Local Government Energy Audit:
Energy Audit Report

West Milford High School

67 Highlander Drive

West Milford, New Jersey 07480

West Milford Township Public Schools

September 10, 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 (TRC) 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 West Milford High 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 public 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 West Milford High School is a 220,000 square foot facility comprised of two floors of classroom space, a gymnasium, locker rooms, kitchen, cafeteria, library, shops, auditorium and office areas. The school was originally built in 1976 and is generally in fair condition. The building is in operation year round. The building is 100% heated and roughly 45% cooled, these areas being the center of the building. The center section of the building has high weekend use which includes the auditorium, cafeteria, gymnasium, locker rooms, shops and some classrooms. The High School has about 174 full time staff members and 1200 students. The building is occupied Monday through Friday starting at 6:00 AM with students getting out at 2:10 PM. Staff stays later and there is a second shift of custodians that occupy the building until 11:00 PM every day. Weekend use is generally between 7:00 AM until 11:00 PM.

There were lighting upgrades completed about three years ago that included retrofit work and some de-lamping of fixtures with a reduced number of T8 lamps and reflectors. The cooling tower is in poor condition; fan motor replacement was underway at the time of the field audit. The replacement motor was observed to be high efficiency. There is an existing Johnson Controls energy management system that includes controls for the boilers and hot water distribution system, the chiller and chilled water system, and the science room unit ventilators and exhaust hoods. The remainder of the building (two floors of classrooms) are conditioned by unit ventilators that have dampers and hot water valves controlled by the original pneumatic control system, served by an air compressor. 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 19 measures which together represent an opportunity for West Milford High School to reduce annual energy costs by roughly $89,229 and annual greenhouse gas emissions by 659,483 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 6.8 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2a, respectively. Together these measures represent an opportunity to reduce West Milford High School's annual energy use by 19%.

TRC recommends 15 measures as high priority which together represent an opportunity for West Milford High School to reduce annual energy costs by roughly $74,197 and annual greenhouse gas emissions by 535,079 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 4.2 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2b, respectively. Together these measures represent an opportunity to reduce West Milford High School's annual energy use by 15%.

Figure 1 – Previous 12 Month Utility Costs

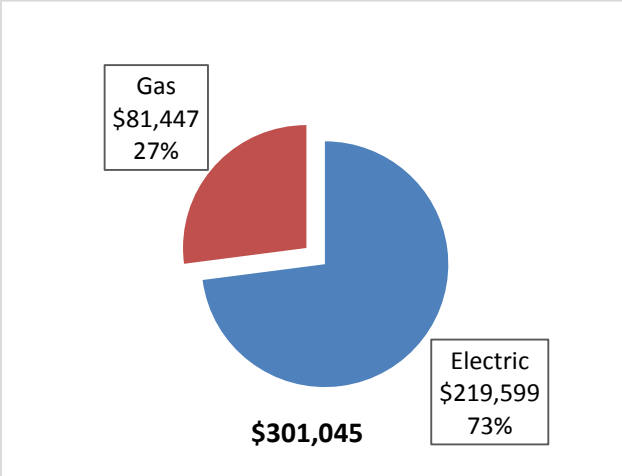


Figure 2a – Potential Post-Implementation Costs (All Evaluated Measures)

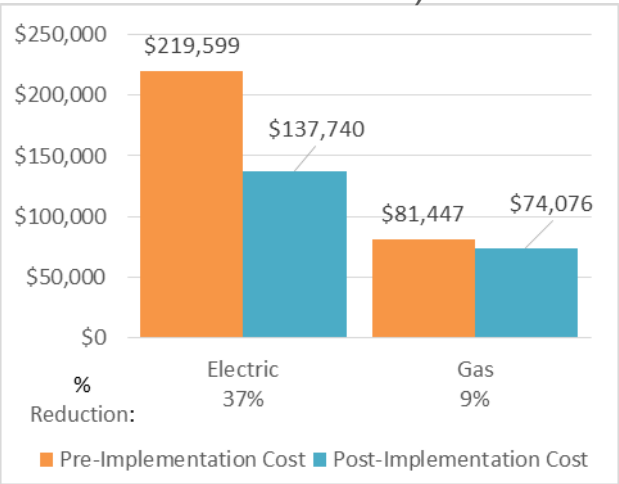
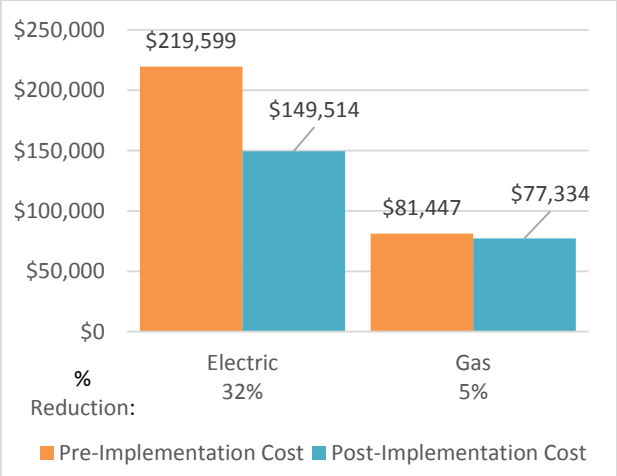


Figure 3b – Potential Post-Implementation Costs (High Priority Measures)



A detailed description of West Milford High School's existing energy use can be found in Section 3.

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

Figure 4 – 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			**302,327**	**45.9**	**0.0**	**$44,463.90**	**$223,342.60**	**$30,475.00**	**$192,867.60**	**4.3**	**304,441**
ECM 1	Install LED Fixtures	Yes	44,717	2.3	0.0	$6,576.64	$80,131.04	$6,150.00	$73,981.04	11.2	45,030
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	328	0.0	0.0	$48.27	$202.00	$0.00	$202.00	4.2	331
ECM 3	Retrofit Fixtures with LED Lamps	Yes	257,282	43.6	0.0	$37,838.99	$143,009.57	$24,325.00	$118,684.57	3.1	259,081
Lighting Control Measures			**33,021**	**4.9**	**0.0**	**$4,856.42**	**$27,124.00**	**$2,220.00**	**$24,904.00**	**5.1**	**33,252**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	23,123	3.5	0.0	$3,400.79	$17,324.00	$2,220.00	$15,104.00	4.4	23,285
ECM 5	Install High/Low Lighitng Controls	Yes	9,897	1.5	0.0	$1,455.63	$9,800.00	$0.00	$9,800.00	6.7	9,967
Motor Upgrades			**5,950**	**1.7**	**0.0**	**$875.03**	**$6,794.72**	**$0.00**	**$6,794.72**	**7.8**	**5,991**
ECM 6	Premium Efficiency Motors	Yes	5,950	1.7	0.0	$875.03	$6,794.72	$0.00	$6,794.72	7.8	5,991
Variable Frequency Drive (VFD) Measures			**95,251**	**24.5**	**0.0**	**$14,008.72**	**$66,179.15**	**$7,400.00**	**$58,779.15**	**4.2**	**95,917**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	32,604	11.2	0.0	$4,795.16	$26,206.80	$3,200.00	$23,006.80	4.8	32,832
ECM 8	Install VFDs on Chilled Water Pumps	Yes	28,051	7.2	0.0	$4,125.47	$16,944.10	$3,600.00	$13,344.10	3.2	28,247
ECM 9	Install VFDs on Hot Water Pumps	Yes	28,641	6.1	0.0	$4,212.33	$19,220.30	$0.00	$19,220.30	4.6	28,841
ECM 10	Install VFDs on Cooling Tower Fans	Yes	5,955	0.0	0.0	$875.76	$3,807.95	$600.00	$3,207.95	3.7	5,996
Electric Unitary HVAC Measures			**1,365**	**0.7**	**0.0**	**$200.79**	**$2,992.44**	**$184.00**	**$2,808.44**	**14.0**	**1,375**
	Install High Efficiency Electric AC	No	1,365	0.7	0.0	$200.79	$2,992.44	$184.00	$2,808.44	14.0	1,375
HVAC System Improvements			**0**	**0.0**	**1.8**	**$15.89**	**$34.80**	**$0.00**	**$34.80**	**2.2**	**213**
ECM 11	Install Pipe Insulation	Yes	0	0.0	1.8	$15.89	$34.80	$0.00	$34.80	2.2	213
Domestic Water Heating Upgrade			**0**	**0.0**	**19.1**	**$166.85**	**$243.78**	**$0.00**	**$243.78**	**1.5**	**2,240**
ECM 12	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	19.1	$166.85	$243.78	$0.00	$243.78	1.5	2,240
Food Service Equipment & Refrigeration Measures			**53,648**	**13.9**	**0.0**	**$7,890.11**	**$83,588.63**	**$6,125.00**	**$77,463.63**	**9.8**	**54,023**
	Food Service Equipment Replacement	No	52,286	13.7	0.0	$7,689.77	$80,256.23	$6,050.00	$74,206.23	9.6	52,651
	Replace Refrigeration Equipment	No	1,362	0.2	0.0	$200.34	$3,332.40	$75.00	$3,257.40	16.3	1,372
Plug Load Equipment Control - Vending Machine			**9,671**	**0.0**	**0.0**	**$1,422.34**	**$1,840.00**	**$0.00**	**$1,840.00**	**1.3**	**9,739**
ECM 13	Vending Machine Control	Yes	9,671	0.0	0.0	$1,422.34	$1,840.00	$0.00	$1,840.00	1.3	9,739
Custom Measures			**55,356**	**0.0**	**824.2**	**$15,328.98**	**$243,866.00**	**$0.00**	**$243,866.00**	**15.9**	**152,248**
ECM 14	Computer Power Management Software	Yes	30,283	0.0	0.0	$4,453.73	$8,950.00	$0.00	$8,950.00	2.0	30,494
ECM 15	Building Envelope Weatherization	Yes	30	0.0	450.6	$3,934.08	$14,916.00	$0.00	$14,916.00	3.8	52,792
	Expand the Energy Management System	No	25,044	0.0	373.6	$6,941.18	$220,000.00	$0.00	$220,000.00	31.7	68,961
TOTALS FOR HIGH PRIORITY MEASURES			**476,531**	**76.9**	**471.6**	**$74,196.96**	**$349,425.06**	**$40,095.00**	**$309,330.06**	**4.2**	**535,079**
TOTALS FOR ALL EVALUATED MEASURES			**556,589**	**91.5**	**845.2**	**$89,229.04**	**$656,006.13**	**$46,404.00**	**$609,602.13**	**6.8**	**659,438**

* - 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 measure 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.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

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 electric outlets when not in use.

Energy Efficient Practices

TRC also identified 15 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 West Milford High School include:

- Reduce Air Leakage
- Close Doors and Windows
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Install Destratification Fans
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Assess Chillers & Request Tune-Ups
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper 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 West Milford High School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array and moderate potential for installing a Microturbine CHP system.

Figure 5 – Photovoltaic Potential

Potential	High	
System Potential	320	kW DC STC
Electric Generation	381,239	kWh/yr
Displaced Cost	$33,170	/yr
Installed Cost	$832,000	

Figure 6 – Combined Heat and Power Potential

Potential	Medium	
System Type	Microturbine	
System Potential	240	kW
Electric Generation	1,959,887	kWh/yr
Thermal Generation	9,656,704	MBtu/yr
Displaced Cost	$120,327	/yr
Installed Cost	$734,000	

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
- Combined Heat and Power Program
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Energy Savings Improvement Program (ESIP)
- Demand Response Energy Aggregator

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 utilize 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 4 are based on the SmartStart program. More details on this program and others are available in Section 8.

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 8.4 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 8.5 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 7 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Chris Kelly	Supervisor Buildings & Grounds	chris.kelly@wmtps.org	973-229-5929
Barbara Francisco	Buisness Administrator	barbara.francisco@wmtps.org	973-697-1700 ext 5050
TRC Energy Services			
Aimee Lalonde	Auditor	Alalonde@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On April 10, 2018, TRC performed an energy audit at West Milford High School located in West Milford, New Jersey. TRC met with facility personnel to review the facility operations and help focus our investigation on specific energy-using systems.

The West Milford High School is a 220,000 square foot facility comprised of two floors of classroom space, a gymnasium, locker rooms, a kitchen, a cafeteria, a library, shops, an auditorium, and office areas. The school was originally built in 1976 and is generally in fair condition. The building operates year-round. The building is 100% heated and roughly 45% cooled, these areas being the center of the building. The center section of the building has high weekend use, which includes the auditorium, cafeteria, gymnasium, locker rooms, shops, and some classrooms.

