Local Government Energy Audit Report

Cedar Drive Middle School

October 15, 2020

Prepared for:

Colts Neck Township School District
73 Cedar Drive
Colts Neck, New Jersey 07722

Prepared by:

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Disclaimer

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

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

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

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

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

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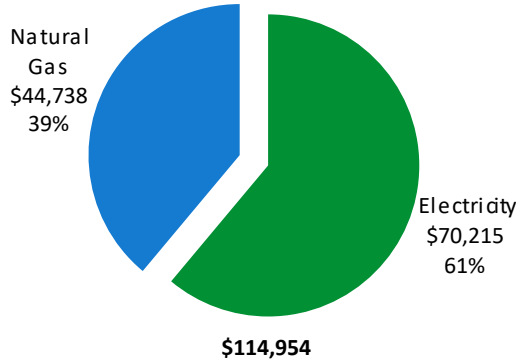
1 EXECUTIVE SUMMARY

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

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $114,954 Electricity: 601,746 kWh Natural Gas: 44,645 Therms	
ENERGY STAR® Benchmarking Score	**42** *(1-100 scale)*	This building performs below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

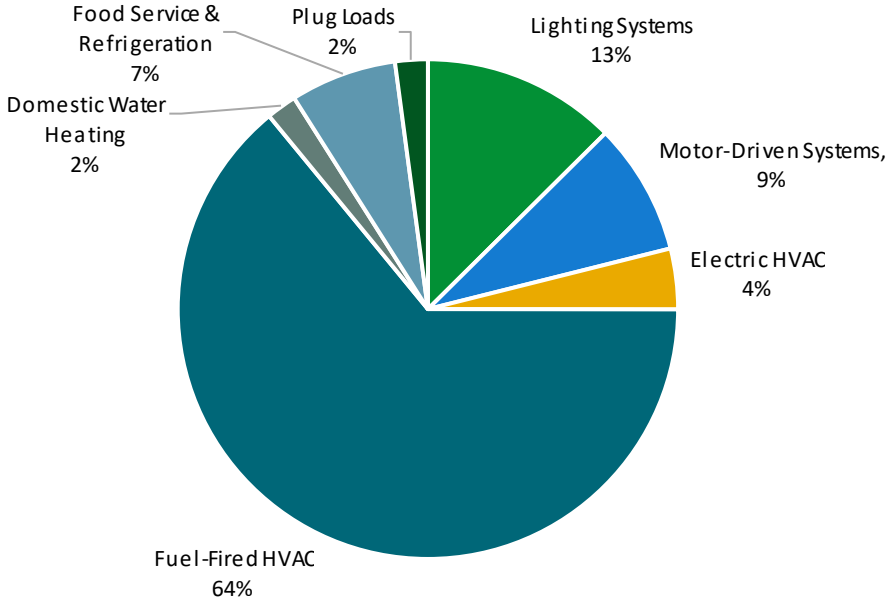


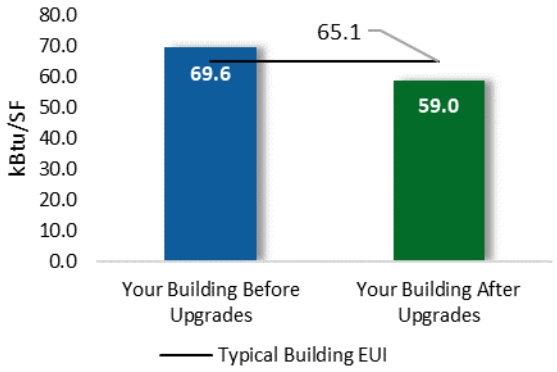
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

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

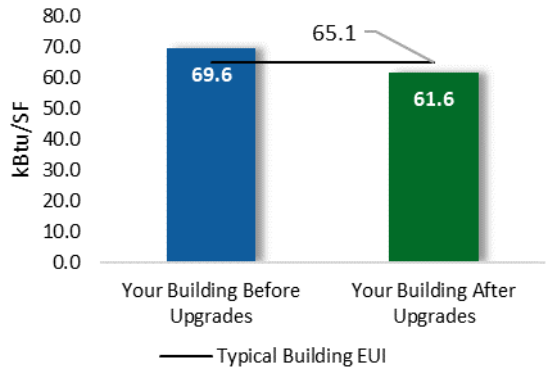
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$259,733
Potential Rebates & Incentives[1]	$63,654
Annual Cost Savings	$30,067
Annual Energy Savings	Electricity: 243,927 kWh Natural Gas: 1,601 Therms
Greenhouse Gas Emission Savings	132 Tons
Simple Payback	6.5 Years
Site Energy Savings (all utilities)	15%



Scenario 2: Cost Effective Package[2]

Installation Cost	$150,002
Potential Rebates & Incentives	$59,223
Annual Cost Savings	$25,396
Annual Energy Savings	Electricity: 217,374 kWh Natural Gas: 31 Therms
Greenhouse Gas Emission Savings	110 Tons
Simple Payback	3.6 Years
Site Energy Savings (all utilities)	11%



On-site Generation Potential

Photovoltaic	High
Combined Heat and Power	None

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**134,587**	**55.3**	**-27**	**$15,431**	**$65,122**	**$31,350**	**$33,772**	**2.2**	**132,334**
ECM 1	Install LED Fixtures	Yes	3,245	0.4	0	$374	$540	$0	$540	1.4	3,214
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	571	0.5	0	$65	$959	$272	$687	10.5	561
ECM 3	Retrofit Fixtures with LED Lamps	Yes	129,538	54.2	-26	$14,850	$62,464	$31,078	$31,386	2.1	127,347
ECM 4	Install LED Exit Signs	Yes	1,233	0.1	0	$141	$1,159	$0	$1,159	8.2	1,212
Lighting Control Measures			**25,683**	**7.7**	**-5**	**$2,943**	**$26,244**	**$11,160**	**$15,084**	**5.1**	**25,233**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	18,615	6.3	-4	$2,133	$18,594	$3,510	$15,084	7.1	18,290
ECM 6	Install High/Low Lighting Controls	Yes	7,067	1.4	-1	$810	$7,650	$7,650	$0	0.0	6,944
Variable Frequency Drive (VFD) Measures			**48,923**	**19.4**	**22**	**$5,924**	**$54,689**	**$16,000**	**$38,689**	**6.5**	**51,783**
ECM 7	Install VFDs on Constant Volume (CV) Fans	Yes	46,888	19.4	0	$5,471	$51,428	$15,800	$35,628	6.5	47,216
ECM 8	Install VFDs on Kitchen Hood Fan Motors	Yes	2,035	0.0	22	$453	$3,261	$200	$3,061	6.8	4,567
Electric Unitary HVAC Measures			**6,719**	**2.5**	**0**	**$784**	**$29,893**	**$2,291**	**$27,602**	**35.2**	**6,766**
ECM 9	Install High Efficiency Air Conditioning Units	No	2,121	1.5	0	$248	$18,994	$1,196	$17,798	71.9	2,136
ECM 10	Install High Efficiency Heat Pumps	No	4,598	1.0	0	$537	$10,899	$1,095	$9,804	18.3	4,630
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**41**	**$411**	**$8,293**	**$1,600**	**$6,693**	**16.3**	**4,808**
ECM 11	Install High Efficiency Furnaces	No	0	0.0	41	$411	$8,293	$1,600	$6,693	16.3	4,808
HVAC System Improvements			**0**	**0.0**	**32**	**$325**	**$5,438**	**$0**	**$5,438**	**16.7**	**3,800**
ECM 12	Implement Demand Control Ventilation (DCV)	No	0	0.0	32	$325	$5,438	$0	$5,438	16.7	3,800
Domestic Water Heating Upgrade			**0**	**0.0**	**14**	**$143**	**$330**	**$213**	**$117**	**0.8**	**1,667**
ECM 13	Install Low-Flow DHW Devices	Yes	0	0.0	14	$143	$330	$213	$117	0.8	1,667
Food Service & Refrigeration Measures			**10,344**	**1.0**	**0**	**$1,207**	**$7,876**	**$1,040**	**$6,836**	**5.7**	**10,416**
ECM 14	Refrigerator/Freezer Case Electrically Commutated Motors	No	590	0.1	0	$69	$910	$240	$670	9.7	594
ECM 15	Refrigeration Display Case Doors or Covers	Yes	3,018	0.3	0	$352	$1,338	$400	$938	2.7	3,039
ECM 16	Refrigeration Controls	No	1,573	0.0	0	$183	$3,348	$300	$3,048	16.6	1,584
ECM 17	Replace Refrigeration Equipment	Yes	3,551	0.4	0	$414	$2,050	$0	$2,050	4.9	3,576
ECM 18	Vending Machine Control	Yes	1,612	0.2	0	$188	$230	$100	$130	0.7	1,623
Custom Measures			**17,671**	**0.0**	**83**	**$2,898**	**$61,849**	**$0**	**$61,849**	**21.3**	**27,567**
ECM 19	Installation of an Energy Management System	No	17,671	0.0	83	$2,898	$61,849	$0	$61,849	21.3	27,567
TOTALS (COST EFFECTIVE MEASURES)			**217,374**	**83.3**	**3**	**$25,396**	**$150,002**	**$59,223**	**$90,780**	**3.6**	**219,256**
TOTALS (ALL MEASURES)			**243,927**	**85.9**	**160**	**$30,067**	**$259,733**	**$63,654**	**$196,079**	**6.5**	**264,375**

* - 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	X
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X	X	X
ECM 3	Retrofit Fixtures with LED Lamps	X	X	X
ECM 4	Install LED Exit Signs		X	X
ECM 5	Install Occupancy Sensor Lighting Controls	X	X	X
ECM 6	Install High/Low Lighting Controls	X	X	X
ECM 7	Install VFDs on Constant Volume (CV) Fans	X	X	X
ECM 8	Install VFDs on Kitchen Hood Fan Motors	X	X	X
ECM 9	Install High Efficiency Air Conditioning Units	X	X	X
ECM 10	Install High Efficiency Heat Pumps	X	X	X
ECM 11	Install High Efficiency Furnaces	X	X	X
ECM 12	Implement Demand Control Ventilation (DCV)		X	X
ECM 13	Install Low-Flow DHW Devices	X	X	X
ECM 14	Refrigerator/Freezer Case Electrically Commutated Motors	X	X	X
ECM 15	Refrigeration Display Case Doors or Covers	X	X	X
ECM 16	Refrigeration Controls	X	X	X
ECM 17	Replace Refrigeration Equipment		X	X
ECM 18	Vending Machine Control	X	X	X
ECM 19	Installation of an Energy Management System			X

Figure 3 – Funding Options

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

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

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

Individual Measures with SmartStart

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

Turnkey Installation with Direct Install

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

Whole Building Approach with Pay for Performance

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

More Options from Around the State

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

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

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

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

Ongoing Electric Savings with Demand Response

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

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Cedar Drive Middle 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 June 25, 2020, TRC performed an energy audit at Cedar Drive Middle School located in Colts Neck, New Jersey. TRC met with Thomas Giglio to review the facility operations and help focus our investigation on specific energy-using systems. Mr. Giglio was very helpful throughout the energy audit process and made sure TRC had all the necessary information.

Cedar Drive Middle School is a one-story, 93,710 square foot building built in 1963. Spaces include classrooms, a gymnasium, a cafeteria, a media center, offices, corridors, a kitchen, locker rooms, a boiler room, and storage rooms.

The site is interested in a new energy management system (EMS) and is currently planning its scope and installation. The Board of Education plans to have the EMS installed by the end of summer 2020. The Board of Education has also planned a new heating, ventilation, and air conditioning (HVAC) system for the gymnasium, locker rooms, and weight room, and they have awarded a contract for this project.

