	100	3	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	100	0.2	29	0	$4	$292	$80	57.0
Kitchen	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	100	3	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	100	0.1	15	0	$2	$146	$40	57.0
Storage Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	100	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	100	0.0	4	0	$0	$37	$10	57.0
Restroom	1	Incandescent: (2) Screw in Lamps	Wall Switch	S	120	100	3	Relamp	No	1	LED Lamps: Screw in Lamp	Wall Switch	18	100	0.1	11	0	$1	$34	$2	22.6
Kitchen Hood	3	Incandescent: Screw in Lamp	Wall Switch	S	100	100	3	Relamp	No	3	LED Lamps: Screw in Lamp	Wall Switch	15	100	0.2	28	0	$4	$52	$3	13.6
Boiler Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.3	1,019	0	$131	$438	$120	2.4
Maintenance Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	234	0	$30	$146	$40	3.5
Electric Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.1	425	0	$54	$183	$50	2.4

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Electric Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Locker Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$11	$37	$10	2.4
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	45	0	$6	$18	$5	2.3
Maintenance Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,700	3, 4	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,863	0.2	659	0	$84	$489	$95	4.7
Shop/Garage	51	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,700	3	Relamp	No	51	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,700	1.2	4,999	-1	$640	$1,862	$510	2.1
Weight Room	42	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,700	3	Relamp	No	42	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,700	1.0	4,116	-1	$527	$1,534	$420	2.1
Weight Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,700	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,700	0.0	104	0	$13	$37	$10	2.0
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$11	$37	$10	2.4
Storage	2	Incandescent: Screw in Lamp	Wall Switch	S	100	2,340	3	Relamp	No	2	LED Lamps: Screw in Lamp	Wall Switch	15	2,340	0.1	438	0	$56	$34	$2	0.6
Storage	1	Compact Fluorescent: Screw in Lamp	Wall Switch	S	23	2,340	3	Relamp	No	1	LED Lamps: Screw in Lamp	Wall Switch	16	2,340	0.0	18	0	$2	$17	$1	7.1
Wrestling Room	42	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,700	3	Relamp	No	42	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,700	1.0	4,116	-1	$527	$1,534	$420	2.1
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	170	0	$22	$73	$20	2.4
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$11	$37	$10	2.4
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	3, 5	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	0.1	554	0	$71	$335	$30	4.3
Kitchen	44	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	44	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	1.0	3,737	-1	$479	$1,607	$440	2.4
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	170	0	$22	$73	$20	2.4
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	170	0	$22	$73	$20	2.4
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	170	0	$22	$73	$20	2.4
Teacher's Lounge	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	352	0	$45	$219	$60	3.5
Cafeteria	112	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	O	62	1,615	3	Relamp	No	112	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	2.7	6,564	-1	$841	$4,090	$1,120	3.5
Classroom 152	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	1,582	0	$203	$986	$270	3.5
Classroom 154	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.4	1,055	0	$135	$657	$180	3.5
Classroom 155	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 156	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	1,582	0	$203	$986	$270	3.5

