Local Government Energy Audit Report

Harding Township Middle School

January 18, 2019

Prepared for:

Harding Township School
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Disclaimer

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

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

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

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

Perform any implementation of energy conservation measures in strict conformance with applicable local, state and federal requirements.

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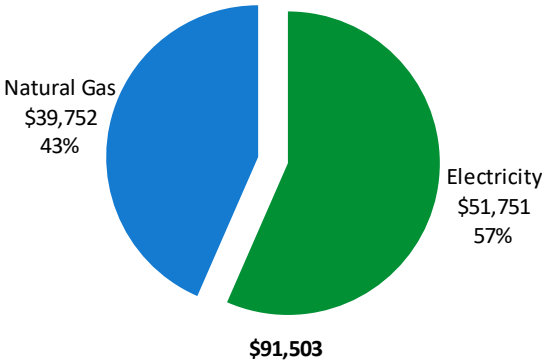
1 EXECUTIVE SUMMARY

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

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $91,503 Electricity: 455,222 kWh Natural Gas: 51,529 Therms	
ENERGY STAR® Benchmarking Score	1 *(1-100 scale)*	This building performs below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

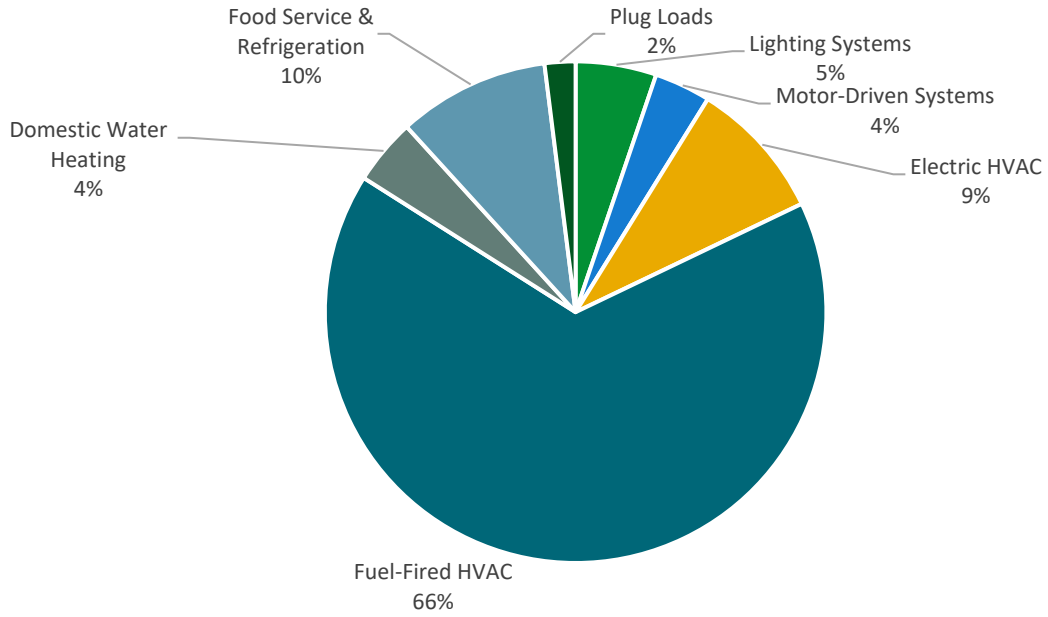


Figure 1 - Energy Use by System

Note: Natural gas use at the Harding Township Middle School is more than two times the typical natural gas use for a school. This is probably due to the fan coil units and furnaces operating long hours when the school is not occupied. A less likely possibility is that the natural gas meter is not properly calibrated and as a result is reading high. Utility meters are rarely out of calibration, however, it does occur occasionally.

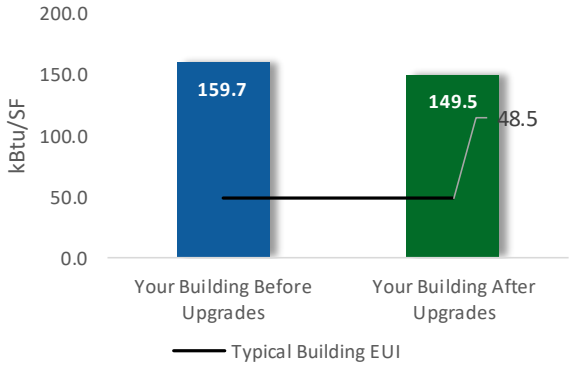
The first step to identifying the problem is to make sure the fan coils and furnaces are turned off at the end of the school day and over weekends. This may require installing automated controls to turn the heating systems on to precondition the school, especially during particularly cold weather. If the natural gas use does not decline noticeably relative to the same time in the previous year once that step has been taken, contact the natural gas company and ask them to check the gas meter.

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.

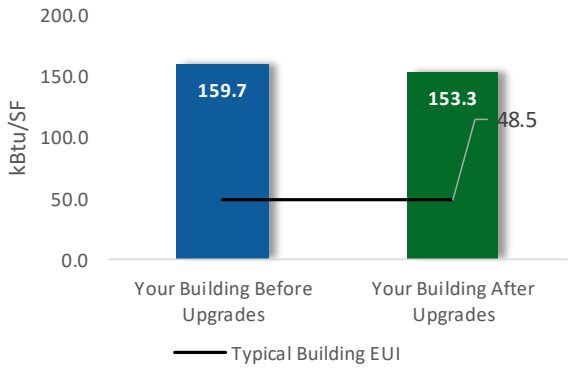
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$110,639
Potential Rebates & Incentives[1]	$13,949
Annual Cost Savings	$10,380
Annual Energy Savings	Electricity: 81,144 kWh Natural Gas: 1,498 Therms
Greenhouse Gas Emission Savings	50 Tons
Simple Payback	9.3 Years
Site Energy Savings (all utilities)	6%



Scenario 2: Cost Effective Package[2]

Installation Cost	$53,140
Potential Rebates & Incentives	$10,749
Annual Cost Savings	$7,509
Annual Energy Savings	Electricity: 62,230 kWh Natural Gas: 563 Therms
Greenhouse Gas Emission Savings	35 Tons
Simple Payback	5.6 Years
Site Energy Savings (all utilities)	4%



On-site Generation Potential

Photovoltaic	Low
Combined Heat and Power	None

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

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

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Lifetime Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**49,512**	**21.9**	**-10**	**$5,549**	**$83,242**	**$37,460**	**$9,369**	**$28,091**	**5.1**	**48,656**
ECM 1	Install LED Fixtures	11,285	4.6	-2	$1,265	$18,971	$12,509	$3,000	$9,509	7.5	11,088
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	312	0.1	0	$35	$524	$206	$30	$176	5.1	306
ECM 3	Retrofit Fixtures with LED Lamps	37,915	17.2	-8	$4,250	$63,747	$24,744	$6,339	$18,405	4.3	37,262
Lighting Control Measures		**8,512**	**3.5**	**-2**	**$954**	**$7,632**	**$13,060**	**$1,330**	**$11,730**	**12.3**	**8,364**
ECM 4	Install Occupancy Sensor Lighting Controls	7,081	2.9	-1	$794	$6,348	$10,260	$1,330	$8,930	11.3	6,957
ECM 5	Install High/Low Lighting Controls	1,432	0.6	0	$160	$1,284	$2,800	$0	$2,800	17.4	1,407
Electric Unitary HVAC Measures		**18,914**	**4.5**	**0**	**$2,150**	**$32,253**	**$45,536**	**$2,400**	**$43,136**	**20.1**	**19,046**
	Install High Efficiency Air Conditioning Units	18,914	4.5	0	$2,150	$32,253	$45,536	$2,400	$43,136	20.1	19,046
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**94**	**$721**	**$14,430**	**$11,963**	**$800**	**$11,163**	**15.5**	**10,951**
	Install High Efficiency Furnaces	0	0.0	94	$721	$14,430	$11,963	$800	$11,163	15.5	10,951
HVAC System Improvements		**2,311**	**0.0**	**14**	**$373**	**$5,589**	**$1,359**	**$0**	**$1,359**	**3.6**	**3,995**
ECM 6	Implement Demand Control Ventilation (DCV)	2,311	0.0	14	$373	$5,589	$1,359	$0	$1,359	3.6	3,995
Domestic Water Heating Upgrade		**0**	**0.0**	**54**	**$417**	**$4,173**	**$136**	**$0**	**$136**	**0.3**	**6,333**
ECM 7	Install Low-Flow DHW Devices	0	0.0	54	$417	$4,173	$136	$0	$136	0.3	6,333
Food Service & Refrigeration Measures		**1,895**	**0.1**	**0**	**$215**	**$3,321**	**$1,125**	**$50**	**$1,075**	**5.0**	**1,908**
ECM 8	Refrigerator/Freezer Case Electrically Commutated Motors	1,105	0.1	0	$126	$1,885	$607	$0	$607	4.8	1,113
ECM 9	Refrigeration Controls	790	0.0	0	$90	$1,436	$519	$50	$469	5.2	795
TOTALS		**81,144**	**30.0**	**150**	**$10,380**	**$150,639**	**$110,639**	**$13,949**	**$96,690**	**9.3**	**99,252**