2.2 Building Occupancy

The school has normal occupancy during the school year (September through June). During weekends, the school gymnasium is often open for sports activities. Typical weekday occupancy is 100 staff and 367 students.

Occupancy is reduced in July and August, and the gymnasium is used for occasional sports activities in these two months.

Building Name	Weekday/Weekend	Operating Schedule
Cedar Drive Middle School (School Hours)	Weekday	7:00 AM - 4:00 PM
	Weekend	8:00 AM - 3:00 PM
	Summer	Varies
Cedar Drive Middle School (Custodial Hours)	Weekday	7:00 AM - 11:00 PM
	Weekend	8:00 AM - 4:00 PM
	Summer	8:00 AM - 4:00 PM

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a brick facade. Majority of the roof is flat except for the gymnasium, which has a pitched roof. The flat roof has sections covered with gravel and some sections finished with rubber membrane.

Most of the windows are old and single glazed. Windows have aluminum frames. The glass-to-frame seals are in fair condition. Windows in the classrooms are operable.

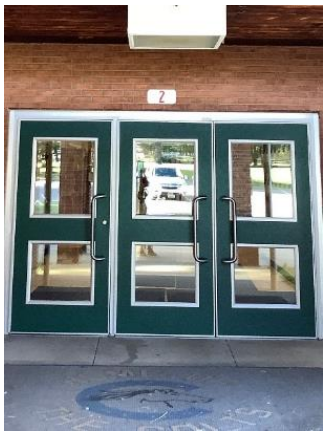
Exterior doors have aluminum frames with double pane glazing in the center and are in good condition with undamaged door seals.

Single pane operable window

Exterior wall of classroom wing

Roof with rubber membrane finish

Roof with gravel finish



Exterior Door

2.4 Lighting Systems

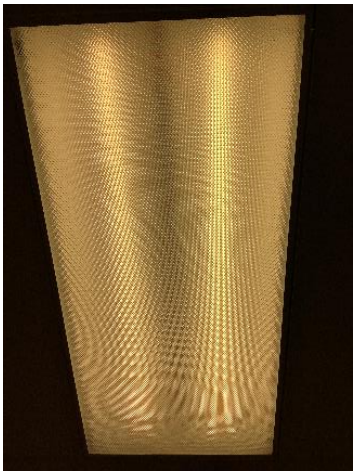
The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also a few 40-Watt and 34-Watt T12 fixtures and some 32-Watt U-shaped T8 fluorescent lamps. Additionally, there are compact fluorescent lamps (CFL), incandescent lamps, and LED general purpose lamps. Gymnasium fixtures have high bay high-output, 54-Watt linear fluorescent lamps that are manually controlled. Typically, T8 fluorescent lamps use electronic ballasts, and T12 fluorescent lamps use magnetic ballasts.

Fixture types include 1- 2- 4- or 6-lamp, 2-foot and 4-foot long troffer, recessed, and surface mounted fixtures. There are also 2-foot fixtures with U-bend tube lamps. Most fixtures are in good condition.

Most of the exit signs are LED; however, there are a few exit signs with CFL lamps.

Although interior lighting levels were generally sufficient, a considerable number of classrooms with 4-lamp 32-Watt T8 linear fluorescent fixtures had lighting levels beyond the recommended lighting level (30-50 foot-candles) and were over lit. Besides being visually uncomfortable, over lit spaces lead to excess energy consumption. When the school upgrades the lighting to LED, it is recommended that the school facility staff works with the contactor to ensure that lighting levels are not excessive.

2' x 4' T8 4-lamp fixture



2' x 4' T8 2-lamp fixture

2' x 4' T5 high output lamps in gym

2' x 2' U-shaped T8 lamp fixture

Lighting fixtures in at least 23 classrooms, the copy room and a storage room were noted to be controlled by wall-mounted occupancy sensors. All remaining interior lighting is manually controlled by wall switches.

T12 2-lamp fixture

Wall-mounted occupancy sensor

8th grade wing hallway fixtures

Media center fixtures

Exterior fixtures include wall-mounted LED fixtures, pole-mounted fixtures with LED *corn* light bulbs, and canopy fixtures that contain either CFL or incandescent lamps. There are also a few wall-mounted fixtures with metal halide lamps. All exterior fixtures are timer controlled.

Pole-mounted fixture in parking lot

Wall-mounted LED fixture

Canopy fixture

LED corn light bulb in a pole-mounted fixture

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators are installed in 24 classrooms. They have supply fan motors and provide only space heating. All unit ventilators are original to the building and are controlled by individual thermostats. TRC recommends installing new unit ventilators when a capital improvement project is taken up.

Packaged Units

A total of 12 packaged units and one packaged terminal heat pump serve different areas. The table below lists the areas served by these units and specifies whether they provide cooling, heating, or both. Five packaged units provide cooling via direct expansion (DX) coils, and their cooling capacities range between 3-ton and 25-ton. These units have a cooling energy efficiency rating values between 10.5 and 11.4 and are controlled by thermostats. Four packaged units provide heating via gas-fired furnaces.

The heating capacity packed units with gas-fired furnaces range between 150 and 215 MBh.

Packaged units serving the following areas are more than 20 years old and are beyond useful life, which includes the Reznor make-up air unit serving the band room and package units serving the media center, classroom 19, and the guidance suite. Remaining packaged units are in fair condition.

A packaged terminal heat pump serves the nurse's office. It has a 0.65-ton cooling capacity and a heating capacity of 6 MBh. The unit is in fair condition.

List of all packaged heating/cooling units

Unit Type	Area Served	Heating/Cooling	Make
Make-up Air Unit	Band Room, two classrooms, and hallway	Heating only (gas-fired furnace)	Reznor
Packaged Rooftop Unit	Classroom 19	Cooling only	Trane
Packaged Rooftop Unit	Classroom 25	Cooling & heating (gas-fired furnace)	Carrier
Packaged Rooftop Unit	Classroom 26	Cooling & heating (gas-fired furnace)	Carrier
Packaged Rooftop Unit	Media Center	Cooling & heating (gas-fired furnace)	Carrier
Packaged Rooftop Unit	Guidance Suite	Cooling & heating (hot water)	Lennox
Packaged Rooftop Unit #3	8th Grade Wing	Heating only (hot water)	McQuay
Packaged Rooftop Unit #2	8th Grade Wing	Heating only (hot water)	McQuay
Packaged Rooftop Unit	Kitchen	Heating only (hot water)	McQuay
Packaged Rooftop Unit #5	Cafeteria	Heating only (hot water)	McQuay
Packaged Rooftop Unit #6	Cafeteria	Heating only (hot water)	McQuay
Packaged Rooftop Unit #8	Science Room #41	Heating only (hot water)	McQuay
Packaged Terminal Heat Pump	Nurse's Office	Heating and Cooling (both DX)	McQuay

Air Conditioners and Split Heat Pumps

There are 27 window air conditioners installed in the classrooms (0.7-ton capacity), six split air-source heat pumps (0.75-ton to 7.5-ton capacity), and two split air conditioners (2.75-ton capacity). The SEER for the window air conditioning (AC) units ranges between 8.8 and 12.1, the SEER for the split air-source heat pumps ranges between 9.1 and 17.1, and the SEER for the two split air conditioners is 10.7.

The split air-source heat pump serving the faculty room has a cooling capacity of 7.5-ton and heating capacity of 90 MBh.

The units that are beyond useful life include the faculty room heat pump and the window ACs serving five classrooms (#12, 17, 21, 32, and 46).

Air Handling Units

The gymnasium and locker rooms are served by two air handling units (AHU). The AHUs have supply fans and hot water coils for heating. There is no space cooling for the gymnasium. One of the two AHUs is not operational. The Board of Education has planned a new HVAC system for the gymnasium, locker rooms, and weight room. New AHUs and condensing units will be installed for the gymnasium and locker rooms (under the new project, gym and lockers rooms will have space cooling). A new ductless split AC system will be installed in the weight room for cooling.

Exhaust Fans

There are over 40 exhaust fans installed on the roof. The exhaust fans serve science classrooms, hallways, the kitchen cooking area, dishwashing area, restrooms, and boiler rooms. The fan motor hp ranges from 0.25 hp to 2 hp. The exhaust fans are in fair condition.

Window AC

Split system heat pump

Packaged rooftop unit

Unit ventilator in classroom

2.6 Heating Hot Water Systems

Three Lochinvar 2,300 MBh hot water, condensing boilers serve majority of the building heating load. The burners are fully modulating with a nominal efficiency of 91 percent. The boilers are configured in an automated lead-lag control scheme. They were installed in 2015 and are in good condition.

The boilers are configured in a variable flow primary distribution with two 10 hp and two 5 hp VFD controlled hot water pumps. Both pairs of pumps operate with an automated lead-lag control scheme. The boilers provide hot water to unit ventilators in the classrooms, seven packaged rooftop units with hot water coils, and to the gymnasium AHU.

The heating hot water system is controlled by a dedicated digital control system. Hot water is supplied at between 160 and 170°F when the outside air temperature is low, and the setpoint is adjusted automatically to lower hot water supply temperatures depending on the outside air temperature.

Three condensing boilers

10 hp and 5 hp hot water pumps

VFD controls for hot water pumps

Dedicated digital controls for boilers

2.7 Domestic Hot Water

Hot water is produced with two 117 gallon, 400 MBh gas-fired Shield storage water heaters. Both water heaters are condensing with maximum efficiencies of 96 percent. One water heater is dedicated for the kitchen and the other heater is for the use in all other areas of the school.

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

Two condensing type domestic hot water heaters

Insulated domestic hot water piping

2.8 Food Service Equipment

The kitchen has a mix of gas and electric equipment, used to prepare meals for students. Most cooking is done using convection gas-fired ovens and gas cooktops.

A high temperature type dishwasher unit is also installed in the kitchen and it also has an electric booster water heater. The dishwasher is not ENERGY STAR® rated.

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

Gas cooktop and oven

Full-sized gas oven

Dishwasher

Electric steamer

2.9 Refrigeration

The kitchen has a stand-up refrigerator with solid doors, a refrigerator chest, and a freezer chest. All equipment is in fair condition.

There is one walk-in cooler and one walk-in freezer (0°F to 30°F). The walk-in cooler has one evaporator fan and the walk-in freezer has two fans.

There is also one refrigerated reach-in cooler, and it has an aluminum night cover.

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

Walk-in cooler and freezer

Refrigerator chest

Reach-in refrigerated case

Freezer chest

2.10 Plug Load and Vending Machines

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

There are approximately 450 desktop computer workstations and laptop computers throughout the facility. Other plug loads throughout the building include general café and office equipment. Café equipment include heated/chilled serving tables and heated display cases in the kitchen and microwave and toaster ovens, residential style refrigerators, coffee makers and water cooler in the break room. Office and other equipment include printers, copiers and a television. There are also typical classroom plug load equipment such as smart boards, projectors, and fans.

There are two refrigerated beverage vending machines and one non-refrigerated vending machine in the school. Vending machines are not equipped with occupancy-based controls.

Heated serving table

Large printer/copier

Refrigerated vending machine

Refrigerator

2.11 Water-Using Systems

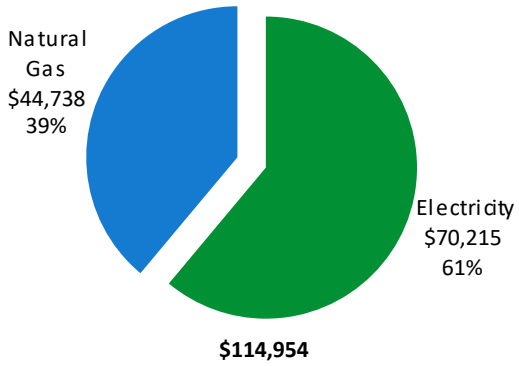
There are total nine restrooms in the school and faucet flow rates in restrooms are at 2.5 gallons per minute (gpm) and 1.5 gpm. Faucet flow rates in other areas such as the kitchen and classrooms are at 2.5 gpm.

