Local Government Energy Audit:
Energy Audit Report

Marlboro Middle School

355 County Rd

Marlboro, New Jersey 07746

Marlboro Township BoE

October 23, 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 Marlboro Middle School.

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

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

1.1 Facility Summary

Marlboro Middle School is a 198,820 square foot facility comprised of various space types within a single building. The building consists mainly of classrooms but also has multiple gymnasiums, cafeterias, kitchens, and offices in a three-story facility.

Lighting at Marlboro Middle School consists mainly of aging and inefficient T8 fluorescent lighting and HVAC equipment which is approaching the end of its useful life. Heating is supplied by natural gas fired boilers as well as three package units with natural gas fired furnaces. Cooling for most of the building is provided by a combination of package and split system units. While in the D Wing, added in 1997, cooling is provided by a 340-ton Trane air-cooled screw chiller. A thorough description of the facility and our observations are provided in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated 15 measures and recommends 11 measures which together represent an opportunity for Marlboro Middle School to reduce annual energy costs by roughly $70,565 and annual greenhouse gas emissions by 537,301 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 8 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2 respectively. Together these measures represent an opportunity to reduce Marlboro Middle School's annual energy use by 15%.

Figure 1 – Previous 12 Month Utility Costs

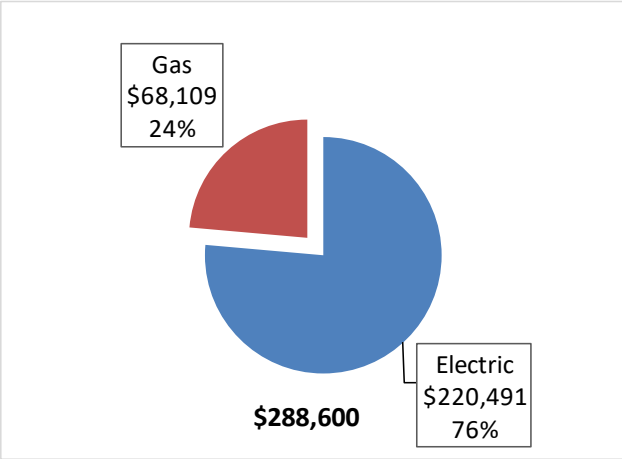
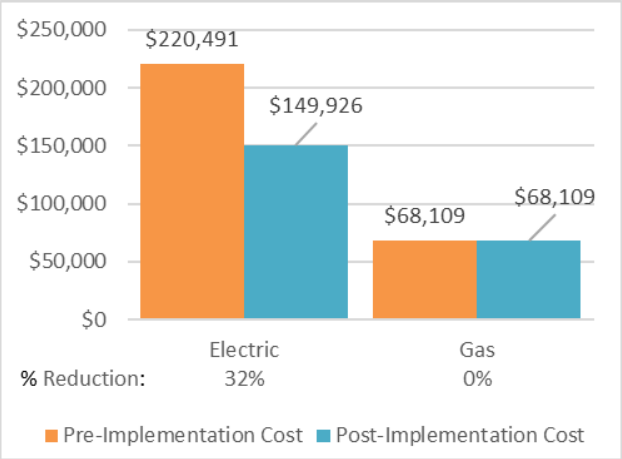


Figure 2 – Potential Post-Implementation Costs



A detailed description of Marlboro Middle 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 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