	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 159	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.2	527	0	$68	$329	$90	3.5
Classroom 158	18	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	559	0	$72	$329	$90	3.3
Classroom 163	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.1	249	0	$32	$146	$40	3.3
IT Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	82	0	$11	$65	$12	5.0
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$11	$37	$10	2.4
Restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	82	0	$11	$65	$12	5.0
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$11	$37	$10	2.4
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,000	0.0	145	0	$19	$37	$10	1.4
Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,340	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.2	648	0	$83	$489	$60	5.2
Server Room 165	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	865	0	$111	$562	$80	4.4
Server Room 165	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	648	0	$83	$489	$60	5.2
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	41	0	$5	$33	$6	5.0
Gym Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,700	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,863	0.1	499	0	$64	$416	$75	5.3
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	41	0	$5	$33	$6	5.0
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	S	60	2,340	3	Relamp	No	1	LED Lamps: Screw in Lamp	Wall Switch	9	2,340	0.0	131	0	$17	$17	$1	1.0
Closet	2	Incandescent: Screw in Lamp	Wall Switch	S	60	2,340	3	Relamp	No	2	LED Lamps: Screw in Lamp	Wall Switch	9	2,340	0.1	263	0	$34	$34	$2	1.0
Closet	1	Compact Fluorescent: Screw in Lamp	Wall Switch	S	13	2,340	3	Relamp	No	1	LED Lamps: Screw in Lamp	Wall Switch	9	2,340	0.0	10	0	$1	$17	$1	12.6
Locker Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,700	3	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,700	0.2	784	0	$100	$292	$80	2.1
Locker Room	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,700	3	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,700	0.4	1,470	0	$188	$548	$150	2.1
Gym Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,700	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,863	0.1	499	0	$64	$416	$75	5.3
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	41	0	$5	$33	$6	5.0
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	S	60	2,340	3	Relamp	No	1	LED Lamps: Screw in Lamp	Wall Switch	9	2,340	0.0	131	0	$17	$17	$1	1.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Closet	2	Incandescent: Screw in Lamp	Wall Switch	S	60	2,340	3	Relamp	No	2	LED Lamps: Screw in Lamp	Wall Switch	9	2,340	0.1	263	0	$34	$34	$2	1.0
Closet	1	Compact Fluorescent: Screw in Lamp	Wall Switch	S	13	2,340	3	Relamp	No	1	LED Lamps: Screw in Lamp	Wall Switch	9	2,340	0.0	10	0	$1	$17	$1	12.6
Locker Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,700	3	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,700	0.2	784	0	$100	$292	$80	2.1
Locker Room	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,700	3	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,700	0.4	1,470	0	$188	$548	$150	2.1
Media Center Room 167	66	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	O	60	1,615		None	No	66	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	60	1,615	0.0	0	0	$0	$0	$0	0.0
Electric Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Classroom 119	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	234	0	$30	$146	$40	3.5
Restroom	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	29	2,340		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	29	2,340	0.0	0	0	$0	$0	$0	0.0
Restroom	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	2,340		None	No	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	2,340	0.0	0	0	$0	$0	$0	0.0
Restroom	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	29	2,340		None	No	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	29	2,340	0.0	0	0	$0	$0	$0	0.0
Restroom	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	2,340		None	No	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	2,340	0.0	0	0	$0	$0	$0	0.0
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	170	0	$22	$73	$20	2.4
Closet	1	Compact Fluorescent: Screw in Lamp	Wall Switch	S	13	2,340	3	Relamp	No	1	LED Lamps: Screw in Lamp	Wall Switch	9	2,340	0.0	10	0	$1	$17	$1	12.6
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	41	0	$5	$33	$6	5.0
Classroom 109	18	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	559	0	$72	$329	$90	3.3
Classroom 109	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.0	117	0	$15	$73	$20	3.5
Classroom 107	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 105	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 103	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 101	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Vestibule	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,000	0.0	290	0	$37	$73	$20	1.4
Vestibule	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	4,000	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,000	0.0	246	0	$32	$73	$20	1.7
Main Office	12	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	2,340	4	None	Yes	12	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	60	1,615	0.2	575	0	$74	$270	$35	3.2
Copy Room	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Principals Office	4	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	2,340	4	None	Yes	4	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	60	1,615	0.1	192	0	$25	$116	$20	3.9

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	41	0	$5	$33	$6	5.0
Conference Room	4	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	2,340	4	None	Yes	4	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	60	1,615	0.1	192	0	$25	$116	$20	3.9
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.1	180	0	$23	$73	$20	2.3
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	432	0	$55	$416	$75	6.2
Office	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	2,340		None	No	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	2,340	0.0	0	0	$0	$0	$0	0.0
Guidance Office	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3, 4	Relamp	Yes	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	679	0	$87	$489	$95	4.5
Office	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	2,340		None	No	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	2,340	0.0	0	0	$0	$0	$0	0.0
Office	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	S	60	2,340		None	No	2	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	2,340	0.0	0	0	$0	$0	$0	0.0
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	0.1	370	0	$47	$298	$20	5.9
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,340	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,615	0.1	381	0	$49	$416	$75	7.0
Nurse's Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Nurse's Office	9	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	9	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.1	405	0	$52	$164	$45	2.3
Exam Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	170	0	$22	$73	$20	2.4
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	45	0	$6	$18	$5	2.3
Resting Rooms	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	170	0	$22	$73	$20	2.4
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	45	0	$6	$18	$5	2.3
Board Room	22	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	22	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.3	684	0	$88	$402	$110	3.3
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.0	88	0	$11	$55	$15	3.5
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	S	33	1,615	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,615	0.0	28	0	$4	$33	$6	7.3
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.0	88	0	$11	$55	$15	3.5