There were lighting upgrades completed about three years ago that included retrofit work and some de-lamping of fixtures with a reduced number of T8 lamps and reflectors. The cooling tower is in poor condition. Fan motor replacement was underway at the time of the field audit. The replacement motor was observed to be high efficiency. There is an existing Johnson Controls energy management system that includes controls for the boilers and hot water distribution system, the chiller and chilled water system, and the science room unit ventilators and exhaust hoods. The remainder of the building (two floors of classrooms) are conditioned by unit ventilators that have dampers and hot water valves controlled by the original pneumatic control system, served by an air compressor.

2.3 Building Occupancy

The high school has about 174 full time staff members and 1,200 students. The building is occupied Monday through Friday starting at 6:00 AM with students getting out at 2:10 PM. Staff stays later and there is a second shift of custodians that occupy the building until 11:00 PM every day. Weekend use is generally between 7:00 AM until 11:00 PM. The typical schedule is presented in the table below.

Figure 8 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
West Milford High School - Students	Weekday	6:00 AM to 2:10 PM
West Milford High School - Students	Weekend	7:00 AM to 2:00 PM
West Milford High School - Staff	Weekday	6:00 AM to 11:00 PM
West Milford High School - Staff	Weekend	7:00 AM to 11:00 PM

2.4 Building Envelope

The building has a flat roof that is in fair condition. The building has double-pane windows with metal frames in fair condition. The exterior doors are constructed of aluminum or metal with glass panes and are in good condition. However, the door seals have worn out, which increases the level of outside air infiltration. Based on visual inspections of the building envelope, there are wall cracks as well as some cracks around window frames. These building envelope deficiencies can lead to excessive infiltration.

Figure 9 - Building Envelope

Figure 10 - Building Envelope Deficiencies

2.5 On-Site Generation

West Milford High School does not have any on-site electric generation capacity.

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 linear fluorescent fixtures with 32-Watt T8 lamps with electronic ballasts. The large shop areas are lit by fixtures with reduced wattage 28-Watt lamps. There are general purpose fixtures throughout the building that utilize some compact fluorescent lamps (CFL), incandescent, and LED lamps. Fluorescent fixture types include 2-lamp, 3-lamp or 4-lamp, 2-foot or 4-foot long troffers, wraparound fixtures, and industrial fixtures. Most fixtures are in fair condition; however, some fixtures are missing lenses. The newer science classrooms are lit by LED fixtures. Most lighting fixtures in classrooms and some offices are controlled by occupancy sensors. The remainder are manually controlled by wall switches. The exit signs throughout the building are LED.

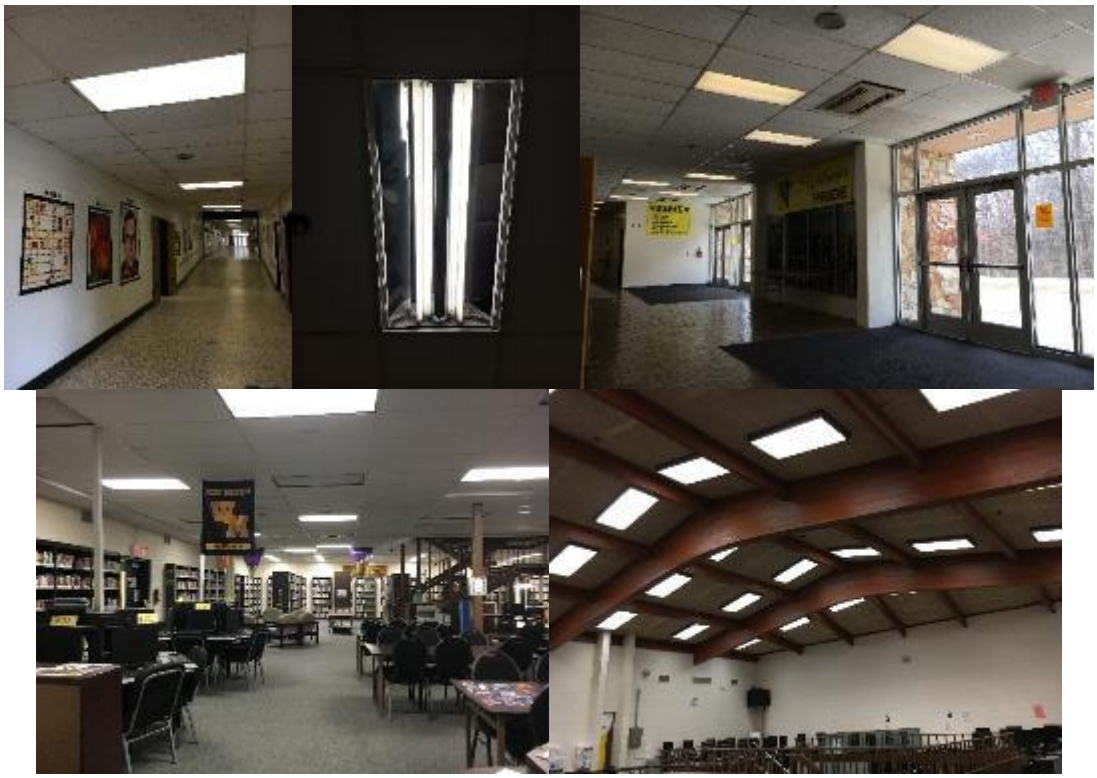


Figure 11 - Interior Lighting Systems

Figure 12 - New LED Lighting

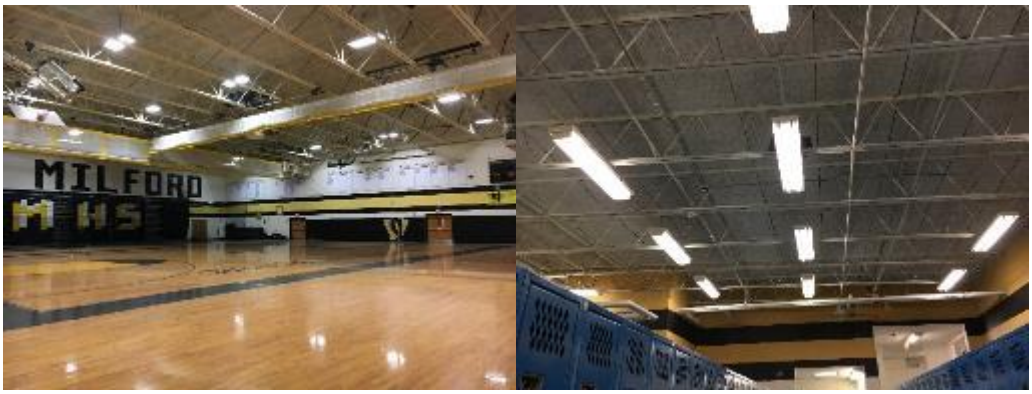


Figure 13 - High Bay Gym and Locker Room Lighting

Figure 14 - Wall Switches and Occupancy Sensors

The exterior lighting includes building mounted wall pack fixtures, pole mounted flood fixtures, and under canopy recessed box fixtures. Higher mounting height fixtures include high pressure sodium lamps and ballasts. The building overhang canopies have traditional incandescent lamps. There were two (2) LED wall pack fixtures noted as well. Exterior light fixtures are controlled by a time clock that operate about 12 hours overnight.

Figure 15 - Exterior Lighting and Timeclock Control

Hot Water Heating System

The building is heated by a hot water system which includes four (4) gas-fired, 3,982 MBH non-condensing hot water boilers. The boilers are high/low fire and are in good condition. They were installed about five years ago and are well maintained. The boilers have a nominal thermal efficiency of 83.9%. Hot water is provided to unit ventilators, heating coils in larger HVAC units, perimeter radiators and hot water unit heaters and radiators throughout the building. There are two (2) 20 HP hot water pumps which operate in lead/lag fashion. There are also two (2) 5 HP hot water pumps which also operate in lead/lag fashion. These primary distribution pumps and motors are constant speed and the triple duty valves were noted to be only partially opened. All pumps operate at constant speed and are driven by premium efficiency motors.

Figure 16 - Hot Water Heating System

Figure 17 - Hot Water Pumps and Motors and Partially Opened Triple Duty Valves

Classrooms throughout the building are conditioned by unit ventilators equipped with fan motors and hot water valves. These have fractional horsepower motors that are in fair condition. Larger areas are conditioned by heating-ventilating (HV) units equipped with hot water heating coils and 1 HP supply fan motors.

Figure 18 - Classroom Unit Ventilators

Figure 19 - Larger Heating-Ventilation Units

Chilled Water Air Conditioning System (CHW)

The central portion of the building is cooled by a chilled water system that includes a 450 ton water-cooled centrifugal variable speed chiller that is high efficiency and in good condition. Per discussions with facility personnel, they recently completed an $80k chiller retrofit project, which included the replacement of motors, sensors, bearings, and miscellaneous parts. The cooling tower located on the roof of the building is in poor condition and nearing the end of its useful life. Chilled water is provided to larger HVAC units. There are two (2) 30 HP chilled water pumps, which operate in lead/lag fashion. There is also a 15 HP condenser water pump motor and a 10 HP cooling tower fan motor. These motors are constant speed and the triple duty valves were noted to be only partially opened. All pumps operate at constant speed and are driven by premium efficiency motors.

Figure 20 - Chilled Water System

Each HVAC unit draws air from its own return air shaft and supplies air to its own air shaft. There are eight (8) of these units located in the penthouse mechanical rooms in the building. The central areas such as the gymnasium, auditorium and cafeteria are conditioned by these HVAC units. Each unit is equipped with a hot water heating coil, a chilled water cooling coil and a 5 HP supply fan motor. There are also some fractional horsepower hot water circulator pumps in the penthouse mechanical rooms. All of these HVAC motors are in fair to good condition.

Figure 21 - HVAC Units with Heating and Cooling Coils

Air Conditioning Systems

Some classrooms and offices are cooled by window air conditioning (AC) units, which are manually turned on and off during the summer months for cooling. These are a ton or half a ton in capacity. The majority are high efficiency and are in good condition.

Figure 22 - Window AC Units

The office area and science rooms are conditioned by split air-source heat pump systems that are in good condition and high efficiency. There are also split AC systems that cool the mathematics lab and IT server rooms. These are also in good condition and high efficiency.

Figure 23 - Split AC Systems

Figure 24 - Split Heat Pump Systems

Building Energy Management System (BEMS)

The energy management system includes the use of direct digital controls (DDC) and a Johnson Controls Auto logic software user interface utilizing BACnet data communication protocol. The boiler and hydronic heating system, chiller and chilled water system, science classroom unit ventilators, and exhaust fans are controlled by the building energy management system. The main pumps and re-heat pumps operate in lead/lag fashion. The boiler hot water supply water temperatures are controlled based on outdoor air temperature. The return water and re-heat temperatures are examples of trended points. The gymnasium schedule is between 6:00 AM and 10:00 PM every day of the week.

The heating system is tied to the energy management system with outdoor air temperature reset controls. Hot water is supplied at 180°F when the outside air temperature is low, and the setpoint is adjusted linearly to 130°F when the outside air increases with a lockout at 45°F. Heating space temperature set points vary between 68°F and 72°F in the winter.

The central chilled water system is also tied to the energy management system with condenser water return water temperature reset controls. Cooling space temperature set points vary between 72°F and 76°F in the summer and setback overnights.