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

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

Figure 2 – Evaluated Energy Improvements

1.1 Planning Your Project

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

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

Pick Your Installation Approach

New Jersey Clean Energy Programs 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	
ECM 3	Retrofit Fixtures with LED Lamps	x	x	
ECM 4	Install Occupancy Sensor Lighting Controls	x	x	
ECM 5	Install High/Low Lighting Controls		x	
ECM 6	Implement Demand Control Ventilation		x	
ECM 7	Install Low-Flow Domestic Hot Water Devices		x	
ECM 8	Refrigerator/Freezer Case Electrically Commutated Motors		x	
ECM 9	Refrigeration Controls	x	x	

Figure 3 – Funding Options

New Jersey Clean Energy Programs At-A-Glance

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

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

Individual Measures with SmartStart

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

Turnkey Installation with Direct Install

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

Whole Building Approach with Pay for Performance

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

More Options from Around the State

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

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

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

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

Ongoing Electric Savings with Demand Response

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

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Harding Township 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 August 16, 2018, TRC performed an energy audit at Harding Township Middle School located in New Vernon, NJ. TRC met with Mark Kenney to review the facility operations and help focus our investigation on specific energy-using systems.

Harding Township Middle School is a three-story, 42,000 square foot building. The spaces inside the building include: classrooms, gymnasium, offices, cafeteria, corridors, stairwells, a commercial kitchen, dark room, music room, electrical rooms and mechanical spaces. The original building was constructed in 1926 with several additions constructed thereafter. The building was last renovated in 2001.

The site recently replaced all exterior wall mount and pole mount fixtures with LEDs.

Image 1: Arial screenshot of the building

2.2 Building Occupancy

The building is in operation 10 months out of the year. General operation is 8:00 AM to 4:00 PM Monday through Friday. There are no weekend activities. The building is occupied by roughly 150 students and staff. The typical schedule is presented in the table below.

Building Name	Weekday/Weekend	Operating Schedule
Harding Township Middle School	Weekday	8:00 AM - 4:00 PM
	Weekend	N/A

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a combination of brick and stucco over brick façade. The building has a combination of gable and flat roof sections, the gable section of which is covered with asphalt shingles and the flat sections with a multi-ply bituminous built-up membrane. The roof sections appear to be in fair condition.

Most of the windows are single pane and have wood frames. The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors have wood frames and are in fair condition with worn door seals. Degraded window and door seals increase drafts and outside air infiltration.

Image 2. Picture of the exterior view of the building

Image 3. Picture of an Exterior Door

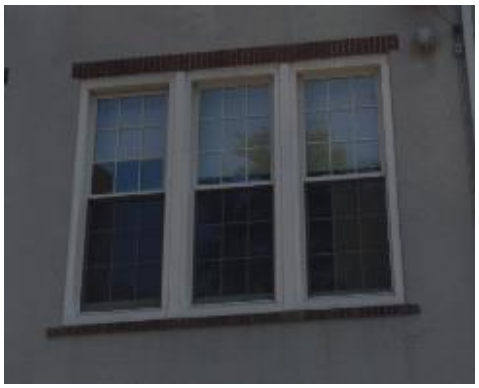


Image 4. Picture of a Window in an Older Section of the Building

Image 5. Picture of a Window in a Newer Section of the Building

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear and U-bend fluorescent T8 lamps. There are also several 40-Watt T12 tube fixtures and a few LED linear tube fixtures. Additionally, there are some compact fluorescent lamps (CFL), incandescent lamps and some LED and metal halide (MH) gym fixtures. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

Fixture types include 1, 2, 3 and 4-lamp, 4-foot long troffer, recessed & surface mounted fixtures and 2-foot fixtures with U-bend tube lamps.

Most fixtures are in fair to good condition.

Gymnasium fixtures have high bay high intensity discharge (HID) and LED lamps and are manually controlled.

All exit signs are LED.

Interior lighting levels were generally sufficient with the exception of a few areas that are over lit.

Image 6. Typical Interior T8 Fixtures

Interior lighting fixtures are all manually controlled by wall switches.

Exterior fixtures include LED wall packs and flood lights on the perimeter walls of the building.

There are also a few exterior pole mounted LED fixtures.

Exterior fixtures are photocell controlled.

Image 7. LED Pole Mounted Fixture

Image 8. LED Wall Mounted Flood Light

2.5 Air Handling Systems

Unit Ventilators

All classrooms are served by unit ventilators to serve their heating needs. Unit ventilators have supply fan motors, pneumatically controlled outside air dampers and fan coil valves that operate with a pneumatic control system. This system is original to the building and appears to be in fair operating condition.

Packaged Units

The majority of the building's conditioned spaces are served by packaged rooftop units (RTUs) controlled by the EMS. There are three RTUs that have heating furnaces serving the band room, gym, and library. These units have cooling capacities of 8, 25 and 16 tons and their heating furnace capacities are 216, 432 and 312 MBH respectively.

Refer to Appendix A for detailed information about each unit.

Air Conditioners

The building's computer room is served by two split system air conditioning (AC) units with cooling capacity of 3 tons each. Also, four classrooms use outdoor condensing units each with a cooling capacity of 3 tons. These units are tied in with the unit ventilators inside the rooms. The units are in fair condition.

The HVAC system uses pneumatic controls. A 3 hp air compressor located in the boiler room serves the pneumatic system. No air leaks were observed during the inspection.

Image 9. Picture of an RTU

Image 10. Picture of a Split System AC Condensing Unit

Image 11. Picture of Lennox Condensing Units serving Unit Ventilators

2.6 Heating Steam Systems

Two Hurst 2,016 MBh steam boilers serve the building heating load. The boilers are configured in a lead-lag control scheme. Installed in 2004, they are in fair condition.

A steam distribution system serves the building heating unit ventilators. There are two ¾ hp boiler feed pumps and two ¾ hp condensate pumps in the boiler room.

Three RTUs are equipped with natural gas-fired furnaces to serve the heating loads of larger spaces.

Image 12. Picture of Steam Boiler

2.7 Building Energy Management Systems (EMS)

An Andover EMS controls the HVAC equipment and the boilers. The EMS provides equipment scheduling control and monitors and controls several setpoints such as space temperatures, supply air temperature, pressure controls, etc.