	Energy Conservation Measure	Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**244,917**	**62.9**	**0.0**	**$32,390.55**	**$253,216.34**	**$29,870.00**	**$223,346.34**	**6.9**	**246,629**
ECM 1	Install LED Fixtures	Yes	61,352	10.9	0.0	$8,113.91	$95,044.80	$3,810.00	$91,234.80	11.2	61,781
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	56	0.0	0.0	$7.36	$289.50	$15.00	$274.50	37.3	56
ECM 3	Retrofit Fixtures with LED Lamps	Yes	170,632	51.1	0.0	$22,566.25	$150,353.19	$26,045.00	$124,308.19	5.5	171,825
ECM 4	Install LED Exit Signs	Yes	12,877	0.8	0.0	$1,703.03	$7,528.85	$0.00	$7,528.85	4.4	12,967
Lighting Control Measures			**48,620**	**14.4**	**0.0**	**$6,430.02**	**$83,934.00**	**$9,925.00**	**$74,009.00**	**11.5**	**48,960**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	45,648	13.6	0.0	$6,036.95	$76,104.00	$9,925.00	$66,179.00	11.0	45,967
ECM 6	Install High/Low Lighitng Controls	Yes	2,972	0.9	0.0	$393.07	$7,830.00	$0.00	$7,830.00	19.9	2,993
Motor Upgrades			**2,448**	**1.3**	**0.0**	**$323.77**	**$11,836.46**	**$0.00**	**$11,836.46**	**36.6**	**2,465**
	Premium Efficiency Motors	No	2,448	1.3	0.0	$323.77	$11,836.46	$0.00	$11,836.46	36.6	2,465
Variable Frequency Drive (VFD) Measures			**58,676**	**12.9**	**0.0**	**$7,759.93**	**$32,527.45**	**$4,800.00**	**$27,727.45**	**3.6**	**59,086**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	7,430	3.5	0.0	$982.62	$5,194.45	$1,200.00	$3,994.45	4.1	7,482
ECM 8	Install VFDs on Chilled Water Pumps	Yes	20,282	6.2	0.0	$2,682.28	$16,944.10	$3,600.00	$13,344.10	5.0	20,424
ECM 9	Install VFDs on Hot Water Pumps	Yes	30,964	3.2	0.0	$4,095.03	$10,388.90	$0.00	$10,388.90	2.5	31,181
Electric Unitary HVAC Measures			**48,483**	**19.4**	**0.0**	**$6,411.99**	**$368,955.58**	**$21,798.00**	**$347,157.58**	**54.1**	**48,822**
	Install High Efficiency Electric AC	No	48,483	19.4	0.0	$6,411.99	$368,955.58	$21,798.00	$347,157.58	54.1	48,822
Electric Chiller Replacement			**176,523**	**118.3**	**0.0**	**$23,345.34**	**$272,190.40**	**$31,280.00**	**$240,910.40**	**10.3**	**177,757**
ECM 10	Install High Efficiency Chillers	Yes	176,523	118.3	0.0	$23,345.34	$272,190.40	$31,280.00	$240,910.40	10.3	177,757
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**311.9**	**$3,421.51**	**$220,882.84**	**$1,200.00**	**$219,682.84**	**64.2**	**36,519**
	Install High Efficiency Hot Water Boilers	No	0	0.0	278.4	$3,053.63	$215,082.56	$0.00	$215,082.56	70.4	32,592
	Install High Efficiency Furnaces	No	0	0.0	33.5	$367.88	$5,800.28	$1,200.00	$4,600.28	12.5	3,926
Plug Load Equipment Control - Vending Machine			**4,836**	**0.0**	**0.0**	**$639.50**	**$690.00**	**$0.00**	**$690.00**	**1.1**	**4,869**
ECM 11	Vending Machine Control	Yes	4,836	0.0	0.0	$639.50	$690.00	$0.00	$690.00	1.1	4,869
Recommended Measures TOTALS			**533,570**	**208.5**	**0.0**	**$70,565.35**	**$642,558.19**	**$75,875.00**	**$566,683.19**	**8.0**	**537,301**
Evaluated Measures TOTALS			**584,501**	**229.1**	**311.9**	**$80,722.62**	**$1,244,233.07**	**$98,873.00**	**$1,145,360.07**	**14.2**	**625,107**

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

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

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

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

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

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

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

Electric Chiller measures generally involve replacing older inefficient hydronic chillers with modern energy efficient systems. New chillers can provide equivalent cooling compared to older chillers at a reduced energy cost. These measures save energy by reducing chiller energy usage, due to improved electrical and heat transfer efficiency.

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

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

Energy Efficient Practices

TRC also identified 13 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 Marlboro Middle School include:

- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- 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
- Perform Proper Boiler Maintenance
- Perform Proper Furnace Maintenance
- Perform Proper Water Heater Maintenance
- 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 Marlboro Middle School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	375	kW DC STC
Electric Generation	446,764	kWh/yr
Displaced Cost	$38,870	/yr
Installed Cost	$1,072,500	

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
- Pay for Performance - Existing Building (P4P)
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may 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 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project's total cost.

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.

Additional information on relevant incentive programs is located in Section 8 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Cindy Barr-Rague	Business Administration/Board Secretary	cbarr-rague@mtps.org	(732) 972-2000 Ext 2010
Michael Crivelli	Supervisor of Building & Grounds	mcrivelli@mtps.org	(732) 972-2122
TRC Energy Services			
Smruti Srinivasan	Auditor	Ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On March 20, 2018, TRC performed an energy audit at Marlboro Middle School located in Marlboro, New Jersey. TRC's team met with Al Giezey, HVAC Specialist, to review the facility operations and help focus our investigation on specific energy-using systems.

Marlboro Middle School is a 198,820 square foot facility comprised of various space types within a single building. The building consists mainly of classrooms but also has multiple gymnasiums, cafeterias, kitchens, and offices in a three-story facility.