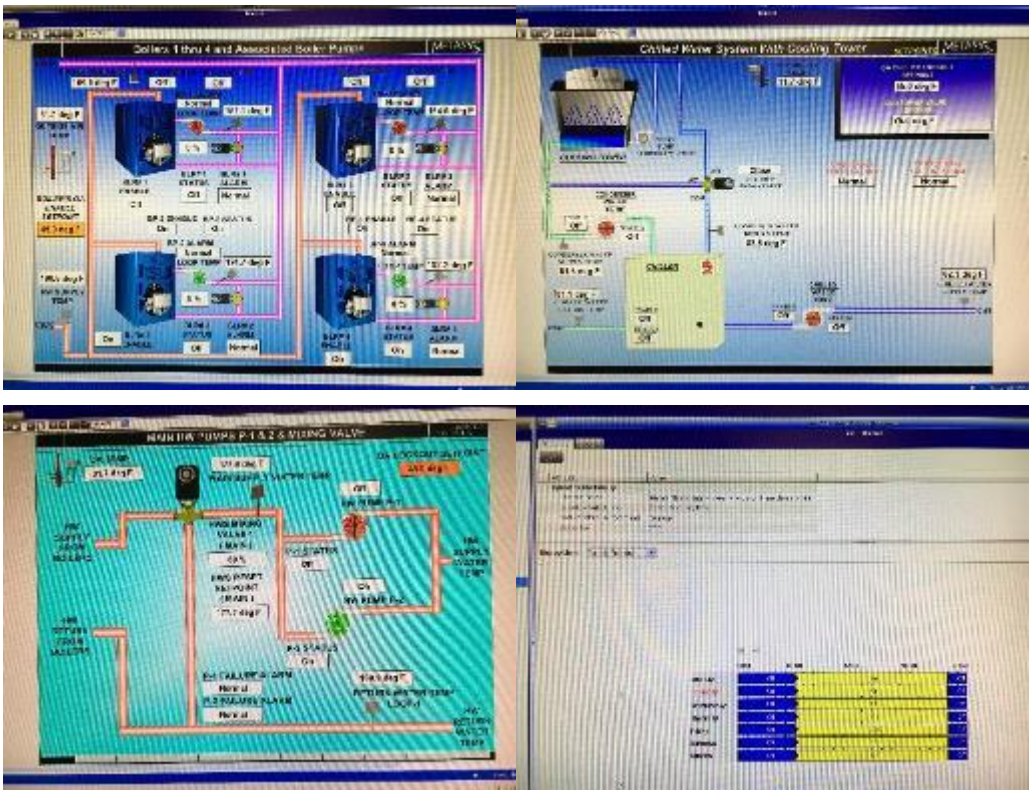


Figure 25 - Energy Management System Graphics

The science classroom unit ventilator schedule is between 6:00 AM and 5:00 PM, Monday through Friday. The unit ventilators are equipped with zone temperature and humidity sensor feedback, supply, and exhaust fan statuses as well as heating valve and economizer damper percentage open. The occupied heating temperature setpoint is 70°F and unoccupied is 68°F. The occupied cooling temperature setpoint is 74°F and unoccupied is 82°F. Heating and cooling is locked out at outdoor air temperature of 60°F.

Figure 26 - Science Classroom HVAC System Graphics and Sensors

HVAC Controls

The unit ventilators throughout the building have supply fan motors, dampers, and valves, which operate through the use of a pneumatic control system. This system is original to the building appears to be in fair operating condition. The air compressor for this system is located in the boiler room, was recently installed, and is in good condition with a high efficiency motor.

Figure 27 - Pneumatic Control System

Domestic Hot Water Heating System

The domestic hot water heating is an indirect system which includes the use of two (2) gas fired 999 MBH boilers and an 85-gallon storage tank. The system is in good condition with a standard system efficiency of 85%. Hot water is provided to hand washing sinks throughout the building and the kitchen.

Figure 28 - Domestic Hot Water System

Food Service & Laundry Equipment

The school has an all-electric kitchen that is used to prepare lunches for almost every student each school day. Most of the cooking is done using a number of electric oven, a fryer, steamer, and griddle. Prepared foods are held in a number of insulated holding cabinets. A majority of this equipment is in fair condition and standard efficiency.

Figure 29 - Food Service Equipment

Refrigeration

The kitchen has a walk-in medium temperature freezer and a walk-in cooler. These are used to store food prepared for school lunches. The evaporators and doors are in good condition and high efficiency.

Figure 30 - Walk-In Refrigeration Equipment

There is also a number of solid door stand-up refrigerators in the kitchen, a few glass front free standing refrigerators and a refrigerated chest. All equipment is standard to high efficiency and in fair to good condition. There are also two (2) ice makers located in the shipping/receiving small garage area, one is in good condition and the other is standard and aging.

Figure 31 - Refrigeration Equipment and Ice Makers

Building Plug Load

There are roughly 430 computer work stations throughout the facility. It is assumed that there is no centralized PC power management software installed. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as smart boards, projectors, and fans. The shop areas also include tool loads and the gymnasium areas also include workout equipment. There are also a number of residential style refrigerators throughout the building. These vary in condition and efficiency. There were a few noted to be almost empty. These should be considered for consolidation and removal of unnecessary refrigerators throughout the building.

Figure 32 - Plug Load Equipment

Refrigerated drink machines are located in the hallways and lounge areas. These do not currently have controls.

Figure 33 - Vending Machines

2.7 Water-Using Systems

There are restrooms throughout this facility. Restrooms have faucets which are rated for 0.5 to 2.2 gallons per minute (gpm).

3 Site Energy Use and Costs

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas 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 3.4 for additional information.

3.1 Total Cost of Energy

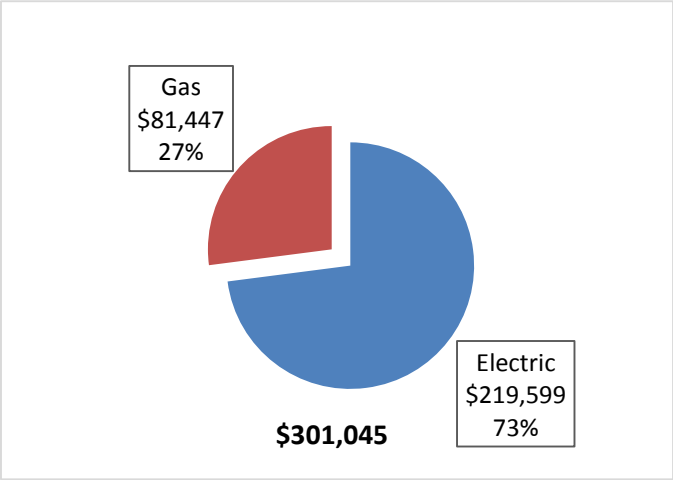
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 34 - Utility Summary

Utility Summary for West Milford High School		
Fuel	**Usage**	**Cost**
Electricity	1,493,135 kWh	$219,599
Natural Gas	93,396 Therms	$81,447
Total		**$301,045**

The current annual energy cost for this facility is $301,045 as shown in the chart below.

Figure 35 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by Rockland Electric. The average electric cost over the past 12 months was $0.147/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 facility pays electrical demand charges. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 36 - Electric Usage & Demand

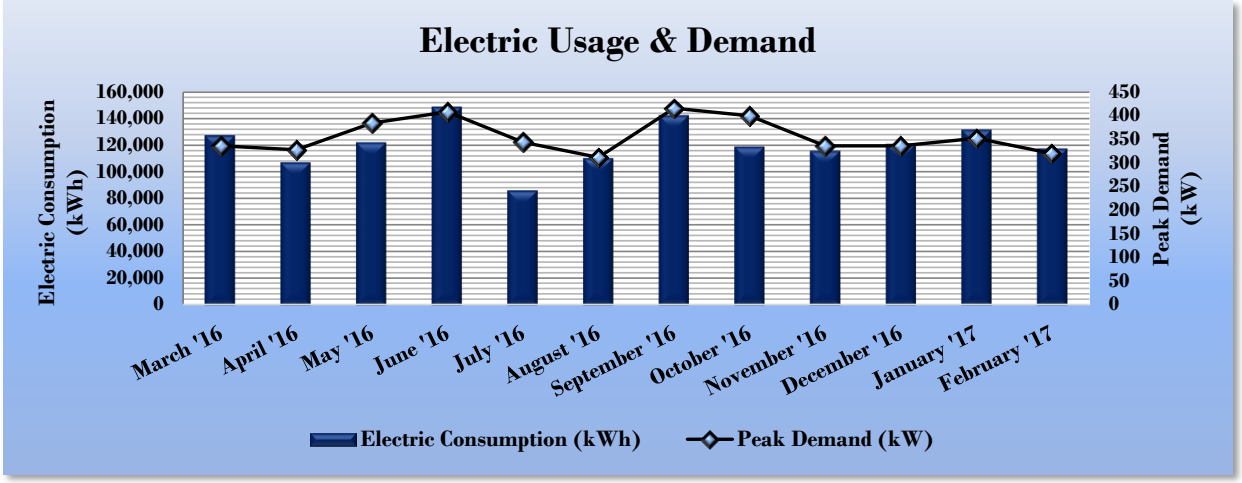


Figure 37 - Electric Usage & Demand

Electric Billing Data for West Milford High School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
3/23/16	28	127,409	336	$1,544	$18,397
4/20/16	27	107,033	328	$1,507	$15,799
5/19/16	28	122,058	384	$1,765	$18,050
6/22/16	33	148,610	408	$1,875	$21,818
7/22/16	29	86,090	344	$1,581	$13,556
8/23/16	31	110,159	312	$1,434	$16,356
9/23/16	30	142,438	416	$1,912	$21,100
10/24/16	30	118,851	400	$1,838	$17,660
11/22/16	28	115,742	336	$1,544	$16,800
12/21/16	28	120,816	336	$1,544	$17,423
1/25/17	34	131,627	352	$1,618	$19,130
2/23/17	28	117,303	320	$1,471	$16,893
Totals	**354**	**1,448,136**	**416**	**$19,631**	**$212,981**
Annual	**365**	**1,493,135**	**416**	**$20,241**	**$219,599**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.872/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 38 - Natural Gas Usage

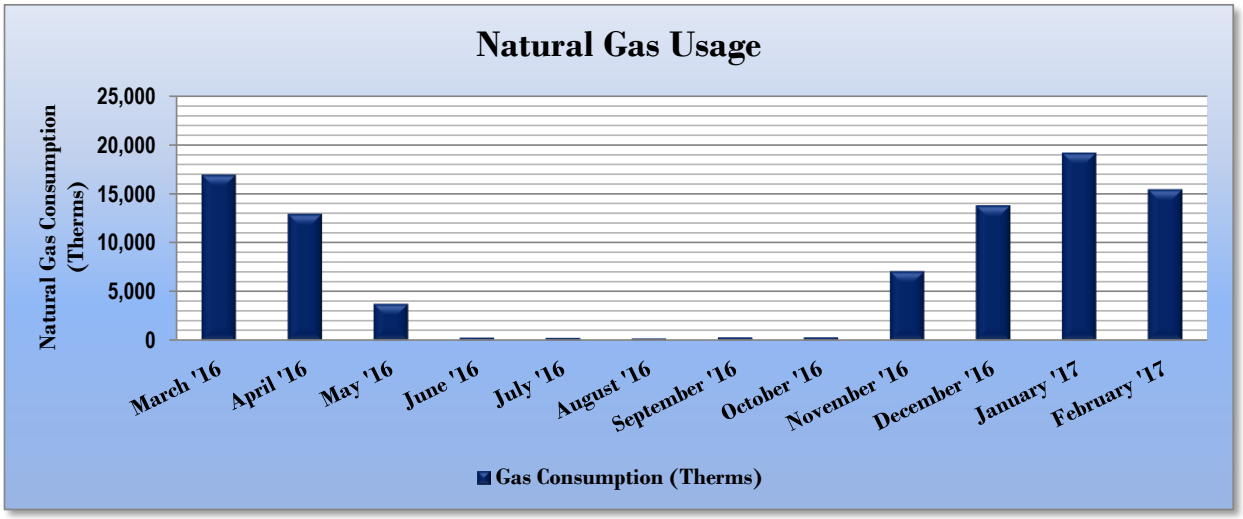


Figure 39 - Natural Gas Usage

Gas Billing Data for West Milford High School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
3/11/16	29	16,941	$14,208
4/12/16	31	12,961	$8,214
5/11/16	28	3,734	$2,445
6/10/16	29	287	$287
7/12/16	31	260	$270
8/10/16	28	207	$237
9/9/16	29	312	$304
10/10/16	30	332	$317
11/10/16	30	7,084	$7,908
12/12/16	31	13,815	$12,930
1/12/17	30	19,184	$17,927
2/10/17	28	15,464	$13,945
Totals	**354**	**90,581**	**$78,992**
Annual	**365**	**93,396**	**$81,447**

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager®*, an online tool created and managed by the United States 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.