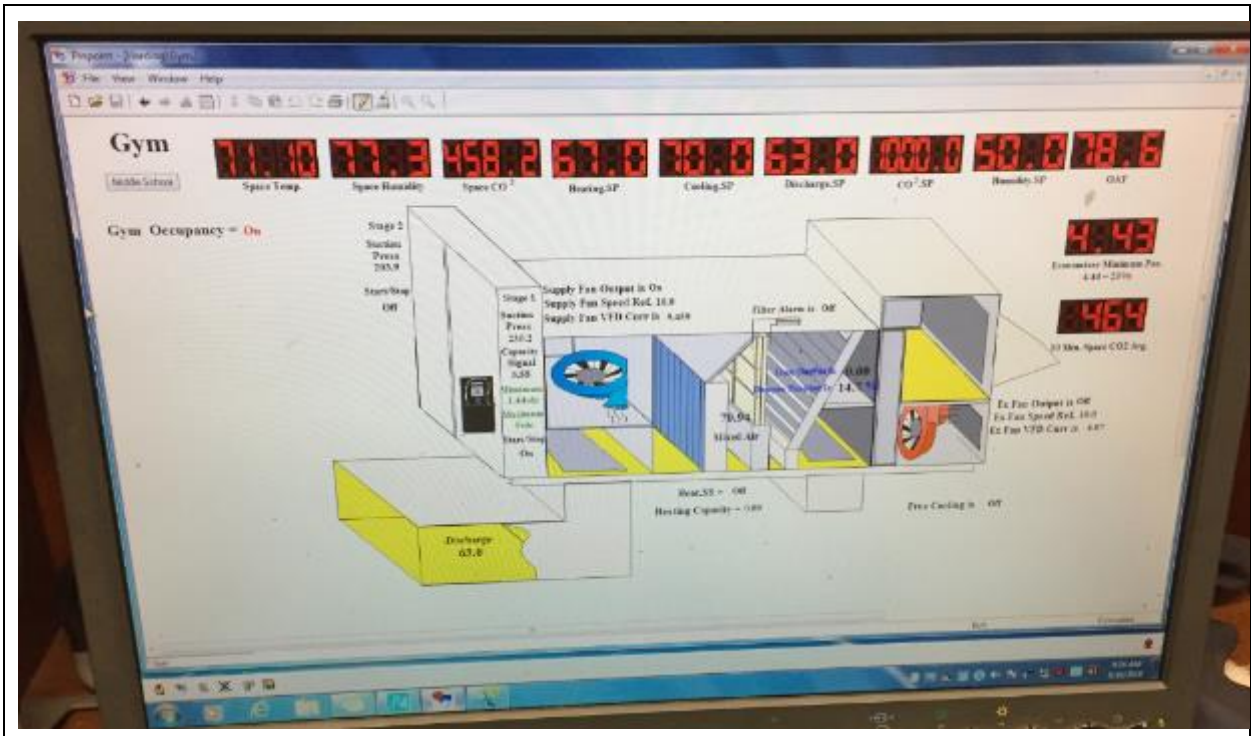


Image 13. Screenshot of the Gym RTU EMS Screenshot

2.8 Domestic Hot Water

The majority of the building's domestic hot water is produced by an 81 gallon 154 MBh gas-fired storage water heater with approximately 80% efficiency. There is also a smaller 38 gallon 3.38 kW electric storage water heater serving a portion of the building.

Image 14. Picture of the Gas DHW Water Heater

Image 15. Picture of the Electric DHW Water Heater

2.9 Food Service Equipment

The kitchen has a mixture of gas and electric equipment used to prepare breakfast and lunch for students and staff. Most cooking is done using a gas-fired combination oven. The kitchen also has a full-size oven. The food is kept warm/cold in respective food warmers and coolers. Equipment is high efficiency and is in fair condition.

The dishwasher is an ENERGY STAR® high temperature, door-type unit.

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

Image 16. Picture of the Combination Oven

Image 17. Picture of the Oven

Image 18. Picture of the Dishwasher

Image 19. Picture of the Food Warmer

2.10 Refrigeration

The kitchen has two reach-in refrigerators, one with solid doors and the other with glass doors. The two units are high-efficiency units and in fair condition.

There is a walk-in freezer which has a 0.5 ton compressor and a two fan evaporator.

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

Image 20. Picture of the Reach-In Refrigerator

Image 21. Picture of the Walk-In Freezer

2.11 Plug Load

The utility bill analysis indicates that plug loads consume approximately 2.0% of total building energy use. This is lower than a typical building.

The school seems to already be doing a great job managing the electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 70 computer work stations throughout the facility. Plug loads throughout the building include general café (like microwave and toasters) and office equipment (like printers and copiers). There are classroom-typical loads such as smart boards and projectors.

There are several residential-style refrigerators throughout the building. These vary in condition and efficiency.

Image 22. Picture of a Smart Projector

Image 23. Picture of a Printer

Image 24. Picture of a Desktop Computer

Image 25. Picture of a Copier

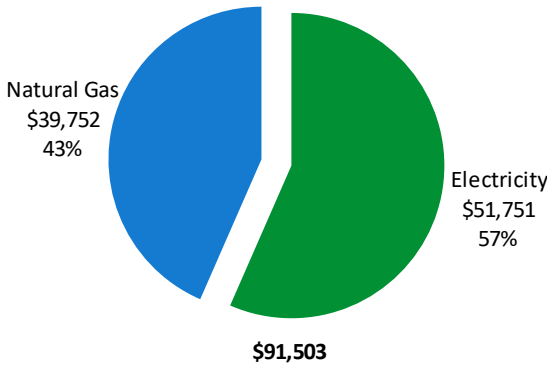
2.12 Water-Using Systems

There are 11 restrooms with toilets, urinals, and sinks. Faucet flow rates are at 2.20 gallons per minute (gpm) or higher.

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	455,222 kWh	$51,751
Natural Gas	51,529 Therms	$39,752
Total		**$91,503**



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 input 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.

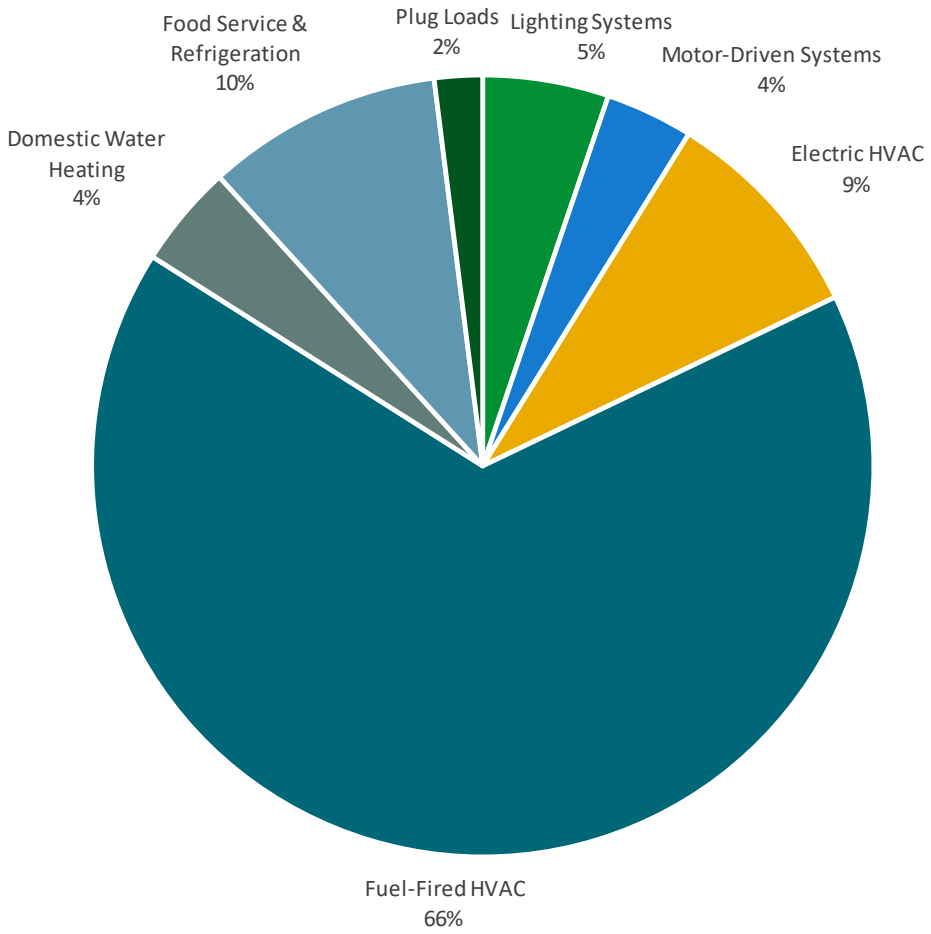
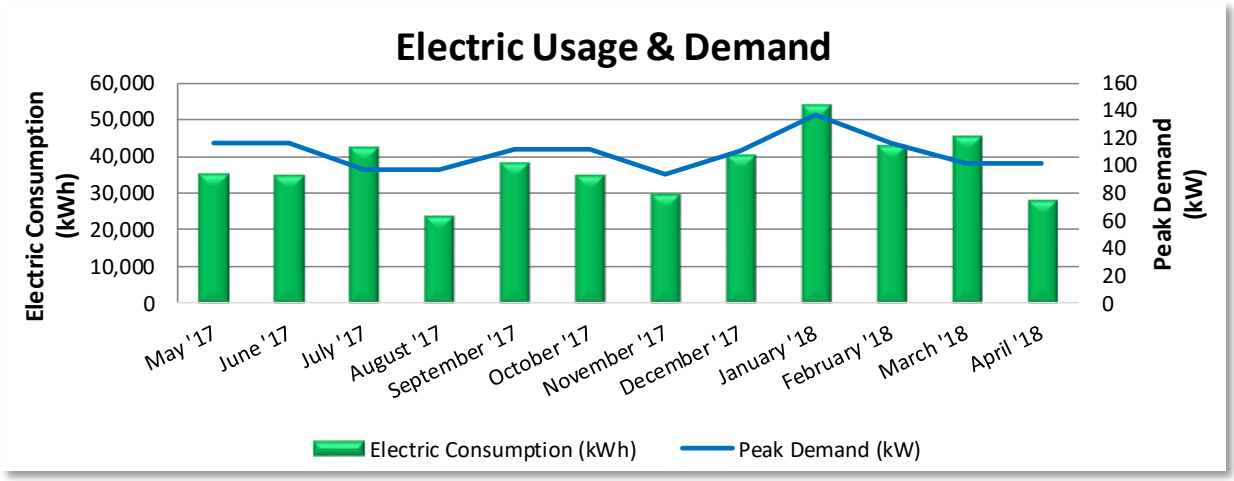


Figure 5 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under rate class General Service Secondary Space Heating Se JC_GS3_03D, with electric production provided by South Jersey Energy, a third-party supplier.