Lighting at Marlboro Middle School consists mainly of aging and inefficient T8 fluorescent lighting and HVAC equipment which is approaching the end of its useful life. Heating is supplied by natural gas fired boilers, which servers the unit ventilators and hallway baseboard radiators. There are also three package units with natural gas fired furnaces that serve classrooms 121, 122, and locker rooms. Cooling for most of the building is provided by a combination of package and split system units. While in the D Wing, added in 1997, cooling is provided by a 340-ton Trane air-cooled screw chiller.

The building was constructed in 1976 and has since had several additions over the years. With the most recent being the addition of the D Wing in 1997.

2.3 Building Occupancy

The school is open Monday through Friday 10 months a year, September through June. Weekend sports and events are fairly typical. The typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately 1,100 students.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Marlboro Middle School	Weekday	7:30 AM - 2:30 PM
Marlboro Middle School	Weekend	Sat: 9:00 AM - 4:00 PM Sun: 9:00 AM - 3:00 PM

2.4 Building Envelope

The building is constructed of concrete block and structural steel with a brick facade. The building has a flat roof covered with a rubber membrane. The membrane on the older section of the building is a lighter color, while the newer wings have a dark colored membrane. The older portion of the building has single pane aluminum framed windows and doors while the newer sections have double pane windows.

Image 1 Building Envelope

2.5 On-Site Generation

Marlboro Middle School does not currently 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 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). Most of the fixtures are 2-lamp, 4-foot long troffers with diffusers or suspended linear fluorescent fixtures.

Lighting control in most spaces is provided by manually operated wall switches. The nurse's office suite and storage area lighting is controlled with occupancy sensors that are either wall or ceiling mounted depending on the space layout.

The building's exterior lighting is minimal and consists of a mix of high pressure sodium (HPS), mercury vapor (MV), CFL, and LED fixtures that are controlled by photocells.

Image 2 Typical hallway lighting

Image 3 Pole mounted LED fixture

Chilled Water System

The D Wing is served by a single 340-ton Trane air-cooled screw chiller. Chilled water is supplied to the D Wing's two packaged rooftop units by two 30 HP constant volume pumps. The two packaged rooftop units each have a 3 HP supply fan motor and a 3 HP return fan motor. There is also a glycol loop serving the D Wing to keep the CHW and HHW from freezing. The Glycol loop flow is maintained by two 15 HP constant flow pumps.

Image 4 Trane air-cooled chiller

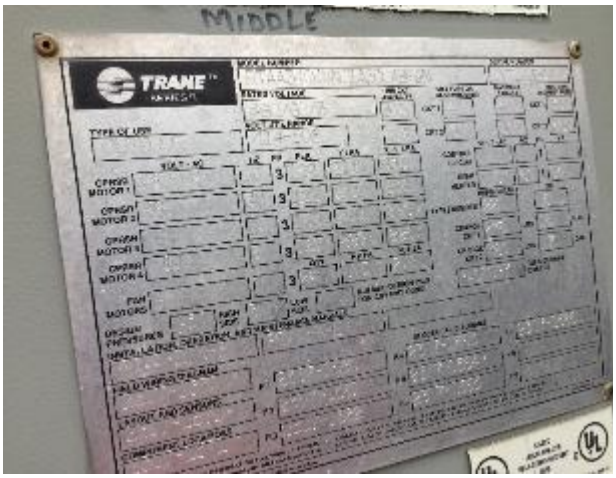


Image 5 Chiller nameplate

Hot Water Heating System

The hot water heating system consists of three Cleaver Brooks forced draft boilers. The boilers each have a rated input of 5,230 MBh and a nominal combustion efficiency of 80%. Each boiler has a 5 hp blower motor. The boilers provide hot water to the building's 88 unit ventilators, hallway baseboard radiators, the gym unit heater, and the indirect domestic hot water system. The hot water is distributed by two 15 HP, four 5 HP, and two 1.5 HP constant volume pumps.

Image 6 Boilers

Image 7 Boiler nameplate

Direct Expansion Air Conditioning System (DX)

This majority of the school is cooled by either direct-expansion (DX) cooling split-system ACs or packaged AC units. The split-system AC units and packaged AC units are located on the roof and serve various building spaces: classrooms, media center, cafeteria, IT room, teacher's lounge, nurses' office, and main office. The split-system AC units range in size from 2.5 tons to 5 tons.

The packaged AC units range in size from 3 tons to 50 tons, and along with the air-cooled chiller serving the D wing, provide mechanical cooling to approximately 90% of the facility. The 3-ton unit serving the locker rooms and the two 4-ton units serving classrooms 121 – 122 are equipped with 81% efficient natural gas furnaces. Other package units are equipped with hot water coils.