The EUI 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 40 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	West Milford High School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	117.3	141.4
Site Energy Use Intensity (kBtu/ft^2)	65.6	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 41 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	West Milford High School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	91.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	56.1	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. Your building is not one of the building categories that are eligible to receive a score. **This facility has a current score of 79.**

A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

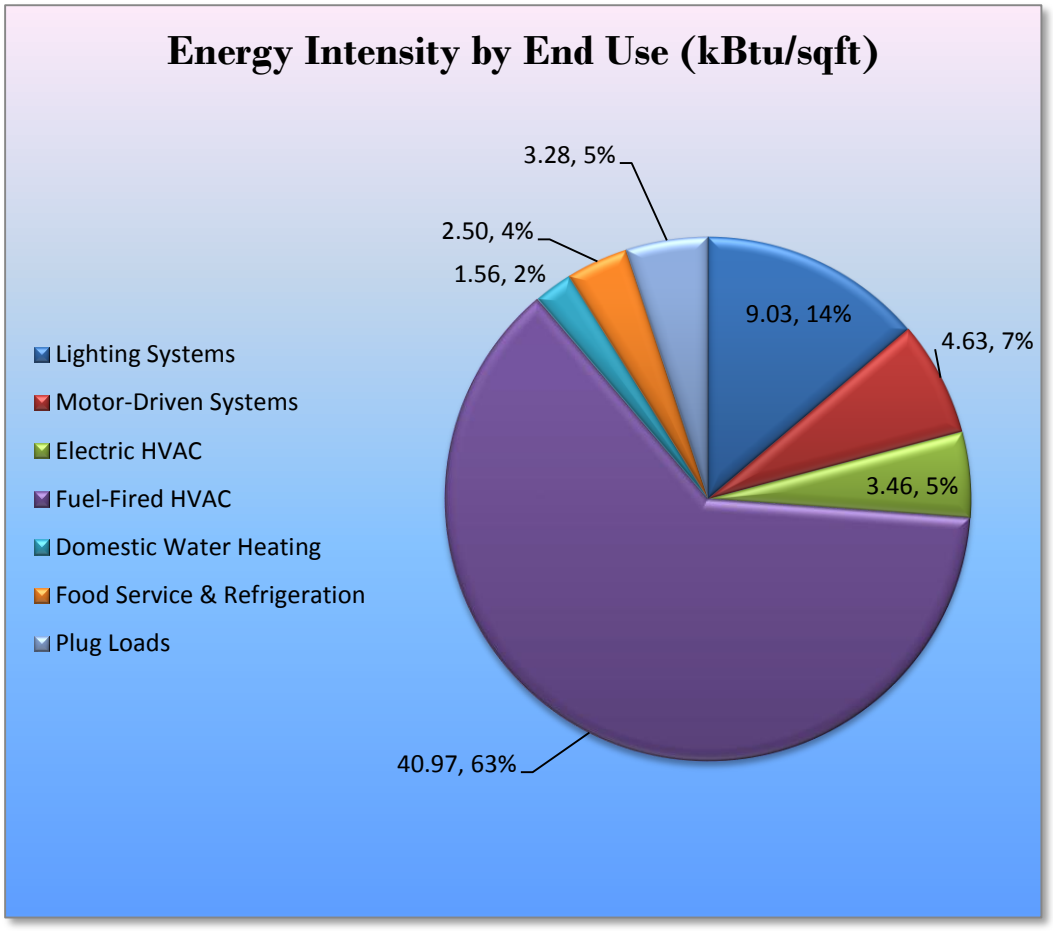
For more information on ENERGY STAR® certification go to:
https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed. 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 42 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the West Milford High 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 43 – 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		**302,327**	**45.9**	**0.0**	**$44,463.90**	**$223,342.60**	**$30,475.00**	**$192,867.60**	**4.3**	**304,441**
ECM 1	Install LED Fixtures	44,717	2.3	0.0	$6,576.64	$80,131.04	$6,150.00	$73,981.04	11.2	45,030
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	328	0.0	0.0	$48.27	$202.00	$0.00	$202.00	4.2	331
ECM 3	Retrofit Fixtures with LED Lamps	257,282	43.6	0.0	$37,838.99	$143,009.57	$24,325.00	$118,684.57	3.1	259,081
Lighting Control Measures		**33,021**	**4.9**	**0.0**	**$4,856.42**	**$27,124.00**	**$2,220.00**	**$24,904.00**	**5.1**	**33,252**
ECM 4	Install Occupancy Sensor Lighting Controls	23,123	3.5	0.0	$3,400.79	$17,324.00	$2,220.00	$15,104.00	4.4	23,285
ECM 5	Install High/Low Lighitng Controls	9,897	1.5	0.0	$1,455.63	$9,800.00	$0.00	$9,800.00	6.7	9,967
Motor Upgrades		**5,950**	**1.7**	**0.0**	**$875.03**	**$6,794.72**	**$0.00**	**$6,794.72**	**7.8**	**5,991**
ECM 6	Premium Efficiency Motors	5,950	1.7	0.0	$875.03	$6,794.72	$0.00	$6,794.72	7.8	5,991
Variable Frequency Drive (VFD) Measures		**95,251**	**24.5**	**0.0**	**$14,008.72**	**$66,179.15**	**$7,400.00**	**$58,779.15**	**4.2**	**95,917**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	32,604	11.2	0.0	$4,795.16	$26,206.80	$3,200.00	$23,006.80	4.8	32,832
ECM 8	Install VFDs on Chilled Water Pumps	28,051	7.2	0.0	$4,125.47	$16,944.10	$3,600.00	$13,344.10	3.2	28,247
ECM 9	Install VFDs on Hot Water Pumps	28,641	6.1	0.0	$4,212.33	$19,220.30	$0.00	$19,220.30	4.6	28,841
ECM 10	Install VFDs on Cooling Tower Fans	5,955	0.0	0.0	$875.76	$3,807.95	$600.00	$3,207.95	3.7	5,996
HVAC System Improvements		**0**	**0.0**	**1.8**	**$15.89**	**$34.80**	**$0.00**	**$34.80**	**2.2**	**213**
ECM 11	Install Pipe Insulation	0	0.0	1.8	$15.89	$34.80	$0.00	$34.80	2.2	213
Domestic Water Heating Upgrade		**0**	**0.0**	**19.1**	**$166.85**	**$243.78**	**$0.00**	**$243.78**	**1.5**	**2,240**
ECM 12	Install Low-Flow Domestic Hot Water Devices	0	0.0	19.1	$166.85	$243.78	$0.00	$243.78	1.5	2,240
Plug Load Equipment Control - Vending Machine		**9,671**	**0.0**	**0.0**	**$1,422.34**	**$1,840.00**	**$0.00**	**$1,840.00**	**1.3**	**9,739**
ECM 13	Vending Machine Control	9,671	0.0	0.0	$1,422.34	$1,840.00	$0.00	$1,840.00	1.3	9,739
Custom Measures		**30,312**	**0.0**	**450.6**	**$8,387.81**	**$23,866.00**	**$0.00**	**$23,866.00**	**2.8**	**83,287**
ECM 14	Computer Power Management Software	30,283	0.0	0.0	$4,453.73	$8,950.00	$0.00	$8,950.00	2.0	30,494
ECM 15	Building Envelope Weatherization	30	0.0	450.6	$3,934.08	$14,916.00	$0.00	$14,916.00	3.8	52,792
TOTALS		**476,531**	**76.9**	**471.6**	**$74,196.96**	**$349,425.06**	**$40,095.00**	**$309,330.06**	**4.2**	**535,079**

* - 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).

4.2 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 44 below.

Figure 44 – 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		**302,327**	**45.9**	**0.0**	**$44,463.90**	**$223,342.60**	**$30,475.00**	**$192,867.60**	**4.3**	**304,441**
ECM 1	Install LED Fixtures	44,717	2.3	0.0	$6,576.64	$80,131.04	$6,150.00	$73,981.04	11.2	45,030
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	328	0.0	0.0	$48.27	$202.00	$0.00	$202.00	4.2	331
ECM 3	Retrofit Fixtures with LED Lamps	257,282	43.6	0.0	$37,838.99	$143,009.57	$24,325.00	$118,684.57	3.1	259,081

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	10,553	2.3	0.0	$1,552.06	$50,347.50	$3,750.00	$46,597.50	30.0	10,627
Exterior	34,164	0.0	0.0	$5,024.57	$29,783.54	$2,400.00	$27,383.54	5.4	34,403

Measure Description

We evaluated replacing linear fluorescent high bay fixtures in the gymnasium with new high performance LED high bay fixtures. We also evaluated the replacement of exterior fixtures containing high pressure sodium lamps with new high performance LED light fixtures. 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 that are much longer than traditional lighting technologies.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent tubes and much longer than traditional HID technologies. It should also be noted that the cost effectiveness for LED fixture replacements depends on the application. Exterior fixture upgrades are typically more cost effective than the interior applications.

Based on the difficulty of performing maintenance on elevated fixtures and the maintenance savings associated with longer life equipment, we recommend this measure for benefits such as improved light quality, reduced maintenance and increased efficiency.

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	328	0.0	0.0	$48.27	$202.00	$0.00	$202.00	4.2	331
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting the one last existing fluorescent T12 fixture by removing fluorescent tubes and 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.

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	251,027	43.6	0.0	$36,919.11	$141,504.48	$24,185.00	$117,319.48	3.2	252,782
Exterior	6,255	0.0	0.0	$919.88	$1,505.08	$140.00	$1,365.08	1.5	6,298

Measure Description

We recommend retrofitting existing incandescent, compact fluorescent and linear fluorescent T8 lamp fixtures with LED 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 that are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

4.3 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 45 below.

Figure 45 – 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		**33,021**	**4.9**	**0.0**	**$4,856.42**	**$27,124.00**	**$2,220.00**	**$24,904.00**	**5.1**	**33,252**
ECM 4	Install Occupancy Sensor Lighting Controls	23,123	3.5	0.0	$3,400.79	$17,324.00	$2,220.00	$15,104.00	4.4	23,285
ECM 5	Install High/Low Lighitng Controls	9,897	1.5	0.0	$1,455.63	$9,800.00	$0.00	$9,800.00	6.7	9,967

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 4: 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)
23,123	3.5	0.0	$3,400.79	$17,324.00	$2,220.00	$15,104.00	4.4	23,285

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in classrooms, offices, restrooms, locker rooms and the upper library. 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 5: 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)
9,897	1.5	0.0	$1,455.63	$9,800.00	$0.00	$9,800.00	6.7	9,967

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. We recommend this control in hallways and lobby areas.

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.

4.4 Motor Upgrades

Our recommendations for motor upgrade measures are summarized in Figure 46 below.

Figure 46 – Summary of Motor 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)
Motor Upgrades		**5,950**	**1.7**	**0.0**	**$875.03**	**$6,794.72**	**$0.00**	**$6,794.72**	**7.8**	**5,991**
ECM 6	Premium Efficiency Motors	5,950	1.7	0.0	$875.03	$6,794.72	$0.00	$6,794.72	7.8	5,991

ECM 6: 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)
5,950	1.7	0.0	$875.03	$6,794.72	$0.00	$6,794.72	7.8	5,991

Measure Description

We recommend replacing standard efficiency motors that drive supply fans in the penthouse HVAC Units 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 (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

4.5 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 47 below.

Figure 47 – 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		**95,251**	**24.5**	**0.0**	**$14,008.72**	**$66,179.15**	**$7,400.00**	**$58,779.15**	**4.2**	**95,917**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	32,604	11.2	0.0	$4,795.16	$26,206.80	$3,200.00	$23,006.80	4.8	32,832
ECM 8	Install VFDs on Chilled Water Pumps	28,051	7.2	0.0	$4,125.47	$16,944.10	$3,600.00	$13,344.10	3.2	28,247
ECM 9	Install VFDs on Hot Water Pumps	28,641	6.1	0.0	$4,212.33	$19,220.30	$0.00	$19,220.30	4.6	28,841
ECM 10	Install VFDs on Cooling Tower Fans	5,955	0.0	0.0	$875.76	$3,807.95	$600.00	$3,207.95	3.7	5,996

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)
32,604	11.2	0.0	$4,795.16	$26,206.80	$3,200.00	$23,006.80	4.8	32,832

Measure Description

We recommend installing variable frequency drives (VFDs) to control supply fan motors in the penthouse HVAC Units. They will control 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 Chilled 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)
28,051	7.2	0.0	$4,125.47	$16,944.10	$3,600.00	$13,344.10	3.2	28,247

Measure Description

We recommend installing a variable frequency drives (VFD) to control the two (2) 30HP chilled water pump motors. This measure requires that chilled water coils be served by 2-way valves and that a differential pressure sensor be installed in the chilled water loop. As the chilled 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 chilled water valves close. The magnitude of energy savings is based on the estimated amount of time that the system operates at reduced loads.

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

ECM 9: 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)
28,641	6.1	0.0	$4,212.33	$19,220.30	$0.00	$19,220.30	4.6	28,841

Measure Description

We recommend installing a variable frequency drives (VFD) to control the two (2) 20 HP hot water pump motors and two (2) 5 HP hot water pump motors. 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.

ECM 10: Install VFDs on Cooling Tower Fans

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)
5,955	0.0	0.0	$875.76	$3,807.95	$600.00	$3,207.95	3.7	5,996

Measure Description

We recommend installing a variable frequency drive (VFD) to control the 15 HP cooling tower fan motor. The VFD will allow the cooling tower fan to operate at the minimum speed necessary to maintain the temperature of the condenser water returning to the chiller. Energy savings results from reducing fan speed (and power) when there is a reduced load on the chiller and outside air wet bulb temperatures are depressed. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.6 HVAC System Upgrades

Our recommendations for HVAC system improvement are summarized in Figure 48 below.

