Local Government Energy Audit:
Energy Audit Report

Franklin Borough School

Franklin Borough Board of Education

50 Washington Avenue
Franklin, NJ 07416

November 13, 2018

Final Report by:

TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

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

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

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

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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 Franklin Borough School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey school districts in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

The Franklin Borough School is a comprehensive community public school that serves students in kindergarten through eighth grade in Sussex County, New Jersey. The facility is three-story building totaling 115,483 square feet. The original building was constructed in 1915 and additional classrooms were added in 1926 and 1960. It is comprised of classrooms, cafeteria, kitchen, gymnasiums, auditorium, meeting rooms, administrative offices, locker rooms, storage and mechanical spaces. The building also houses the Franklin Borough Board of Education office. The building is occupied by approximately 428 students and 95 staff. The gymnasium and auditorium are used after hours. The classrooms hours of operation are between 7:00 AM and 3:45 PM during the weekdays and it operates on a 10-month schedule. The school is closed on weekends.

The foundation consists of cast-in-place concrete perimeter wall footings with concrete walls. Exterior walls are finished with brick masonry. The building has a flat roof covered with a multi-ply bituminous built-up membrane that is under warranty and appears to be in good condition. The windows throughout the facility are glass single paned with aluminum frames. They appear in poor condition with signs of outside air infiltration. We recommend the school district to replace the windows. Exterior doors are constructed of metal and glass. They were replaced a few years ago except two doors. The door seals were found to be in good condition.

The building's interior lighting consists mainly of linear fluorescent T8 fixtures with electronic ballasts. Lighting is controlled throughout the building by manual switches except the hallways which have occupancy sensors. The building's exterior illumination is provided by a combination of LED and HID fixtures that are controlled with photocells.

The heating system consists of two Cleaver Brook steam boilers with two steam-to-hot water heat exchangers. Cooling is provided in classrooms by window air conditioners while the main offices, the library and the main server room are using split system air conditioners.

The facility has photovoltaic (PV) arrays installed on the roof and the front parking lot metallic structure that has 219 kW generating capability and represent approximately 61% of the building electricity needs.

Air is exhausted from the cafeteria, gymnasium, auditorium and corridors through the roof and wall exhausters.

A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated 16 measures and recommends 14 measures which together represent an opportunity for Franklin Borough School to reduce annual energy costs by $34,263 and annual greenhouse gas emissions by 288,952 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 5.3 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Franklin Borough School's annual energy use by 13%.

Figure 1 – Previous 12 Month Utility Costs

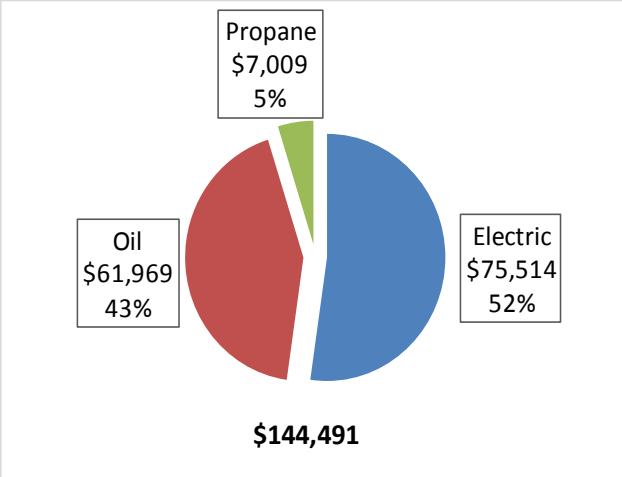
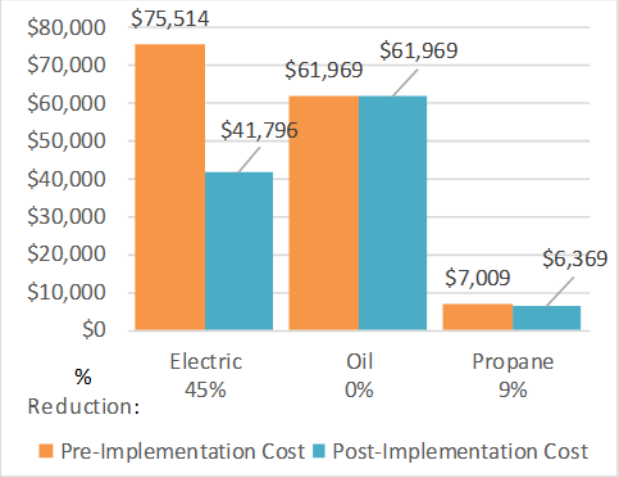


Figure 2 – Potential Post-Implementation Costs



A detailed description of Franklin Borough School's existing energy use can be found in Section 3 "Site Energy Use and Costs."

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4, "Energy Conservation Measures."

Figure 3 – Summary of Energy Reduction Opportunities

	Energy Conservation Measure	Recommend?	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			**190,609**	**36.8**	**0.0**	**$22,952.20**	**$125,268.76**	**$18,170.00**	**$107,098.76**	**4.7**	**191,942**
ECM 1	Install LED Fixtures	Yes	45,594	9.2	0.0	$5,490.18	$38,089.17	$3,730.00	$34,359.17	6.3	45,913
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	493	0.1	0.0	$59.32	$392.00	$20.00	$372.00	6.3	496
ECM 3	Retrofit Fixtures with LED Lamps	Yes	143,524	27.4	0.0	$17,282.44	$84,744.04	$14,420.00	$70,324.04	4.1	144,528
ECM 4	Install LED Exit Signs	Yes	999	0.1	0.0	$120.25	$2,043.55	$0.00	$2,043.55	17.0	1,006
Lighting Control Measures			**37,502**	**7.4**	**0.0**	**$4,515.75**	**$32,602.00**	**$4,630.00**	**$27,972.00**	**6.2**	**37,764**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	32,365	6.7	0.0	$3,897.23	$30,726.00	$4,030.00	$26,696.00	6.8	32,591
ECM 6	Install High/Low Lighting Controls	Yes	5,137	0.7	0.0	$618.52	$1,876.00	$600.00	$1,276.00	2.1	5,172
Motor Upgrades			**9,484**	**2.1**	**0.0**	**$1,142.01**	**$39,969.40**	**$0.00**	**$39,969.40**	**35.0**	**9,550**
	Premium Efficiency Motors	No	9,484	2.1	0.0	$1,142.01	$39,969.40	$0.00	$39,969.40	35.0	9,550
Variable Frequency Drive (VFD) Measures			**19,116**	**4.8**	**0.0**	**$2,301.90**	**$24,585.70**	**$1,400.00**	**$23,185.70**	**10.1**	**19,250**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	7,990	1.9	0.0	$962.16	$10,158.50	$1,400.00	$8,758.50	9.1	8,046
ECM 8	Install VFDs on Hot Water Pumps	Yes	11,126	3.0	0.0	$1,339.74	$14,427.20	$0.00	$14,427.20	10.8	11,204
Electric Unitary HVAC Measures			**7,786**	**3.9**	**0.0**	**$937.60**	**$12,243.60**	**$552.00**	**$11,691.60**	**12.5**	**7,841**
ECM 9	Install High Efficiency Electric AC	Yes	7,786	3.9	0.0	$937.60	$12,243.60	$552.00	$11,691.60	12.5	7,841
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**193.4**	**$2,439.80**	**$143,709.43**	**$7,732.00**	**$135,977.43**	**55.7**	**31,640**
	Install High Efficiency Steam Boilers	No	0	0.0	193.4	$2,439.80	$143,709.43	$7,732.00	$135,977.43	55.7	31,640
Domestic Water Heating Upgrade			**0**	**0.0**	**49.3**	**$639.61**	**$4,819.92**	**$300.00**	**$4,519.92**	**7.1**	**6,980**
ECM 10	Install Tankless Water Heater	Yes	0	0.0	26.0	$337.47	$4,705.20	$300.00	$4,405.20	13.1	3,683
ECM 11	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	23.3	$302.14	$114.72	$0.00	$114.72	0.4	3,297
Food Service Equipment & Refrigeration Measures			**1,618**	**0.0**	**0.0**	**$194.88**	**$2,192.60**	**$125.00**	**$2,067.60**	**10.6**	**1,630**
ECM 12	Refrigeration Controls	Yes	1,618	0.0	0.0	$194.88	$2,192.60	$125.00	$2,067.60	10.6	1,630
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$194.09**	**$230.00**	**$0.00**	**$230.00**	**1.2**	**1,623**
ECM 13	Vending Machine Control	Yes	1,612	0.0	0.0	$194.09	$230.00	$0.00	$230.00	1.2	1,623
Custom Measures			**21,770**	**0.0**	**0.0**	**$2,527.49**	**$6,175.00**	**$0.00**	**$6,175.00**	**2.4**	**21,922**
ECM 14	Computer Power management Software	Yes	21,770	0.0	0.0	$2,527.49	$6,175.00	$0.00	$6,175.00	2.4	21,922
TOTALS FOR HIGH PRIORITY MEASURES			**280,014**	**53.0**	**49.3**	**$34,263.52**	**$208,117.58**	**$25,177.00**	**$182,940.58**	**5.3**	**288,952**
TOTALS FOR ALL EVALUATED MEASURES			**289,498**	**55.1**	**242.7**	**$37,845.34**	**$391,796.42**	**$32,909.00**	**$358,887.42**	**9.5**	**330,142**

* - All incentives presented in this table are based on NJ Smart Start Building 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).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

Gas Heating (HVAC/Process) measures generally involve replacing older inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide equivalent heating compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel demands for heating, due to improved combustion and heat transfer efficiency.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Food Service Equipment & Refrigeration measures generally involve improvements in the efficiency of cooking, food service, dishwashing, and food storage equipment. These measures may include more efficient convection ovens, steamers, ice machines, or refrigeration. These measures save energy by reducing the energy usage with more energy efficient equipment.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

Energy Efficient Practices

TRC Energy Services also identified 12 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Franklin Borough School include:

- Reduce Air Leakage
- Use Window Treatments/Coverings
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Use Thermostat Schedules and Temperature Resets
- Clean Evaporator/Condenser Coils on AC Systems
- Perform Boiler Maintenance
- Perform Water Heater Maintenance
- Perform Maintenance on Compressed Air Systems
- Install Plug Load Controls
- Water Conservation

For details on these Energy Efficient Practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Franklin Borough School. Based on the configuration of the site and its loads there is a low potential for installing additional PV and combined heat and power self-generation measures. For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered, and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Direct Install (DI)
- Energy Savings Improvement Program (ESIP)

For facilities wanting 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 in this program you may use internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated DI contractor and, in most cases, they will perform the installation work.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (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. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce 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. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage 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 DR programs. Program participation is voluntary, and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
William J. Sabo	Business Administrator/Board Sec.	bsabo@fboe.org	973-827-9775
Designated Representative			
Mark Postas	Supervisor Building & Ground	mpostas@fboe.org	973-827-9775
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On May 29, 2018, TRC performed an energy audit at Franklin Borough School located in Franklin, NJ. TRC's auditor met with Mark Postas to review the facility operations and help focus our investigation on specific energy-using systems.