	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
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	S	33	1,615	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,615	0.0	28	0	$4	$33	$6	7.3
Auditorium	48	LED Lamps: Dimmable LED Screw in Lamp / Recessed Can	Other		16	1,000		None	No	48	LED Lamps: Dimmable LED Screw in Lamp / Recessed Can	Other	16	1,000	0.0	0	0	$0	$0	$0	0.0
Auditorium	9	Incandescent: Screw in Lamp / Recessed Can	Other		200	1,000	1	Fixture Replacement	No	9	LED - Fixtures: Downlight Recessed	Other	30	1,000	1.1	1,683	0	$216	$1,366	$45	6.1
Auditorium	18	Halogen Incandescent: Screw in Lamp / Recessed Can	Other		65	1,000	1	Fixture Replacement	No	18	LED - Fixtures: Downlight Recessed	Other	10	1,000	0.7	1,094	0	$140	$2,732	$90	18.9
Stage	18	Metal Halide: (1) 1000W Lamp	Other		1,080	500		None	No	18	Metal Halide: (1) 1000W Lamp	Other	1,080	500	0.0	0	0	$0	$0	$0	0.0
Stage	12	Halogen Incandescent: Track Lights	Other		65	500	3	Relamp	No	12	LED Lamps: Screw in Lamp	Other	10	500	0.5	365	0	$47	$279	$12	5.7
Stage	384	LED Lamps: Track Lights	Other		9	500		None	No	384	LED Lamps: Track Lights	Other	9	500	0.0	0	0	$0	$0	$0	0.0
Stage	12	LED - Fixtures: Low-Bay	Other		50	1,000		None	No	12	LED - Fixtures: Low-Bay	Other	50	1,000	0.0	0	0	$0	$0	$0	0.0
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,000	3, 5	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	2,760	0.0	194	0	$25	$262	$10	10.1
Dressing Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	170	0	$22	$73	$20	2.4
Dressing Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	324	0	$42	$380	$65	7.6
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	41	0	$5	$33	$6	5.0
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	41	0	$5	$33	$6	5.0
Band Room	27	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	27	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.3	839	0	$107	$493	$135	3.3
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.0	117	0	$15	$73	$20	3.5
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	4,000	3, 5	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	2,760	0.0	194	0	$25	$262	$10	10.1
Practice Room	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	2,340	3	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,340	0.0	71	0	$9	$49	$9	4.4
Practice Room	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	2,340	3	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,340	0.0	71	0	$9	$49	$9	4.4
Practice Room	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	2,340	3	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,340	0.0	71	0	$9	$49	$9	4.4
Practice Room	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	2,340	3	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	2,340	0.0	71	0	$9	$49	$9	4.4
Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	135	0	$17	$55	$15	2.3
Vocal Room	25	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	25	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.3	777	0	$100	$456	$125	3.3
Closet	1	Compact Fluorescent: (2) Screw in Lamps	Wall Switch	S	13	2,340	3	Relamp	No	1	LED Lamps: Screw in Lamp	Wall Switch	9	2,340	0.0	10	0	$1	$34	$2	25.2
Life Skills Classroom	24	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	24	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.3	746	0	$96	$438	$120	3.3

	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
TV Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.0	31	0	$4	$18	$5	3.3
Locker Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$11	$37	$10	2.4
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	41	0	$5	$33	$6	5.0
Pantry	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Pantry	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,340	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,340	0.0	127	0	$16	$55	$15	2.4
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Kitchen Hood	3	Incandescent: Screw in Lamp	Other		100	1,000	3	Relamp	No	3	LED Lamps: Screw in Lamp	Other	15	1,000	0.2	281	0	$36	$52	$3	1.4
Hallway	137	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	3, 5	Relamp	Yes	137	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	4.1	25,312	-5	$3,241	$10,403	$1,370	2.8
Display Cases	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	8,760	3	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	8,760	0.1	675	0	$86	$73	$20	0.6
Vestibules	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	4,000	3	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,000	0.6	3,485	-1	$446	$876	$240	1.4
Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	176	0	$23	$110	$30	3.5
Training Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.3	703	0	$90	$438	$120	3.5
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.0	117	0	$15	$73	$20	3.5
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	324	0	$42	$380	$65	7.6
Restroom	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	648	0	$83	$489	$95	4.7
Storage	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3, 4	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.1	453	0	$58	$416	$40	6.5
Storage	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3, 4	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.1	453	0	$58	$416	$40	6.5
Auxillary Gym	30	Linear Fluorescent - T5HO: 4' T5HO (54W) - 4L	Occupancy Sensor	S	234	2,500	3	Relamp	No	30	LED - Linear Tubes: (4) 4' T5HO (25W) Lamps	Occupancy Sensor	102	2,500	2.9	10,890	-2	$1,395	$3,168	$0	2.3
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	3, 5	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	0.2	1,293	0	$166	$706	$70	3.8
Locker Room	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3, 4	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,725	0.5	1,963	0	$251	$1,161	$240	3.7
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,500	0.0	182	0	$23	$73	$20	2.3
Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,500	0.1	272	0	$35	$110	$30	2.3
Shower Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,500	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,500	0.0	96	0	$12	$37	$10	2.2
Team Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,725	0.1	346	0	$44	$380	$65	7.1
Locker Room	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,725	0.3	1,039	0	$133	$599	$125	3.6