2.5 gpm restroom faucet

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	601,746 kWh	$70,215
Natural Gas	44,645 Therms	$44,738
Total		**$114,954**



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

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

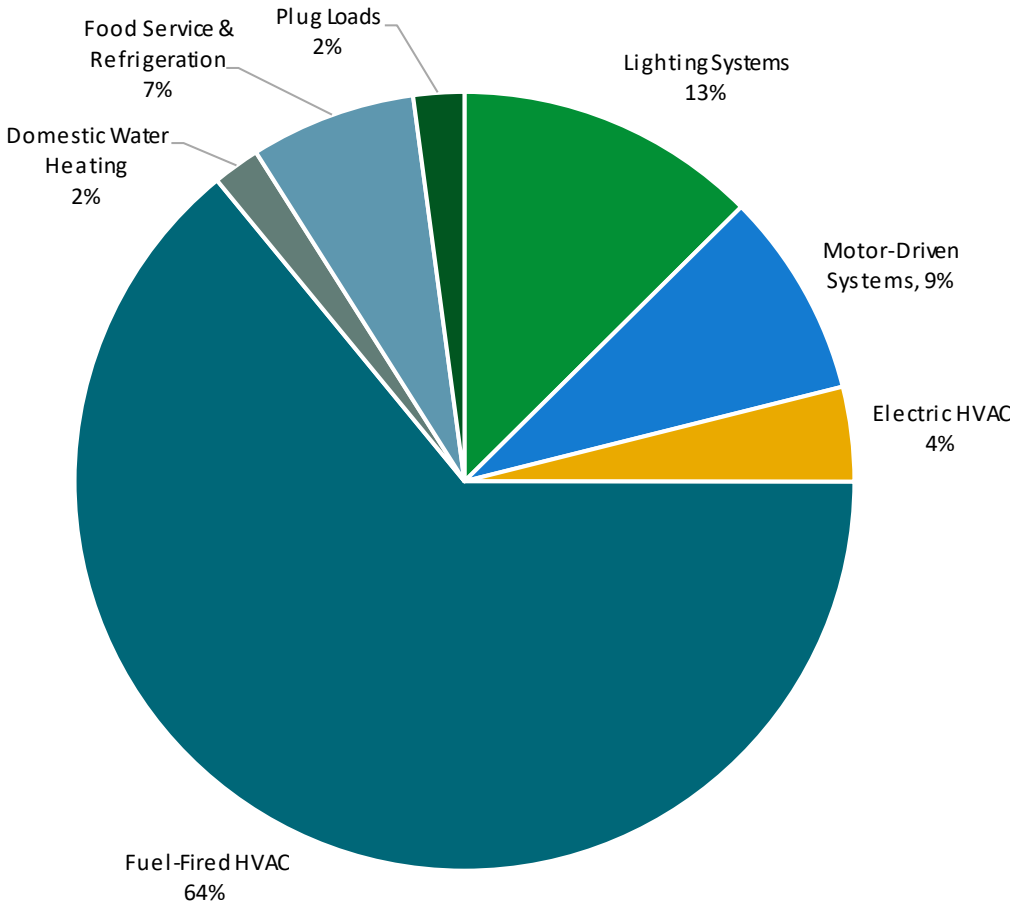
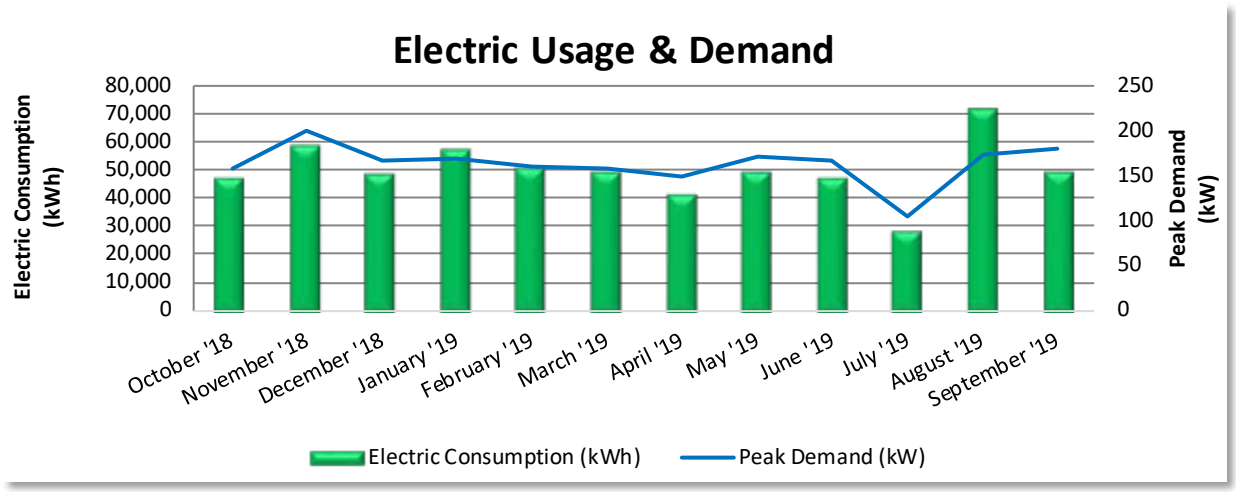


Figure 5 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under rate class General Service Secondary, with electric production provided by East Coast Power & Gas, a third-party supplier.



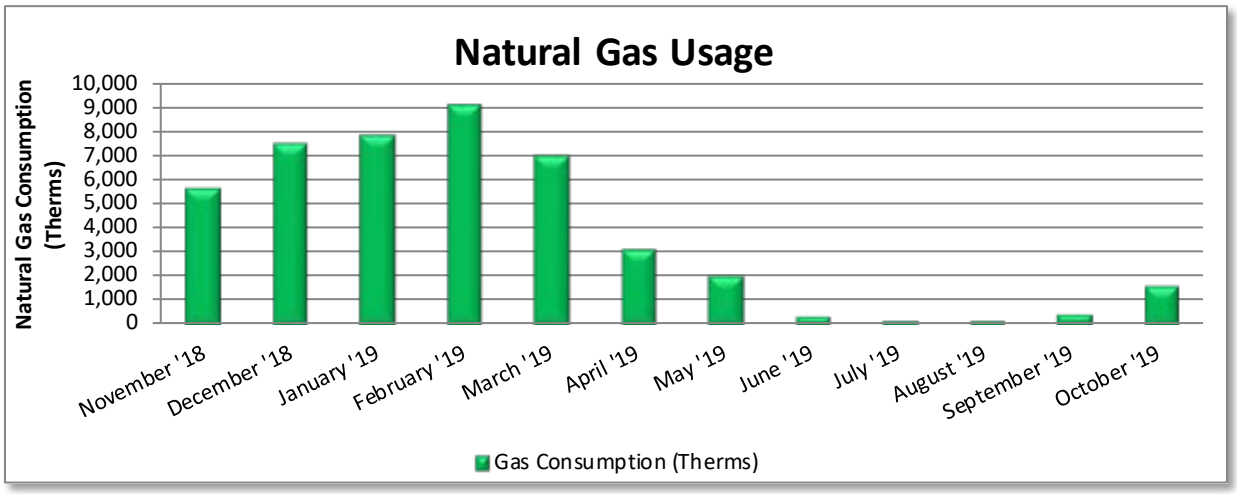
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
11/10/18	29	47,200	158	$929	$5,916
12/11/18	31	58,560	201	$1,195	$7,322
1/11/19	31	48,320	166	$977	$5,507
2/11/19	31	56,640	169	$998	$6,385
3/12/19	29	50,720	160	$941	$5,668
4/10/19	29	48,800	158	$925	$5,476
5/10/19	30	41,280	148	$867	$4,861
6/11/19	32	49,120	170	$1,065	$5,636
7/11/19	30	46,720	167	$1,041	$5,565
8/9/19	29	28,800	106	$634	$3,461
9/11/19	33	71,360	175	$1,091	$8,000
10/9/19	28	49,280	181	$1,053	$5,840
Totals	**362**	**596,800**	**201**	**$11,715**	**$69,638**
Annual	**365**	**601,746**	**201**	**$11,812**	**$70,215**

Notes:

- Peak demand of 201 kW occurred in November '18.
- Average demand over the past 12 months was 163 kW.
- The average electric cost over the past 12 months was $0.117/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

New Jersey Natural Gas delivers natural gas under rate class Monthly 057CNN2G, with natural gas supply provided by UGI Energy Services, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
11/26/18	33	5,605	$4,934
12/28/18	32	7,492	$6,381
1/25/19	28	7,781	$8,218
2/26/19	32	9,023	$8,590
3/27/19	29	6,943	$6,168
4/26/19	30	3,148	$3,109
5/29/19	33	2,025	$2,194
6/26/19	28	344	$897
7/29/19	33	242	$809
8/27/19	29	163	$748
9/25/19	29	421	$939
10/25/19	30	1,580	$1,873
Totals	**366**	**44,767**	**$44,861**
Annual	**365**	**44,645**	**$44,738**

Notes:

- The average gas cost for the past 12 months is $1.002/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

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

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

Benchmarking Score	42

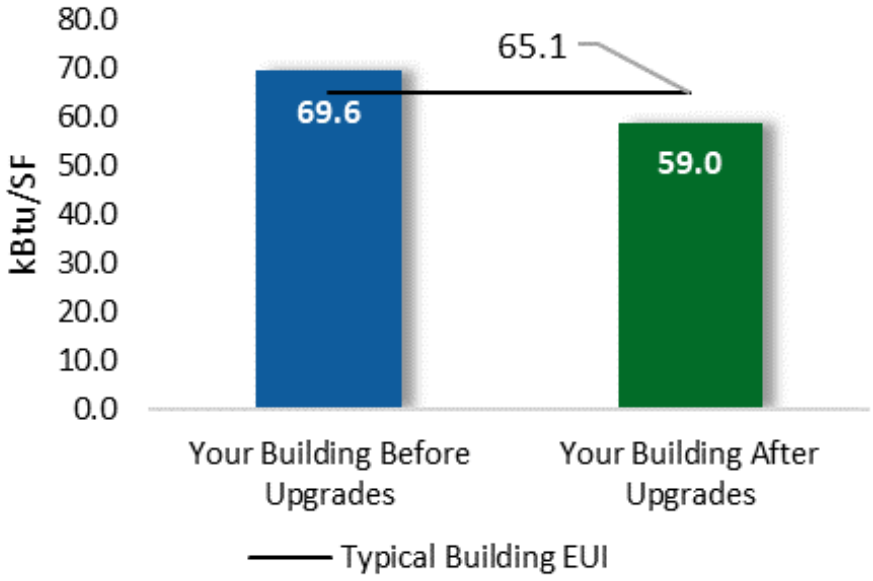


Figure 6 - Energy Use Intensity Comparison[3]

At 69.6 kBTU/ft^2, this building's energy usage exceeds the national average of 65.1 kBTU/ft^2 for schools, meaning building performance is slightly below the national average.