The Franklin Borough School is a comprehensive community public school that serves students in kindergarten through eighth grade in Sussex County, New Jersey. The facility is three-story building totaling 115,483 square feet. The original building was constructed in 1915 and additional classrooms were added in 1926 and 1960. It is comprised of classrooms, cafeteria, kitchen, gymnasiums, auditorium, meeting rooms, administrative offices, locker rooms, storage and mechanical spaces. The building also houses the Franklin Borough school district office.

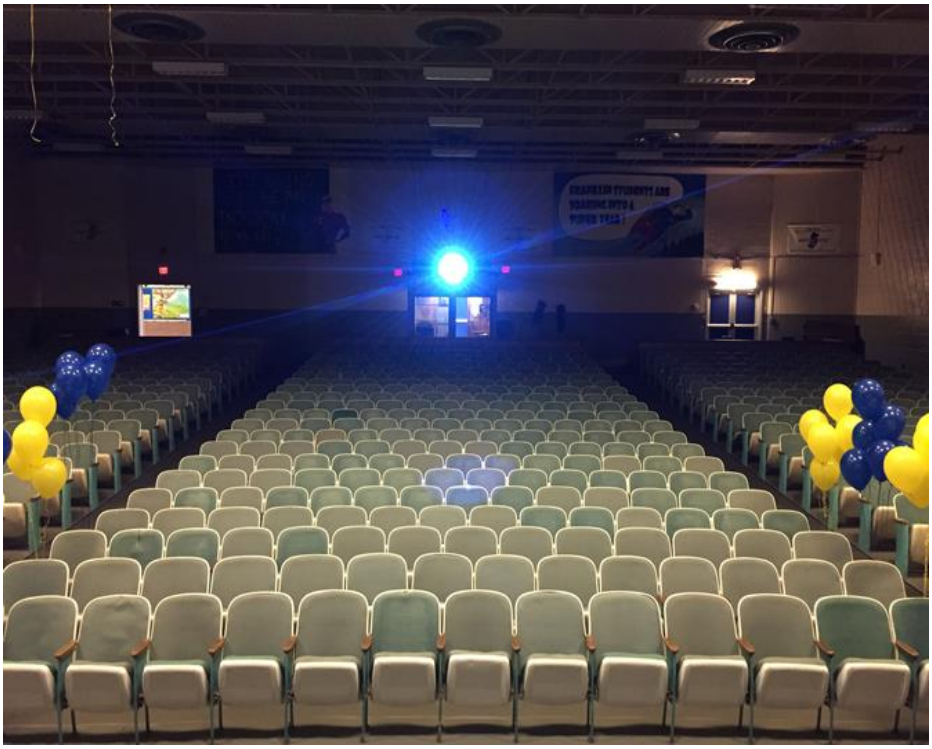


Image 1: Auditorium

2.3 Building Occupancy

The building is in operation 10 months out of the year. General operation is 6:00 AM to 10:00 PM Monday through Friday. The school is cleaned after hours between 6:00 PM and 10:00 PM. The building is occupied by 428 students and about 95 staff. The typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Occupancy Schedule		
Building Name	**Weekday/Weekend**	**Operating Schedule**
Franklin Borough School Classe's Hours of Operation	Weekday	7:00 AM - 3:45 PM
Franklin Borough School Classe's Hours of Operation	Weekend	Closed

2.4 Building Envelope

The building is constructed of concrete block and structural steel with a brick facade. The building has flat roof sections covered with roofing membrane. The roof is in good condition and under warranty. The old gymnasium walls are in poor condition with some visible signs of cracks. The windows throughout the building are glass single paned windows with aluminum frames. They appear in poor condition with signs of outside air infiltration. We recommend the school district to replace them with efficient windows and this will contribute to reduce the heating load. The exterior doors are typically metal or metal with glass panes and metal frames. The exterior doors were installed a few years ago and are in good condition except the two doors located behind the Business Office Trailer.

Image 2: Building Envelope

Image 3: Typical Window

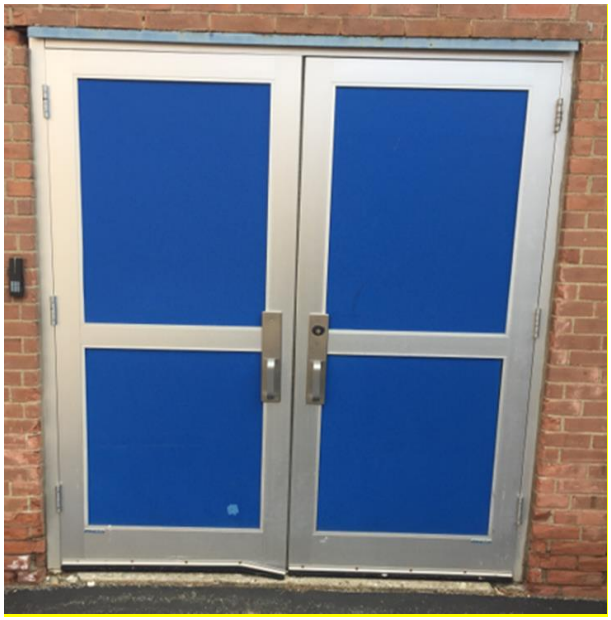


Image 4: New Exterior Door

Image 5: Roofing Membrane with PV Arrays

Image 6: Old Exterior Door

2.5 On-Site Generation

Franklin Borough School installed a 219 kW DC solar energy generation system in 2011 and is operating exclusively as a Net Metering PV Solar Electric Facility (SEF). The system includes PV arrays on the building roof and the front parking lot metallic structure. Based on the information provided for the PV system

generation and the building utility bills, the system generates 61% of the total annual electric consumption for the building

2.6 Energy-Using Systems

Please see **Appendix A: Equipment Inventory & Recommendations** for an inventory of the facility's equipment.

Lighting System

Lighting is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts. Fixtures throughout the building include pendant mounted continuous row fixtures, surface mounted wraps, recessed troffer fixtures or industrial fixtures. Most of the fixtures are 2 lamps, 4-foot long. The two gymnasiums are lit with 400-Watt metal halide lamps. Some incandescent lamps are found in spaces such as kitchen hood, auditorium stage and storage rooms. The zoo room lighting system has been retrofitted with 4-foot LED panel fixtures. Lighting is controlled by wall switches in most spaces and is turned on during operating hours of the building except a few hallways which have occupancy sensor control systems. Exit signs throughout the building are a combination of LED and fluorescent lamps.

The building's exterior lighting consists of wall mounted fixtures, parking lot and playground pole mounted fixtures. Sources include LED fixtures, 100-Watt high pressure sodium (HPS) fixtures, and 400-Watt metal halide (MH) fixtures. All exterior lighting is controlled by daylight dimming sensors.

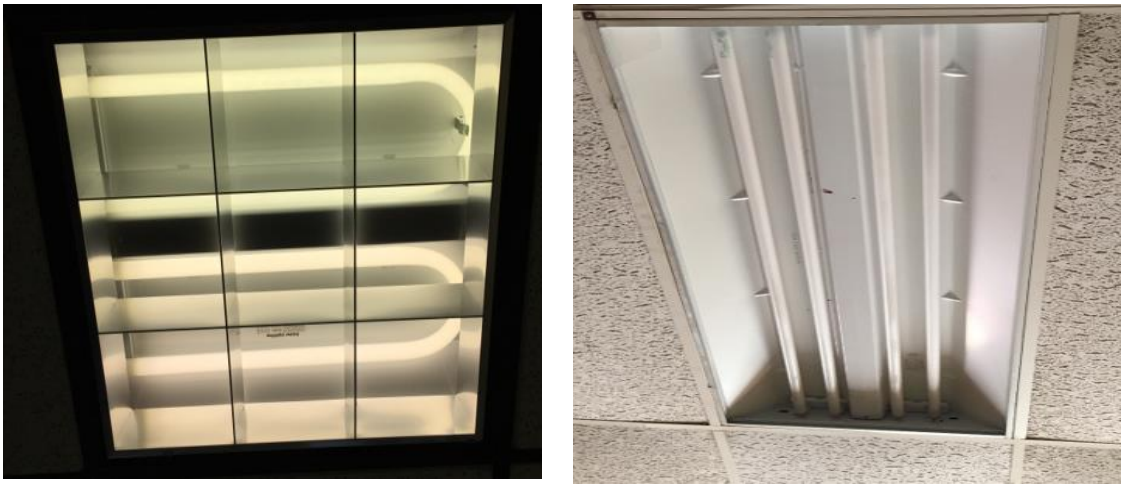


Image 7: Typical Interior Lighting System

Image 8: Exterior Wall Packs

Steam and Hot Water Heating Systems

The steam system consists of two oil-fired Cleaver Brook 3,866 kBtu/hr output, forced draft boilers. The boilers have a nominal combustion efficiency of 77%. Each boiler has a 7.5 hp forced draft fan with discharge dampers to control the volume of combustion air. Two 1 hp and two 0.75 hp pumps are used to pump oil from the oil tank to the oil burner. There are four 0.8 hp condensate return pumps.