Figure 48 - Summary of HVAC System Improvement 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)
HVAC System Improvements		**0**	**0.0**	**1.8**	**$15.89**	**$34.80**	**$0.00**	**$34.80**	**2.2**	**213**
ECM 11	Install Pipe Insulation	0	0.0	1.8	$15.89	$34.80	$0.00	$34.80	2.2	213

ECM 11: Install Pipe Insulation

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	1.8	$15.89	$34.80	$0.00	$34.80	2.2	213

Measure Description

We recommend installing insulation on heating system piping that is uninsulated in the penthouse mechanical rooms. Distribution system losses are dependent on heating water system temperature, the size of the distribution system, and the level of insulation of the piping. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced. This measure saves energy by reducing heat losses from the heating distribution system.

4.7 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 49 below.

Figure 49 - Summary of Domestic Water Heating 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)
Domestic Water Heating Upgrade		**0**	**0.0**	**19.1**	**$166.85**	**$243.78**	**$0.00**	**$243.78**	**1.5**	**2,240**
ECM 12	Install Low-Flow Domestic Hot Water Devices	0	0.0	19.1	$166.85	$243.78	$0.00	$243.78	1.5	2,240

ECM 12: 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	19.1	$166.85	$243.78	$0.00	$243.78	1.5	2,240

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 reduce hot water usage, relative to standard 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.

4.8 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 50 below.

Figure 50 - Summary of Plug Load Equipment 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)
Plug Load Equipment Control - Vending Machine		**9,671**	**0.0**	**0.0**	**$1,422.34**	**$1,840.00**	**$0.00**	**$1,840.00**	**1.3**	**9,739**
ECM 13	Vending Machine Control	9,671	0.0	0.0	$1,422.34	$1,840.00	$0.00	$1,840.00	1.3	9,739

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)
9,671	0.0	0.0	$1,422.34	$1,840.00	$0.00	$1,840.00	1.3	9,739

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. We recommend installing controls on refrigerated vending machines in the hallways and lounge.

4.9 Custom Measures

Additional custom measure energy saving opportunities are addressed in this section. Recommended custom measures are summarized in Figure 51 below.

Figure 51 - Summary of Custom 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)
Custom Measures		**30,312**	**0.0**	**450.6**	**$8,387.81**	**$23,866.00**	**$0.00**	**$23,866.00**	**2.8**	**83,287**
ECM 14	Computer Power Management Software	30,283	0.0	0.0	$4,453.73	$8,950.00	$0.00	$8,950.00	2.0	30,494
ECM 15	Building Envelope Weatherization	30	0.0	450.6	$3,934.08	$14,916.00	$0.00	$14,916.00	3.8	52,792

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)
30,283	0.0	0.0	$4,453.73	$8,950.00	$0.00	$8,950.00	2.0	30,494

Measure Description

We recommend the implementation of computer power management software. The computing environment in most school and office facilities includes desktops, which are typically left on over nights, weekends and holidays. Screen savers are commonly confused as a power management strategy. This contributes to excessive electrical energy consumption, which may be avoided by proper management. There are innovative software packages available in the market today that are designed to deliver significant energy saving and provide ongoing tracking measurements. Operational and maintenance benefits are captured through the use of a central power management platform where issues may be diagnosed and problematic devices may be isolated. Energy savings policies may be enforced as well as identifying and eliminating underutilized devices. This measure investigates the potential benefits to implementing computer power management software to better match the energy use to user needs.

ECM 15: Building Envelope Weatherization

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)
30	0.0	450.6	$3,934.08	$14,916.00	$0.00	$14,916.00	3.8	52,792

Measure Description

We recommend weather-stripping the exterior doors, caulking perimeter of window frames and sealing wall cracks throughout the building. Exterior doors should be properly weather-stripped which may include the installation of a bottom sweep, center sweep and weather-stripping around the perimeter of the door.

Building envelopes that limit air infiltration and that have adequate insulation play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Cracks and gaps throughout the building – around windows and doors, through utility openings, at the foundation and roof – may not seem significant, but their effects add up. Reducing uncontrolled air infiltration through air sealing is a cost effective way to improve the performance and energy efficiency of your facility. The proper sealing of sources for air infiltration and exfiltration will mitigate the air through the building and thus reduce the load on the facility's heating and cooling equipment.

4.10 ECMs Evaluated, But Not Recommended as High Priority

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 52 – Summary of Measures Evaluated, But Not Recommended as High Priority

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**1,365**	**0.7**	**0.0**	**$200.79**	**$2,992.44**	**$184.00**	**$2,808.44**	**14.0**	**1,375**
Install High Efficiency Electric AC	1,365	0.7	0.0	$200.79	$2,992.44	$184.00	$2,808.44	14.0	1,375
Food Service Equipment & Refrigeration Measures	**53,648**	**13.9**	**0.0**	**$7,890.11**	**$83,588.63**	**$6,125.00**	**$77,463.63**	**9.8**	**54,023**
Food Service Equipment Replacement	52,286	13.7	0.0	$7,689.77	$80,256.23	$6,050.00	$74,206.23	9.6	52,651
Replace Refrigeration Equipment	1,362	0.2	0.0	$200.34	$3,332.40	$75.00	$3,257.40	16.3	1,372
Custom Measures	**25,044**	**0.0**	**373.6**	**$6,941.18**	**$220,000.00**	**$0.00**	**$220,000.00**	**31.7**	**68,961**
Expand the Energy Management System	25,044	0.0	373.6	$6,941.18	$220,000.00	$0.00	$220,000.00	31.7	68,961
TOTALS	**80,057**	**14.6**	**373.6**	**$15,032.08**	**$306,581.07**	**$6,309.00**	**$300,272.07**	**20.0**	**124,359**

* - 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).

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)
1,365	0.7	0.0	$200.79	$2,992.44	$184.00	$2,808.44	14.0	1,375

Measure Description

We evaluated replacing standard efficiency packaged and split system air conditioning units with high efficiency 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.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings exceeds the expected useful life of the replacement equipment. The upgrade to high efficiency is not justified by energy savings alone.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure for the aging split system unit.

Food Service Equipment Replacement

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)
52,286	13.7	0.0	$7,689.77	$80,256.23	$6,050.00	$74,206.23	9.6	52,651

Measure Description

We evaluated the replacement existing food service equipment with new high efficiency equipment. Buildings that use a lot of food service equipment are often among the most energy intensive commercial buildings. Energy usage in commercial kitchens is primarily used for cooking and refrigeration. There have been many energy efficiency improvements for cooking, dishwashing, and refrigerated food storage. For more information on improved energy efficiency for food service and storage see the Food Service Technology Center website at: www.fishnick.com.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings exceeds the expected useful life of the replacement equipment. The upgrade to high efficiency is not justified by energy savings alone.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure.

Replace Refrigeration Equipment

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)
1,362	0.2	0.0	$200.34	$3,332.40	$75.00	$3,257.40	16.3	1,372

Measure Description

We evaluated replacing an existing commercial refrigerator and refrigerator chest with new ENERGY STAR® high efficiency equipment. There have been many improvements in refrigeration system equipment, operation, and insulation. The energy savings associated with this measure come from reduced energy usage, due to more efficient technology, and reduced run times.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings exceeds the expected useful life of the replacement equipment. The upgrade to high efficiency is not justified by energy savings alone.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure.

Expand the Energy Management System

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)
25,044	0.0	373.6	$6,941.18	$220,000.00	$0.00	$220,000.00	31.7	68,961

Measure Description

We evaluated the potential in expanding the current Energy Management System (EMS) to extend control to include systems currently controlled by the pneumatic system. The installation of expanding hardware and software for the EMS would increase the efficiency of the building HVAC system operation. Upgrade of controls to optimize the start/stop of all key HVAC equipment and tying in all space temperature controls would minimize wasted energy and simplify operations. Schedules could be put in place to limit system operation when the building is closed. Temperature set back controls may be applied to operate systems only to the point necessary. Ventilation and economizer controls and programming would allow air handling units to operate according to room schedules, occupancy and availability for "free cooling" or "free heating."

For the purposes of this report, the potential energy savings and measure costs were estimated to demonstrate the cost effectiveness of this measure and promote moving toward design and construction. Based on our limited evaluation it does not appear cost effective to expand the control system. However, we recommend that an HVAC contractor who specializes in energy management systems be contacted for a detailed evaluation and implementation costs.

Reasons for not Recommending as a High Priority Measure

This measure is not recommended based on the preliminary economic results. The expansion of the energy management system cannot be justified by energy savings alone. However, based on the existing level of control we recommend considering this measure for implementation based on other benefits such as improved indoor air quality, controllability and operational and maintenance benefits.

Considerations

If the school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program (ESIP), we would recommend including this measure.

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.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

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 Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Install Destratification Fans

Allowing air to thermally stratify in spaces with high ceilings results in additional energy consumption by requiring the heating system to heat a volume of space much larger than the actual occupied space. Additional inefficiencies also occur because there are higher temperatures at the ceiling level than at the floor level. Higher temperatures at the ceiling accelerate heat loss through the roof, requiring additional energy consumption by the heating equipment in order to compensate for the accelerated heat transfer.

Destratification fans are specially designed to deliver a columnar, laminar flow of air balancing the air temperature from floor to ceiling. In addition to fuel savings, the use of destratification fans will reduce the recovery time necessary to warm the space after nightly temperature setbacks and will increase the comfort level of the occupants.

Practice Proper Use of 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.

Assess Chillers & Request Tune-Ups

Chillers are responsible for a substantial portion of a commercial building's overall energy usage. When components of a chiller are not optimized, this can quickly result in a noticeable increase in energy bills. Chiller diagnostics can produce a 5% to 10% cost avoidance potential from discovery and implementation of low/no cost optimization strategies.

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.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5 to 25 percent of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Perform Proper 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 Proper 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 "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 4.7 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.

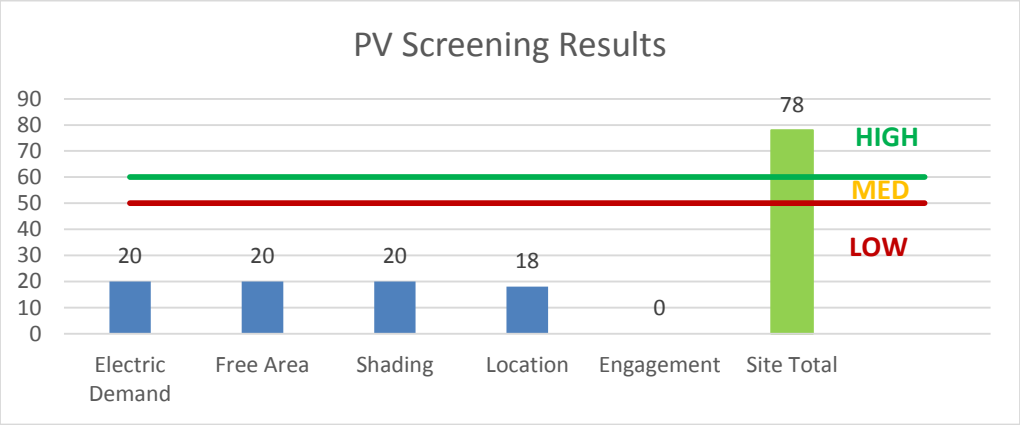
6.1 Photovoltaic

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 a High potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the **high** potential for PV at the site. A PV array located on the roof of the main building/ground next to the building/over the main parking lot may be feasible. If West Milford High School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 53 - Photovoltaic Screening



Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (SRP) prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

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.

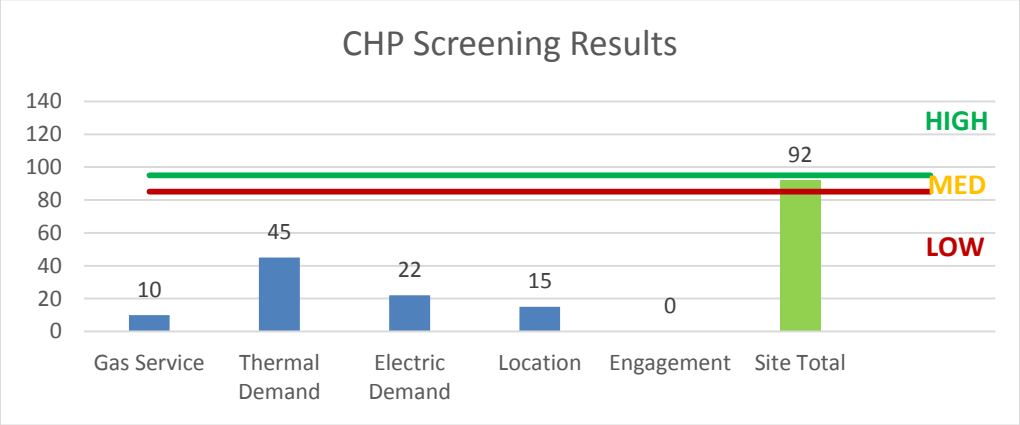
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste 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 Medium potential for installing a cost-effective CHP system.