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	170	0	$22	$73	$20	2.4
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$11	$37	$10	2.4
Computer Lab	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.4	1,055	0	$135	$657	$180	3.5
Classroom 148	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	170	0	$22	$73	$20	2.4
Classroom 145	31	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	31	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.4	964	0	$123	$566	$155	3.3
Art Classroom 141	31	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	31	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.4	964	0	$123	$566	$155	3.3
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Classroom 137	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 135	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 133	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 131	18	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	559	0	$72	$329	$90	3.3
Classroom 129	9	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	9	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.1	280	0	$36	$164	$45	3.3
Classroom 130	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 132	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 134	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	176	0	$23	$110	$30	3.5
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	45	0	$6	$18	$5	2.3
Elevator Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	45	0	$6	$18	$5	2.3
Storage	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	648	0	$83	$489	$60	5.2
Restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	432	0	$55	$416	$75	6.2
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	45	0	$6	$18	$5	2.3
Hallway	34	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	3, 5	Relamp	Yes	34	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,760	1.0	6,282	-1	$804	$2,592	$340	2.8
Work Room 200	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3, 4	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.1	340	0	$44	$380	$65	7.2
Classroom 202	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	1,582	0	$203	$986	$270	3.5

	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
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3
Prep Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.1	180	0	$23	$73	$20	2.3
Classroom 201	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	1,582	0	$203	$986	$270	3.5
Storage (3 Total)	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	135	0	$17	$55	$15	2.3
Classroom 203	30	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	30	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.4	932	0	$119	$548	$150	3.3
Classroom 204	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	176	0	$23	$110	$30	3.5
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	45	0	$6	$18	$5	2.3
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	45	0	$6	$18	$5	2.3
Storage	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	648	0	$83	$489	$60	5.2
Restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.1	432	0	$55	$416	$75	6.2
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	45	0	$6	$18	$5	2.3
Classroom 205	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 209	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.5	1,319	0	$169	$822	$225	3.5
Prep Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	135	0	$17	$55	$15	2.3
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	45	0	$6	$18	$5	2.3
Work Room 213	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,615	3	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,615	0.2	398	0	$51	$292	$80	4.2
Office 212	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,615	3	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,615	0.2	398	0	$51	$292	$80	4.2
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,340	0.0	41	0	$5	$33	$6	5.0
Electric Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,340	0.0	85	0	$11	$37	$10	2.4
Classroom 214	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,615	3	Relamp	No	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,615	0.2	597	0	$76	$438	$120	4.2
Classroom 214	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	S	33	1,615	3	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,615	0.0	85	0	$11	$98	$18	7.3
Classroom 215	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,615	3	Relamp	No	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,615	0.4	895	0	$115	$657	$180	4.2
Work Room 216	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,340	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.2	648	0	$83	$489	$95	4.7
Classroom 217	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,615	3	Relamp	No	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,615	0.4	895	0	$115	$657	$180	4.2