Heating hot water is supplied to air handlers and classrooms unit ventilators through two heat exchangers, each with two 7.5 hp based-mounted constant flow hot water pumps. There is an opportunity for energy savings by installing variable frequency drives (VFDs) to control the hot water pump motors. The boilers operate in a lead/lag configuration.

The boilers are 60 years old and have passed their useful service life. They are well maintained, but there is an opportunity for energy savings by replacing with gas-fired condensing hot water boilers. The site contact noted that natural gas service is now few blocks away from the school. However, this measure exceeds standard cost effectiveness criteria.

The heating system is controlled through pneumatic control system using compressed air. Pneumatic thermostats are located in spaces for heating temperature control. One air compressor with 2 hp dual motors and one 5 hp backup air compressors provide compress air to the building.

Image 9: Cleaver Brook Steam Boilers

The classrooms are outfitted with a Nesbitt and Trane unit ventilators. Most of the units were installed in 1983 and appear to be in poor condition. There is an opportunity for energy savings by replacing the capacitor supply fan motors in unit ventilators with high efficiency electrically-commutated motors (ECMs) which have variable speed capabilities.

Image 10: Classroom Nestbitt Unit Ventilator

Ventilation Systems

Three build-up indoor air handlers (AHU1, 2 & 3) equipped with hot water coils for heating are used to condition the gymnasium and the auditorium. AHUs 1 & 3 serve the gymnasium. Each has a 5 hp constant speed supply fan. AHU 2 with a 7.5 hp constant speed supply fan serves the auditorium. There is an opportunity for energy savings by installing variable frequency drives (VFDs) to control the supply fan motors. The AHUs are located in the mechanical room.

The gymnasium and the auditorium each have two 1.5 hp roof-mounted exhaust fans that are manually controlled. The Cafeteria has three wall-mounted exhaust fans. Most of the roof-mounted exhaust fans - which were used to serve areas such as hallways and restrooms - are not operational.

Overall, the building fan and pump motors are generally in good condition and of standard to high efficiency.

Image 11: Air Handler Unit

Image 12: Gym & Auditorium Exhaust Fans

Image 13: Base-Mounted Hot Water Pumps & Backup Air Compressor

Direct Expansion Air Conditioning System (DX)

The building cooling load is minimal and consists primarily of window air conditioners. There are 22 window AC units that serve primarily the classrooms. They range from 0.4 ton to 2 ton and appear in good condition except the units serving the library (two units) and room 124 (one unit). The main office and sections of the library are served respectively by two 3.5-ton split system ACs while the server room is cooled by a 1.5 ton split system AC. The two York units serving the main office are 16 years old. They have passed their useful service life and appear in poor condition. The split system is controlled by programmable thermostats while the window ACs are manually controlled.

Image 14: Window AC Units


Image 15: Split System AC

Domestic Water Heating System

The building is supplied domestic hot water by a propane-fired tankless water heater. The heater is 47 years old and is of standard efficiency and in fair condition. It is located in the boiler room and has separate 400-gallon storage tank. There is an opportunity for energy savings by replacing the existing water heater with a high efficiency hot water heater.


Image 16: Domestic Water Heating System

Food Service & Refrigeration

The facility has a small institutional kitchen that is used to prepare lunch for the students. The ovens and range tops are propane-fired and the warmers are all electric. The ovens and warmers are turned on when the kitchen staff arrive and turned off around 1:30 PM when lunch service stops. Dishes are cleaned using the door type high temperature dishwasher located in the dishwasher room. The kitchen is well maintained.

The kitchen also includes one walk-in cooler, seven stand-up commercial size refrigerators, two refrigerator chests, and one ice making machine. The walk-in unit has no evaporator fan control and electric defrost control.

Image 17: Kitchen Equipment

Building Plug Load

There are roughly 245 computer work stations throughout the facility. There is no centralized PC power management software installed. Some of these computers were noted to be in idle mode or left on while not in use. This provides a potential for implementing computer power management software. The plug loads in the building also consist of copy machines, printers, microwaves, TV, small refrigerators, and coffee machines. The facility has one refrigerated vending machine located in the teacher room.

2.7 Water-Using Systems

There are several restrooms at this facility. A sampling of restrooms found that some faucets are rated for 2.5 gpm or higher, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush. The kitchen also has two faucets that are found to be rated for 2.5 gpm or higher. There are two locker rooms with showers that were not in use at the time of the audit. There is an opportunity for energy

savings by replacing these high flow aerators with low flow devices. This is a cost-effective approach to reducing energy used to provide domestic hot water throughout the building.

3 SITE ENERGY USE AND COSTS

Utility data for electricity, No. 2 fuel oil and propane was analyzed to identify opportunities for savings. In addition, data for Electricity, No. 2 Fuel Oil and Propane was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 0 for additional information.

3.1 Total Cost of Energy

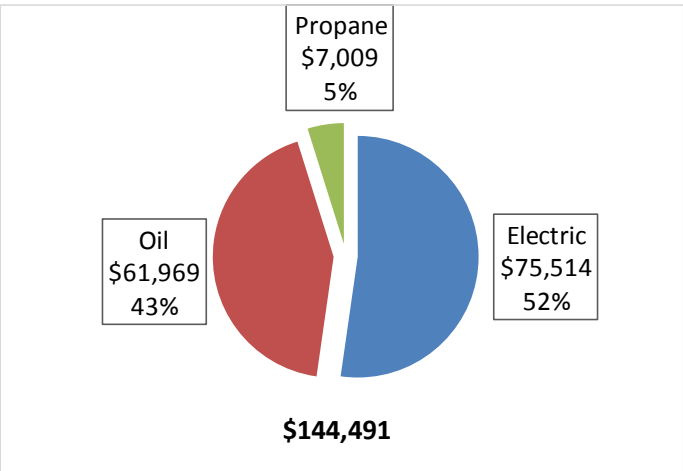
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Franklin Borough School		
Fuel	**Usage**	**Cost**
Electricity	627,112 kWh	$75,514
No. 2 Fuel Oil	35,440 Gallons	$61,969
Propane	5,895 Gallons	$7,009
Total		**$144,491**

The current annual energy cost for this facility is $144,491 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L and by on-site solar production. The average electric cost over the past 12 months was $0.120/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - 12 Months Electric Usage & Demand

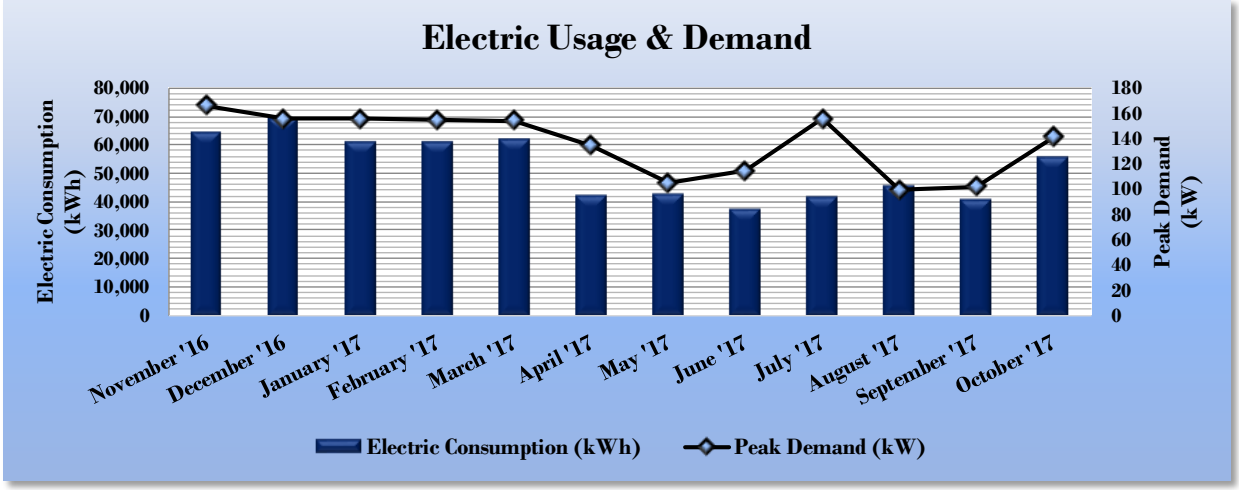


Figure 9 - 12 Months Electric Usage & Demand

Electric Billing Data for Franklin Borough School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
12/7/16	31	64,482	166	$875	$7,726
1/9/17	31	69,772	156	$858	$8,291
2/6/17	28	61,441	155	$963	$7,588
3/9/17	31	61,402	155	$957	$7,597
4/7/17	30	62,074	154	$953	$7,634
5/8/17	31	42,365	135	$826	$5,377
6/8/17	30	43,000	105	$672	$5,286
7/11/17	31	37,737	114	$740	$4,705
8/9/17	31	42,062	156	$502	$4,843
9/8/17	30	45,888	99	$632	$5,301
10/10/17	31	40,832	102	$607	$4,759
11/8/17	30	56,057	141	$867	$6,408
Totals	**365**	**627,112**	**165.9**	**$9,451**	**$75,514**
Annual	**365**	**627,112**	**165.9**	**$9,451**	**$75,514**

3.3 No. 2 Fuel Oil Usage

No. 2 fuel oil is provided by Allied Oil/Finch Fuel Oil. The average oil cost for the past 12 months is $1.749/Gallon, which is the blended rate used throughout the analyses in this report. The oil consumption is shown in the table below.

Figure 10 –12 Months No. 2 Fuel Oil Usage

No. 2 Fuel Oil Billing Data for Franklin Borough School			
Period Ending	**Days in Period**	**Oil Usage (Gallons)**	**Fuel Cost**
11/1/16	30	5,001	$8,201
12/1/16	31	5,033	$8,757
1/1/17	31	5,000	$8,585
2/1/17	28	10,000	$17,554
3/1/17	31	5,406	$8,834
4/1/17	30	0	$0
5/1/17	31	0	$0
6/1/17	30	0	$0
7/1/17	31	0	$0
8/1/17	31	0	$0
9/1/17	30	0	$0
10/1/17	31	5,000	$10,038
Totals	**365**	**35,440**	**$61,969**
Annual	**365**	**35,440**	**$61,969**

3.4 Propane Usage

Propane is provided by Amerigas Propane. The average propane cost for the past 12 months is $1.189/Gallon, which is the blended rate used throughout the analyses in this report. The Propane consumption is shown in the table below.