The magnitude, type, and duration of the thermal demand, the coincident electric load, and the ease of interconnection contribute to the potential for CHP at the site. Based on the amount of hot water used throughout the year and the concurrent electric demand a gas turbine/reciprocating engine/microturbine/fuel cell may be feasible. If West Milford High School is interested in pursuing the installation of CHP, we recommended a more detailed feasibility study be conducted. Space near the existing boilers will need to be evaluated during feasibility.

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 54 - Combined Heat and Power Screening



Please see Section 8.2 for additional information in the Combined Heat & Power Program.

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 (http://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 (http://www.pjm.com/training/training%20material.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.

In our opinion, this facility has a moderate potential for Demand Response based on the connected electrical load and the capabilities of the Energy Management System.

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 55 for a list of the eligible programs identified for each recommended ECM.

Figure 55 - 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					
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers						
ECM 3	Retrofit Fixtures with LED Lamps	x					
ECM 4	Install Occupancy Sensor Lighting Controls	x					
ECM 5	Install High/Low Lighitng Controls						
ECM 6	Premium Efficiency Motors						
ECM 7	Install VFDs on Constant Volume (CV) HVAC	x					
ECM 8	Install VFDs on Chilled Water Pumps	x					
ECM 9	Install VFDs on Hot Water Pumps						
ECM 10	Install VFDs on Cooling Tower Fans	x					
ECM 11	Install Pipe Insulation						
ECM 12	Install Low-Flow Domestic Hot Water Devices						
ECM 13	Vending Machine Control						
ECM 14	Computer Power Management Software						
ECM 15	Building Envelope Weatherization						

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 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 SmartStart 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

The SmartStart program 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 Combined Heat and Power Program

Overview

One of the goals of the State of New Jersey is to enhance energy efficiency through on-site power generation with recovery and productive use of waste heat, and to reduce existing and new demands to the electric power grid. The Combined Heat & Power (CHP) program provides incentives for eligible CHP or Waste Heat to Power (WHP) projects. Eligible CHP or Waste Heat to Power (WHP) projects must achieve an annual system efficiency of at least 65% (Lower Heating Value - LHV), based on total energy input and total utilized energy output. Mechanical energy may be included in the efficiency evaluation.

Incentives

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

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

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

How to Participate

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

8.3 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec.

8.4 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.

8.5 Demand Response Energy Aggregator

The first step toward participation in a Demand Response (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 (http://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 (http://www.pjm.com/training/training%20material.aspx), along with a variety of other 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 the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

See Section 7 for additional information.

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
Mechanical Room	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.26	1,763	0.0	$259.33	$819.00	$140.00	2.62
Kitchen Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.08	549	0.0	$80.76	$375.50	$30.00	4.28
Kitchen Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.08	549	0.0	$80.76	$291.50	$30.00	3.24
Kitchen	35	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	35	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.76	5,069	0.0	$745.58	$2,047.50	$350.00	2.28
Kitchen	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.24	1,593	0.0	$234.33	$643.50	$110.00	2.28
Locker Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Dish Washing Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.09	579	0.0	$85.21	$314.00	$40.00	3.22
Office - Locked	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.08	549	0.0	$80.76	$291.50	$50.00	2.99
Lounge	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,672	0.58	3,866	0.0	$568.58	$1,681.60	$310.00	2.41
Cafeteria	45	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	45	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	1.23	8,236	0.0	$1,211.33	$3,442.50	$555.00	2.38
Cafeteria Hall	4	Incandescent: Screw in Lamp	Wall Switch	60	3,817	Relamp	Yes	4	LED Screw-In Lamps: Screw in Lamps	High/Low Control	9	2,672	0.14	943	0.0	$138.66	$415.01	$20.00	2.85
Lobby	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,672	0.19	1,289	0.0	$189.53	$580.53	$80.00	2.64
Vestibule	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,672	0.14	966	0.0	$142.14	$485.40	$60.00	2.99
Shipping/Receiving	5	Compact Fluorescent: Screw in Lamp	Wall Switch	23	3,817	Relamp	No	5	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	3,817	0.02	154	0.0	$22.59	$268.77	$0.00	11.90
Shipping/Receiving	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.08	549	0.0	$80.76	$445.50	$65.00	4.71
Storage Room	1	Compact Fluorescent: Screw in Lamp	Wall Switch	23	3,817	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	3,817	0.00	31	0.0	$4.52	$53.75	$0.00	11.90
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Office Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$78.50	$10.00	3.22
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Locker Room	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.03	211	0.0	$30.99	$144.60	$30.00	3.70
Hallway	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.46	3,111	0.0	$457.61	$1,394.50	$170.00	2.68
Eleectric Room	2	Compact Fluorescent: Screw in Lamp	Wall Switch	32	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	22	3,817	0.01	88	0.0	$12.91	$107.51	$0.00	8.33
Wood Shop	36	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	36	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.78	5,214	0.0	$766.88	$2,106.00	$360.00	2.28
Storage Room	4	Compact Fluorescent: Screw in Lamp	Wall Switch	23	3,817	Relamp	No	4	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	3,817	0.02	123	0.0	$18.07	$215.01	$0.00	11.90

	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 Area	6	Incandescent: Screw in Lamp	Wall Switch	60	3,817	Relamp	Yes	6	LED Screw-In Lamps: Screw in Lamps	Occupancy Sensor	9	2,672	0.21	1,414	0.0	$207.99	$438.52	$30.00	1.96
Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,672	0.14	966	0.0	$142.14	$401.40	$80.00	2.26
Graphic Arts Shop	36	Linear Fluorescent - RWT8: 4' RWT8 (28W) - 2L	Occupancy Sensor	49	2,672	Relamp	No	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.47	2,212	0.0	$325.34	$2,106.00	$360.00	5.37
Storage Room	2	Incandescent: Screw in Lamp	Wall Switch	40	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	6	3,817	0.04	298	0.0	$43.90	$107.51	$10.00	2.22
Storage Area	12	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	12	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.03	211	0.0	$30.99	$645.04	$0.00	20.82
Auto Shop	38	Linear Fluorescent - RWT8: 4' RWT8 (28W) - 2L	Wall Switch	49	3,817	Relamp	No	38	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.50	3,336	0.0	$490.60	$2,223.00	$380.00	3.76
Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.11	732	0.0	$107.67	$350.00	$40.00	2.88
Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,672	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,672	0.11	516	0.0	$75.91	$285.40	$60.00	2.97
Welding Room	2	Compact Fluorescent: Screw in Lamp	Wall Switch	23	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	3,817	0.01	61	0.0	$9.04	$107.51	$0.00	11.90
Locker Room	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.25	1,647	0.0	$242.27	$796.50	$125.00	2.77
Locker Room - Toilets	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Locker Room - Toilets	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.02	140	0.0	$20.66	$96.40	$20.00	3.70
Locker Room - Showers	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.13	869	0.0	$127.81	$351.00	$60.00	2.28
Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.13	608	0.0	$89.47	$351.00	$60.00	3.25
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.01	70	0.0	$10.33	$68.20	$10.00	5.63
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$78.50	$10.00	3.22
Training Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.09	406	0.0	$59.65	$234.00	$40.00	3.25
Restroom	6	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	Yes	6	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,672	0.08	556	0.0	$81.72	$559.20	$95.00	5.68
Gym	25	Linear Fluorescent - T5HO: 4' T5HO (54W) - 6L	Occupancy Sensor	358	2,672	Fixture Replacement	No	25	LED - Fixtures: High-Bay	Occupancy Sensor	200	2,672	2.59	12,136	0.0	$1,784.87	$50,347.50	$3,750.00	26.11
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Locker Room	33	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	33	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.90	6,040	0.0	$888.31	$2,200.50	$365.00	2.07
Locker Room - Showers	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.11	724	0.0	$106.51	$292.50	$50.00	2.28
Locker Room - Toilets	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.02	140	0.0	$20.66	$96.40	$20.00	3.70
Closet	1	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.00	18	0.0	$2.58	$53.75	$0.00	20.82

	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
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.11	732	0.0	$107.67	$350.00	$60.00	2.69
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.01	70	0.0	$10.33	$48.20	$10.00	3.70
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Coach Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,672	0.10	644	0.0	$94.76	$346.27	$60.00	3.02
Lobby	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,672	0.10	644	0.0	$94.76	$390.27	$40.00	3.70
Restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.03	211	0.0	$30.99	$144.60	$30.00	3.70
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.30	2,013	0.0	$296.10	$1,043.50	$110.00	3.15
Media Classroom C8	40	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	40	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.87	4,056	0.0	$596.46	$2,340.00	$400.00	3.25
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Storage	2	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.01	35	0.0	$5.16	$107.51	$0.00	20.82
Weight Room	30	Linear Fluorescent - RWT8: 4' RWT8 (28W) - 2L	Wall Switch	49	3,817	Relamp	No	30	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.39	2,634	0.0	$387.31	$1,755.00	$300.00	3.76
Arts Classroom C6	24	Linear Fluorescent - RWT8: 4' RWT8 (28W) - 2L	Wall Switch	49	3,817	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.45	3,023	0.0	$444.64	$2,214.00	$345.00	4.20
Kiln Room	2	Incandescent: Screw in Lamp	Wall Switch	60	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.07	448	0.0	$65.84	$107.51	$10.00	1.48
Kiln Room	1	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.00	18	0.0	$2.58	$53.75	$0.00	20.82
Arts Classroom C5	24	Linear Fluorescent - RWT8: 4' RWT8 (28W) - 2L	Wall Switch	49	3,817	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.45	3,023	0.0	$444.64	$2,214.00	$345.00	4.20
Storage	2	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.01	35	0.0	$5.16	$107.51	$0.00	20.82
Hallway	1	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.00	18	0.0	$2.58	$53.75	$0.00	20.82
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.11	732	0.0	$107.67	$434.00	$40.00	3.66
Hallway	35	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	35	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.96	6,406	0.0	$942.14	$2,847.50	$350.00	2.65
Classroom 119	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 120	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 121	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25

	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
Classroom 122	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 123	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 124	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
TV Rooms	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 126	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 127	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 128	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 129	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Library Storage	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.16	1,098	0.0	$161.51	$467.00	$60.00	2.52
Classroom 131	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 132	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 133	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 134	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 135	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.44	2,928	0.0	$430.69	$1,206.00	$195.00	2.35
Lobby	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,672	0.10	644	0.0	$94.76	$390.27	$40.00	3.70
Library - Lower Level	35	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	35	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.76	3,549	0.0	$521.91	$2,047.50	$350.00	3.25
Library - Lower Level	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.39	1,825	0.0	$268.41	$1,053.00	$180.00	3.25
Reference Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.13	608	0.0	$89.47	$351.00	$60.00	3.25
Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.13	608	0.0	$89.47	$351.00	$60.00	3.25
Storage	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.13	608	0.0	$89.47	$351.00	$60.00	3.25
Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.25	1,647	0.0	$242.27	$726.50	$90.00	2.63
Vestibule	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,672	0.10	644	0.0	$94.76	$390.27	$40.00	3.70
Faculty Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.01	70	0.0	$10.33	$48.20	$10.00	3.70
Faculty Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.03	211	0.0	$30.99	$144.60	$30.00	3.70

	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
Restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.03	211	0.0	$30.99	$144.60	$30.00	3.70
Custodial Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,672	0.10	644	0.0	$94.76	$306.27	$40.00	2.81
Custodial Closet	1	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.00	18	0.0	$2.58	$53.75	$0.00	20.82
Lounge Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.22	1,464	0.0	$215.35	$584.00	$100.00	2.25
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.11	732	0.0	$107.67	$350.00	$60.00	2.69
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.11	732	0.0	$107.67	$350.00	$60.00	2.69
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.27	1,830	0.0	$269.18	$785.00	$100.00	2.54
Lobby - Auditorium	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.44	2,928	0.0	$430.69	$1,336.00	$160.00	2.73
Music Room	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	30	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.82	5,491	0.0	$807.55	$2,025.00	$335.00	2.09
Hallway	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.01	70	0.0	$10.33	$48.20	$10.00	3.70
Practice Rooms	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.09	579	0.0	$85.21	$234.00	$40.00	2.28
Chorus Room	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.49	3,295	0.0	$484.53	$1,323.00	$215.00	2.29
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Restroom	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.04	281	0.0	$41.31	$192.80	$40.00	3.70
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.08	549	0.0	$80.76	$445.50	$65.00	4.71
Restroom	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.04	281	0.0	$41.31	$192.80	$40.00	3.70
Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.08	549	0.0	$80.76	$445.50	$65.00	4.71
Classroom	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.39	1,825	0.0	$268.41	$1,053.00	$180.00	3.25
Classroom	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.39	1,825	0.0	$268.41	$1,053.00	$180.00	3.25
Classroom	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.52	2,433	0.0	$357.88	$1,404.00	$240.00	3.25
Storage/Laundry Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.16	1,098	0.0	$161.51	$467.00	$60.00	2.52
Closet	1	Incandescent: Screw in Lamp	Wall Switch	60	3,817	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.03	224	0.0	$32.92	$53.75	$5.00	1.48
Electric Room	1	Compact Fluorescent: Screw in Lamp	Wall Switch	23	3,817	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	3,817	0.00	31	0.0	$4.52	$53.75	$0.00	11.90