Image 8 Typical split-system AC condenser

Image 9 Trane package AC w/gas heat

Food Service Equipment

The school has three kitchens: the main kitchen, the A Wing kitchen, and the B Wing kitchen. The kitchens are used to prepare lunches daily for the students and staff. The A and B Wing kitchens each have a freezer chest, reach-in milk cooler, double door refrigerator, two food warmers, and an electric convection oven. The main kitchen's equipment consists of an electric six plate cooking range, four door freezer/refrigerator, glass door refrigerator, a walk-in cooler, and a walk-in freezer. The kitchen is occupied Monday through Friday from September through June.

Building Plug Load

There are approximately 230 desktop computer work stations throughout the facility and roughly 1,050 Chromebooks. There is no centralized PC power management software installed.

General office equipment and break room amenities contribute to the plug load. Classrooms are outfitted with projectors, smartboards, and other audio-visual aids.

The facility has three refrigerated beverage vending machines.

2.7 Water-Using Systems

There are approximately 23 restrooms at this facility three faculty lounges with sinks, the three kitchens, and various locker rooms. A sampling of restrooms found the faucets rated for 1.5 to 2.0 gallons per minute (gpm) and the toilets are rated at 1.6 gallons per flush (gpf).

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

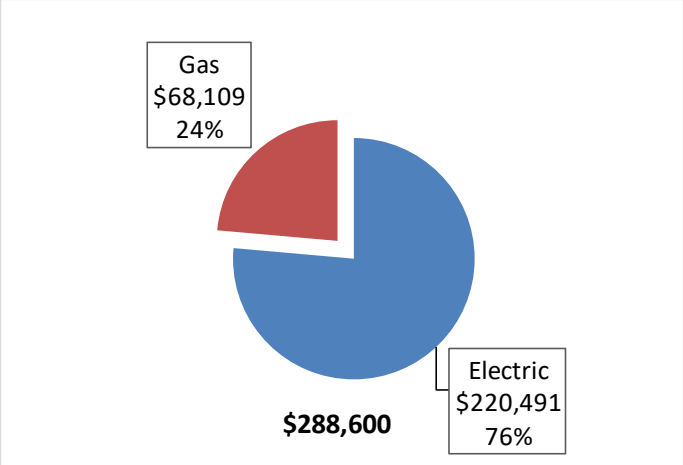
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Marlboro Middle School		
Fuel	**Usage**	**Cost**
Electricity	1,667,212 kWh	$220,491
Natural Gas	62,086 Therms	$68,109
Total		**$288,600**

The current annual energy cost for this facility is $288,600 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.132/kWh, which is the blended rate that includes energy supply, distribution, and other charges, including demand. This rate is used throughout the analyses in this report to assess energy costs and savings. The demand is higher during the cooling periods and reduces during the heating periods, which is typical for a site with mechanical cooling and gas heating. The figure below suggests the building is conditioned year round, while it was noted during the inspection that the building is only in operation ten months a year. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 9 - Electric Usage & Demand