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

[3] Based on all evaluated ECMs

Tracking Your Energy Performance

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

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

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

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

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

4 Energy Conservation Measures

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

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

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

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

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

#	Energy Conservation Measure	Cost Effective?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**134,587**	**55.3**	**-27**	**$15,431**	**$65,122**	**$31,350**	**$33,772**	**2.2**	**132,334**
ECM 1	Install LED Fixtures	Yes	3,245	0.4	0	$374	$540	$0	$540	1.4	3,214
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	571	0.5	0	$65	$959	$272	$687	10.5	561
ECM 3	Retrofit Fixtures with LED Lamps	Yes	129,538	54.2	-26	$14,850	$62,464	$31,078	$31,386	2.1	127,347
ECM 4	Install LED Exit Signs	Yes	1,233	0.1	0	$141	$1,159	$0	$1,159	8.2	1,212
Lighting Control Measures			**25,683**	**7.7**	**-5**	**$2,943**	**$26,244**	**$11,160**	**$15,084**	**5.1**	**25,233**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	18,615	6.3	-4	$2,133	$18,594	$3,510	$15,084	7.1	18,290
ECM 6	Install High/Low Lighting Controls	Yes	7,067	1.4	-1	$810	$7,650	$7,650	$0	0.0	6,944
ECM 7	Install VFDs on Constant Volume (CV) Fans	Yes	46,888	19.4	0	$5,471	$51,428	$15,800	$35,628	6.5	47,216
ECM 8	Install VFDs on Kitchen Hood Fan Motors	Yes	2,035	0.0	22	$453	$3,261	$200	$3,061	6.8	4,567
Electric Unitary HVAC Measures			**6,719**	**2.5**	**0**	**$784**	**$29,893**	**$2,291**	**$27,602**	**35.2**	**6,766**
ECM 9	Install High Efficiency Air Conditioning Units	No	2,121	1.5	0	$248	$18,994	$1,196	$17,798	71.9	2,136
ECM 10	Install High Efficiency Heat Pumps	No	4,598	1.0	0	$537	$10,899	$1,095	$9,804	18.3	4,630
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**41**	**$411**	**$8,293**	**$1,600**	**$6,693**	**16.3**	**4,808**
ECM 11	Install High Efficiency Furnaces	No	0	0.0	41	$411	$8,293	$1,600	$6,693	16.3	4,808
HVAC System Improvements			**0**	**0.0**	**32**	**$325**	**$5,438**	**$0**	**$5,438**	**16.7**	**3,800**
ECM 12	Implement Demand Control Ventilation (DCV)	No	0	0.0	32	$325	$5,438	$0	$5,438	16.7	3,800
Domestic Water Heating Upgrade			**0**	**0.0**	**14**	**$143**	**$330**	**$213**	**$117**	**0.8**	**1,667**
ECM 13	Install Low-Flow DHW Devices	Yes	0	0.0	14	$143	$330	$213	$117	0.8	1,667
Food Service & Refrigeration Measures			**10,344**	**1.0**	**0**	**$1,207**	**$7,876**	**$1,040**	**$6,836**	**5.7**	**10,416**
ECM 14	Refrigerator/Freezer Case Electrically Commutated Motors	No	590	0.1	0	$69	$910	$240	$670	9.7	594
ECM 15	Refrigeration Display Case Doors or Covers	Yes	3,018	0.3	0	$352	$1,338	$400	$938	2.7	3,039
ECM 16	Refrigeration Controls	No	1,573	0.0	0	$183	$3,348	$300	$3,048	16.6	1,584
ECM 17	Replace Refrigeration Equipment	Yes	3,551	0.4	0	$414	$2,050	$0	$2,050	4.9	3,576
ECM 18	Vending Machine Control	Yes	1,612	0.2	0	$188	$230	$100	$130	0.7	1,623
Custom Measures			**17,671**	**0.0**	**83**	**$2,898**	**$61,849**	**$0**	**$61,849**	**21.3**	**27,567**
ECM 19	Installation of an Energy Management System	No	17,671	0.0	83	$2,898	$61,849	$0	$61,849	21.3	27,567
TOTALS			**243,927**	**85.9**	**160**	**$30,067**	**$259,733**	**$63,654**	**$196,079**	**6.5**	**264,375**

* - 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		**134,587**	**55.3**	**-27**	**$15,431**	**$65,122**	**$31,350**	**$33,772**	**2.2**	**132,334**
ECM 1	Install LED Fixtures	3,245	0.4	0	$374	$540	$0	$540	1.4	3,214
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	571	0.5	0	$65	$959	$272	$687	10.5	561
ECM 3	Retrofit Fixtures with LED Lamps	129,538	54.2	-26	$14,850	$62,464	$31,078	$31,386	2.1	127,347
ECM 4	Install LED Exit Signs	1,233	0.1	0	$141	$1,159	$0	$1,159	8.2	1,212
Lighting Control Measures		**25,683**	**7.7**	**-5**	**$2,943**	**$26,244**	**$11,160**	**$15,084**	**5.1**	**25,233**
ECM 5	Install Occupancy Sensor Lighting Controls	18,615	6.3	-4	$2,133	$18,594	$3,510	$15,084	7.1	18,290
ECM 6	Install High/Low Lighting Controls	7,067	1.4	-1	$810	$7,650	$7,650	$0	0.0	6,944
Variable Frequency Drive (VFD) Measures		**48,923**	**19.4**	**22**	**$5,924**	**$54,689**	**$16,000**	**$38,689**	**6.5**	**51,783**
ECM 7	Install VFDs on Constant Volume (CV) Fans	46,888	19.4	0	$5,471	$51,428	$15,800	$35,628	6.5	47,216
ECM 8	Install VFDs on Kitchen Hood Fan Motors	2,035	0.0	22	$453	$3,261	$200	$3,061	6.8	4,567
Domestic Water Heating Upgrade		**0**	**0.0**	**14**	**$143**	**$330**	**$213**	**$117**	**0.8**	**1,667**
ECM 13	Install Low-Flow DHW Devices	0	0.0	14	$143	$330	$213	$117	0.8	1,667
Food Service & Refrigeration Measures		**8,181**	**0.9**	**0**	**$955**	**$3,618**	**$500**	**$3,118**	**3.3**	**8,239**
ECM 15	Refrigeration Display Case Doors or Covers	3,018	0.3	0	$352	$1,338	$400	$938	2.7	3,039
ECM 17	Replace Refrigeration Equipment	3,551	0.4	0	$414	$2,050	$0	$2,050	4.9	3,576
ECM 18	Vending Machine Control	1,612	0.2	0	$188	$230	$100	$130	0.7	1,623
TOTALS		**217,374**	**83.3**	**3**	**$25,396**	**$150,002**	**$59,223**	**$90,780**	**3.6**	**219,256**

* - 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		**134,587**	**55.3**	**-27**	**$15,431**	**$65,122**	**$31,350**	**$33,772**	**2.2**	**132,334**
ECM 1	Install LED Fixtures	3,245	0.4	0	$374	$540	$0	$540	1.4	3,214
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	571	0.5	0	$65	$959	$272	$687	10.5	561
ECM 3	Retrofit Fixtures with LED Lamps	129,538	54.2	-26	$14,850	$62,464	$31,078	$31,386	2.1	127,347
ECM 4	Install LED Exit Signs	1,233	0.1	0	$141	$1,159	$0	$1,159	8.2	1,212

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

ECM 1: Install LED Fixtures

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

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

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: 8th grade wing hallway and the exterior metal halide fixtures.

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: T12 fixtures in storage space of classrooms 38 and 39, and the nurse's office bathroom.

ECM 3: Retrofit Fixtures with LED Lamps

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

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

Affected building areas: all areas with fluorescent fixtures with T8 tubes, incandescent lamps and CFLs.

ECM 4: Install LED Exit Signs

Replace compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output. Maintenance savings and improved reliability may also be achieved, as the longer-lasting LED lamps will not need to be replaced as often as the existing 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		**25,683**	**7.7**	**-5**	**$2,943**	**$26,244**	**$11,160**	**$15,084**	**5.1**	**25,233**
ECM 5	Install Occupancy Sensor Lighting Controls	18,615	6.3	-4	$2,133	$18,594	$3,510	$15,084	7.1	18,290
ECM 6	Install High/Low Lighting Controls	7,067	1.4	-1	$810	$7,650	$7,650	$0	0.0	6,944

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 5: Install Occupancy Sensor Lighting Controls

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

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

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

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

Affected building areas: classrooms, main office and other offices, lockers rooms, cafeteria, media center, gymnasium, kitchen, and restrooms.

ECM 6: Install High/Low Lighting Controls

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

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

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

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

Affected building areas: hallways.

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

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**48,923**	**19.4**	**22**	**$5,924**	**$54,689**	**$16,000**	**$38,689**	**6.5**	**51,783**
ECM 7	Install VFDs on Constant Volume (CV) Fans	46,888	19.4	0	$5,471	$51,428	$15,800	$35,628	6.5	47,216
ECM 8	Install VFDs on Kitchen Hood Fan Motors	2,035	0.0	22	$453	$3,261	$200	$3,061	6.8	4,567

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

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

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

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

For air handlers with DX cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing must be determined during the final project design. The control system programming should maintain the minimum air flow whenever the compressor is operating. Prior to implementation, verify minimum fan speed in cooling mode with the manufacturer. Note that savings will vary depending on the operating characteristics of each AHU.

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

Affected air handlers: 8th grade wing rooftop unit (RTU) #2 & #3, RTUs for classroom 25 & 26, kitchen RTU, media center RTU, cafeteria RTU #5 & #6, and the AHU for gymnasium.

ECM 8: Install VFDs on Kitchen Hood Fan Motors

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

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

4.4 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		**6,719**	**2.5**	**0**	**$784**	**$29,893**	**$2,291**	**$27,602**	**35.2**	**6,766**
ECM 9	Install High Efficiency Air Conditioning Units	2,121	1.5	0	$248	$18,994	$1,196	$17,798	71.9	2,136
ECM 10	Install High Efficiency Heat Pumps	4,598	1.0	0	$537	$10,899	$1,095	$9,804	18.3	4,630

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 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 packaged rooftop units, heat pump system and window ACs are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 9: Install High Efficiency Air Conditioning Units

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

Affected units: packaged rooftop unit for classroom 19, guidance suite and window ACs in classrooms 32, 40, 46, and 48.

ECM 10: Install High Efficiency Heat Pumps

We evaluated replacing standard efficiency heat pumps with high efficiency heat pumps. A higher EER or SEER rating indicates a more efficient cooling system and a higher HSPF rating indicates more efficient heating mode. 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 heating and cooling loads, and the estimated annual operating hours.

Affected units: heat pump system for faculty room (Carrier 38AQS008).

4.5 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**	**41**	**$411**	**$8,293**	**$1,600**	**$6,693**	**16.3**	**4,808**
ECM 11	Install High Efficiency Furnaces	0	0.0	41	$411	$8,293	$1,600	$6,693	16.3	4,808

ECM 11: Install High Efficiency Furnaces

We evaluated replacing 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.

Affected units: Reznor make-up air unit and media center unit.

4.6 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**0**	**0.0**	**32**	**$325**	**$5,438**	**$0**	**$5,438**	**16.7**	**3,800**
ECM 12	Implement Demand Control Ventilation (DCV)	0	0.0	32	$325	$5,438	$0	$5,438	16.7	3,800

ECM 12: Implement Demand Control Ventilation (DCV)

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

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

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

Affected building areas: gymnasium and cafeteria.

4.7 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**14**	**$143**	**$330**	**$213**	**$117**	**0.8**	**1,667**
ECM 13	Install Low-Flow DHW Devices	0	0.0	14	$143	$330	$213	$117	0.8	1,667

ECM 13: Install Low-Flow DHW Devices

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

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

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing.

Additional cost savings may result from reduced water usage.