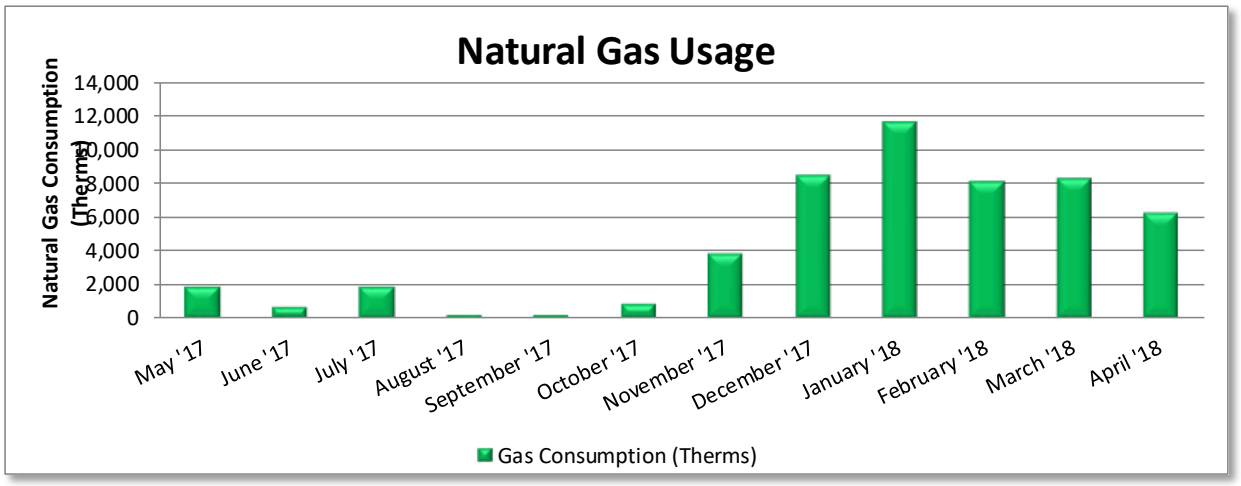
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
5/15/17	30	35,360	116		$4,585
6/15/17	31	34,880	116		$4,136
7/17/17	32	42,720	98		$4,605
8/15/17	29	24,000	98		$2,921
9/15/17	31	38,360	112		$4,406
10/17/17	32	35,040	112		$3,948
11/14/17	28	29,760	94		$3,401
12/15/17	31	40,480	111		$4,491
1/16/18	32	53,920	137		$5,885
2/14/18	29	43,040	117		$4,756
3/14/18	28	45,760	102		$4,907
4/12/18	29	28,160	102		$3,285
Totals	**362**	**451,480**	**137**	**$0**	**$51,326**
Annual	**365**	**455,222**	**137**	**$0**	**$51,751**

Notes:

- Peak demand of 137 kW occurred in January 2018.
- The average electric cost over the past 12 months was $0.114/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

PSE&G delivers natural gas under rate class GSG (HTG) & LVG, with natural gas supply provided by a third-party supplier (name of supplier not available).



Gas Billing Data				
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**	**TRC Estimated Usage?**
5/22/17	31	1,854	$1,194	No
6/21/17	30	586	$468	No
7/22/17	31	1,826	$1,106	Yes
8/20/17	30	169	$218	Yes
9/20/17	30	169	$218	Yes
10/18/17	28	814	$563	No
11/17/17	30	3,771	$3,085	No
12/19/17	32	8,426	$6,746	No
1/22/18	34	11,583	$9,166	No
2/20/18	29	8,067	$6,807	No
3/23/18	31	8,303	$6,958	No
4/23/18	31	6,242	$3,441	No
Totals	**367**	**51,811**	**$39,970**	
Annual	**365**	**51,529**	**$39,752**	

Notes:

- The average gas cost for the past 12 months is $0.771/therm, which is the blended rate used throughout the analysis.
- Natural gas use at the Harding Township Middle School is more than two times the typical natural gas use for a school. This is probably due to the fan coil/unit ventilator units and furnaces operating long hours when the school is not occupied. A less likely possibility is that the natural gas meter is not properly calibrated and as a result is reading high. Utility meters are rarely out of calibration; however, it does occur occasionally.

3.3 Benchmarking

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

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

Benchmarking Score	1

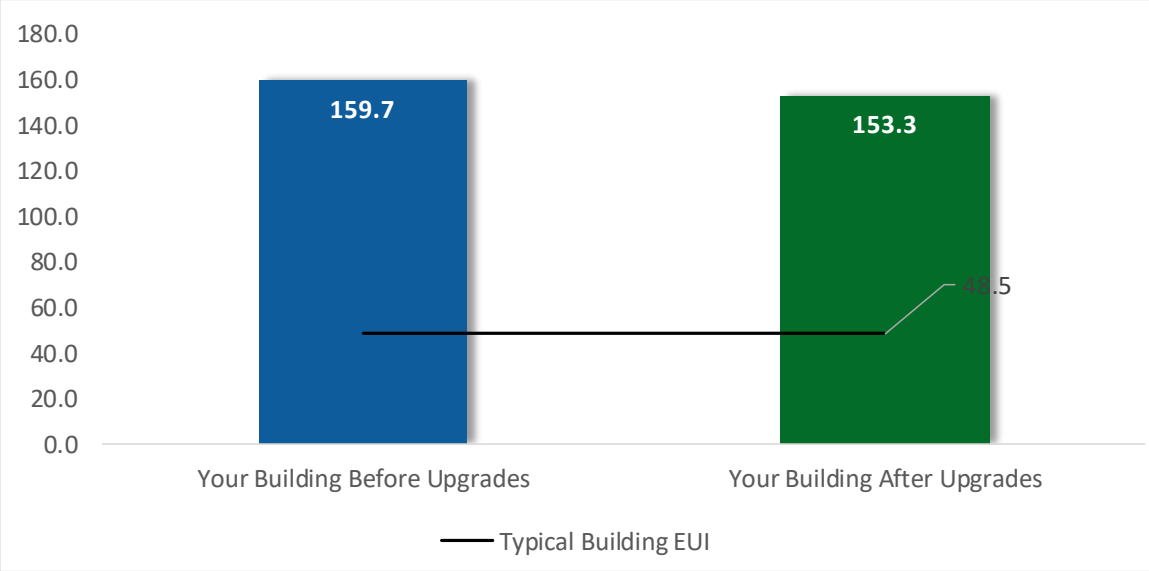


Figure 6 - Energy Use Intensity Comparison

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

Energy use intensity (EUI) measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. A number of factors can cause 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.

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 have already entered the monthly utility data shown above for you. Account login information for your account will be sent via email.

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

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

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

4 Energy Conservation Measures

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

This appendix provides a detailed list of the locations and recommended upgrades for each energy conservation measure.