Figure 11 –12 Months Propane Usage

Propane Billing Data for Franklin Borough School			
Period Ending	**Days in Period**	**Propane Usage (Gallons)**	**Fuel Cost**
11/1/16	30	240	$254
12/1/16	31	1,018	$1,101
1/1/17	31	534	$676
2/1/17	28	452	$558
3/1/17	31	444	$482
4/1/17	30	546	$657
5/1/17	31	220	$244
6/1/17	30	818	$887
7/1/17	31	133	$151
8/1/17	31	259	$330
9/1/17	30	630	$802
10/1/17	31	601	$866
Totals	**365**	**5,895**	**$7,009**
Annual	**365**	**5,895**	**$7,009**

3.5 Benchmarking

This facility was benchmarked using *Portfolio Manager*, an online tool created and managed by the U.S. Environmental Protection Agency (EPA) through the ENERGY STAR™ program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR Score for select building types.

Energy Use Intensity is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. 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.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Franklin Borough School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	105.9	141.4
Site Energy Use Intensity (kBtu/ft^2)	65.7	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Franklin Borough School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	79.5	141.4
Site Energy Use Intensity (kBtu/ft^2)	57.0	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 62.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see

Appendix B: ENERGYSTAR® Statement of Energy Performance.

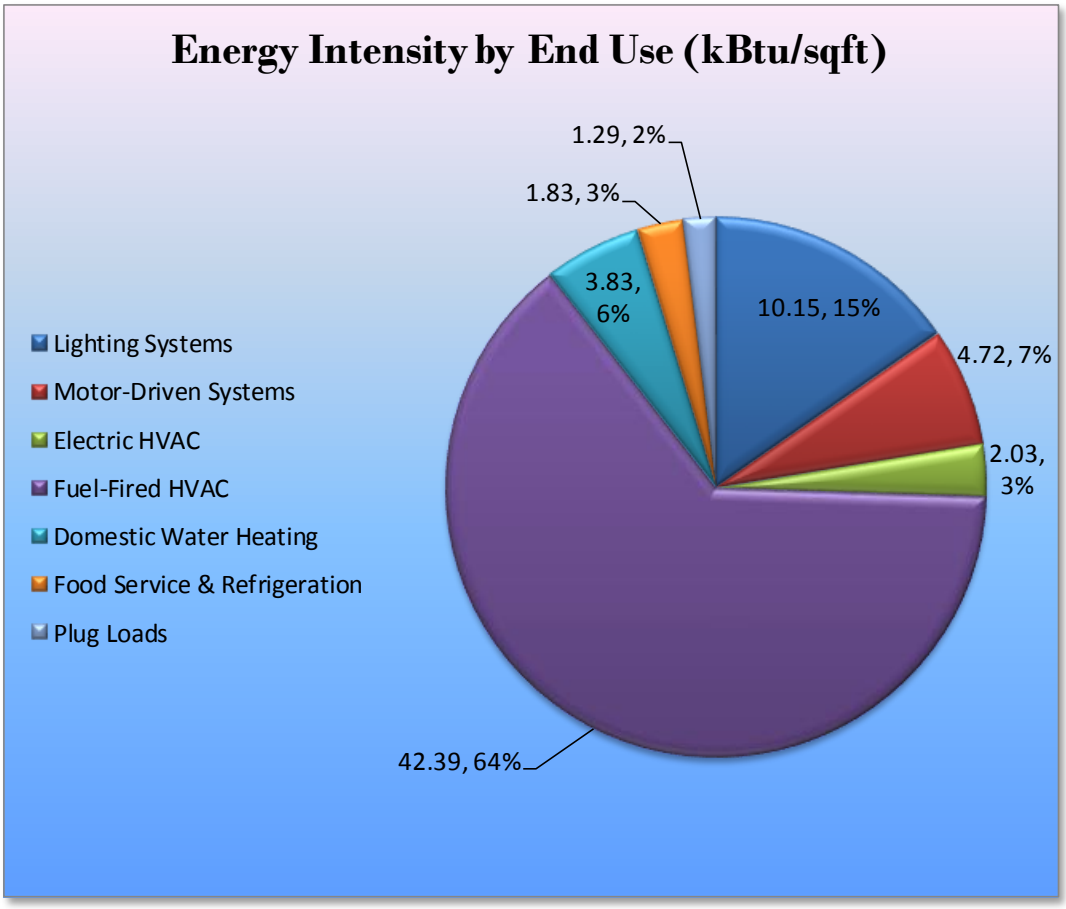
For more information on Energy Star certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. 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

3.6 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 14 - Energy Balance (% and kBtu/SF)



4 Energy Conservation Measures

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Franklin Borough School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended 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		**190,609**	**36.8**	**0.0**	**$22,952.20**	**$125,268.76**	**$18,170.00**	**$107,098.76**	**4.7**	**191,942**
ECM 1	Install LED Fixtures	45,594	9.2	0.0	$5,490.18	$38,089.17	$3,730.00	$34,359.17	6.3	45,913
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	493	0.1	0.0	$59.32	$392.00	$20.00	$372.00	6.3	496
ECM 3	Retrofit Fixtures with LED Lamps	143,524	27.4	0.0	$17,282.44	$84,744.04	$14,420.00	$70,324.04	4.1	144,528
ECM 4	Install LED Exit Signs	999	0.1	0.0	$120.25	$2,043.55	$0.00	$2,043.55	17.0	1,006
Lighting Control Measures		**37,502**	**7.4**	**0.0**	**$4,515.75**	**$32,602.00**	**$4,630.00**	**$27,972.00**	**6.2**	**37,764**
ECM 5	Install Occupancy Sensor Lighting Controls	32,365	6.7	0.0	$3,897.23	$30,726.00	$4,030.00	$26,696.00	6.8	32,591
ECM 6	Install High/Low Lighting Controls	5,137	0.7	0.0	$618.52	$1,876.00	$600.00	$1,276.00	2.1	5,172
Variable Frequency Drive (VFD) Measures		**19,116**	**4.8**	**0.0**	**$2,301.90**	**$24,585.70**	**$1,400.00**	**$23,185.70**	**10.1**	**19,250**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	7,990	1.9	0.0	$962.16	$10,158.50	$1,400.00	$8,758.50	9.1	8,046
ECM 8	Install VFDs on Hot Water Pumps	11,126	3.0	0.0	$1,339.74	$14,427.20	$0.00	$14,427.20	10.8	11,204
Electric Unitary HVAC Measures		**7,786**	**3.9**	**0.0**	**$937.60**	**$12,243.60**	**$552.00**	**$11,691.60**	**12.5**	**7,841**
ECM 9	Install High Efficiency Electric AC	7,786	3.9	0.0	$937.60	$12,243.60	$552.00	$11,691.60	12.5	7,841
Domestic Water Heating Upgrade		**0**	**0.0**	**49.3**	**$639.61**	**$4,819.92**	**$300.00**	**$4,519.92**	**7.1**	**6,980**
ECM 10	Install Tankless Water Heater	0	0.0	26.0	$337.47	$4,705.20	$300.00	$4,405.20	13.1	3,683
ECM 11	Install Low-Flow Domestic Hot Water Devices	0	0.0	23.3	$302.14	$114.72	$0.00	$114.72	0.4	3,297
Food Service Equipment & Refrigeration Measures		**1,618**	**0.0**	**0.0**	**$194.88**	**$2,192.60**	**$125.00**	**$2,067.60**	**10.6**	**1,630**
ECM 12	Refrigeration Controls	1,618	0.0	0.0	$194.88	$2,192.60	$125.00	$2,067.60	10.6	1,630
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$194.09**	**$230.00**	**$0.00**	**$230.00**	**1.2**	**1,623**
ECM 13	Vending Machine Control	1,612	0.0	0.0	$194.09	$230.00	$0.00	$230.00	1.2	1,623
Custom Measures		**21,770**	**0.0**	**0.0**	**$2,527.49**	**$6,175.00**	**$0.00**	**$6,175.00**	**2.4**	**21,922**
ECM 14	Computer Power management Software	21,770	0.0	0.0	$2,527.49	$6,175.00	$0.00	$6,175.00	2.4	21,922
TOTALS		**280,014**	**53.0**	**49.3**	**$34,263.52**	**$208,117.58**	**$25,177.00**	**$182,940.58**	**5.3**	**288,952**

* - All incentives presented in this table are based on NJ Smart Start Building 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).

Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each measure.

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade 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		**190,609**	**36.8**	**0.0**	**$22,952.20**	**$125,268.76**	**$18,170.00**	**$107,098.76**	**4.7**	**191,942**
ECM 1	Install LED Fixtures	45,594	9.2	0.0	$5,490.18	$38,089.17	$3,730.00	$34,359.17	6.3	45,913
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	493	0.1	0.0	$59.32	$392.00	$20.00	$372.00	6.3	496
ECM 3	Retrofit Fixtures with LED Lamps	143,524	27.4	0.0	$17,282.44	$84,744.04	$14,420.00	$70,324.04	4.1	144,528
ECM 4	Install LED Exit Signs	999	0.1	0.0	$120.25	$2,043.55	$0.00	$2,043.55	17.0	1,006

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	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)
Interior	15,722	5.3	0.0	$1,893.20	$21,823.08	$130.00	$21,693.08	11.5	15,832
Exterior	29,872	3.9	0.0	$3,596.98	$16,266.09	$3,600.00	$12,666.09	3.5	30,080

Measure Description

We recommend replacing existing fixtures containing linear fluorescent U-shape and HID lamps with new high performance LED light fixtures. Replace the metal halide (MH) and high pressure sodium (HPS) fixtures located along the building exterior and the metal halide fixtures serving the gymnasium, parking lot and playground. Consider specifying interior LED fixtures with on-board occupancy controls for additional savings. Replace the fluorescent U-shape fixtures with 2'x2' LED panel. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and HID lamps.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	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)
Interior	493	0.1	0.0	$59.32	$392.00	$20.00	$372.00	6.3	496
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing hallway display fixtures containing T12 fluorescent tubes by removing them alone with the ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes.