4.8 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**10,344**	**1.0**	**0**	**$1,207**	**$7,876**	**$1,040**	**$6,836**	**5.7**	**10,416**
ECM 14	Refrigerator/Freezer Case Electrically Commutated Motors	590	0.1	0	$69	$910	$240	$670	9.7	594
ECM 15	Refrigeration Display Case Doors or Covers	3,018	0.3	0	$352	$1,338	$400	$938	2.7	3,039
ECM 16	Refrigeration Controls	1,573	0.0	0	$183	$3,348	$300	$3,048	16.6	1,584
ECM 17	Replace Refrigeration Equipment	3,551	0.4	0	$414	$2,050	$0	$2,050	4.9	3,576
ECM 18	Vending Machine Control	1,612	0.2	0	$188	$230	$100	$130	0.7	1,623

ECM 14: Refrigerator/Freezer Case Electrically Commutated Motors

We evaluated replacing shaded pole or permanent split capacitor (PSC) motors with electronically commutated (EC) motors in 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 15: Refrigeration Display Case Doors or Covers

Install insulated doors on the open refrigerated display case in the cafeteria/kitchen area. Open refrigerated display cases have higher heat gain than covered cases which means the refrigeration compressor must work harder to keep food cool.

ECM 16: Refrigeration Controls

We evaluated installation of 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 this control measure accounts for reduction in compressor and fan operating hours as well as reduction in the refrigeration heat load as appropriate.

ECM 17: Replace Refrigeration Equipment

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

ECM 18: 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.

4.9 Custom Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures		**17,671**	**0.0**	**83**	**$2,898**	**$61,849**	**$0**	**$61,849**	**21.3**	**27,567**
ECM 19	Installation of an Energy Management System	17,671	0.0	83	$2,898	$61,849	$0	$61,849	21.3	27,567

ECM 19: Installation of an EMS

We understand that the Board of Education is interested in a new EMS for this site and is currently planning its scope and installation. We have provided an analysis of cost and savings potential, which we believe to be conservative. Savings potential depends on current operations, the control capabilities of the new system, and how the system will be operated and maintained.

Most larger facilities have some type of EMS, which provides for centralized, remote control and monitoring of HVAC equipment and sometimes lighting or other building systems. An EMS utilizes a system of temperature and pressure sensors that obtain feedback about field conditions and provide signals to control systems that adjust HVAC system operation for optimal functioning. Thirty years ago, most control systems were pneumatic systems driven by compressed air, with pneumatic thermostats and air driven actuators for valves and dampers. Pneumatic controls have largely been replaced by direct digital control (DDC) systems, but many pneumatic systems remain. Contemporary DDC systems afford tighter controls and enhanced monitoring and trending capabilities as compared to the older systems.

Often smaller facilities are not equipped with central controls. For many small sites, it has been less costly to install distributed local controls, such as programmable thermostats and timeclocks, rather than centralized DDC. Local controls do a reasonably good job of scheduling equipment and maintaining operating conditions by relying on controls integral to HVAC units, such as logic for compressor staging, to manage the equipment operating algorithms.

Even for smaller sites, inefficiencies arise when temperature sensors and thermostat schedules are not maintained, when there are separate systems for heating and cooling, and especially when equipment is added, or the facility is reconfigured or repurposed.

Based on our survey, it appears that the installation of an EMS at your site could increase the efficiency of your building HVAC system operation.

A controls upgrade would enable automated equipment *start* and *stop* times, temperature setpoints, lockouts, and deadbands to be programmed remotely using a graphic interface. Controls can be configured to optimize ventilation and outside air intake by adjusting economizer position, damper function and fan speed. Existing chilled and hot water distribution system controls are typically *tied in*, including associated pumps and valves. Coordinated control of HVAC systems is dependent on a network

of sensors and status points. A comprehensive building control system provides monitoring and control for all HVAC systems so operators can adjust system programming for optimal comfort and energy savings.

It is recommended that an HVAC engineer or contractor who specializes in EMSs 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 report is not an investment grade analysis, and it should not be used as a basis for design and construction.

A high-level evaluation of potential savings and costs is provided for demonstration purposes only. It is a screening evaluation for the potential in installing an EMS. Based on industry standards and previous project experience, the potential energy savings may be up to 20 percent of existing HVAC energy use. The average cost for installing and EMS may be between $2 and $4 per square foot. Actual savings and costs will need to be outlined by the specific contractor engaged to implement the system. For the purposes of this report, we have conservatively estimated savings to be 5 percent of the HVAC energy consumption baseline.

5 Energy Efficient Best Practices

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs.

Operation and maintenance (O&M) plans enhance the operational efficiency of HVAC and other energy intensive systems and could save between 5 to 20 percent of the energy usage in your building without substantial capital investment. A successful plan includes your records of energy usage trends and costs, building equipment lists, current maintenance practices, planned capital upgrades, and incorporates your ideas for improved building operation. Your plan will address goals for energy-efficient operation, provide detail on how to reach the goals, and will outline procedures for measuring and reporting whether goals have been achieved.

You may already be doing some of these things— see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR® Portfolio Manager®

You've heard it before - you can't manage what you don't measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[5] . Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

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 percent while still drawing full power.

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

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

Lighting Controls

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

Motor Maintenance

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

Thermostat Schedules and Temperature Resets

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

Economizer Maintenance

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

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

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Ductwork Maintenance

Duct maintenance has two primary goals: keep the ducts clean to avoid air quality problems and seal leaks to save energy. Check for cleanliness, obstructions that block airflow, water damage, and leaks. Ducts should be inspected at least every two years.

The biggest symptoms of clogged air ducts are differing temperatures throughout the building and areas with limited airflow from supply registers. If a particular air duct is clogged, then air flow will only be cut off to some rooms in the building - not all of them. The reduced airflow will make it more difficult for those areas to reach the temperature setpoint which will cause the HVAC system to run longer to cool or heat that area properly. If you suspect clogged air ducts, ensure that all areas in front of supply registers are clear of items that may block or restrict air flow, and check for fire dampers or balancing dampers that have failed closed.

Duct leakage in commercial buildings can account for 5 percent to 25 percent of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building wasting conditioned air. Check ductwork for leakage. Eliminating duct leaks can improve ventilation system performance and reduce heating and cooling system operation.

Distribution system losses are dependent on air system temperature, the size of the distribution system, and the level of insulation of the ductwork. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is missing or worn, the system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Boiler Maintenance

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

Furnace Maintenance

Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should: check for gas / carbon monoxide leaks; change the air and fuel filters; check components for cracks, corrosion, dirt, or debris build-up; ensure the ignition system is working properly; test and adjust operation and safety controls; inspect electrical connections; and lubricate motors and bearings.

Label HVAC Equipment

For improved coordination in maintenance practices, we recommend labeling or re-labeling the site HVAC equipment. Maintain continuity in labeling by following labeling conventions as indicated in the facility drawings or EMS building equipment list. Use weatherproof or heatproof labeling or stickers for permanence, but do not cover over original equipment nameplates, which should be kept clean and readable whenever possible. Besides equipment, label piping for service and direction of flow when possible. Ideally, maintain a log of HVAC equipment, including nameplate information, asset tag designation, areas served, installation year, service dates, and other pertinent information.

This investment in your equipment will enhance collaboration and communication between your staff and your contracted service providers and may help you with regulatory compliance.

Water Heater Maintenance

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

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

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

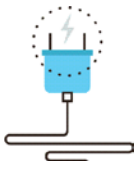
Refrigeration Equipment Maintenance

Preventative maintenance keeps commercial refrigeration equipment running reliably and efficiently. Commercial refrigerators and freezers are mission-critical equipment that can cost a fortune when they go down. Even when they appear to be working properly, refrigeration units can be consuming too much energy. Have walk-in refrigeration and freezer and other commercial systems serviced at least annually. This practice will allow systems to perform to their highest capabilities and will help identify system issues if they exist.

Maintaining your commercial refrigeration equipment can save between 5 and 10 percent on energy costs. When condenser coils are dirty, your commercial refrigerators and freezers work harder to maintain the temperature inside. Worn gaskets, hinges, door handles or faulty seals cause cold air to leak from the unit, forcing the unit to run longer and use more electricity.

Regular cleaning and maintenance also help your commercial refrigeration equipment to last longer.

Plug Load Controls



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

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

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

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

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

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

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.

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

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

6 On-site Generation

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

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

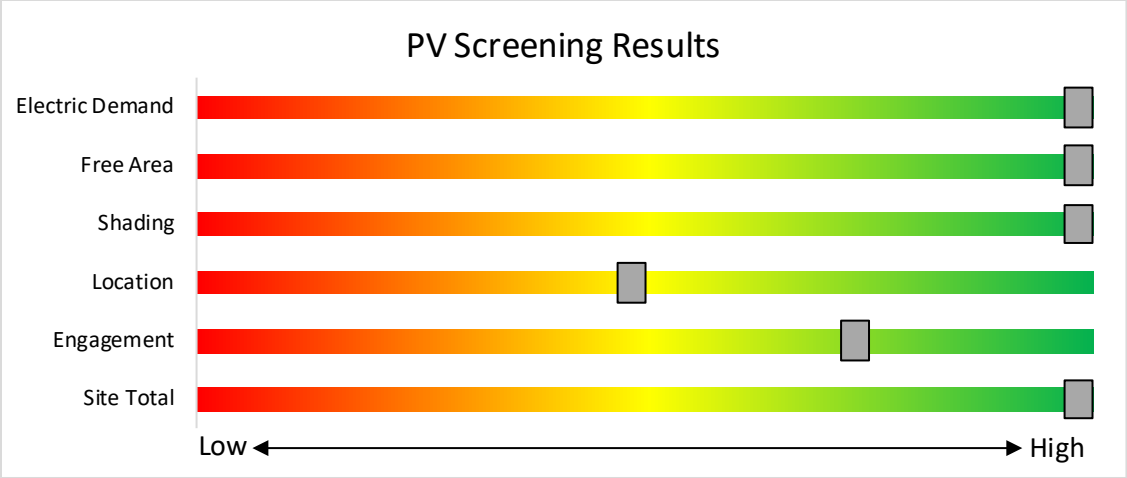
6.1 Solar Photovoltaic

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

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

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

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



Potential	High	
System Potential	95	kW DC STC
Electric Generation	113,180	kWh/yr
Displaced Cost	$13,210	/yr
Installed Cost	$370,500	

Figure 9 - Photovoltaic Screening

Transition Incentive (TI) Program

The TI program is a bridge between the Legacy SREC Program and a to-be determined Successor Incentive Program. The program 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 TRECs (Transition Incentive Renewable Energy Certificates). The Transition Incentive is structured as a factorized renewable energy certificate. The factors allow the TI Program to provide differentiated financial incentives for different types of solar installation.

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:

Transition Incentive (TI) Program: https://www.njcleanenergy.com/renewable-energy/programs/transition-incentive-program

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

6.2 Combined Heat and Power

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

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

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

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

Based on a preliminary analysis, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. Low and infrequent thermal load is the most significant factor contributing to the lack of CHP potential.