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**49,512**	**21.9**	**-10**	**$5,549**	**$37,460**	**$9,369**	**$28,091**	**5.1**	**48,656**
ECM 1	Install LED Fixtures	11,285	4.6	-2	$1,265	$12,509	$3,000	$9,509	7.5	11,088
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	312	0.1	0	$35	$206	$30	$176	5.1	306
ECM 3	Retrofit Fixtures with LED Lamps	37,915	17.2	-8	$4,250	$24,744	$6,339	$18,405	4.3	37,262
Lighting Control Measures		**8,512**	**3.5**	**-2**	**$954**	**$13,060**	**$1,330**	**$11,730**	**12.3**	**8,364**
ECM 4	Install Occupancy Sensor Lighting Controls	7,081	2.9	-1	$794	$10,260	$1,330	$8,930	11.3	6,957
ECM 5	Install High/Low Lighting Controls	1,432	0.6	0	$160	$2,800	$0	$2,800	17.4	1,407
Electric Unitary HVAC Measures		**18,914**	**4.5**	**0**	**$2,150**	**$45,536**	**$2,400**	**$43,136**	**20.1**	**19,046**
	Install High Efficiency Air Conditioning Units	18,914	4.5	0	$2,150	$45,536	$2,400	$43,136	20.1	19,046
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**94**	**$721**	**$11,963**	**$800**	**$11,163**	**15.5**	**10,951**
	Install High Efficiency Furnaces	0	0.0	94	$721	$11,963	$800	$11,163	15.5	10,951
HVAC System Improvements		**2,311**	**0.0**	**14**	**$373**	**$1,359**	**$0**	**$1,359**	**3.6**	**3,995**
ECM 6	Implement Demand Control Ventilation (DCV)	2,311	0.0	14	$373	$1,359	$0	$1,359	3.6	3,995
Domestic Water Heating Upgrade		**0**	**0.0**	**54**	**$417**	**$136**	**$0**	**$136**	**0.3**	**6,333**
ECM 7	Install Low-Flow DHW Devices	0	0.0	54	$417	$136	$0	$136	0.3	6,333
Food Service & Refrigeration Measures		**1,895**	**0.1**	**0**	**$215**	**$1,125**	**$50**	**$1,075**	**5.0**	**1,908**
ECM 8	Refrigerator/Freezer Case Electrically Commutated Motors	1,105	0.1	0	$126	$607	$0	$607	4.8	1,113
ECM 9	Refrigeration Controls	790	0.0	0	$90	$519	$50	$469	5.2	795
TOTALS		**81,144**	**30.0**	**150**	**$10,380**	**$110,639**	**$13,949**	**$96,690**	**9.3**	**99,252**

* - 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		**49,512**	**21.9**	**-10**	**$5,549**	**$37,460**	**$9,369**	**$28,091**	**5.1**	**48,656**
ECM 1	Install LED Fixtures	11,285	4.6	-2	$1,265	$12,509	$3,000	$9,509	7.5	11,088
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	312	0.1	0	$35	$206	$30	$176	5.1	306
ECM 3	Retrofit Fixtures with LED Lamps	37,915	17.2	-8	$4,250	$24,744	$6,339	$18,405	4.3	37,262
Lighting Control Measures		**8,512**	**3.5**	**-2**	**$954**	**$13,060**	**$1,330**	**$11,730**	**12.3**	**8,364**
ECM 4	Install Occupancy Sensor Lighting Controls	7,081	2.9	-1	$794	$10,260	$1,330	$8,930	11.3	6,957
ECM 5	Install High/Low Lighting Controls	1,432	0.6	0	$160	$2,800	$0	$2,800	17.4	1,407
HVAC System Improvements		**2,311**	**0.0**	**14**	**$373**	**$1,359**	**$0**	**$1,359**	**3.6**	**3,995**
ECM 6	Implement Demand Control Ventilation (DCV)	2,311	0.0	14	$373	$1,359	$0	$1,359	3.6	3,995
Domestic Water Heating Upgrade		**0**	**0.0**	**54**	**$417**	**$136**	**$0**	**$136**	**0.3**	**6,333**
ECM 7	Install Low-Flow DHW Devices	0	0.0	54	$417	$136	$0	$136	0.3	6,333
Food Service & Refrigeration Measures		**1,895**	**0.1**	**0**	**$215**	**$1,125**	**$50**	**$1,075**	**5.0**	**1,908**
ECM 8	Refrigerator/Freezer Case Electrically Commutated Motors	1,105	0.1	0	$126	$607	$0	$607	4.8	1,113
ECM 9	Refrigeration Controls	790	0.0	0	$90	$519	$50	$469	5.2	795
TOTALS		**62,230**	**25.5**	**56**	**$7,509**	**$53,140**	**$10,749**	**$42,391**	**5.6**	**69,255**

* - 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		**49,512**	**21.9**	**-10**	**$5,549**	**$37,460**	**$9,369**	**$28,091**	**5.1**	**48,656**
ECM 1	Install LED Fixtures	11,285	4.6	-2	$1,265	$12,509	$3,000	$9,509	7.5	11,088
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	312	0.1	0	$35	$206	$30	$176	5.1	306
ECM 3	Retrofit Fixtures with LED Lamps	37,915	17.2	-8	$4,250	$24,744	$6,339	$18,405	4.3	37,262

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 gym lighting fixtures containing metal halide (MH) lamps with new LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

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

Maintenance savings may also be achieved since LED lamps last longer than other light sources and, therefore, do not need to be replaced as often.

Affected building areas: gymnasium

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit existing fluorescent T12 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 electrical room and dark room

ECM 3: Retrofit Fixtures with LED Lamps

Replace T8 linear fluorescent and U-bend tube lamps, compact fluorescent (CFL) 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, pin based and screw-in based CFL lamps and incandescent lamps

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**8,512**	**3.5**	**-2**	**$954**	**$13,060**	**$1,330**	**$11,730**	**12.3**	**8,364**
ECM 4	Install Occupancy Sensor Lighting Controls	7,081	2.9	-1	$794	$10,260	$1,330	$8,930	11.3	6,957
ECM 5	Install High/Low Lighting Controls	1,432	0.6	0	$160	$2,800	$0	$2,800	17.4	1,407

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

ECM 4: Install Occupancy Sensor Lighting Controls

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

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

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

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

Affected building areas: offices, classrooms, gymnasium, restrooms, music room, art room, cafeteria, faculty room, library, and storage rooms

ECM 5: Install High/Low Lighting Controls

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

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

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 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		**18,914**	**4.5**	**0**	**$2,150**	**$45,536**	**$2,400**	**$43,136**	**20.1**	**19,046**
	Install High Efficiency Air Conditioning Units	18,914	4.5	0	$2,150	$45,536	$2,400	$43,136	20.1	19,046

Replacing the unitary HVAC units has a long payback period and may not be justifiable based simply on energy considerations. We recommend that high efficiency units be considered when unit replacement is being considered for maintenance reasons or recapitalization. Packaged AC units at this site are equipped with gas-fired furnaces, therefore, this measure can be implemented in conjunction with the gas furnace replacement measure, potentially at a lower overall cost than has been conservatively estimated. When these units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

Install High Efficiency Air Conditioning Units

As warranted, replace standard efficiency packaged air conditioning units and split system 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.

4.4 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**94**	**$721**	**$11,963**	**$800**	**$11,163**	**15.5**	**10,951**
	Install High Efficiency Furnaces	0	0.0	94	$721	$11,963	$800	$11,163	15.5	10,951

Install High Efficiency Furnaces

The replacement of standard efficiency furnaces has a long payback period and may not be justifiable based simply on energy considerations. As warranted, replace standard efficiency furnaces with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases which can significantly improve furnace efficiency. Savings result from improved system efficiency.

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

This measure is part of a measure to replace package units at this site and as such must be considered in combination with the measure to replace air conditioning units noted above.

4.5 HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**2,311**	**0.0**	**14**	**$373**	**$1,359**	**$0**	**$1,359**	**3.6**	**3,995**
ECM 6	Implement Demand Control Ventilation (DCV)	2,311	0.0	14	$373	$1,359	$0	$1,359	3.6	3,995

ECM 6: Implement Demand Control Ventilation (DCV)

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

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

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

Affected building areas: library

4.6 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**	**54**	**$417**	**$136**	**$0**	**$136**	**0.3**	**6,333**
ECM 7	Install Low-Flow DHW Devices	0	0.0	54	$417	$136	$0	$136	0.3	6,333

ECM 7: 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. [Pre-rinse spray valves (PRSVs) — often used in commercial and institutional kitchens — remove food waste from dishes prior to dishwashing.]

Additional cost savings may result from reduced water usage.

4.7 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		**1,895**	**0.1**	**0**	**$215**	**$1,125**	**$50**	**$1,075**	**5.0**	**1,908**
ECM 8	Refrigerator/Freezer Case Electrically Commutated Motors	1,105	0.1	0	$126	$607	$0	$607	4.8	1,113
ECM 9	Refrigeration Controls	790	0.0	0	$90	$519	$50	$469	5.2	795

ECM 8: Refrigerator/Freezer Case Electrically Commutated Motors

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

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

Affected building areas: kitchen

ECM 9: Refrigeration Controls

Install additional controls to optimize the operation of the walk-in freezer.