	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
Electric Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Stage	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	13	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.28	1,883	0.0	$276.93	$760.50	$130.00	2.28
Auditorium	58	LED - Fixtures: Downlight Recessed	Wall Switch	14	3,817	None	No	58	LED - Fixtures: Downlight Recessed	Wall Switch	14	3,817	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Auditorium	10	LED - Fixtures: Wall Sconces	Wall Switch	29	3,817	None	No	10	LED - Fixtures: Wall Sconces	Wall Switch	29	3,817	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Electric Room	2	Compact Fluorescent: Screw in Lamp	Wall Switch	23	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	16	3,817	0.01	61	0.0	$9.04	$107.51	$0.00	11.90
Ticket Booth	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Projector Booth	4	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	4	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.01	70	0.0	$10.33	$215.01	$0.00	20.82
Projector Booth	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Lobby	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,672	0.10	644	0.0	$94.76	$390.27	$40.00	3.70
Classroom 145	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,672	0.19	1,289	0.0	$189.53	$730.53	$115.00	3.25
Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.22	1,464	0.0	$215.35	$668.00	$80.00	2.73
Office Room 118	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	No	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,817	0.29	1,966	0.0	$289.19	$761.07	$160.00	2.08
Conference Room 117	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,817	0.04	246	0.0	$36.15	$95.13	$20.00	2.08
Office 116	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,817	0.04	246	0.0	$36.15	$95.13	$20.00	2.08
Office 115	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,672	0.58	3,866	0.0	$568.58	$2,221.60	$380.00	3.24
Electric Room	2	Incandescent: Screw in Lamp	Wall Switch	60	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.07	448	0.0	$65.84	$107.51	$10.00	1.48
Vestibule	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,672	0.10	644	0.0	$94.76	$390.27	$40.00	3.70
Office Room 106	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.49	3,295	0.0	$484.53	$1,863.00	$285.00	3.26
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.19	1,281	0.0	$188.43	$609.50	$70.00	2.86
Classroom 107 -- Old	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.49	3,295	0.0	$484.53	$1,593.00	$250.00	2.77
Classroom 107 -- Old	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.08	549	0.0	$80.76	$445.50	$65.00	4.71
Classroom 108 - New	32	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	None	No	32	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 108 - New	4	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	22	2,672	None	No	4	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	22	2,672	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 108 - New	2	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	22	2,672	None	No	2	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	22	2,672	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	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
Vestibule	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.30	2,013	0.0	$296.10	$1,043.50	$110.00	3.15
Classroom 109	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	30	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.65	3,042	0.0	$447.35	$1,755.00	$300.00	3.25
Conference Room 110	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,672	0.22	1,467	0.0	$215.73	$496.80	$80.00	1.93
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Computer Lab 111	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.52	2,433	0.0	$357.88	$1,404.00	$240.00	3.25
ISS Room 112	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.11	732	0.0	$107.67	$350.00	$60.00	2.69
Training Room 114	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	22	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.60	4,027	0.0	$592.20	$1,827.00	$290.00	2.60
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.11	732	0.0	$107.67	$434.00	$40.00	3.66
Restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.03	211	0.0	$30.99	$144.60	$30.00	3.70
Restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.03	211	0.0	$30.99	$144.60	$30.00	3.70
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.36	2,379	0.0	$349.94	$1,160.50	$130.00	2.94
Office Room 100	12	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	None	No	12	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Closet - Locked	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Computer Lab 101	12	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	None	No	12	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 103	12	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	None	No	12	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 104	17	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	None	No	17	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Office 105	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.44	2,928	0.0	$430.69	$1,206.00	$195.00	2.35
Copy Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.11	732	0.0	$107.67	$350.00	$60.00	2.69
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,817	0.04	246	0.0	$36.15	$95.13	$20.00	2.08
Office	7	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	3,817	None	No	7	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	3,817	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Conference Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,672	0.29	1,933	0.0	$284.29	$686.80	$140.00	1.92
Conference Room	2	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	3,817	None	No	2	LED Screw-In Lamps: Screw in Lamp	Wall Switch	7	3,817	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.08	549	0.0	$80.76	$375.50	$30.00	4.28

	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
Mail Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.19	1,281	0.0	$188.43	$525.50	$90.00	2.31
Guidance Office	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.44	2,928	0.0	$430.69	$1,746.00	$265.00	3.44
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,672	0.10	644	0.0	$94.76	$306.27	$60.00	2.60
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Nurse's Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.04	203	0.0	$29.82	$117.00	$20.00	3.25
Nurse's Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.13	608	0.0	$89.47	$351.00	$60.00	3.25
Resting Rooms	2	Incandescent: Screw in Lamp	Wall Switch	60	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.07	448	0.0	$65.84	$107.51	$10.00	1.48
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.04	203	0.0	$29.82	$117.00	$20.00	3.25
Stairwells	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,672	0.15	1,024	0.0	$150.67	$979.20	$0.00	6.50
Stairwells	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.33	2,196	0.0	$323.02	$1,902.00	$120.00	5.52
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,672	0.29	1,933	0.0	$284.29	$770.80	$120.00	2.29
Break Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Break Room	1	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.00	18	0.0	$2.58	$53.75	$0.00	20.82
Hallway	38	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	38	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	1.04	6,955	0.0	$1,022.90	$3,023.00	$380.00	2.58
Restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.03	211	0.0	$30.99	$144.60	$30.00	3.70
Restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.03	211	0.0	$30.99	$144.60	$30.00	3.70
Classroom 218	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.52	2,433	0.0	$357.88	$1,404.00	$240.00	3.25
Closet	1	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	3,817	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	3,817	0.06	377	0.0	$55.52	$202.00	$0.00	3.64
Office 216	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Classroom 215	34	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	34	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.74	3,447	0.0	$506.99	$1,989.00	$340.00	3.25

	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 239	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Classroom 211	34	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	34	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.74	3,447	0.0	$506.99	$1,989.00	$340.00	3.25
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Storage	2	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.01	35	0.0	$5.16	$107.51	$0.00	20.82
Classroom 210	40	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	40	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.87	4,056	0.0	$596.46	$2,340.00	$400.00	3.25
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Storage	2	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.01	35	0.0	$5.16	$107.51	$0.00	20.82
Classroom 209	40	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	40	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.87	4,056	0.0	$596.46	$2,340.00	$400.00	3.25
Classroom 206	27	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	None	No	27	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	37	2,672	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	2	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	15	2,672	None	No	2	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	15	2,672	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	3	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	29	2,672	None	No	3	LED - Fixtures: Ambient - 4' - Indirect/Direct Fixture	Occupancy Sensor	29	2,672	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 204	24	Linear Fluorescent - RWT8: 4' RWT8 (28W) - 3L	Wall Switch	72	3,817	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,672	0.65	4,377	0.0	$643.72	$2,614.80	$465.00	3.34
Classroom 204	3	Linear Fluorescent - RWT8: 4' RWT8 (28W) - 1L	Wall Switch	25	3,817	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,817	0.02	138	0.0	$20.33	$107.70	$15.00	4.56
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Storage	2	Compact Fluorescent: Screw in Lamp	Wall Switch	13	3,817	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	3,817	0.01	35	0.0	$5.16	$107.51	$0.00	20.82
Classroom 202	24	Linear Fluorescent - RWT8: 4' RWT8 (28W) - 3L	Wall Switch	72	3,817	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,672	0.65	4,377	0.0	$643.72	$2,614.80	$465.00	3.34
Classroom 202	3	Linear Fluorescent - RWT8: 4' RWT8 (28W) - 1L	Wall Switch	25	3,817	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,817	0.02	138	0.0	$20.33	$107.70	$15.00	4.56
Office 201	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.08	549	0.0	$80.76	$445.50	$65.00	4.71
Classroom 200	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.16	1,098	0.0	$161.51	$621.00	$95.00	3.26
Classroom 219	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.33	2,196	0.0	$323.02	$972.00	$155.00	2.53
Classroom 220	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.52	2,433	0.0	$357.88	$1,404.00	$240.00	3.25
Faculty Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.01	70	0.0	$10.33	$48.20	$10.00	3.70
Classroom 203	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,672	0.44	2,934	0.0	$431.47	$1,031.60	$155.00	2.03
Classroom 217	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,672	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,672	0.28	1,300	0.0	$191.14	$571.20	$90.00	2.52

	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
Classroom 205	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.43	2,028	0.0	$298.23	$1,170.00	$200.00	3.25
Childs Study Team Office Room 214	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,672	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,672	0.07	344	0.0	$50.61	$190.27	$40.00	2.97
Childs Study Team Office Room 214	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.30	1,419	0.0	$208.76	$819.00	$140.00	3.25
Classroom 207	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.17	811	0.0	$119.29	$468.00	$80.00	3.25
Classroom 213	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.17	811	0.0	$119.29	$468.00	$80.00	3.25
Classroom 208	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.17	811	0.0	$119.29	$468.00	$80.00	3.25
Classroom 212	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.17	811	0.0	$119.29	$468.00	$80.00	3.25
Custodial Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.02	145	0.0	$21.30	$58.50	$10.00	2.28
Custodial Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,817	0.04	290	0.0	$42.60	$117.00	$20.00	2.28
Hallway	31	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	31	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,672	0.85	5,674	0.0	$834.47	$2,613.50	$310.00	2.76
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,817	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,672	0.29	1,933	0.0	$284.29	$770.80	$120.00	2.29
Classroom 221	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.33	2,196	0.0	$323.02	$972.00	$155.00	2.53
Restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.03	211	0.0	$30.99	$144.60	$30.00	3.70
Restroom	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.03	211	0.0	$30.99	$144.60	$30.00	3.70
Faculty Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,817	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,817	0.01	70	0.0	$10.33	$48.20	$10.00	3.70
Classroom 242	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.13	608	0.0	$89.47	$351.00	$60.00	3.25
Office 241	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.06	304	0.0	$44.73	$175.50	$30.00	3.25
Classroom 222	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 223	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 224	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 225	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 226	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 227	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Office Room 228	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,817	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.27	1,830	0.0	$269.18	$1,055.00	$135.00	3.42
Classroom 229	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25

	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
Classroom 230	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 231	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 232	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Computer Lab 233	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 234	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 235	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 236	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 237	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.35	1,622	0.0	$238.59	$936.00	$160.00	3.25
Classroom 238	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.26	1,217	0.0	$178.94	$702.00	$120.00	3.25
Classroom 239	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.26	1,217	0.0	$178.94	$702.00	$120.00	3.25
Classroom 240	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,672	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,672	0.26	1,217	0.0	$178.94	$702.00	$120.00	3.25
Library - Upper Level	60	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,817	Relamp	Yes	60	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,672	2.46	16,473	0.0	$2,422.65	$5,592.00	$1,040.00	1.88
Reading Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,817	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,672	0.33	2,196	0.0	$323.02	$871.60	$155.00	2.22
Office Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,817	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,672	0.16	1,098	0.0	$161.51	$570.80	$95.00	2.95
Office Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,817	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,672	0.16	1,098	0.0	$161.51	$570.80	$95.00	2.95
Transition Spaces	46	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	46	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	15	High-Pressure Sodium: (1) 400W Lamp	None	465	4,380	Fixture Replacement	No	15	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	140	4,380	-1.38	-10,578	0.0	-$1,555.69	$21,971.17	$1,500.00	-13.16
Exterior	4	High-Pressure Sodium: (1) 400W Lamp	None	465	4,380	Fixture Replacement	No	4	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	140	4,380	-0.37	-2,821	0.0	-$414.85	$5,858.98	$400.00	-13.16
Exterior	5	High-Pressure Sodium: (1) 400W Lamp	None	465	4,380	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	140	4,380	-0.46	-3,526	0.0	-$518.56	$1,953.39	$500.00	-2.80
Exterior	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	23	4,380	None	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	23	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	28	Incandescent: Screw in Lamp	None	60	4,380	Relamp	No	28	LED Screw-In Lamps: Screw in Lamps	None	9	4,380	-0.17	-1,269	0.0	-$186.68	$1,505.08	$140.00	-7.31