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	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)
Interior	143,524	27.4	0.0	$17,282.44	$84,744.04	$14,420.00	$70,324.04	4.1	144,528
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing fluorescent T8, and incandescent lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs 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.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 4: Install LED EXIT Signs

Summary of Measure Economics

Interior/ Exterior	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)
Interior	999	0.1	0.0	$120.25	$2,043.55	$0.00	$2,043.55	17.0	1,006
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend replacing all compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control 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 Control Measures		**37,502**	**7.4**	**0.0**	**$4,515.75**	**$32,602.00**	**$4,630.00**	**$27,972.00**	**6.2**	**37,764**
ECM 5	Install Occupancy Sensor Lighting Controls	32,365	6.7	0.0	$3,897.23	$30,726.00	$4,030.00	$26,696.00	6.8	32,591
ECM 6	Install High/Low Lighitng Controls	5,137	0.7	0.0	$618.52	$1,876.00	$600.00	$1,276.00	2.1	5,172

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 5: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

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)
32,365	6.7	0.0	$3,897.23	$30,726.00	$4,030.00	$26,696.00	6.8	32,591

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in restrooms, storage rooms, classrooms, offices, and other selected areas. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to

manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 6: Install High/Low Lighting Controls

Summary of Measure Economics

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)
5,137	0.7	0.0	$618.52	$1,876.00	$600.00	$1,276.00	2.1	5,172

Measure Description

We recommend installing 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. Typical areas for such lighting control are stairwells, interior corridors, parking lots, and parking garages.

Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. The lighting systems are switched to full lighting levels whenever an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period of time. Energy savings results from only providing full lighting levels when it is required.

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

Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 18 below.

Figure 18 – Summary of Variable Frequency Drive 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)
Variable Frequency Drive (VFD) Measures		**19,116**	**4.8**	**0.0**	**$2,301.90**	**$24,585.70**	**$1,400.00**	**$23,185.70**	**10.1**	**19,250**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	7,990	1.9	0.0	$962.16	$10,158.50	$1,400.00	$8,758.50	9.1	8,046
ECM 8	Install VFDs on Hot Water Pumps	11,126	3.0	0.0	$1,339.74	$14,427.20	$0.00	$14,427.20	10.8	11,204

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

Summary of Measure Economics

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)
7,990	1.9	0.0	$962.16	$10,158.50	$1,400.00	$8,758.50	9.1	8,046

Measure Description

We recommend installing variable frequency drives (VFDs) to control supply fan motor speeds to convert a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one. Zone thermostats will cause the VFD to modulate fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings results from reducing fan speed (and power) when there is a reduced load required for the zone. The magnitude of energy savings is based on the estimated amount of time that fan motors operate at partial load.

ECM 8: Install VFDs on Hot Water Pumps

Summary of Measure Economics

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)
11,126	3.0	0.0	$1,339.74	$14,427.20	$0.00	$14,427.20	10.8	11,204

We recommend installing a variable frequency drives (VFD) to control a hot water pumps. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.4 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 19 below.

Figure 19 - Summary of Unitary HVAC ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures			**7,786**	**3.9**	**0.0**	**$937.60**	**$12,243.60**	**$552.00**	**$11,691.60**	**12.5**	**7,841**
ECM 9	Install High Efficiency Electric AC	Yes	7,786	3.9	0.0	$937.60	$12,243.60	$552.00	$11,691.60	12.5	7,841

ECM 9: Install High Efficiency Air Conditioning Units

Summary of Measure Economics

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)
7,786	3.9	0.0	$937.60	$12,243.60	$552.00	$11,691.60	12.5	7,841

Measure Description

We recommend replacing the two 3 ton standard efficiency split system serving the main office and two window air conditioning units with high efficiency split system and window air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. 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.

4.1.5 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 20 below.

Figure 20 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Recommend?	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**	**49.3**	**$639.61**	**$4,819.92**	**$300.00**	**$4,519.92**	**7.1**	**6,980**
ECM 10	Install Tankless Water Heater	Yes	0	0.0	26.0	$337.47	$4,705.20	$300.00	$4,405.20	13.1	3,683
ECM 11	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	23.3	$302.14	$114.72	$0.00	$114.72	0.4	3,297

ECM 10: Install Tankless Hot Water Heater

Summary of Measure Economics

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)
0	0.0	26.0	$337.47	$4,705.20	$300.00	$4,405.20	13.1	3,683

Measure Description

We recommend replacing the existing tankless water heater with a high efficient tankless water heating system. Tankless water heaters (a.k.a. "on-demand water heaters") only heat water when hot water is needed. Water is heated as it flows through the pipe to the hot water tap. Energy savings from a tankless water heater is based from eliminating heat losses associated with maintaining unnecessary standby hot water capacity.

ECM 11: Install Low-Flow DHW Devices

Summary of Measure Economics

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)
0	0.0	23.3	$302.14	$114.72	$0.00	$114.72	0.4	3,297

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy. Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.6 Food Service Equipment & Refrigeration Measures

Food service and refrigeration measures recommendations are summarized in Figure 21 below.

Figure 21 - Summary of Food Service Equipment & Refrigeration ECMs

Energy Conservation Measure		Recommend?	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 Equipment & Refrigeration Measures			**1,618**	**0.0**	**0.0**	**$194.88**	**$2,192.60**	**$125.00**	**$2,067.60**	**10.6**	**1,630**
ECM 12	Refrigeration Controls	Yes	1,618	0.0	0.0	$194.88	$2,192.60	$125.00	$2,067.60	10.6	1,630

ECM 12: Walk-In Cooler or Freezer Controls

Summary of Measure Economics

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)
1,618	0.0	0.0	$194.88	$2,192.60	$125.00	$2,067.60	10.6	1,630

Measure Description

We recommend the installation of additional controls to optimize the operation of walk-in coolers.

Defrost controllers can be used to override defrost of evaporator fans when the defrost operation is not necessary, reducing annual energy consumption. This measure is applicable to existing evaporator fans with a traditional electric defrost mechanism.

The walk-in cooler has evaporator fans which run continuously. The measure adds a control system feature to automatically shut off evaporator fans when the cooler's thermostat is not calling for cooling.

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

4.1.7 Plug Load Equipment Control - Vending Machines

Figure 22 – Summary of Plug Load Equipment ECMs

Energy Conservation Measure		Recommend?	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)
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$194.09**	**$230.00**	**$0.00**	**$230.00**	**1.2**	**1,623**
ECM 13	Vending Machine Control	Yes	1,612	0.0	0.0	$194.09	$230.00	$0.00	$230.00	1.2	1,623

ECM 13: Vending Machine Control

Summary of Measure Economics

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)
1,612	0.0	0.0	$194.09	$230.00	$0.00	$230.00	1.2	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

4.1.8 Custom Measures

Additional custom measure energy saving opportunities are addressed in this section. Recommended custom measures are summarized in Figure 23 below.

Figure 23 - Summary of Custom ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures			**21,770**	**0.0**	**0.0**	**$2,527.49**	**$6,175.00**	**$0.00**	**$6,175.00**	**2.4**	**21,922**
ECM 14	Computer Power management Software	Yes	21,770	0.0	0.0	$2,527.49	$6,175.00	$0.00	$6,175.00	2.4	21,922

ECM 14: Computer Power Management Software

Summary of Measure Economics

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)
21,770	0.0	0.0	$2,527.49	$6,175.00	$0.00	$6,175.00	2.4	21,922

Measure Description

This measure refers to the mechanism for controlling the power use of desktop computer. This is typically through the use of software that puts the hardware into the lowest power demand state available. It is an aspect of Green computing. A typical office PC might use on the order of 120 watts when active (approximately 70 watts for the base unit, and 50 watts for a typical LCD screen); and three to four watts when 'asleep'. Up to 10% of a modern office's electricity demand might be due to PCs and monitors. While some PCs allow low power settings, there are many situations, especially in a networked environment, where processes running on the computer will prevent the low power settings from taking effect. This can have a dramatic effect on energy use that is invisible to the user. The monitor may have gone into standby mode, and the PC may appear to be idle, but operational testing has shown that on any given day an average of over 50% of an organization's computers would fail to go to sleep, and over time this happened to over 90% of the machines. This provides a potential for implementing computer power management software.

4.2 ECMs Evaluated but Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 24 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades	**9,484**	**2.1**	**0.0**	**$1,142.01**	**$39,969.40**	**$0.00**	**$39,969.40**	**35.0**	**9,550**
Premium Efficiency Motors	9,484	2.1	0.0	$1,142.01	$39,969.40	$0.00	$39,969.40	35.0	9,550
Gas Heating (HVAC/Process) Replacement	**0**	**0.0**	**193.4**	**$2,439.80**	**$143,709.43**	**$7,732.00**	**$135,977.43**	**55.7**	**31,640**
Install High Efficiency Steam Boilers	0	0.0	193.4	$2,439.80	$143,709.43	$7,732.00	$135,977.43	55.7	31,640
TOTALS	**9,484**	**2.1**	**193.4**	**$3,581.82**	**$183,678.83**	**$7,732.00**	**$175,946.83**	**49.1**	**41,190**

* - All incentives presented in this table are based on NJ Smart Start Building 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).

Premium Efficiency Motors

Summary of Measure Economics

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)
9,484	2.1	0.0	$1,142.01	$39,969.40	$0.00	$39,969.40	35.0	9,550

Measure Description

We evaluated replacing most of the unit ventilators. The primary savings from replacing unit ventilators will be from improved fan motor efficiency, however, those savings are unlikely to justify replacing the unit ventilators. The next potential savings would be from installing unit ventilators that provide for more optimal use of outside air than the existing unit ventilators.