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 measure account for reduction in compressor and fan operating hours as well as reduction in the refrigeration heat load as appropriate.

Affected building areas: kitchen

5 Energy Efficient Best Practices

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

Energy Tracking with ENERGY STAR® Portfolio Manager®

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

Doors and Windows

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

AC System Evaporator/Condenser Coil Cleaning

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

HVAC Filter Cleaning and Replacement

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

Boiler Maintenance

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

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

Furnace Maintenance

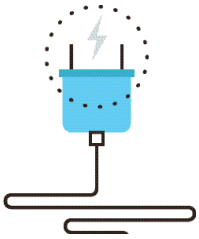
Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should include the following: check for gas/carbon monoxide leaks, change the air and fuel filters, check components for cracks, 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.

Water Heater Maintenance

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

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

Plug Load Controls



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

Computer Power Management Software

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

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

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

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

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

Procurement Strategies

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

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

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

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

6.1 Solar Photovoltaic

Photovoltaic (PV) panels convert sunlight into electricity. Individual panels are combined into an array that produces direct current (DC) electricity. The DC 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 **low** potential for installing a PV array.

This facility does not appear to meet the minimum criteria for a cost-effective solar PV installation. To be cost-effective, a solar PV array needs certain minimum criteria, such as flat or south-facing rooftop or other unshaded space on which to place the PV panels.

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

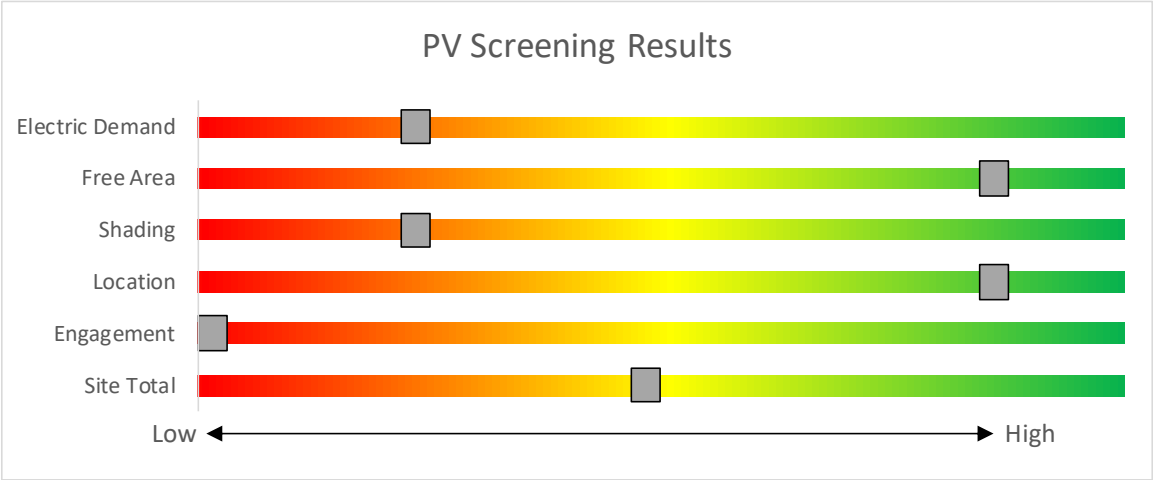


Figure 9 - Photovoltaic Screening

Solar Renewable Energy Certificate (SREC) Registration Program

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

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

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

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

6.2 Combined Heat and Power

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

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

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

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

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

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

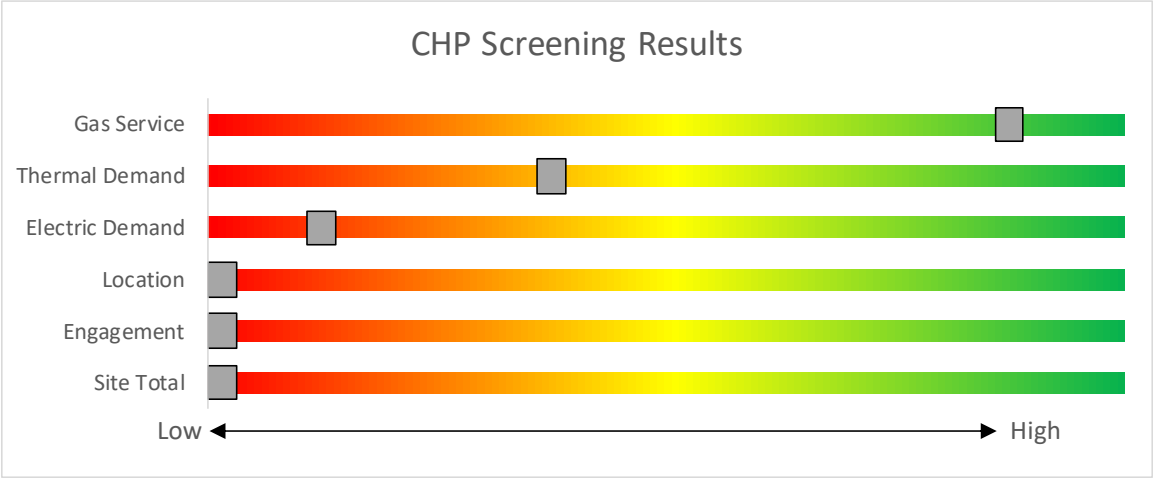


Figure 10 - Combined Heat and Power Screening

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

7 PROJECT FUNDING AND INCENTIVES

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

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

7.1 SmartStart

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

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

Equipment with Prescriptive Incentives Currently Available:

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

Incentives

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

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

How to Participate

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

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

7.2 Direct Install

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

Incentives

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

How to Participate

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

Detailed program description and application can be found at: www.njcleanenergy.com/DI.

7.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. An ESIP is a type of performance contract, whereby school districts, counties, municipalities, housing authorities and other public and state entities enter into 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.

8 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

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

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

A list of licensed third-party electric suppliers is available at the NJBPU website[8].