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	**Fixture Quantity**	**Fixture Description**	**Control System**	**Light Level**	**Watts per Fixture**	**Annual Operating Hours**	**ECM #**	**Fixture Recommendation**	**Add Controls?**	**Fixture Quantity**	**Fixture Description**	**Control System**	**Watts per Fixture**	**Annual Operating Hours**	**Total Peak kW Savings**	**Total Annual kWh Savings**	**Total Annual MMBtu Savings**	**Total Annual Energy Cost Savings**	**Total Installation Cost**	**Total Incentives**	**Simple Payback w/ Incentives in Years**
Classroom 218	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,615	3	Relamp	No	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,615	0.4	895	0	$115	$657	$180	4.2
Classroom 224	18	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	559	0	$72	$329	$90	3.3
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.0	59	0	$8	$37	$10	3.5
Classroom 225	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Classroom 226	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	1,615	3	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,615	0.4	1,055	0	$135	$657	$180	3.5
Prep Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.1	225	0	$29	$91	$25	2.3
Prep Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	135	0	$17	$55	$15	2.3
Prep Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.1	225	0	$29	$91	$25	2.3
Classroom 228	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.6	1,582	0	$203	$986	$270	3.5
Classroom 231	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	1,615	3	Relamp	No	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,615	0.7	1,846	0	$236	$1,150	$315	3.5
Copy Room 229	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.0	62	0	$8	$37	$10	3.3
Classroom 227	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	S	32	1,615	3	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,615	0.2	466	0	$60	$274	$75	3.3
Stairwells	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,000	3	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,000	0.6	3,485	-1	$446	$876	$240	1.4
Transition Spaces	48	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	48	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gymnasium	56	Linear Fluorescent - T5HO: 4' T5HO (54W) - 4L	Occupancy Sensor	S	234	2,500	3	Relamp	No	56	LED - Linear Tubes: (4) 4' T5HO (25W) Lamps	Occupancy Sensor	102	2,500	5.3	20,328	-4	$2,603	$5,913	$0	2.3
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,340	3	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,340	0.0	90	0	$12	$37	$10	2.3