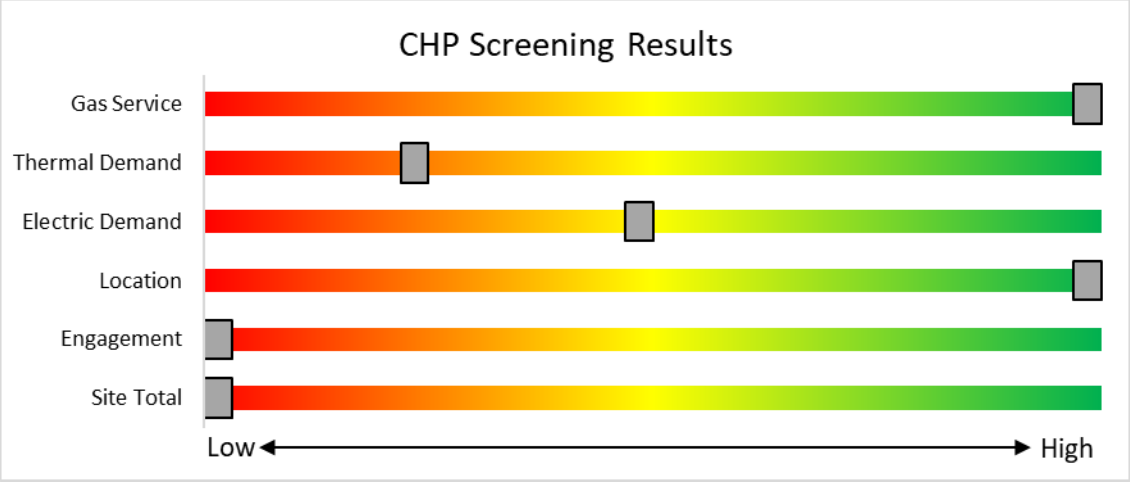


Figure 10 – Combined Heat & Power Screening

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

7 PROJECT FUNDING AND INCENTIVES

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

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

7.1 SmartStart

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

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

Equipment with Prescriptive Incentives Currently Available:

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

Incentives

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

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

How to Participate

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

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

7.2 Direct Install

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

Incentives

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

How to Participate

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

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

7.3 Pay for Performance - Existing Buildings

Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures that results in at least 15 percent source energy savings, and lighting cannot make up the majority of the savings.

P4P is a generally a good option for medium-to-large sized facilities looking to implement as many measures as possible under a single project to achieve deep energy savings. This program has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program.

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

Incentives

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

How to Participate

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

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

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

7.4 Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

7.5 Energy Savings Improvement Program

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

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

How to Participate

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

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

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

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

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

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

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

7.6 Transition Incentive (TI) Program

The TI program is a bridge between the Legacy SREC Program and a to-be determined Successor Incentive Program. The program 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 TRECs (Transition Incentive Renewable Energy Certificates). The Transition Incentive is structured as a factorized renewable energy certificate. The factors allow the TI Program to provide differentiated financial incentives for different types of solar installations. NJBPU calculates the value of a Transition Renewable Energy Certificate (TREC) by multiplying the base compensation rate ($152/MWh) by the project's assigned factor (i.e. $152 x 0.85 = $129.20/MWh). The TREC factors are defined based on the chart below:

Project Type	Factor
Subsection (t): landfill, brownfield, areas of historic fill	1.00
Grid supply (Subsection (r)) rooftop	1.00
Net metered non-residential rooftop and carport	1.00
Community solar	0.85
Grid supply (Subsection (r)) ground mount	0.60
Net metered residential ground mount	0.60
Net metered residential rooftop and carport	0.60
Net metered non-residential ground mount	0.60

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 TRECs.

Eligible projects may generate TRECs for 15 years following the commencement of commercial operations (also referred to as the "Transition Incentive Qualification Life"). After 15 years, projects may be eligible for a New Jersey Class I REC.

TRECs will be used by the identified compliance entities to satisfy a compliance obligation tied to a new Transition Incentive Renewable Portfolio Standard ("TI-RPS"), which will exist in parallel with, and completely separate from, the existing Solar RPS for Legacy SRECs. The TI-RPS is a carve-out of the current Class I RPS requirement. The creation of TRECs is based upon metered generation supplied to PJM-EIS General Attribute Tracking System ("GATS") by the owners of eligible facilities or their agents. GATS would create one TREC for each MWh of energy produced from a qualified facility.

TRECs will be purchased monthly by a TREC Administrator who will allocate the TRECs to the Load Serving Entities (BGS Providers and Third-Party Suppliers) annually based on their market share of retail electricity sold during the relevant Energy Year.

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan. The Transition Incentive Program online portal is now open to new applications effective May 1, 2020. There are instructions on "How and When to Transfer my SRP Registration to the Transition Incentive Program". If you are considering installing solar photovoltaics on your building, visit the following link for more information:

https://www.njcleanenergy.com/renewable-energy/programs/transition-incentive-program

8 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third-party supplier, consider shopping for a reduced rate from third-party electric suppliers. If your facility already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

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

8.2 Retail Natural Gas Supply Options

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

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

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

A list of licensed third-party natural gas suppliers is available at the NJBPU website[10].

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler/Mech Room	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	690		None	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	690	0.0	0	0	$0	$0	$0	0.0
Boys / Bathroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,070	3, 5	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,428	0.1	382	0	$44	$416	$150	6.1
Boys / Small room	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	0.1	337	0	$39	$262	$120	3.7
Boys / Locker area	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,381	3, 5	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,333	0.3	1,651	0	$189	$708	$310	2.1
Cafeteria	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Cafeteria	49	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	49	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	2.6	8,254	-2	$946	$4,658	$2,240	2.6
Central Storage	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	690	3, 5	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	476	0.4	382	0	$44	$708	$240	10.7
Classroom 12	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.6	1,874	0	$215	$1,168	$640	2.5
Classroom 14	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 15	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 17	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 21	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 22 Band Room / Music storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,070	3, 5	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,428	0.1	382	0	$44	$416	$80	7.7
Classroom 22 Band Room	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,070	3, 5	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,428	0.9	2,868	-1	$329	$1,635	$740	2.7
Classroom 32	11	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	11	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.4	1,289	0	$148	$803	$440	2.5
Classroom 32	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,070	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,070	0.0	66	0	$8	$72	$20	6.9
Classroom 33	11	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	11	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.4	1,289	0	$148	$803	$440	2.5
Classroom 33	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,070	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,070	0.0	66	0	$8	$72	$20	6.9
Classroom 34	11	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	11	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.4	1,289	0	$148	$803	$440	2.5
Classroom 34	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,070	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,070	0.0	66	0	$8	$72	$20	6.9
Classroom 35	11	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	11	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.4	1,289	0	$148	$803	$440	2.5
Classroom 35 / Storage closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	690	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	690	0.0	22	0	$3	$72	$20	20.8
Classroom 36	11	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	11	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.4	1,289	0	$148	$803	$440	2.5
Classroom 36	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,070	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,070	0.0	66	0	$8	$72	$20	6.9
Classroom 37	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5

	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 38 (science) / Storage room	5	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	690	2, 5	Relamp & Reballast	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	476	0.2	258	0	$30	$614	$100	17.4
Classroom 38 (science)	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	0.6	2,021	0	$232	$1,146	$550	2.6
Classroom 39 / Storage room	5	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	690	2, 5	Relamp & Reballast	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	476	0.2	258	0	$30	$614	$100	17.4
Classroom 39	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,300	3, 5	Relamp	Yes	13	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,587	0.7	2,433	-1	$279	$1,219	$590	2.3
Classroom 40 (Science) / Storage room	1	Compact Fluorescent: (2) 18W Plug-In Lamps	Wall Switch	S	36	690	3	Relamp	No	1	LED Lamps: (2) 12W Plug-In Lamps	Wall Switch	24	690	0.0	9	0	$1	$25	$4	20.1
Classroom 40 (Science)	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.6	1,874	0	$215	$1,168	$640	2.5
Classroom 40 (Science) / Storage Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	690	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	690	0.0	22	0	$3	$72	$20	20.8
Classroom 41	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	18	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	1.0	3,032	-1	$347	$1,855	$860	2.9
Classroom 44	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,428	0.0	110	0	$13	$319	$18	23.8
Classroom 44	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 44	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	1,902	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,902	0.0	61	0	$7	$72	$20	7.5
Classroom 45	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,428	0.0	110	0	$13	$319	$18	23.8
Classroom 45	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 46	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,428	0.0	110	0	$13	$319	$18	23.8
Classroom 46	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 47	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,428	0.0	110	0	$13	$319	$18	23.8
Classroom 47	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 48	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,428	0.0	110	0	$13	$319	$18	23.8
Classroom 48	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 49	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,428	0.0	110	0	$13	$319	$18	23.8
Classroom 49	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 5	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	18	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	1.0	3,032	-1	$347	$1,855	$860	2.9
Classroom 50	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,428	0.0	110	0	$13	$319	$18	23.8
Classroom 50	11	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	2,161	3	Relamp	No	11	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,161	0.4	1,464	0	$168	$803	$440	2.2
Classroom 51	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,428	0.0	110	0	$13	$319	$18	23.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 51	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 52	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,428	0.0	110	0	$13	$319	$18	23.8
Classroom 52	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Classroom 53	3	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,428	0.0	110	0	$13	$319	$18	23.8
Classroom 53	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	S	114	1,902	3	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,902	0.5	1,406	0	$161	$876	$480	2.5
Conf. Room 30	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	0.2	674	0	$77	$562	$230	4.3
Copy room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	2,161	3	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,161	0.1	471	0	$54	$219	$120	1.8
Corridor 10 to 26	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 10 to 26	1	Exit Signs: Fluorescent	None		14	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	77	0	$9	$72	$0	8.2
Corridor 10 to 26	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,381	3, 6	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,333	0.2	781	0	$89	$408	$325	0.9
Corridor 12 to 24	1	Exit Signs: Fluorescent	None		14	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	77	0	$9	$72	$0	8.2
Corridor 12 to 24	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,381	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,381	0.0	123	0	$14	$37	$20	1.2
Corridor 49 to 13	3	Compact Fluorescent: (2) 18W Plug-In Lamps	Wall Switch	S	36	3,381	3, 6	Relamp	Yes	3	LED Lamps: (2) 12W Plug-In Lamps	High/Low Control	24	2,333	0.0	217	0	$25	$75	$12	2.5
Corridor 49 to 13	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 49 to 13	27	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,381	3, 6	Relamp	Yes	27	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,333	0.8	4,216	-1	$483	$2,111	$1,665	0.9
Corridor 53 to 41	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 53 to 41	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,381	3, 6	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,333	0.4	1,874	0	$215	$888	$690	0.9
Corridor 7 to 16 / Spread all over hallways	8	Compact Fluorescent: (2) 32W Plug-In Lamps	Wall Switch	S	64	3,381	3, 6	Relamp	Yes	8	LED Lamps: (2) 23W Plug-In Lamps	High/Low Control	46	2,333	0.2	960	0	$110	$200	$32	1.5
Corridor 7 to 16	3	Exit Signs: Fluorescent	None		14	8,760	4	Fixture Replacement	No	3	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	231	0	$27	$217	$0	8.2
Corridor 7 to 16	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,381	3, 6	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,333	0.7	3,592	-1	$412	$1,740	$1,360	0.9
Corridor 8th grade POD	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor 8th grade POD	64	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,381	3, 6	Relamp	Yes	64	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,333	1.9	9,995	-2	$1,145	$4,812	$3,755	0.9
Corridor 8th grade POD	6	Metal Halide: (1) 100W Lamp	Wall Switch	S	128	3,381	1, 6	Fixture Replacement	Yes	6	LED - Fixtures: (1) 30W Wall-mounted uplight fixture	High/Low Control	30	2,333	0.5	2,394	-1	$274	$360	$0	1.3
Corridor cafeteria to 37	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor cafeteria to 37	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,381	3, 6	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,333	0.7	3,592	-1	$412	$1,740	$1,360	0.9