8.2 Retail Natural Gas Supply Options

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

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

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

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

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.2	407	0	$46	$256	$70	4.1
Boiler Room	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
Electrical Room	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	1,600	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.0	104	0	$12	$69	$10	5.1
CRM 301 (NC)	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	1,600	3	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.3	813	0	$91	$511	$140	4.1
CRM302	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,600	3, 4	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.5	1,330	0	$149	$927	$215	4.8
CRM304	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,600	3, 4	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.5	1,330	0	$149	$927	$215	4.8
Small Group Inventory	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,600	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.0	116	0	$13	$73	$20	4.1
Small Group Inventory	2	Compact Fluorescent: (2) 13W CFL - 4 Pin	Wall Switch	S	26	1,600	3	Relamp	No	2	LED Screw-In Lamps: LED 4-Pin Lamps	Wall Switch	18	1,600	0.0	27	0	$3	$109	$0	35.3
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.0	116	0	$13	$73	$20	4.1
Storage	2	Compact Fluorescent: (2) 13W CFL - 4 Pin	Wall Switch	S	26	1,600	3	Relamp	No	2	LED Screw-In Lamps: LED 4-Pin Lamps	Wall Switch	18	1,600	0.0	27	0	$3	$109	$0	35.3
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,600	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,600	0.0	31	0	$3	$18	$5	3.8
Hallway	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3, 5	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,104	0.5	1,182	0	$133	$1,184	$160	7.7
Hallway	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
Womens Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.1	333	0	$37	$434	$80	9.5
Mens Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.1	333	0	$37	$434	$80	9.5
Elevator	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.0	58	0	$7	$37	$10	4.1
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,600	0.1	261	0	$29	$164	$45	4.1
Stairwell	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.1	290	0	$33	$183	$50	4.1
Mens Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,600	0.0	99	0	$11	$73	$20	4.8
Womens Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,600	0.0	99	0	$11	$73	$20	4.8
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3, 5	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,104	0.2	517	0	$58	$456	$70	6.7
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 5	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,104	0.5	1,109	0	$124	$948	$150	6.4
Hallway	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Stairwell	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.1	348	0	$39	$219	$60	4.1
Closet (NC)	1	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch	S	13	1,600	3	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	7	0	$1	$17	$1	21.1
CR M-205	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	1,600	3, 4	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.4	1,035	0	$116	$781	$175	5.2
CR M-205	1	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch	O	13	1,600	3	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	7	0	$1	$17	$1	21.1
CR M-206	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	1,600	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.4	887	0	$99	$708	$155	5.6
CR M-206	1	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch	O	13	1,600	3	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	7	0	$1	$17	$1	21.1
CR M-204	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	1,600	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.4	887	0	$99	$708	$155	5.6
CR M-204	1	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch	O	13	1,600	3	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	7	0	$1	$17	$1	21.1
Dark Room	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch		88	1,600	2	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.1	208	0	$23	$138	$20	5.1
Dark Room	1	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch		13	1,600	3	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	7	0	$1	$17	$1	21.1
Closet	2	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch		13	1,600	3	Relamp	No	2	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	14	0	$2	$34	$2	21.1
CR M-203	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,600	3, 4	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.4	1,035	0	$116	$781	$175	5.2
CR M-203	1	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch		13	1,600	3	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	7	0	$1	$17	$1	21.1
CR M-201	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,600	3, 4	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.5	1,182	0	$133	$854	$195	5.0
Comp M-202	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,600	3, 4	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.7	1,774	0	$199	$1,416	$310	5.6
Stairwell	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,600	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.0	116	0	$13	$73	$20	4.1
Stairwell	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.0	51	0	$6	$72	$10	10.9
Comp Lab (NC)	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,600	3	Relamp	No	17	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.4	987	0	$111	$621	$170	4.1
Library	65	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch		62	1,600	3, 4	Relamp	Yes	65	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	2.0	4,804	-1	$538	$3,453	$790	4.9
Stairwell	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	3	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,600	0.2	394	0	$44	$292	$80	4.8
Stairwell	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	1,600	3	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,600	0.0	31	0	$3	$18	$5	3.8
Closet (NC)	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.0	51	0	$6	$72	$10	10.9
Closet (NC)	1	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch	S	13	1,600	3	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	7	0	$1	$17	$1	21.1
Custodial	1	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch	S	13	1,600	3	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	7	0	$1	$17	$1	21.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mens Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.0	51	0	$6	$72	$10	10.9
Womens Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	1,600	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,600	0.0	51	0	$6	$72	$10	10.9
Exit	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
Cafeteria	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	1.1	2,660	-1	$298	$1,855	$430	4.8
Café Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	222	0	$25	$380	$65	12.7
Café Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,104	0.2	521	0	$58	$562	$115	7.7
Café Storage	2	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch	S	13	1,600	3	Relamp	No	2	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	14	0	$2	$34	$2	21.1
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.1	174	0	$20	$110	$30	4.1
Student Services	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.5	1,109	0	$124	$818	$185	5.1
Mechanical Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	3	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,600	0.1	197	0	$22	$146	$40	4.8
Faculty Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.3	776	0	$87	$653	$140	5.9
Main Office	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.4	998	0	$112	$763	$170	5.3
Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,600	0.0	99	0	$11	$73	$20	4.8
Boys Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,104	0.1	260	0	$29	$416	$75	11.7
Girls Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	3, 4	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,104	0.1	260	0	$29	$416	$75	11.7
Closet (NC)	1	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch	S	13	1,600	3	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	7	0	$1	$17	$1	21.1
Nurse Office	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.5	1,219	0	$137	$872	$200	4.9
Guidance	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.2	443	0	$50	$489	$95	7.9
CR M-103 (NC)	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	1,600	3	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.2	465	0	$52	$292	$80	4.1
CR M-100 (NC)	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	O	29	1,600		None	No	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.0	0	0	$0	$0	$0	0.0
CR M-100 (NC)	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	O	93	1,600	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,600	0.1	174	0	$20	$110	$30	4.1
CR M-107 (NC)	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	O	93	1,600	3	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,600	0.1	174	0	$20	$110	$30	4.1
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,600	0.0	87	0	$10	$55	$15	4.1
Art Room	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	O	114	1,600	3, 4	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,104	0.8	1,953	0	$219	$1,365	$335	4.7
Art Room Kiln Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	1,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	296	0	$33	$416	$75	10.3

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
CR M-102	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	1,600	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.4	887	0	$99	$708	$155	5.6
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	O	62	1,600	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.0	58	0	$7	$37	$10	4.1
Athletic Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.2	443	0	$50	$489	$95	7.9
Boys Restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	296	0	$33	$416	$75	10.3
Boys Locker Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.3	665	0	$75	$599	$125	6.4
Girls Restroom	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.2	554	0	$62	$544	$110	7.0
Girls Locker Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 4	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,104	0.2	554	0	$62	$544	$110	7.0
Music Room	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	1,600	4	None	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	237	0	$27	$270	$35	8.8
Gym (NC)	20	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	1,600	1	Fixture Replacement	No	20	LED - Fixtures: Low-Bay	Wall Switch	137	1,600	4.6	11,285	-2	$1,265	$12,509	$3,000	7.5
Gym	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3, 4	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.4	1,035	0	$116	$781	$175	5.2
Gym Stage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.1	296	0	$33	$416	$75	10.3
Gym Stage (NC)	4	Incandescent: (12) 100W Incandescent Stage Light	Wall Switch	S	1,200	400	3	Relamp	No	4	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	360	400	2.4	1,478	0	$166	$758	$44	4.3
Gym	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gym	19	LED - Fixtures: LED Stage Light	Wall Switch		360	1,600		None	No	19	LED - Fixtures: LED Stage Light	Wall Switch	360	1,600	0.0	0	0	$0	$0	$0	0.0
Hallway	27	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3, 5	Relamp	Yes	27	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,104	0.8	1,995	0	$224	$1,986	$270	7.7
Hallway	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Hallway	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	1,600	3, 5	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,104	0.8	1,885	0	$211	$1,531	$255	6.0
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	1,600	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,600	0.0	99	0	$11	$73	$20	4.8
Maintenance Office	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,600	3, 4	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,104	0.5	1,182	0	$133	$854	$195	5.0
Maintenance Office	2	Compact Fluorescent: (1) 13W CFL - Screw-In	Wall Switch	S	13	1,600	3	Relamp	No	2	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	9	1,600	0.0	14	0	$2	$34	$2	21.1
Entry	8	Compact Fluorescent: (3) 13W CFL - Pin Based	Photocell	S	39	4,380	3	Relamp	No	8	LED Screw-In Lamps: LED 4-Pin Lamps	Photocell	27	4,380	0.0	410	0	$47	$435	$0	9.3
Building Perimeter	16	LED - Fixtures: 78W LED Wallpacks	Photocell	S	78	4,380		None	No	16	LED - Fixtures: 78W LED Wallpacks	Photocell	78	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Pole Lights	1	LED - Fixtures: 78W LED Pole Light	Photocell	S	78	4,380		None	No	1	LED - Fixtures: 78W LED Pole Light	Photocell	78	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Pole Lights	2	LED - Fixtures: 150W LED Pole Light	Photocell	S	150	4,380		None	No	2	LED - Fixtures: 150W LED Pole Light	Photocell	150	4,380	0.0	0	0	$0	$0	$0	0.0

Motor Inventory & Recommendations

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Boiler	2	Boiler Feed Water Pump	0.8	81.1%	No	W	2,745		No	81.1%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler	2	Condensate Pump	0.8	81.1%	No	W	2,745		No	81.1%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Pneumatics Controls	2	Air Compressor	1.5	78.5%	No	W	6,978		No	78.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Locker Rooms and Bathrooms	1	Makeup Air Fan	1.0	86.5%	No	W	2,745		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Band Room	1	Supply Fan	2.0	86.5%	No	B	2,745		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Gym	1	Supply Fan	5.0	89.5%	Yes	N	2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Bathroom (RTU-M004)	1	Makeup Air Fan	0.3	72.4%	No	W	2,745		No	72.4%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Library	1	Supply Fan	3.0	89.5%	No	B	2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Classrooms	Classrooms	4	Fan Coil Unit	0.3	62.2%	No	W	2,745		No	62.2%	No		0.0	0	0	$0	$0	$0	0.0
Elevator Room	Elevator	1	Other	25.0	75.5%	No	W	720		No	75.5%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Room	AHU-1	1	Supply Fan	1.0	85.5%	No	B	2,745		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Gym	1	Exhaust Fan	5.0	89.5%	Yes	N	2,745		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Classrooms	Classrooms	5	Fan Coil Unit	0.3	62.2%	No	W	2,745		No	62.2%	No		0.0	0	0	$0	$0	$0	0.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Band Room	1	Packaged AC	8.00		B	NR	Yes	1	Packaged AC	8.00		11.50		0.7	2,899	0	$330	$14,257	$584	41.5
Roof	Gym (RTU-M001)	1	Packaged AC	25.00		N		No							0.0	0	0	$0	$0	$0	0.0
Roof	Comp Room	2	Split-System AC	3.00		B	NR	Yes	2	Split-System AC	3.00		14.00		1.2	4,859	0	$552	$8,977	$552	15.3
Roof	Library	1	Packaged AC	16.00		B	NR	Yes	1	Packaged AC	16.00		11.50		2.7	11,156	0	$1,268	$22,302	$1,264	16.6
Roof	3rd Floor Classrooms	4	Split-System AC	3.00		W		No							0.0	0	0	$0	$0	$0	0.0