The potential savings from installing new unit ventilators with electronically commutated (EC) motors was evaluated. EC motors are generally more efficient than other fractional hp motors and have the capability of operating at variable speeds, therefore, the savings from installing a premium efficiency motor is taken as a proxy for replacing the entire unit.

We also evaluated replacing standard efficiency motors of the two AHUs supply fan motors serving the gymnasium and one 7.5 hp hot water pump with *NEMA Premium™* efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

Reasons for not Recommending

The simple payback of this measure exceeds the expected useful life of the equipment and is therefore not recommended on the basis of energy savings alone. However, as the unit has passed its useful service

life service and appears to be in poor condition, also taking into consideration the operation and maintenance costs, it is likely in the best interest of the school to replace the motors.

In general, replacing the unit ventilators should be considered a capital improvement measure that has the potential to provide energy savings and improve occupant comfort.

Install High Efficiency Steam Boilers

Summary of Measure Economics

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)
0	0.0	193.4	$2,439.80	$143,709.43	$7,732.00	$135,977.43	55.7	31,640

Measure Description

We evaluated replacing older inefficient steam boilers with high efficiency steam boilers. Significant improvements have been made in combustion technology resulting in increases in overall boiler efficiency. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

Reasons for not Recommending

The simple payback of this measure exceeds the expected useful life of the equipment and is therefore not recommended on the basis of energy savings alone. However, as the unit has passed its useful service life and appears to be in fair condition, it is likely in the best interest of the town to replace the boiler.

Replacement of the boiler may also necessitate replacement of ancillary equipment, including pumping, piping, and controls. Such additional work may increase the overall cost significantly beyond the estimate provided. It is recommended to engage the services of a local heating system engineer to establish a basis of design for your optimal heating system.

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Use Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

Perform Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Water Heater Maintenance

At least once a year, 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. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any 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 any 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 over three to four years old have a technician inspect the sacrificial anode annually.

Perform Maintenance on Compressed Air Systems

Like all electro-mechanical equipment, compressed air systems require periodic maintenance to operate at peak efficiency. A maintenance plan should be developed for process related compressed air systems to include inspection, cleaning, and replacement of inlet filter cartridges, cleaning of drain traps, daily inspection of lubricant levels to reduce unwanted friction, inspection of belt condition and tension, checking for system leaks and adjustment of loose connections, and overall system cleaning. Contact a qualified technician for help with setting up periodic maintenance schedule.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some

control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. 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. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 0 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-Site Generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

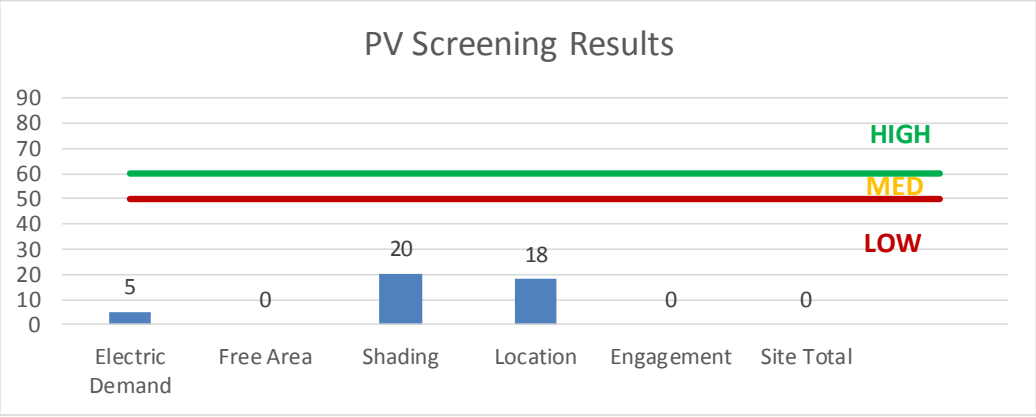
Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has no spaces for installing additional PV array.

Figure 25 - Photovoltaic Screening



For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar

- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://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) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

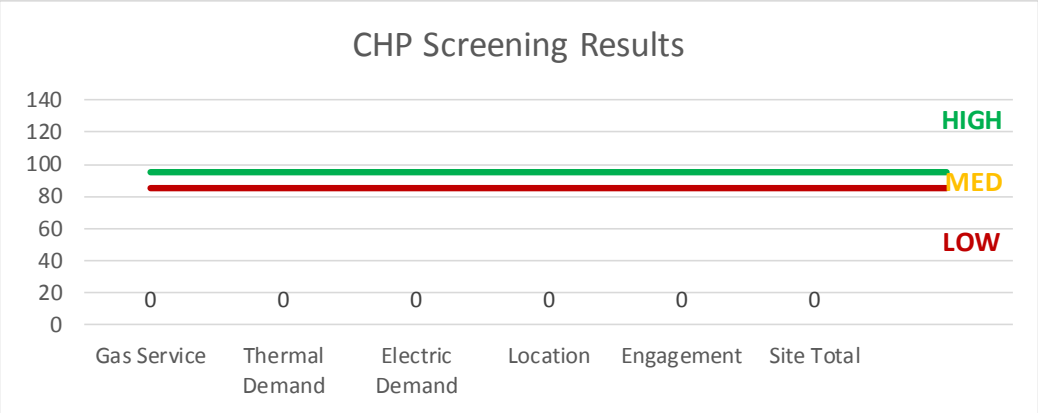
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use 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 a **Low** potential for installing a cost-effective CHP system.

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/

Figure 26 - Combined Heat and Power Screening



7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage 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 DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

This facility has no potential for DR curtailment. There is no load to be shed.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 27 for a list of the eligible programs identified for each recommended ECM.

Figure 27 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
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 LED Exit Signs			X			
ECM 5	Install Occupancy Sensor Lighting Controls	X		X			
ECM 6	Install High/Low Lighitng Controls			X			
ECM 7	Install VFDs on Constant Volume (CV) HVAC	X		X			
ECM 8	Install VFDs on Hot Water Pumps			X			
ECM 9	Install High Efficiency Electric AC	X		X			
ECM 10	Install Tankless Water Heater	X		X			
ECM 11	Install Low-Flow Domestic Hot Water Devices	X		X			
ECM 12	Refrigeration Controls	X		X			
ECM 13	Vending Machine Control						
ECM 14	Computer Power management Software						

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

SmartStart offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program 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

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the Retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, 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

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB

8.2 Direct Install

Overview

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 DI website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

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

8.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract", whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. 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 can be leveraged to help further reduce the total project cost of eligible measures.

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 utilized 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. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

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 is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. 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 is typically dependent upon whether a customer seeks 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 is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: 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	Watts per Fixture	Annual Operating Hours	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	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,910	0.17	1,161	0.0	$139.83	$526.50	$90.00	3.12
Boiler Room	2	Compact Fluorescent: CFL Screw in	Wall Switch	42	3,910	Relamp	No	2	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	15	3,910	0.04	243	0.0	$29.24	$107.51	$0.00	3.68
Boiler Room	1	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.00	60	0.0	$7.28	$107.56	$0.00	14.78
Break Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.05	265	0.0	$31.88	$233.00	$20.00	6.68
Maintenance Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.05	265	0.0	$31.88	$233.00	$20.00	6.68
Maintenance Shop	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.14	662	0.0	$79.69	$408.50	$70.00	4.25
Telecom Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.05	265	0.0	$31.88	$233.00	$20.00	6.68
Gym Mechanical Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,760	0.15	733	0.0	$88.29	$409.50	$70.00	3.85
Gym Mechanical Room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gymnasium	18	Metal Halide: (1) 400W Lamp	Wall Switch	458	1,840	Fixture Replacement	Yes	18	LED - Fixtures: Downlight Pendant	Occupancy Sensor	125	1,288	4.37	14,112	0.0	$1,699.25	$14,914.44	$720.00	8.35
Gymnasium	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gymnasium	2	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	121	0.0	$14.56	$215.11	$0.00	14.78
Gymnasium	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,910	0.06	445	0.0	$53.60	$175.50	$30.00	2.71
Gym Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.08	563	0.0	$67.73	$291.50	$50.00	3.57
Gym Office	1	Incandescent: Screw in	Wall Switch	75	2,760	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	11	2,760	0.04	203	0.0	$24.46	$97.85	$5.00	3.80
Boys Locker Room	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.30	2,063	0.0	$248.36	$913.50	$145.00	3.09
Boys Locker Room	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.11	529	0.0	$63.75	$350.00	$40.00	4.86
Gym Storage	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym Storage	1	Incandescent: Screw in	Wall Switch	75	2,760	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	11	2,760	0.04	203	0.0	$24.46	$97.85	$5.00	3.80
Girls Locker Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.33	2,250	0.0	$270.94	$972.00	$155.00	3.02
Girls Locker Room	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Lower Annex Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,737	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.17	831	0.0	$100.06	$468.00	$80.00	3.88
Lower Annex Hallway	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Auditorium Stage	27	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,737	Relamp	No	27	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,737	0.31	1,487	0.0	$179.08	$969.30	$135.00	4.66

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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
Auditorium Stage	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Auditorium Stage	8	Incandescent: Screw in	Occupancy Sensor	75	2,737	Relamp	No	8	LED Screw-In Lamps: LED Screw-In Lamps	Occupancy Sensor	11	2,737	0.34	1,612	0.0	$194.05	$782.82	$40.00	3.83
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,910	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,910	0.02	157	0.0	$18.95	$71.80	$10.00	3.26
Auditorium	30	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,760	Relamp	No	30	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,760	0.97	4,713	0.0	$567.56	$2,256.00	$450.00	3.18
Auditorium	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Auditorium	2	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	121	0.0	$14.56	$215.11	$0.00	14.78
Auditorium	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,760	0.02	105	0.0	$12.61	$58.50	$10.00	3.85
Auditorium Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,737	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.24	1,143	0.0	$137.58	$643.50	$110.00	3.88
Auditorium Hallway	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Women Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.05	375	0.0	$45.16	$233.00	$20.00	4.72
Handicap Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,910	0.02	148	0.0	$17.87	$58.50	$10.00	2.71
Custodial	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,760	0.02	105	0.0	$12.61	$58.50	$10.00	3.85
Men Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.08	563	0.0	$67.73	$445.50	$65.00	5.62
Hallway Display Lights	4	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	3,910	Relamp & Reballast	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,910	0.08	567	0.0	$68.22	$392.00	$20.00	5.45
Room 5	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 6	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 3	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 4	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Annex Hallway	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.33	2,250	0.0	$270.94	$972.00	$155.00	3.02
Annex Hallway	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Men Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.05	375	0.0	$45.16	$233.00	$20.00	4.72
Women Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.05	375	0.0	$45.16	$233.00	$20.00	4.72
Room 1	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.52	2,515	0.0	$302.81	$1,381.50	$225.00	3.82
Room 2	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.52	2,515	0.0	$302.81	$1,381.50	$225.00	3.82
Custodial	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,760	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,760	0.01	56	0.0	$6.69	$35.90	$5.00	4.62