	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
Corridor Cafeteria to 7	1	Exit Signs: Fluorescent	None		14	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	77	0	$9	$72	$0	8.2
Corridor Cafeteria to 7	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,381	3, 6	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,333	0.3	1,718	0	$197	$852	$670	0.9
Corridor Gym to 22	4	Exit Signs: Fluorescent	None		14	8,760	4	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	308	0	$35	$290	$0	8.2
Corridor Gym to 22	25	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,381	3, 6	Relamp	Yes	25	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,333	0.8	3,904	-1	$447	$2,038	$1,625	0.9
Exterior/ Building Envelope / Building exterior doors	5	Compact Fluorescent: (1) 18W Plug-In Lamp	Timeclock		18	3,600	3	Relamp	No	5	LED Lamps: (1) 12W Plug-In Lamp	Timeclock	12	3,600	0.0	108	0	$13	$63	$10	4.2
Exterior/ Building Envelope / Exterior doors	12	Incandescent: (2) 40W A19 Screw-In Lamps	Timeclock		80	3,600	3	Relamp	No	12	LED Lamps: (2) 6W A19 LED Lamps	Timeclock	12	3,600	0.0	2,938	0	$343	$413	$48	1.1
Exterior/ Building Envelope / Building Exterior walls	19	LED - Fixtures: 40W Wall Pack LED Fixtures	Timeclock		40	3,600		None	No	19	LED - Fixtures: 40W Wall Pack LED Fixtures	Timeclock	40	3,600	0.0	0	0	$0	$0	$0	0.0
Exterior/ Building Envelope / Parking lot	10	LED Lamps: (1) 80W Corn Bulb Screw-In Lamp	Timeclock		80	3,600		None	No	10	LED Lamps: (1) 80W Corn Bulb Screw-In Lamp	Timeclock	80	3,600	0.0	0	0	$0	$0	$0	0.0
Exterior/ Building Envelope / Parking Lot	4	LED Lamps: (2) 80W Corn Bulb Screw-In Lamps	Timeclock		160	3,600		None	No	4	LED Lamps: (2) 80W Corn Bulb Screw-In Lamps	Timeclock	160	3,600	0.0	0	0	$0	$0	$0	0.0
Exterior/ Building Envelope / Building exterior walls	3	Metal Halide: (1) 100W Lamp	Timeclock		128	3,600	1	Fixture Replacement	No	3	LED - Fixtures: (1) 30W Wall-mounted outdoor fixture	Timeclock	30	3,600	0.0	1,058	0	$124	$180	$0	1.5
Faculty room	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	0.4	1,348	0	$154	$854	$390	3.0
Girls	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,070	3, 5	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,428	0.1	382	0	$44	$416	$150	6.1
Girls	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	0.1	337	0	$39	$262	$120	3.7
Girls	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	0.3	1,011	0	$116	$708	$310	3.4
Gymnasium	4	Exit Signs: Fluorescent	None		14	8,760	4	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	308	0	$35	$290	$0	8.2
Gymnasium	6	Halogen Incandescent: (2) 100W BR30 Screw-In Lamps	Wall Switch	S	200	690	3, 5	Relamp	Yes	6	LED Lamps: (2) 15W BR30 LED Lamps	Occupancy Sensor	30	476	0.8	817	0	$94	$557	$142	4.4
Gymnasium / Stage lighting colored	3	Incandescent: (80) 100W A19 Screw-In Lamps	Wall Switch	S	8,000	25	3	Relamp	No	3	LED Lamps: (80) 15W A19 LED Lamps	Wall Switch	1,200	25	14.7	561	0	$64	$4,134	$480	56.8
Gymnasium	8	LED Lamps: (1) 9W A19 Screw-In Lamp	Wall Switch	S	9	690	5	None	Yes	8	LED Lamps: (1) 9W A19 Screw-In Lamp	Occupancy Sensor	9	476	0.0	17	0	$2	$270	$70	103.0
Gymnasium	72	Linear Fluorescent - T5HO: 4' T5HO (54W) - 6L	Wall Switch	S	358	2,070	3, 5	Relamp	Yes	72	LED - Linear Tubes: (6) 4' T5HO (25W) Lamps	Occupancy Sensor	153	1,428	13.1	41,384	-9	$4,742	$10,289	$4,670	1.2
Gymnasium	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,070	3, 5	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,428	0.1	287	0	$33	$380	$130	7.6
Gymnasium / Lobby to boys locker room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,070	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,428	0.1	191	0	$22	$189	$40	6.8
Gymnasium / Lobby to girls locker room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,070	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,428	0.1	191	0	$22	$189	$40	6.8
Gymnasium / Storage room 1 on stage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	690	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	476	0.1	64	0	$7	$189	$40	20.4
Gymnasium / Storage room 2 on stage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	690	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	476	0.1	64	0	$7	$189	$40	20.4
IDF 3 + Custodial closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	690	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	690	0.0	25	0	$3	$37	$20	5.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Janitorial 53	1	Compact Fluorescent: (2) 18W Plug-In Lamps	Wall Switch	S	36	690	3	Relamp	No	1	LED Lamps: (2) 12W Plug-In Lamps	Wall Switch	24	690	0.0	9	0	$1	$25	$4	20.1
Kitchen / Kitchen dishwasher area	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,035	3, 5	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	714	0.1	143	0	$16	$380	$130	15.2
Kitchen / Kitchen storage area	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,035	3, 5	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	714	0.3	430	0	$49	$599	$180	8.5
Kitchen / Kitchen cooking area	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,035	3, 5	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	714	0.2	382	0	$44	$562	$230	7.6
Kitchen / Kitchen cooking area	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,035	3, 5	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	714	0.1	191	0	$22	$416	$150	12.1
Main office	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,760	3, 5	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,904	0.4	1,797	0	$206	$854	$390	2.3
Main office / Break room	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,070	0.0	128	0	$15	$73	$40	2.3
MDF 28	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,070	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,428	0.1	191	0	$22	$189	$40	6.8
Media Center / Entrance	7	Compact Fluorescent: (1) 18W Plug-In Lamp	Wall Switch	S	18	2,070	3, 5	Relamp	Yes	7	LED Lamps: (1) 12W Plug-In Lamp	Occupancy Sensor	12	1,428	0.0	155	0	$18	$358	$84	15.4
Media Center / Tables area	9	Compact Fluorescent: (2) 32W Plug-In Lamps	Wall Switch	S	64	2,070	3, 5	Relamp	Yes	9	LED Lamps: (2) 23W Plug-In Lamps	Occupancy Sensor	46	1,428	0.2	661	0	$76	$495	$106	5.1
Media Center	2	Exit Signs: Fluorescent	None		14	8,760	4	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	154	0	$18	$145	$0	8.2
Media Center / Entrance	16	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	2,070	3, 5	Relamp	Yes	16	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,428	0.3	801	0	$92	$832	$300	5.8
Media Center / Room 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,035	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	714	0.1	96	0	$11	$189	$40	13.6
Media Center / Room 2	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,035	3, 5	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	714	0.1	143	0	$16	$380	$130	15.2
Media Center / Room 3	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,035	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	714	0.1	96	0	$11	$189	$40	13.6
Media Center / Room 4	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,035	3, 5	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	714	0.6	956	0	$110	$1,270	$540	6.7
Media Center / Room 5	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,035	3, 5	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	714	0.6	956	0	$110	$1,270	$540	6.7
Media Center / Reference area	48	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,070	3, 5	Relamp	Yes	48	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,428	1.5	4,589	-1	$526	$2,833	$1,240	3.0
Nurse office / Shower	1	Compact Fluorescent: (1) 18W Plug-In Lamp	Wall Switch	S	18	690	3	Relamp	No	1	LED Lamps: (1) 12W Plug-In Lamp	Wall Switch	12	690	0.0	5	0	$1	$13	$2	20.1
Nurse office / Bathroom	1	Linear Fluorescent - T12: 2' T12 (20W) - 2L	Wall Switch	S	50	690	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	690	0.0	25	0	$3	$65	$12	18.4
Nurse office	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	0.5	1,685	0	$193	$1,000	$470	2.7
Principal's office / Bathroom	1	Compact Fluorescent: (2) 18W Plug-In Lamps	Wall Switch	S	36	690	3	Relamp	No	1	LED Lamps: (2) 12W Plug-In Lamps	Wall Switch	24	690	0.0	9	0	$1	$25	$4	20.1
Principal's office	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,070	3, 5	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,428	0.3	842	0	$97	$635	$270	3.8
Restroom - Female (53)	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	690	3, 5	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	476	0.2	159	0	$18	$453	$170	15.5
Restroom - Female(47)	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	690	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	690	0.0	25	0	$3	$37	$20	5.8

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restroom - Male (cls 36)	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	O	114	690	3, 5	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	476	0.3	337	0	$39	$708	$310	10.3
Restroom - Male (cls 36)	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	690	3, 5	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	476	0.3	281	0	$32	$635	$270	11.3
Restroom - Male(47)	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	690	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	690	0.0	25	0	$3	$37	$20	5.8
Restroom - Male(53)	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	690	3, 5	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	476	0.2	159	0	$18	$453	$170	15.5
Storage (20)	3	Linear Fluorescent - EST12: 4' T12 (34W) - 2L	Wall Switch	S	72	690	2, 5	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	476	0.1	118	0	$14	$476	$60	30.7
Storage room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	2,161	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,161	0.1	235	0	$27	$110	$60	1.8
Walk-in Cooler	1	LED Lamps: (1) 10.5W Plug-In Lamp	Wall Switch	S	11	104		None	No	1	LED Lamps: (1) 10.5W Plug-In Lamp	Wall Switch	11	104	0.0	0	0	$0	$0	$0	0.0
Walk-in freezer	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	104	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	104	0.0	4	0	$0	$37	$20	38.4

Motor Inventory & Recommendations

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Classroom 13	1	Exhaust Fan	0.2	60.0%	No	W	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	classroom 14	1	Exhaust Fan	0.2	60.0%	No	W	2,745		No	60.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Dishwasher Ef	1	Exhaust Fan	0.3	62.5%	No	W	1,400		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Gym EFs	2	Exhaust Fan	0.5	75.0%	No	W	2,745		No	75.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Kitchen hood EF	1	Kitchen Hood Exhaust Fan	2.0	84.0%	No	W	1,620	8	No	86.5%	Yes	1	0.0	2,035	22	$453	$3,261	$200	6.8
Roof	Medium size	17	Exhaust Fan	0.3	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Small EFs	24	Exhaust Fan	0.3	62.5%	No	W	2,745		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Reznor MAU	1	Supply Fan	5.0	87.5%	No	W	2,013	7	No	89.5%	Yes	1	1.5	3,347	0	$391	$4,076	$1,800	5.8
Roof	8th grade wing RTU #3	1	Supply Fan	10.0	89.5%	No	W	2,013	7	No	91.7%	Yes	1	3.0	6,564	0	$766	$5,152	$2,200	3.9
Roof	8th grade wing RTU #3	1	Return Fan	3.0	86.5%	No	W	2,013	7	No	89.5%	Yes	1	0.9	2,071	0	$242	$3,884	$400	14.4
Roof	Classroom 19	1	Supply Fan	1.0	82.5%	No	W	1,098		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Classroom 25 RTU	1	Supply Fan	3.0	86.5%	No	W	2,928	7	No	89.5%	Yes	1	0.9	3,012	0	$351	$3,884	$400	9.9
Roof	Classroom 26 RTU	1	Supply Fan	3.0	86.5%	No	W	2,928	7	No	89.5%	Yes	1	0.9	3,012	0	$351	$3,884	$400	9.9
Roof	Guidance suite	1	Supply Fan	0.8	78.0%	No	W	2,928		No	78.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Kitchen RTU	1	Supply Fan	3.0	86.5%	No	W	1,830	7	No	89.5%	Yes	1	0.9	1,883	0	$220	$3,884	$400	15.9
Roof	Media center unit	1	Supply Fan	10.0	89.5%	No	W	2,928	7	No	91.7%	Yes	1	3.0	9,547	0	$1,114	$5,152	$2,200	2.6
Roof	RTU #2 8th grade	1	Supply Fan	7.5	88.5%	No	W	2,196	7	No	91.0%	Yes	1	2.2	5,464	0	$638	$4,738	$2,000	4.3
Roof	RTU #2 8th grade	1	Return Fan	3.0	86.5%	No	W	2,196	7	No	89.5%	Yes	1	0.9	2,259	0	$264	$3,884	$400	13.2
Roof	RTU #5 (lunch room) same as #6	1	Supply Fan	5.0	87.5%	No	W	1,830	7	No	89.5%	Yes	1	1.5	3,043	0	$355	$4,076	$1,800	6.4
Roof	RTU #6 (Lunch room)	1	Supply Fan	5.0	87.5%	No	W	1,830	7	No	89.5%	Yes	1	1.5	3,043	0	$355	$4,076	$1,800	6.4