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Throughout building	2	Forced Draft Steam Boiler	2,016.00	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	Band Room	1	Furnace	216.00	B	NR	Yes	1	Furnace	216.00	95.00%	AFUE	0.0	0	39	$297	$4,894	$400	15.1
Roof	Gym	1	Furnace	432.00	N		No						0.0	0	0	$0	$0	$0	0.0
Roof	Library	1	Furnace	312.00	B	NR	Yes	1	Furnace	312.00	95.00%	AFUE	0.0	0	55	$424	$7,069	$400	15.7

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
Library	Library	6	1.00	16.00	0.00	312.00	0.0	2,311	14	$373	$1,359	$0	3.6

DHW Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Remaining Useful Life	ECM #	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Throughout Building	1	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
Boiler Room	Building	1	Storage Tank Water Heater (≤ 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms Throughout Building	7	19	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	54	$417	$136	$0	0.3

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

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions				Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	ECM #	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Medium Temp Freezer (0F to 30F)	8, 9	Yes	Yes	No	0.1	1,895	0	$215	$1,125	$50	5.0

Novelty Cooler Inventory & Recommendations

	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Cooler Description	ECM #	Install Automatic Shutoff Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Cold Food Base		No	0.00	0	0	$0	$0	$0	0.0
Kitchen	1	Hot Food Base		No	0.00	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Gas Rack Oven (Double)	Yes		No	0.0	0	0	$0	$0	$0	0.0

Dishwasher Inventory & Recommendations

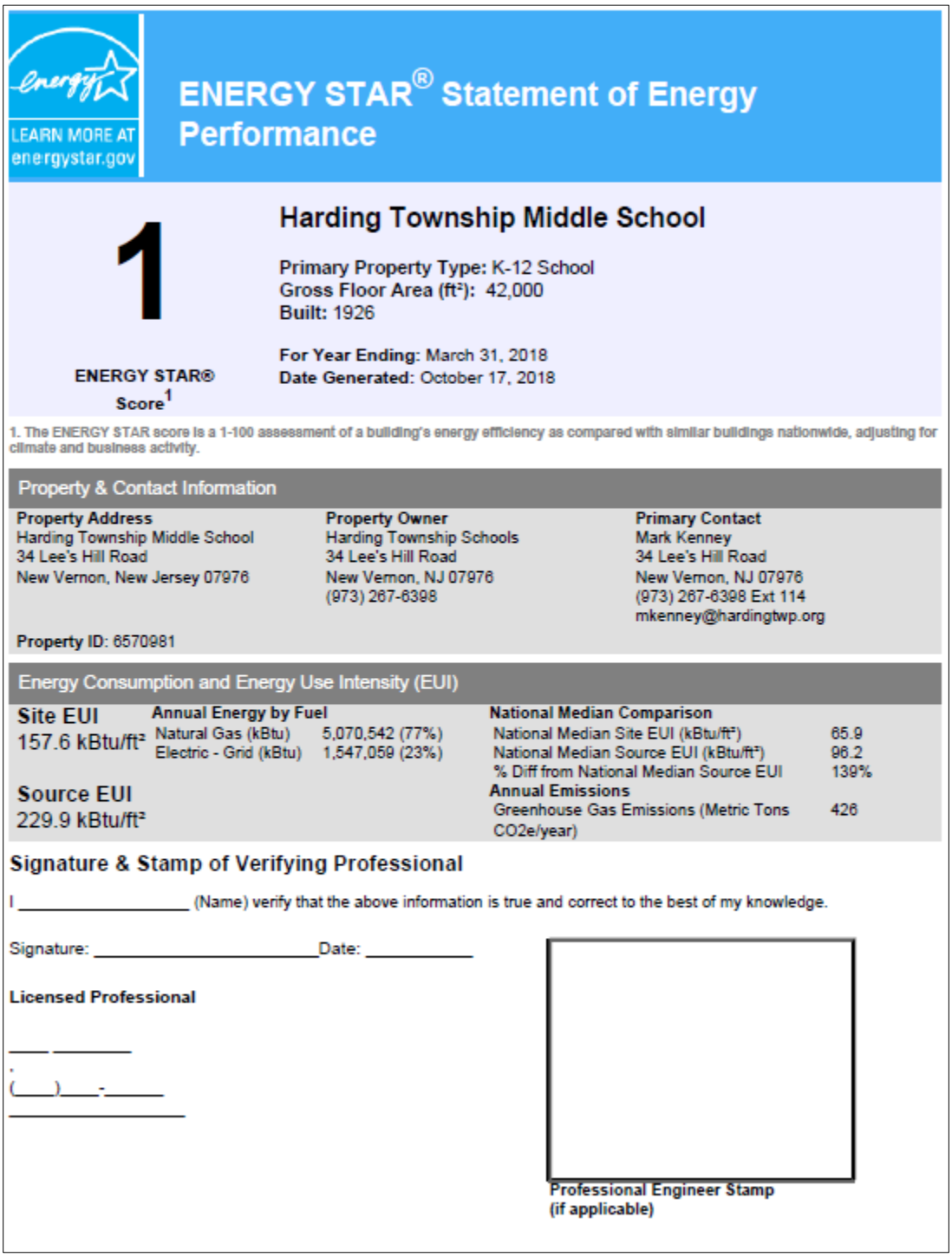
	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Door Type (High Temp)	Electric	N/A	Yes		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?
Classrooms	12	Smart Boards	360.0	Yes
Throughout Building	70	Desktops	160.0	Yes
Throughout Building	5	Printers (small)	60.0	Yes
Throughout Building	4	Printers (Medium)	200.0	Yes
Throughout Building	5	Printers (Large)	600.0	Yes
Throughout Building	3	Refrigerators	172.0	Yes
Throughout Building	3	TV (CRT)	120.0	No
Throughout Building	2	Microwave	1,000.0	Yes
Throughout Building	1	Toaster	850.0	Yes

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.



LEARN MORE AT energystar.gov

ENERGY STAR® Statement of Energy Performance

1

ENERGY STAR® Score[1]

Harding Township Middle School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 42,000
Built: 1926

For Year Ending: March 31, 2018
Date Generated: October 17, 2018

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Harding Township Middle School 34 Lee's Hill Road New Vernon, New Jersey 07976	Harding Township Schools 34 Lee's Hill Road New Vernon, NJ 07976 (973) 267-6398	Mark Kenney 34 Lee's Hill Road New Vernon, NJ 07976 (973) 267-6398 Ext 114 mkenney@hardingtwp.org

Property ID: 6570981

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
157.6 kBtu/ft²

Source EUI
229.9 kBtu/ft²

Annual Energy by Fuel		
Natural Gas (kBtu)	5,070,542	(77%)
Electric - Grid (kBtu)	1,547,059	(23%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	65.9
National Median Source EUI (kBtu/ft²)	96.2
% Diff from National Median Source EUI	139%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	426

Signature & Stamp of Verifying Professional

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

Signature: _____ Date: _____

Licensed Professional

____ _____
.
(___)___-_____
_____

Professional Engineer Stamp (if applicable)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate financial savings. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is $22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
BTU	A British thermal unit is the amount of heat required to increase the temperature of one pound water by one-degree Fahrenheit. Commonly used to measure natural gas consumption.
Demand Response	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
Energy Efficiency	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing energy management systems.
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
HVAC	Heating, ventilation, and air conditioning.
kW	Kilowatt. Equal to 1,000 Watts.
Load	The total amount of power used by a building system at any given time.
Measure	A single activity, or installation of a single type of equipment, that is implemented in a building system to reduce total energy consumption.
MMBtu	One million British thermal units.
psig	Pounds per square inch.
Plug Load	Refers to the amount of energy used in a space by products that are powered by means of an ordinary AC plug.
Simple Payback	The amount of time needed to recoup the funds expended in an investment, or to reach the break-even point.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
Turnkey	Provision of a complete product or service that is ready for immediate use
Watt (W)	Unit of power commonly used to measure electricity use.