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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
Library Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.16	794	0.0	$95.63	$467.00	$80.00	4.05
Main Hallway	31	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,737	Relamp	No	31	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.67	3,220	0.0	$387.73	$1,813.50	$310.00	3.88
Storage Room	1	Incandescent: Screw in	Wall Switch	75	2,760	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	11	2,760	0.04	203	0.0	$24.46	$97.85	$5.00	3.80
Library	48	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	48	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,737	1.31	9,000	0.0	$1,083.76	$3,408.00	$2,160.00	1.15
Library	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 102	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.55	2,647	0.0	$318.75	$1,710.00	$270.00	4.52
Room 103	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.57	2,779	0.0	$334.69	$1,768.50	$280.00	4.45
Room 104	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Superintendent Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.16	794	0.0	$95.63	$621.00	$95.00	5.50
Superintendent Office	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,760	Fixture Replacement	Yes	6	LED - Fixtures: LED Panel 2'x2'	Occupancy Sensor	40	1,932	0.13	647	0.0	$77.97	$1,470.00	$35.00	18.40
Conference Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.08	397	0.0	$47.81	$291.50	$50.00	5.05
VP Office	7	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,760	Fixture Replacement	Yes	7	LED - Fixtures: LED Panel 2'x2'	Occupancy Sensor	40	1,932	0.16	755	0.0	$90.96	$1,516.00	$20.00	16.45
Main Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,760	0.11	524	0.0	$63.06	$292.50	$50.00	3.85
Main Entrance	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.16	794	0.0	$95.63	$621.00	$95.00	5.50
Main Entrance	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Teacher Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.19	926	0.0	$111.56	$525.50	$90.00	3.90
Nurse Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.16	794	0.0	$95.63	$467.00	$80.00	4.05
Room 110	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.63	3,044	0.0	$366.56	$1,885.50	$300.00	4.33
Room 111	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.63	3,044	0.0	$366.56	$1,885.50	$300.00	4.33
Room 112	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 113	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.57	2,779	0.0	$334.69	$1,498.50	$245.00	3.75
Room 114	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 115	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.25	1,191	0.0	$143.44	$642.50	$110.00	3.71
Room 116	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.25	1,191	0.0	$143.44	$642.50	$110.00	3.71
Room 122	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.05	265	0.0	$31.88	$233.00	$20.00	6.68

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boys Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.05	375	0.0	$45.16	$233.00	$20.00	4.72
Room 117	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.57	2,779	0.0	$334.69	$1,768.50	$280.00	4.45
Room 118	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.57	2,779	0.0	$334.69	$1,768.50	$280.00	4.45
Room 119	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.57	2,779	0.0	$334.69	$1,768.50	$280.00	4.45
Room 120	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 121	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Cafeteria	36	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.98	6,750	0.0	$812.82	$2,646.00	$430.00	2.73
Kitchen	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.25	1,688	0.0	$203.20	$796.50	$125.00	3.30
Kitchen	10	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,910	Relamp	Yes	10	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,737	0.14	982	0.0	$118.31	$629.00	$85.00	4.60
Kitchen	1	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.00	60	0.0	$7.28	$107.56	$0.00	14.78
Kitchen	3	Incandescent: Screw in	Wall Switch	75	3,910	Relamp	No	3	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	11	3,910	0.13	863	0.0	$103.96	$293.56	$15.00	2.68
Room 09	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 09	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,760	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,760	0.01	56	0.0	$6.69	$35.90	$5.00	4.62
Room 09	1	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.00	60	0.0	$7.28	$107.56	$0.00	14.78
Basement Hallway	27	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	27	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,737	0.74	5,063	0.0	$609.61	$1,811.50	$270.00	2.53
Basement Hallway	6	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	6	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	363	0.0	$43.67	$645.33	$0.00	14.78
Room 46	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,760	0.02	105	0.0	$12.61	$58.50	$10.00	3.85
Room 11	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.27	1,324	0.0	$159.38	$855.00	$135.00	4.52
Room 12	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.14	662	0.0	$79.69	$408.50	$70.00	4.25
Room 14	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.27	1,324	0.0	$159.38	$855.00	$135.00	4.52
School Store	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,760	0.02	105	0.0	$12.61	$58.50	$10.00	3.85
School Store	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,760	Fixture Replacement	No	1	LED - Fixtures: LED Panel 2'x2'	Wall Switch	40	2,760	0.01	70	0.0	$8.41	$200.00	$0.00	23.79
Room 45	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,760	0.02	105	0.0	$12.61	$58.50	$10.00	3.85
Room 16	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,760	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,932	0.38	1,864	0.0	$224.43	$877.07	$180.00	3.11
Room 17	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.38	1,853	0.0	$223.13	$1,089.00	$175.00	4.10

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Storage Room	1	Incandescent: Screw in	Wall Switch	75	2,760	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	11	2,760	0.04	203	0.0	$24.46	$97.85	$5.00	3.80
Mechanical Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.05	265	0.0	$31.88	$233.00	$20.00	6.68
Boys Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.05	375	0.0	$45.16	$233.00	$20.00	4.72
Storage Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.16	794	0.0	$95.63	$467.00	$60.00	4.26
Zoo Room	40	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	50	2,760	None	Yes	40	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	50	1,932	0.39	1,904	0.0	$229.32	$540.00	$70.00	2.05
Zoo Room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Women Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.05	265	0.0	$31.88	$233.00	$20.00	6.68
Room 35	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.05	265	0.0	$31.88	$233.00	$20.00	6.68
Custodial	1	Compact Fluorescent: CFL Screw in	Wall Switch	42	2,760	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	15	2,760	0.02	86	0.0	$10.32	$53.75	$0.00	5.21
Room 24	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.71	3,441	0.0	$414.38	$2,061.00	$330.00	4.18
Room 34	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,760	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,932	0.48	2,330	0.0	$280.53	$1,221.33	$235.00	3.52
Server Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.05	265	0.0	$31.88	$233.00	$20.00	6.68
Room 33	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.66	3,177	0.0	$382.50	$1,944.00	$310.00	4.27
Room 33	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,760	Fixture Replacement	No	1	LED - Fixtures: LED Panel 2'x2'	Wall Switch	40	2,760	0.01	70	0.0	$8.41	$200.00	$0.00	23.79
Pre-School Room	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.55	2,647	0.0	$318.75	$1,710.00	$270.00	4.52
Room 26	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.11	529	0.0	$63.75	$350.00	$60.00	4.55
Machine Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.08	397	0.0	$47.81	$291.50	$50.00	5.05
Elevator Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.05	265	0.0	$31.88	$233.00	$20.00	6.68
Elevator Room	1	Compact Fluorescent: CFL Screw in	Wall Switch	42	2,760	Relamp	No	1	LED Screw-In Lamps: LED Screw-In Lamps	Wall Switch	15	2,760	0.02	86	0.0	$10.32	$53.75	$0.00	5.21
Old Gym	8	Metal Halide: (1) 400W Lamp	Wall Switch	458	1,040	Fixture Replacement	Yes	8	LED - Fixtures: Downlight Pendant	Occupancy Sensor	125	728	1.94	3,545	0.0	$426.86	$6,628.64	$320.00	14.78
Old Gym	2	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	121	0.0	$14.56	$215.11	$0.00	14.78
Back Entrance	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,910	0.09	594	0.0	$71.47	$234.00	$40.00	2.71
Back Entrance	2	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	121	0.0	$14.56	$215.11	$0.00	14.78
OPTA Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,760	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,932	0.25	1,191	0.0	$143.44	$567.20	$110.00	3.19
East Stairwell	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,737	0.19	1,313	0.0	$158.05	$641.50	$70.00	3.62

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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
East Stairwell	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,910	Fixture Replacement	No	4	LED - Fixtures: LED Panel 2'x2'	Wall Switch	40	3,910	0.06	396	0.0	$47.65	$800.00	$0.00	16.79
East Stairwell	2	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	121	0.0	$14.56	$215.11	$0.00	14.78
Rocket Room	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.25	1,688	0.0	$203.20	$796.50	$125.00	3.30
South-East Stairwell	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,737	0.22	1,500	0.0	$180.63	$584.00	$80.00	2.79
South-East Stairwell	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
South-West Stairwell	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,737	0.27	1,875	0.0	$225.78	$701.00	$100.00	2.66
South-West Stairwell	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
West Stiarwell	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,737	0.27	1,875	0.0	$225.78	$701.00	$100.00	2.66
West Stiarwell	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
North Stairwell	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,737	0.30	2,063	0.0	$248.36	$759.50	$110.00	2.62
North Stairwell	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Floor Hallway	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	30	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,737	0.82	5,625	0.0	$677.35	$2,103.00	$300.00	2.66
3rd Floor 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	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 202	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 202	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,760	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,760	0.04	178	0.0	$21.40	$95.13	$20.00	3.51
Room 203	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.57	2,779	0.0	$334.69	$1,768.50	$280.00	4.45
Room 205	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.57	2,779	0.0	$334.69	$1,768.50	$280.00	4.45
Room 204	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 207	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.66	3,177	0.0	$382.50	$1,944.00	$310.00	4.27
Room 206	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.66	3,177	0.0	$382.50	$1,944.00	$310.00	4.27
Room 208A	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,760	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,932	0.14	699	0.0	$84.16	$401.40	$80.00	3.82
Room 207A	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.16	794	0.0	$95.63	$467.00	$80.00	4.05
Room 209	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.22	1,059	0.0	$127.50	$584.00	$100.00	3.80
Room 208	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 208B	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,760	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,932	0.14	699	0.0	$84.16	$401.40	$80.00	3.82