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	Space Heating/Cooling	1	Heating Hot Water Pump	10.0	89.5%	No	W	3,391	9	No	91.7%	Yes	1	1.1	11,057	0	$1,434	$5,375	$0	3.7
Boiler Room	Space Heating/Cooling	1	Heating Hot Water Pump	10.0	89.5%	No	W	3,391	9	No	91.7%	Yes	1	1.1	11,057	0	$1,434	$5,375	$0	3.7
Boiler Room	Space Heating/Cooling	1	Chilled Water Pump	10.0	89.5%	No	W	3,391	8	No	91.7%	Yes	1	1.9	11,057	0	$1,434	$5,375	$0	3.7
Boiler Room	Domestic Hot Water	2	Water Supply Pump	0.5	74.0%	No	W	8,760		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Burners	2	Combustion Air Fan	3.0	82.5%	No	W	2,745	6	Yes	85.5%	No		0.1	392	0	$51	$1,547	$0	30.4
Kitchen Area	H&V-7	1	Supply Fan	5.0	87.5%	No		2,745	7	No	89.5%	Yes	1	1.5	4,565	0	$592	$4,076	$400	6.2
Gym	H&V-3 to 6	4	Supply Fan	5.0	87.5%	No		2,745	7	No	89.5%	Yes	4	5.9	18,258	0	$2,368	$16,305	$1,600	6.2
Hallways	MUAs	8	Supply Fan	1.0	82.5%	No		3,431	7	No	85.5%	Yes	8	2.4	9,896	0	$1,284	$24,081	$640	18.3
Locker Room Areas	MUAs	8	Supply Fan	2.0	84.0%	No		3,431	7	No	86.5%	Yes	8	4.8	19,235	0	$2,495	$26,088	$1,280	9.9
Guidance Office	AHU-1	1	Supply Fan	3.0	87.5%	No		3,431	7	No	89.5%	Yes	1	0.9	3,423	0	$444	$3,884	$240	8.2
Drama Area Hallway	AHU-2	1	Supply Fan	3.0	87.5%	No		3,431	7	No	89.5%	Yes	1	0.9	3,423	0	$444	$3,884	$240	8.2
Vocal Music Offices	AHU-3	1	Supply Fan	3.0	87.5%	No		3,431	7	No	89.5%	Yes	1	0.9	3,423	0	$444	$3,884	$240	8.2
Band Room	AHU-4	1	Supply Fan	3.0	87.5%	No		3,431	7	No	89.5%	Yes	1	0.9	3,423	0	$444	$3,884	$240	8.2
Auditorium	AHU-5 & 6	2	Supply Fan	3.0	87.5%	No		3,431	7	No	89.5%	Yes	2	1.8	6,847	0	$888	$7,768	$480	8.2
Library	AHU-7	1	Supply Fan	3.0	87.5%	No		3,431	7	No	89.5%	Yes	1	0.9	3,423	0	$444	$3,884	$240	8.2
Cafeteria	AHU-8 & 9	2	Supply Fan	3.0	87.5%	No		3,431	7	No	89.5%	Yes	2	1.8	6,847	0	$888	$7,768	$480	8.2
Teacher's Lounge	AHU-10	1	Supply Fan	3.0	87.5%	No		3,431	7	No	89.5%	Yes	1	0.9	3,423	0	$444	$3,884	$240	8.2
Classrooms & Offices	Unit Ventilators	38	Supply Fan	0.3	74.0%	No		3,431		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
General Exhaust	General Exhaust	34	Exhaust Fan	0.3	74.0%	No		3,431		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Coaches & Trainers Office	Fan Coil Units	3	Supply Fan	1.0	82.5%	No		3,431		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions								Energy Impact & Financial Analysis						
Location	**Area(s)/System(s) Served**	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Office	1	Split-System Air-Source HP	2.75	34.00	N		No							0.0	0	0	$0	$0	$0	0.0
Roof	MUAs Serving the Hallways	8	Packaged AC	4.50		W	10	Yes	8	Packaged AC	4.50		14.00		6.2	5,752	0	$746	$32,673	$3,312	39.4
Roof	Office	1	Split-System AC	2.00		B	10	Yes	1	Split-System AC	2.00		14.00		0.5	444	0	$58	$2,992	$184	48.8
Roof	Guidance Office AHU-1	1	Split-System AC	4.00		B	10	Yes	1	Split-System AC	4.00		14.00		1.0	888	0	$115	$5,985	$368	48.8
Roof	Board Room	1	Split-System AC	4.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Drama Area Hallway AHU-2	1	Split-System AC	7.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Coaches Offices	1	Split-System AC	1.50		B	10	Yes	1	Split-System AC	1.50		14.00		0.4	333	0	$43	$2,244	$138	48.8
Roof	Vocal Music Offices AHU-3	1	Split-System AC	10.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Band Room AHU-4	1	Split-System AC	8.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Auditorium AHU-5 & 6	2	Split-System AC	35.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Library AHU-7	1	Split-System AC	20.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Cafeteria AHU-8 & 9	2	Split-System AC	20.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Teacher's Lounge AHU-10	1	Split-System AC	6.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Summer Classroom UVs	4	Split-System AC	4.00		W		No							0.0	0	0	$0	$0	$0	0.0
TC Building	TC Building	4	Through-The-Wall AC	2.00		W		No							0.0	0	0	$0	$0	$0	0.0
TC Building	TC Building	4	Electric Resistance Heat		24.00	W		No							0.0	0	0	$0	$0	$0	0.0
School	Maintenance Office	1	Window AC	2.00		W		No							0.0	0	0	$0	$0	$0	0.0
School	Kitchen Office	1	Window AC	0.83		W		No							0.0	0	0	$0	$0	$0	0.0
School	Classrooms	2	Window AC	2.00		W		No							0.0	0	0	$0	$0	$0	0.0
School	Offices	1	Window AC	0.83		B	10	Yes	1	Window AC	0.83		12.00		0.1	102	0	$13	$907	$0	68.4

		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 (kBtu/hr)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	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
School	Offices	1	Window AC	0.83		N		No							0.0	0	0	$0	$0	$0	0.0
School	Server Room	1	Split-System AC	3.00		W		No							0.0	0	0	$0	$0	$0	0.0

Electric Chiller Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Remaining Useful Life	ECM #	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Outside	Chilled Water System	1	Air-Cooled Reciprocating Chiller	170.00	B	11	Yes	1	Air-Cooled Centrifugal Chiller	Variable	170.00	1.24	0.73	17.8	15,935	0	$2,067	$145,041	$15,640	62.6