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	Heating System	1	Heating Hot Water Pump	20.0	93.0%	No	1,696	No	93.0%	Yes	1	2.42	11,832	0.0	$1,740.22	$6,334.30	$0.00	3.64
Boiler Room	Heating System	1	Heating Hot Water Pump	20.0	93.0%	No	1,696	No	93.0%	Yes	1	2.42	11,832	0.0	$1,740.22	$6,334.30	$0.00	3.64
Boiler Room	Heating System	1	Heating Hot Water Pump	5.0	89.5%	No	1,373	No	89.5%	Yes	1	0.63	2,488	0.0	$365.95	$3,275.85	$0.00	8.95
Boiler Room	Heating System	1	Heating Hot Water Pump	5.0	89.5%	No	1,373	No	89.5%	Yes	1	0.63	2,488	0.0	$365.95	$3,275.85	$0.00	8.95
Boiler Room	Cooling System	1	Condenser Water Pump	15.0	93.0%	No	1,130	No	93.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Cooling System	1	Chilled Water Pump	30.0	94.1%	No	1,356	No	94.1%	Yes	1	3.59	14,025	0.0	$2,062.73	$8,472.05	$1,800.00	3.23
Boiler Room	Cooling System	1	Chilled Water Pump	30.0	94.1%	No	1,356	No	94.1%	Yes	1	3.59	14,025	0.0	$2,062.73	$8,472.05	$1,800.00	3.23
Boiler Room	Pneumatic Control System	2	Air Compressor	3.0	89.5%	No	2,479	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Cooling Tower Fan	1	Cooling Tower Fan	10.0	89.5%	No	1,696	Yes	92.4%	Yes	1	0.13	6,254	0.0	$919.79	$4,199.71	$600.00	3.91
Boiler Room	Heating System	4	Boiler Feed Water Pump	2.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Boiler Burner Motors	4	Other	3.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Unit Ventilators	2	Supply Fan	1.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Unit Ventilators	18	Supply Fan	0.8	74.0%	No	2,745	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Attendance Offices	HVAC Unit	1	Supply Fan	5.0	82.0%	No	2,745	Yes	89.5%	Yes	1	1.59	4,782	0.0	$703.27	$4,076.22	$400.00	5.23
Lower Level Library	HVAC Unit	1	Supply Fan	5.0	82.0%	No	2,745	Yes	89.5%	Yes	1	1.59	4,782	0.0	$703.27	$4,076.22	$400.00	5.23
Upper Level Library	HVAC Unit	1	Supply Fan	5.0	82.0%	No	2,745	Yes	89.5%	Yes	1	1.59	4,782	0.0	$703.27	$4,076.22	$400.00	5.23
Cafeteria	HVAC Unit	1	Supply Fan	5.0	82.0%	No	2,745	Yes	89.5%	Yes	1	1.59	4,782	0.0	$703.27	$4,076.22	$400.00	5.23
Cafeteria	HVAC Unit	1	Supply Fan	5.0	82.0%	No	2,745	Yes	89.5%	Yes	1	1.59	4,782	0.0	$703.27	$4,076.22	$400.00	5.23
Center 2nd Floor	HVAC Unit	1	Supply Fan	5.0	82.0%	No	2,745	Yes	89.5%	Yes	1	1.59	4,782	0.0	$703.27	$4,076.22	$400.00	5.23
South 1st Floor	HVAC Unit	1	Supply Fan	5.0	82.0%	No	2,745	Yes	89.5%	Yes	1	1.59	4,782	0.0	$703.27	$4,076.22	$400.00	5.23

		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
South 2nd Floor	HVAC Unit	1	Supply Fan	5.0	82.0%	No	2,745	Yes	89.5%	Yes	1	1.59	4,782	0.0	$703.27	$4,076.22	$400.00	5.23
Various	Hot Water Circulators	8	Heating Hot Water Pump	0.3	74.0%	No	2,745	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Building Exhaust	40	Exhaust Fan	0.1	74.0%	No	2,745	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Shop Exhaust	1	Exhaust Fan	0.3	74.0%	No	2,745	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen Exhaust	4	Exhaust Fan	0.3	74.0%	No	2,745	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Unit Ventilators	40	Supply Fan	0.2	74.0%	No	2,745	No	74.0%	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
Roof	Office Area	1	Split-System Air-Source HP	3.00	36.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Math Labs	2	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Science Rooms	2	Split-System Air-Source HP	5.00	60.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Science Rooms	1	Split-System Air-Source HP	4.00	50.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	IT Room	1	Split-System AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	IT Room	1	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Unknown	1	Split-System AC	2.00		Yes	1	Split-System AC	2.00		14.00		No	0.74	1,365	0.0	$200.79	$2,992.44	$184.00	13.99
Classroom & Offices	Classroom & Offices	6	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom & Offices	Classroom & Offices	2	Window AC	0.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom & Offices	Classroom & Offices	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Cooling for Central Section of Building	1	Water-Cooled Centrifugal Chiller	450.00	No							0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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	Heating System	1	Non-Condensing Hot Water Boiler	3,982.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Heating System	1	Non-Condensing Hot Water Boiler	3,982.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Heating System	1	Non-Condensing Hot Water Boiler	3,982.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Heating System	1	Non-Condensing Hot Water Boiler	3,982.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Pipe Insulation Recommendations

		Recommendation Inputs		Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	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
Penthouse	Hot Water System	8	1.50	0.00	0	1.8	$15.89	$34.80	$0.00	2.19

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	Domestic Hot Water System	2	Indirect System	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Restrooms	4	Faucet Aerator (Lavatory)	1.50	1.00	0.00	0	1.1	$9.53	$28.68	$0.00	3.01
Restrooms	15	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	8.2	$71.51	$107.55	$0.00	1.50
Restrooms	15	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	9.8	$85.81	$107.55	$0.00	1.25

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	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Medium Temp Freezer (0F to 30F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	Yes	0.04	356	0.0	$52.29	$1,216.00	$75.00	21.82
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Refrigerator Chest	No	Yes	0.11	1,007	0.0	$148.05	$2,116.40	$0.00	14.29
Kitchen	3	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Stand-Up Refrigerator, Glass Door (16 - 30 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
Shipping/Receiving	1	Ice Making Head (<450 lbs/day), Continuous	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Shipping/Receiving	1	Ice Making Head (<450 lbs/day), Batch	No	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	Electric Fryer	No	Yes	1.93	7,352	0.0	$1,081.33	$5,620.63	$200.00	5.01
Kitchen	1	Electric Steamer	No	Yes	0.43	1,650	0.0	$242.67	$7,422.50	$1,250.00	25.44
Kitchen	2	Electric Combination Oven/Steam Cooker (<15 Pans)	No	Yes	5.56	21,213	0.0	$3,119.89	$31,578.61	$2,000.00	9.48
Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	No	Yes	0.34	1,305	0.0	$191.97	$4,747.37	$400.00	22.65
Kitchen	2	Electric Convection Oven (Full Size)	No	Yes	2.56	9,763	0.0	$1,435.86	$14,881.26	$700.00	9.88
Kitchen	1	Electric Griddle (3 Feet Width)	No	Yes	1.86	7,086	0.0	$1,042.12	$1,763.75	$300.00	1.40
Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	No	Yes	0.34	1,305	0.0	$191.97	$4,747.37	$400.00	22.65
Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	No	Yes	0.34	1,305	0.0	$191.97	$4,747.37	$400.00	22.65
Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	No	Yes	0.34	1,305	0.0	$191.97	$4,747.37	$400.00	22.65

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
High School	430	Computers	120.0	
High School	10	Laptop Carts	1,200.0	
High School	17	Coffee Maker	400.0	
High School	14	Refrigerator	700.0	
High School	23	Microwave	1,100.0	
High School	53	Fan	90.0	
High School	53	Printer	40.0	
High School	57	Projector	200.0	
High School	33	TV	150.0	
High School	2	Smart Board	316.0	
High School	17	Mini Fridge	360.0	
High School	14	Speaker	100.0	
High School	2	Large Aquarium	90.0	
High School	7	Oven	1,500.0	
High School	3	Kilns	3,500.0	
High School	1	Misc. Sound Equipment	1,000.0	
High School	9	Large Xerox- Type Printers	515.0	
High School	2	Tredmills	1,500.0	
High School	1	Woodshop Equipment	3,500.0	
High School	1	Misc Tools	2,500.0	

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
Hallway	4	Refrigerated	Yes	0.00	6,447	0.0	$948.23	$920.00	$0.00	0.97
Hallway	2	Non-Refrigerated	No	0.00	0	0.0	$0.00	$460.00	$0.00	0.00
Lounge	2	Refrigerated	Yes	0.00	3,224	0.0	$474.11	$460.00	$0.00	0.97

Custom Recommendations

Computer Power Management Software

# of Desktops	Normal Running Mode					Idle Running Mode					Suspended/Off Mode				
430	*Mon - Fri 8AM-5PM*	*Mon - Fri 5PM-8AM*	*Weekends & Holidays*	Energy Rate (W)*	Weekly Run Hours	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	*Weekends & Holidays*	*Energy Rate (W)**	*Weekly Run Hours*	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	Weekends & Holidays	Energy Rate (W)*	*Weekly Run Hours*
Existing Conditions	50%	10%	5%	120	**30**	10%	5%	5%	80	**10**	40%	85%	90%	5	**127**
Proposed Conditions	50%	0%	0%	120	**20**	0%	0%	0%	80	**0**	50%	100%	100%	5	**148**

Usage per Device			Energy Impact & Financial Analysis					
Weeks of Use	Annual kWh Usage	*Diversity Factor***	Total Annual kWh Savings	Total Annual Energy Cost Savings	*Cost per Desktop*	*Add'l Hardware Cost*	Total Installation Cost	Simple Payback Period (Years)
44	225	90%	30,283	$4,454	$15.00	$2,500.0	$8,950	2.01
44	147							

Building Envelope Weatherization

Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis					
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Gas Use (mmBtu)*	*Annual Heating Oil Use (mmBtu)*	Assumed % Electric HVAC Savings		Total Annual kWh Savings	Total Annual Gas mmBtu Savings	Total Annual Fuel mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
59,100	9,013	0	0.1%	5.0%	30	451	0	$3,934	$14,916	3.79

	qty	$/unit	est. costs
Weather-strip Exterior Double Doors	16	100	$ 1,600
Weather-strip Exterior Single Doors	6	60	$ 360
Caulk the Perimeter of Windows and Wall Cracks	3239	4	$ 12,956
		Total Estimated Costs	**$ 14,916**

Expand the Energy Management System

Existing Conditions				Proposed Conditions			Energy Impact & Financial Analysis					
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Gas Use (mmBtu)*	*Annual Heating Oil Use (mmBtu)*	*Annual Motor HVAC Energy Use (kWh)*	Assumed % Cooling Savings	Assumed % Heating Savings	Assumed % Motor Savings	Total Annual kWh Savings	Total Annual Gas mmBtu Savings	Total Annual Fuel mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
59,100	9,339.6	0.0	298,278	2%	4%	8%	25,044	374	0	$6,941	$220,000	31.69

Equations: (Based on Industry Standards)

Average Cost for EMS installation is $1.50/sqft
Energy savings range between 10% and 30%
An estimated $1/sqft is assumed for expanding this system

Notes:

Throughout the building, there are unit ventilators and heating-ventilation units have supply fan motors that operate majority of the time
Larger motors were on during spring break and likely uncontrolled throughout the year
These supply fan motors are tied to the old, original penuamatic control system with local manual dial thermostats
This measure should consider the replacement of old motors with EC motors
The motors in HVAC systems are operating longer than a typical high school building

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR® Score[1]

West Milford High School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 220,000
Built: 1976

For Year Ending: January 31, 2017
Date Generated: April 25, 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
West Milford High School 67 Highlander Drive West Milford, New Jersey 07480	West Milford Township School District 46 Highlander Drive West Milford, NJ 07480 (973) 697-1700	Barbara Francisco 46 Highlander Drive West Milford, NJ 07480 (973) 697-1700 Ext. 5050 barbara.francisco@wmtps.org

Property ID: 6234775

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
63.7 kBtu/ft²

Source EUI
114.1 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	9,040,342 (64%)
Electric - Grid (kBtu)	4,971,650 (36%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	86.4
National Median Source EUI (kBtu/ft²)	154.9
% Diff from National Median Source EUI	-26%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	1,032

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)