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU #8 Room 41 (science)	1	Supply Fan	1.0	82.5%	No	W	1,464		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 12	Unit Ventilator	1	Supply Fan	0.2	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 14	Unit Ventilator	1	Supply Fan	0.2	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 15	Unit Ventilator	1	Supply Fan	0.2	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 17	Unit Ventilator	1	Supply Fan	0.2	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 32	Unit Ventilator	1	Supply Fan	0.2	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 33	Unit Ventilator	1	Supply Fan	0.2	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 34	Unit Ventilator	1	Supply Fan	0.2	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 35	Unit Ventilator	1	Supply Fan	0.2	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 36	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,464		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 37	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,464		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 38 (science)	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,464		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 39	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,464		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 40 (Science)	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,464		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 5	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,464		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU #5 (lunch room) same as #6	1	Return Fan	1.5	84.0%	No	W	1,464		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU #6 (Lunch room)	1	Return Fan	1.5	84.0%	No	W	1,464		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	HHW System	1	Heating Hot Water Pump	10.0	89.5%	Yes	W	2,562		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	HHW System	1	Heating Hot Water Pump	10.0	89.5%	Yes	W	732		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	HHW System	1	Heating Hot Water Pump	5.0	87.5%	Yes	W	2,562		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	HHW System	1	Heating Hot Water Pump	5.0	87.5%	Yes	W	915		No	87.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 41	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 31	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 13	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 11	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 10	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 9	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 8	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 13	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 16	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Classroom 18	Unit Ventilator	1	Supply Fan	0.3	62.5%	No	W	1,830		No	62.5%	No		0.0	0	0	$0	$0	$0	0.0
Gymnasium	Gymnasium	1	Supply Fan	7.5	88.5%	No	W	0		No	88.5%	No		0.0	0	0	$0	$0	$0	0.0
Gymnasium	Locker Rooms	1	Supply Fan	7.5	88.5%	No	W	1,464	7	No	91.0%	Yes	1	2.2	3,642	0	$425	$4,738	$2,000	6.4

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	Nurse's Office	1	Packaged Terminal HP	0.64	6.01	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	8th grade MDF	1	Split-System Air-Source HP	1.50	19.00	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Classroom 13	1	Ductless Mini-Split AC	2.76		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Classroom 14	1	Ductless Mini-Split AC	2.76		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	MDF room unit	1	Split-System Air-Source HP	0.75	12.00	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Storage room	1	Split-System Air-Source HP	1.50	21.60	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Faculty room	1	Split-System Air-Source HP	7.50	90.00	B	10	Yes	1	Split-System Air-Source HP	7.50	90.00	11.50	3.60	1.0	4,598	0	$537	$10,899	$1,095	18.3
Roof	MDF across media center	1	Split-System Air-Source HP	1.00	14.00	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	MDF room	1	Split-System Air-Source HP	0.75	12.00	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Classroom 19	1	Packaged AC	3.00		B	9	Yes	1	Packaged AC	3.00		14.00		0.4	274	0	$32	$6,807	$552	195.6
Roof	Classroom 25 RTU	1	Packaged AC	7.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Classroom 26 RTU	1	Packaged AC	7.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Guidance suite	1	Packaged AC	3.50		B	9	Yes	1	Packaged AC	3.50		14.00		0.5	311	0	$36	$7,941	$644	201.0
Roof	Media center unit	1	Packaged AC	25.00		B		No							0.0	0	0	$0	$0	$0	0.0
Classroom 12	Classroom 12	1	Window AC	0.67		B		No							0.0	0	0	$0	$0	$0	0.0
Classroom 17	Classroom 17	1	Window AC	0.67		B		No							0.0	0	0	$0	$0	$0	0.0
Classroom 21	Classroom 21	1	Window AC	0.67		B		No							0.0	0	0	$0	$0	$0	0.0
Classroom 32	Classroom 32	1	Window AC	0.97		B	9	Yes	1	Window AC	0.97		12.00		0.2	463	0	$54	$1,052	$0	19.5
Classroom 33	Classroom 33	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 37	Classroom 37	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0

		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
Classroom 38 (science)	Classroom 38 (science)	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 39	Classroom 39	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 40 (Science)	Classroom 40 (Science)	1	Window AC	0.97		W	9	Yes	1	Window AC	0.97		12.00		0.2	463	0	$54	$1,052	$0	19.5
Classroom 41	Classroom 41	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 46	Classroom 46	1	Window AC	1.00		B	9	Yes	1	Window AC	1.00		12.00		0.1	146	0	$17	$1,089	$0	63.7
Classroom 47	Classroom 47	1	Window AC	1.25		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 48	Classroom 48	1	Window AC	0.97		W	9	Yes	1	Window AC	0.97		12.00		0.2	463	0	$54	$1,052	$0	19.5
Classroom 5	Classroom 5	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 50	Classroom 50	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 51	Classroom 51	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 53	Classroom 53	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 52	Classroom 52	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 36	Classroom 36	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 16	Classroom 16	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 18	Classroom 18	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 8	Classroom 8	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 9	Classroom 9	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 10	Classroom 10	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 11	Classroom 11	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0
Classroom 24	Classroom 24	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0

		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
Classroom 29	Classroom 29	1	Window AC	0.67		W		No							0.0	0	0	$0	$0	$0	0.0

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Reznor MAU	1	Furnace	150	B	11	Yes	1	Furnace	150	95.00%	AFUE	0.0	0	19	$188	$3,399	$800	13.8
Roof	Classroom 25 RTU	1	Furnace	148	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	Classroom 26 RTU	1	Furnace	148	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	Media center unit	1	Furnace	216	B	11	Yes	1	Furnace	216	82.00%	AFUE	0.0	0	22	$223	$4,894	$800	18.4
Boiler/Mech Room	HHW System	1	Condensing Hot Water Boiler	2,300	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler/Mech Room	HHW System	1	Condensing Hot Water Boiler	2,300	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler/Mech Room	HHW System	1	Condensing Hot Water Boiler	2,300	W		No						0.0	0	0	$0	$0	$0	0.0

Demand Control Ventilation Recommendations

		Recommendation Inputs					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Number of Zones	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Gymnasium	Gymnasium	12	2.00	0.00	0.00	460.00	0.0	0	16	$163	$2,719	$0	16.7
Cafeteria	Cafeteria	12	2.00	0.00	0.00	460.00	0.0	0	16	$163	$2,719	$0	16.7

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/Mech Room	DHW for building	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler/Mech Room	DHW system for kitchen	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classes, Media Center, Faculty Room	13	27	Faucet Aerator (Kitchen)	2.50	1.50	0.0	0	8	$76	$194	$108	1.1
Kitchen	13	10	Faucet Aerator (Kitchen)	2.50	1.50	0.0	0	3	$28	$72	$40	1.1
Restrooms	13	5	Faucet Aerator (Lavatory)	2.50	0.50	0.0	0	3	$28	$36	$36	0.0
Restrooms	13	4	Faucet Aerator (Lavatory)	1.50	0.50	0.0	0	1	$11	$29	$29	0.0

Reach-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 Energy Efficient Doors?	Install Door Heater Control?	Install Aluminum Night Covers?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Cooler (35F to 55F)	15	No	No	Yes	No	No	0.3	3,018	0	$352	$1,338	$400	2.7

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
Storage Room	1	Cooler (35F to 55F)	14, 16	Yes	No	Yes	0.0	791	0	$92	$1,977	$230	18.9
Storage Room	1	Medium Temp Freezer (0F to 30F)	14, 16	Yes	No	Yes	0.1	1,371	0	$160	$2,281	$310	12.3

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Freezer Chest	No	17	Yes	0.4	3,551	0	$414	$2,050	$0	4.9
Cafeteria	1	Refrigerator Chest	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
Kitchen	2	Electric Steamer	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Gas Combination Oven/Steam Cooker (<15 Pans)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Gas Steamer	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Gas Convection Oven (Full Size)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	1	Electric Convection Oven (Full Size)	No		No	0.0	0	0	$0	$0	$0	0.0

Dishwasher Inventory & Recommendations

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

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Kitchen	1	Serving Table (Heated)	4,000	No
Kitchen	1	Serving Table (Chilled)	850	No
Kitchen	1	Heated Display Case	1,810	No
Kitchen	1	Heated Display Case	1,000	No
Kitchen	2	Desktop PCs	120	Yes
Cafeteria	9	Ceiling Fan	100	No
Gymnasium	4	Ceiling Fan	100	No
Classrooms	26	Wall-mounted Fan	75	No
Classrooms, Offices, Media Center	60	Desktop PCs	26	Yes
Classrooms, break rooms	7	Microwave Ovens	1,200	No
Copy Room, Media Center	5	Printer/Copier (Large)	550	Yes
Classrooms	35	Projector	200	No
Classrooms, Copy Room	19	Small/Medium Printer	50	Yes
Classrooms; Gymnasium	18	Television	23	No
Classrooms	2	Toaster Oven	1,500	No
Classrooms, Offices, Media Center	52	Laptops	15	Yes
Faculty Room	2	Mini Fridge	100	No
Faculty Room	2	Residential Refrigerator	550	No
Faculty Room	2	Water Cooler/Heater	750	No
Faculty Room	1	Coffee Maker	1,500	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Faculty Room	1	Refrigerated	18	Yes	0.2	1,612	0	$188	$230	$100	0.7

Custom (High Level) Measure Analysis

Installation of an Energy Management System

Building Square Footage	28,113		Fuel Utility Rate	$10.021	MMBtu
Percent of Conditioned Area Impacted	100%		Blended Electric Utility Rate	$0.117	kWh

Existing Conditions						Proposed Conditions					Energy Impact & Financial Analysis						
Description	Area(s)/System(s) Served	Remaining Useful Life	Total HVAC Motor Usage kWh	Total HVAC Electric Usage kWh	Total HVAC Fuel Usage MMBtu	Description	% Savings HVAC Motor Usage kWh	% Savings HVAC Electric Usage kWh	% Savings HVAC Fuel Usage MMBtu	Estimated Cost per Sqft	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Limited/No HVAC Controls	HVAC Equipment & Systems	B	162,994	75,034	4,173	Installation of an Energy Management System	9%	4%	2%	$2.20	0.00	17,671	83	$2,898	$61,849	$0	21.34

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR® Score[1]

Cedar Drive Middle School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 93,170
Built: 1963

For Year Ending: September 30, 2019
Date Generated: August 22, 2020

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Cedar Drive Middle School 73 Cedar Drive Colts Neck, New Jersey 07722	Colts Neck Township Board of Education 70 Conover Road Colts Neck, NJ 07722 (732) 946-0055	NJ Clean Energy LGEA Program 900 ROUTE 9 NORTH SUITE 404 WOODBRIDGE, NJ 07095 732-855-2864 amiller@trcsolutions.com

Property ID: 10189306

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
70 kBtu/ft²

Source EUI
111.8 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	4,477,978 (69%)
Electric - Grid (kBtu)	2,042,080 (31%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	65.1
National Median Source EUI (kBtu/ft²)	104
% Diff from National Median Source EUI	8%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	445

Signature & Stamp of Verifying Professional

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

LP Signature: _____ Date: _____

Licensed Professional

___ _____
,
(___)___-_____
_____

Professional Engineer or Registered Architect Stamp (if applicable)

APPENDIX C: GLOSSARY

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

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

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