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Space Heating System	1	Non-Condensing Hot Water Boiler	5,360.00	B		No						0.0	0	0	$0	$0	$0	0.0
Boiler Room	Space Heating System	1	Non-Condensing Hot Water Boiler	5,360.00	B		No						0.0	0	0	$0	$0	$0	0.0
Roof	MUAs Serving the Hallways	4	Furnace	160.00	W	12	Yes	4	Furnace	160.00	95.00%	AFUE	0.0	0	52	$410	$8,700	$1,600	17.3
Roof	MUA Serving Locker Room Areas	2	Furnace	283.00	W	12	Yes	2	Furnace	283.00	95.00%	AFUE	0.0	0	43	$338	$7,694	$800	20.4
Roof	MUA Serving Locker Room Areas	2	Furnace	182.00	W	12	Yes	2	Furnace	182.00	95.00%	AFUE	0.0	0	27	$217	$4,948	$800	19.1
Roof	MUA Serving Locker Room Areas	2	Furnace	243.00	W	12	Yes	2	Furnace	243.00	95.00%	AFUE	0.0	0	36	$287	$6,607	$800	20.3
Roof	MUA Serving Locker Room Areas	2	Furnace	121.00	W	12	Yes	2	Furnace	121.00	95.00%	AFUE	0.0	0	19	$147	$3,290	$800	17.0

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 System	1	Boiler	W		No						0.0	0	0	$0	$0	$0	0.0
Snack Stand	Domestic Hot Water System	1	Storage Tank Water Heater (≤ 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
School Kitchen	Dishwasher	1	Booster Water Heater	W	13	Yes	1	Booster Water Heater	Natural Gas	85.00%	Et	10.8	36,000	-125	$3,681	$9,288	$2,125	1.9

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	14	48	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	23	$180	$344	$0	1.9

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
School Kitchen	1	Cooler (35F to 55F)	15, 16	Yes	No	Yes	0.2	2,027	0	$263	$1,977	$115	7.1
School Kitchen	1	Medium Temp Freezer (0F to 30F)	15, 16	Yes	No	Yes	0.7	7,935	0	$1,029	$2,887	$235	2.6

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Snack Stand	1	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Snack Stand	2	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Snack Stand	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Snack Stand	1	Freezer Chest	Yes		No	0.0	0	0	$0	$0	$0	0.0
School Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	No		No	0.0	0	0	$0	$0	$0	0.0
School Kitchen	1	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
School Kitchen	1	Freezer Chest	Yes		No	0.0	0	0	$0	$0	$0	0.0
School Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
School Kitchen	2	Stand-Up Refrigerator, Solid Door (≤15 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
School Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Life Skills Classroom	1	Ice Making Head (<450 lbs/day), Batch	No		No	0.0	0	0	$0	$0	$0	0.0
Maintenance Office	1	Ice Making Head (<450 lbs/day), Batch	No		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Snack Stand	2	Gas Fryer	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Snack Stand	1	Gas Combination Oven/Steam Cooker (<15 Pans)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Snack Stand	1	Gas Griddle (≤2 Feet Width)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
School Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
School Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
School Kitchen	1	Gas Rack Oven (Double)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
School Kitchen	1	Gas Rack Oven (Single)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
School Kitchen	1	Gas Fryer	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
School Kitchen	1	Gas Steamer	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
TC Building	25	Computers	120.0	
TC Building	1	Smart Board / Projector	300.0	
TC Building	1	Small Office Printers	50.0	
Snack Stand	7	Heat Lamps & Hot Dof Cookers	250.0	
Snack Stand	1	Kitchen Hood Exhaust Fan	373.0	
Snack Stand	3	Fans	100.0	
Snack Stand	3	Coffee Machine	1,800.0	
School	231	Computers	120.0	
School	474	Laptops/Chromebooks	90.0	
School	4	Large Floor Fans	186.5	
School	4	Large TV	295.0	
School	45	Smart Board / Projector	300.0	
School	56	Small Office Printers	50.0	
School	4	Medium Office Printers	250.0	
School	2	Large Office Printers	515.0	
School	4	Coffee Maker	400.0	
School	8	Microwave	1,100.0	
School	4	Speakers	500.0	
School	5	Residential Refrigerator	690.0	
School	5	Mini Fridge	260.0	
School	22	Fan	100.0	
School	1	Portable Electric Unit Heater	1,500.0	
School	1	Treadmill	1,500.0	
School	1	Misc Entertainment Equipment	5,500.0	
School	1	Misc Kitchen Equipment	9,500.0	
Life Skills Classroom	2	Washer/Dryer	2,500.0	
School Kitchen	1	Washer/Dryer	2,500.0	