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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
Room 210	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.66	3,177	0.0	$382.50	$1,944.00	$310.00	4.27
Room 211	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.41	1,985	0.0	$239.06	$1,147.50	$185.00	4.03
Custodial	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.05	265	0.0	$31.88	$233.00	$20.00	6.68
Room 213	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 212	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 214	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Child Study Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.22	1,059	0.0	$127.50	$584.00	$115.00	3.68
Room 216	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,760	Fixture Replacement	Yes	11	LED - Fixtures: LED Panel 2'x2'	Occupancy Sensor	40	1,932	0.25	1,187	0.0	$142.94	$2,470.00	$35.00	17.03
Room 217	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	30	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.82	3,971	0.0	$478.13	$2,565.00	$405.00	4.52
Boys Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.08	563	0.0	$67.73	$291.50	$50.00	3.57
Girls Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,910	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,737	0.08	563	0.0	$67.73	$291.50	$50.00	3.57
Room 221	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 218	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,760	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,932	0.29	1,398	0.0	$168.32	$686.80	$140.00	3.25
Room 219	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Room 220	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,760	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,932	0.49	2,382	0.0	$286.88	$1,323.00	$215.00	3.86
Exterior Perimeter Wall Pack	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	18	4,380	None	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	18	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior Perimeter Wall Pack	4	High-Pressure Sodium: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	100	4,380	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	25	4,380	0.20	1,511	0.0	$181.96	$1,562.71	$400.00	6.39
Exterior Perimeter Wall Pack	5	Metal Halide: (1) 400W Lamp	Daylight Dimming	458	4,380	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	125	4,380	1.09	8,387	0.0	$1,009.87	$1,953.39	$500.00	1.44
Exterior Perimeter Wall Pack	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	55	4,380	None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	55	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Front Entrance	6	LED - Fixtures: Downlight Solid State Retrofit	Daylight Dimming	11	4,380	None	No	6	LED - Fixtures: Downlight Solid State Retrofit	Daylight Dimming	11	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Parking Lot	22	Metal Halide: (1) 150W Lamp	Daylight Dimming	190	4,380	Fixture Replacement	No	22	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	45	4,380	2.09	16,068	0.0	$1,934.83	$11,000.00	$2,200.00	4.55
Maintenance Shop	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,070	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,449	0.16	596	0.0	$71.72	$467.00	$80.00	5.40
Garage	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,070	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,449	0.30	1,092	0.0	$131.49	$759.50	$130.00	4.79
Playground	5	Metal Halide: (1) 400W Lamp	Daylight Dimming	458	4,380	Fixture Replacement	No	5	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	125	4,380	1.09	8,387	0.0	$1,009.87	$1,750.00	$500.00	1.24

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?	Annual Operating Hours	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	Condensate System	2	Process Pump	0.3	78.0%	No	1,300	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Combustion System	2	Process Pump	7.5	84.0%	No	650	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Oil Pump	2	Process Pump	1.0	74.0%	No	1,300	Yes	85.5%	No		0.12	212	0.0	$25.47	$948.12	$0.00	37.22
Boiler Room	Compressed Air	2	Air Compressor	2.0	78.5%	No	780	No	78.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Compressed Air	1	Air Compressor	5.0	89.5%	No	520	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Hot Water Heating System	1	Heating Hot Water Pump	7.5	91.0%	No	1,300	No	91.0%	Yes	1	0.74	2,782	0.0	$334.94	$3,606.80	$0.00	10.77
Boiler Room	Hot Water Heating System	1	Heating Hot Water Pump	7.5	84.0%	No	1,300	Yes	91.0%	Yes	1	0.95	3,141	0.0	$378.25	$4,738.24	$0.00	12.53
Boiler Room	Oil Pump	2	Process Pump	0.8	78.0%	No	1,300	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Booster Pump	1	Process Pump	3.0	84.0%	No	1,300	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Sump Pump	1	Process Pump	1.0	82.0%	No	1,380	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Maintenance Shop	Hot Water Heating System	2	Heating Hot Water Pump	7.5	91.0%	No	1,300	No	91.0%	Yes	2	1.48	5,563	0.0	$669.87	$7,213.60	$0.00	10.77
Maintenance Shop	Condensate System	2	Process Pump	0.3	78.0%	No	1,300	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cafeteria	Cafeteria	1	Exhaust Fan	0.5	78.0%	No	2,300	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cafeteria	Cafeteria	1	Exhaust Fan	0.5	78.0%	No	2,300	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cafeteria	Cafeteria	1	Exhaust Fan	0.5	78.0%	No	2,300	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Gymnasium (AHU1, AHU1)	2	Supply Fan	5.0	84.0%	No	4,140	Yes	89.5%	Yes	2	1.30	6,189	0.0	$745.27	$8,152.44	$800.00	9.87
Mechanical Room	Auditorium (AHU2)	1	Supply Fan	7.5	92.0%	No	3,450	No	92.0%	Yes	1	0.79	3,021	0.0	$363.81	$3,606.80	$600.00	8.26
School Classrooms	School Classrooms	82	Supply Fan	0.3	60.0%	No	3,680	Yes	69.5%	No		1.55	7,693	0.0	$926.32	$36,289.10	$0.00	39.18
Roof	Auditorium	2	Exhaust Fan	1.5	82.5%	No	2,300	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gymnasium	2	Exhaust Fan	1.5	82.0%	No	2,300	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		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?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Hallway	1	Exhaust Fan	0.3	78.0%	No	2,300	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Zoom Room	Zoom Room	1	Supply Fan	1.5	82.0%	No	2,300	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Elevator Room	Elevator Room	1	Process Pump	15.0	70.0%	No	2,300	No	70.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Old Gymnasium	Old Gymnasium	1	Supply Fan	3.0	86.0%	No	920	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gymnasium	Stage Displacement & Basketball Court	4	Process Pump	0.8	78.0%	No	2,300	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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 (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Break Room	Break Room	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Library	Library	2	Window AC	2.00		Yes	1	Window AC	2.00		12.00		No	2.19	2,129	0.0	$256.31	$2,177.52	$0.00	8.50
Room 104	Room 104	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 108	Room 108	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 112	Room 112	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 122	Room 122	1	Window AC	0.43		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 118	Room 118	1	Window AC	0.43		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 119	Room 119	1	Window AC	0.43		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 09	Room 09	1	Window AC	0.43		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 124	Room 124	1	Window AC	0.43		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 124	Room 124	1	Window AC	1.00		Yes	1	Window AC	1.00		12.00		No	0.21	414	0.0	$49.89	$1,088.76	$0.00	21.82
Server Room	Server Room	1	Split-System AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 23	Room 23	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pre-K Room	Pre-K Room	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 207	Room 207	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 208A	Room 208A	1	Window AC	0.43		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 208B	Room 208B	1	Window AC	0.43		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 214	Room 214	1	Window AC	0.43		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Child Study Offices	Child Study Offices	4	Window AC	0.43		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ground Floor	Library	2	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	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
Ground Floor	Main Offices	2	Split-System AC	3.00		Yes	2	Split-System AC	3.00		14.00		No	1.53	5,244	0.0	$631.41	$8,977.32	$552.00	13.34

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)	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	School Building	2	Forced Draft Steam Boiler	3,866.00	Yes	2	Forced Draft Steam Boiler	3,866.00	81.00%	Et	0.00	0	193.4	$2,439.80	$143,709.43	$7,732.00	55.73

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	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	School Building	1	Tankless Water Heater	Yes	1	Tankless Water Heater	Propane	85.00%	EF	0.00	0	26.0	$337.47	$4,705.20	$300.00	13.05

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	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
School	14	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	22.6	$293.75	$100.38	$0.00	0.34
Kitchen	2	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	0.6	$8.39	$14.34	$0.00	1.71

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Cooler (35F to 55F)	No	Yes	Yes	0.02	1,618	0.0	$194.88	$2,192.60	$125.00	10.61

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	3	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	4	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Ice Making Head (<450 lbs/day), Batch	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	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	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Convection Oven (Half Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Gas Rack Oven (Single)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Insulated Food Holding Cabinet (1/2 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Insulated Food Holding Cabinet (1/2 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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?	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	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
School	245	Desktop With LCD Monitors	120.0	Yes
Boiler Room	1	Washing Machine	1,200.0	No
Boiler Room	1	Dryer Machine	1,300.0	No
School	5	Microwave	800.0	No
School	2	Toaster	700.0	No
School	6	Refrigeratrs	125.0	Yes
School	6	Copy Machines	600.0	Yes
School	43	Printer	45.0	Yes
School	16	Falt Screen TVs	122.0	Yes
School	5	Coffee Machine	650.0	No
School	8	Ventilation fans	45.0	No
Kitchen	1	Commercial Coffee Machine	1,570.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Teacher Room	1	Refrigerated	Yes	0.00	1,612	0.0	$194.09	$230.00	$0.00	1.19

Appendix B: ENERGYSTAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Franklin Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 115,483
Built: 1915

For Year Ending: October 31, 2017
Date Generated: June 06, 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
Franklin Elementary School 50 Washington Avenue Franklin, Nevada 07416	Franklin Borough Board of Education 50 Washington Avenue Franklin, NV 07416 973-827-9775	William Sabo 50 Washington Avenue Franklin, NV 07416 973-827-9775 bsabo@fboe.org

Property ID: 6372489

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
65.3 kBtu/ft²

Source EUI
93.7 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	1,510,147 (20%)
Electric - Solar (kBtu)	593,283 (8%)
Fuel Oil (No. 2) (kBtu)	4,890,720 (65%)
Propane (kBtu)	542,331 (7%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	72.6
National Median Source EUI (kBtu/ft²)	104.2
% Diff from National Median Source EUI	-10%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	565

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)