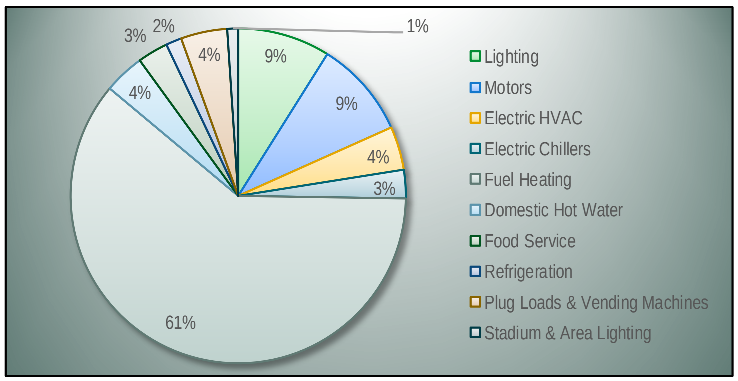
Vending Machine Inventory & Recommendations

	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
Teacher's Lounge	1	Refrigerated	17	Yes	0.2	1,612	0	$209	$230	$50	0.9
Cafeteria	1	Refrigerated	17	Yes	0.2	1,612	0	$209	$230	$50	0.9
Cafeteria	1	Non-Refrigerated	N/A	No	0.0	0	0	$0	$0	$0	0.0

Custom Measure (High Level Screening)

Building Energy Management System

Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis					
Description	Area(s)/System(s) Served	Remaining Useful Life	Total HVAC Motor Usage kWh	Total HVAC Electric Usage kWh	Total HVAC Gas Usage MMBtu	Description	% Savings HVAC Motor Usage kWh	% Savings HVAC Electric Usage kWh	% Savings HVAC Gas Usage MMBtu	Total Estimated kWh Savings	Total Estimated MMBtu Savings	Total Annual Energy Cost Savings	Estimated Cost per Sqft	Total Estimated Installation Cost	Estimated Simple Payback (years)
Building Energy Management System	HVAC Equipment and Systems	B	308,168	228,168	6,822	Replace EMS	5%	5%	5%	26,817	341	$6,176	$1.50	$221,865	35.9



Notes:

This measure has been evaluated at a high level. Facility staff reported a need to replace the existing EMS. The greatest operational and maintenance concern was the functionality and sustainability of a building energy management system. The existing control system is beyond its useful life and parts are no longer available in the market. This measure evaluates the savings and cost potential with replacing the EMS.

Equations: (Based on Industry Standards)

Average Cost for EMS installation is $1.50/sqft

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

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

Electronic control should be provided to all HVAC equipment and systems, eliminating manual control

Heating hot water and chilled water systems should be controlled with an outdoor air temperature reset schedule.

Unit ventilator dampers and 3-way valves should be controlled based on the needs of the space.

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

Roof top units should be equipped with economizer controls. All HVAC sensors throughout the building should be replaced.

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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

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ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

David Brearley Middle/High School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 147,910
Built: 1966

For Year Ending: July 31, 2018
Date Generated: May 17, 2019

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
David Brearley Middle/High School 401 Monroe Ave Kenilworth, New Jersey 07033	Kenilworth Board of Education 426 Boulevard Kenilworth, NJ 07033 (____)____-______	Vincent Gonnella 426 Boulevard Kenilworth, NJ 07033 9082761993 vincent_gonnella@kenilworthschools.com

Property ID: 6808684

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
76.6 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	7,433,631 (66%)
Electric - Grid (kBtu)	3,893,643 (34%)

Source EUI
126.5 kBtu/ft²

National Median Comparison

National Median Site EUI (kBtu/ft²)	82.1
National Median Source EUI (kBtu/ft²)	135.8
% Diff from National Median Source EUI	-7%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	789

Signature & Stamp of Verifying Professional

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

Signature: ______________________Date: ___________

Licensed Professional

____ ________
,
(____)____-______
____

Professional Engineer Stamp (if applicable)

APPENDIX C: GLOSSARY

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

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

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR® Portfolio Manager®.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of 1/8th of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use
VAV	*Variable air volume*
VFD	*Variable frequency drive*: a controller used to vary the speed of an electric motor.
WaterSense™	The symbol for water efficiency. The WaterSense program is managed by the EPA.
Watt (W)	Unit of power commonly used to measure electricity use.