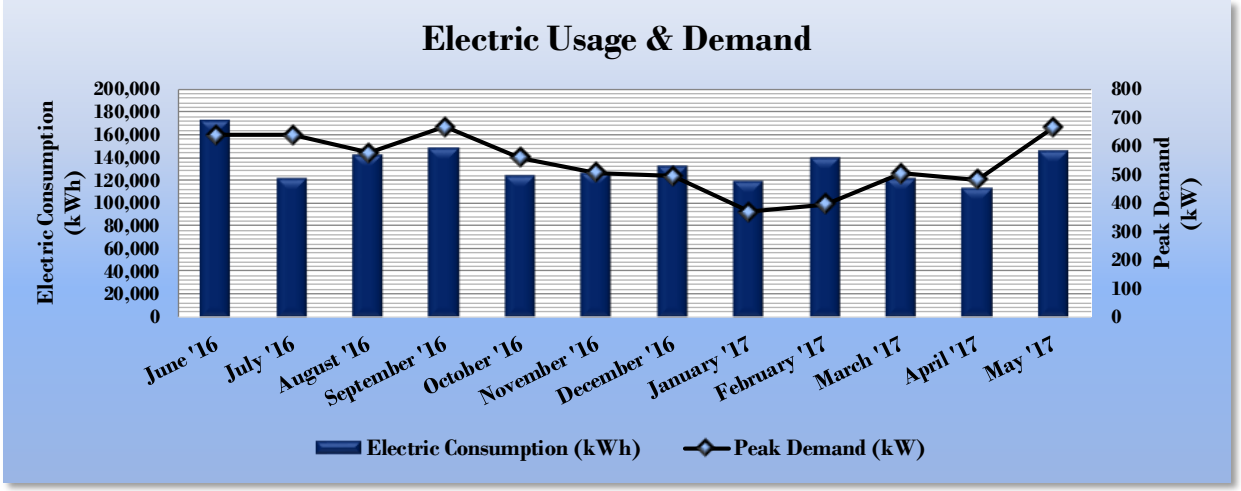


Figure 10 - Electric Usage & Demand

Electric Billing Data for Marlboro Middle School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/30/16	29	172,400	639	$0	$21,742
7/31/16	30	122,000	639	$0	$16,734
8/31/16	30	142,800	575	$0	$18,519
9/30/16	29	148,800	668	$0	$19,936
10/31/16	30	124,800	560	$0	$16,626
11/30/16	29	126,400	506	$0	$16,537
12/31/16	30	133,200	493	$0	$17,133
1/31/17	30	119,600	369	$0	$15,301
2/28/17	27	140,000	394	$0	$17,910
3/31/17	30	122,400	504	$0	$16,731
4/30/17	29	113,600	482	$0	$15,675
5/31/17	30	146,400	664	$0	$20,399
Totals	**353**	**1,612,400**	**668.4**	**$0**	**$213,242**
Annual	**365**	**1,667,212**	**668.4**	**$0**	**$220,491**

3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.097/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. The gas use profile is consistent with sites where heating energy is the dominant factor in gas consumption.

Figure 11 - Natural Gas Usage

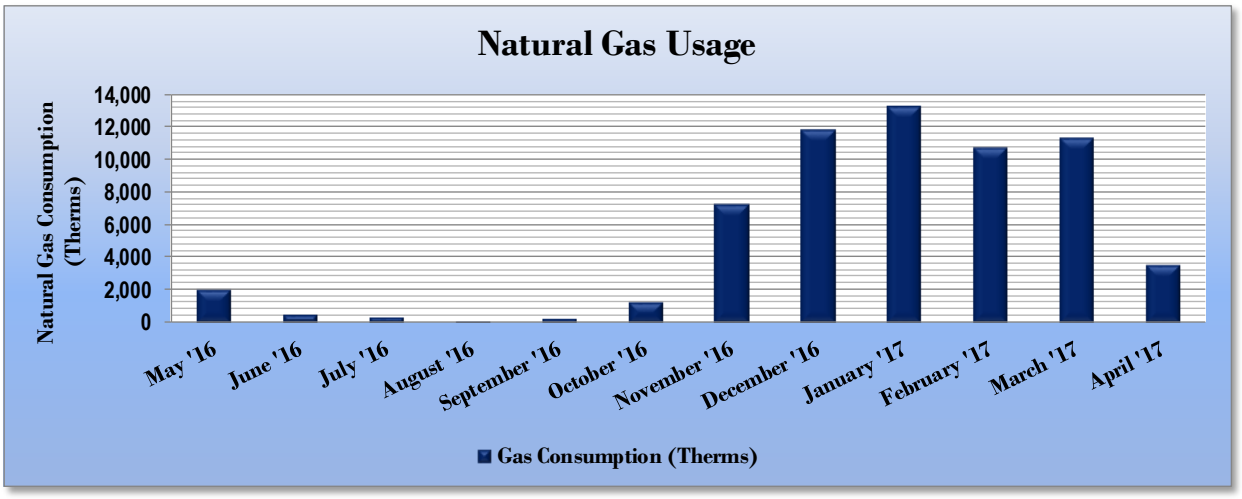


Figure 12 - Natural Gas Usage

Gas Billing Data for Marlboro Middle School				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
5/31/16	32	2,020	$2,487	No
6/30/16	30	549	$1,275	No
8/1/16	32	388	$900	Yes
8/29/16	28	2	$825	No
9/27/16	29	293	$1,062	No
10/27/16	30	1,237	$2,159	No
11/29/16	33	7,283	$7,686	No
12/30/16	31	11,795	$11,837	No
1/31/17	32	13,254	$13,165	No
3/1/17	29	10,746	$11,745	No
3/31/17	30	11,342	$11,442	No
5/1/17	31	3,516	$3,899	No
Totals	**367**	**62,426**	**$68,482**	
Annual	**365**	**62,086**	**$68,109**	

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 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Marlboro Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	122.6	141.4
Site Energy Use Intensity (kBtu/ft^2)	59.8	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 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Marlboro Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	93.9	141.4
Site Energy Use Intensity (kBtu/ft^2)	50.7	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 56.

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

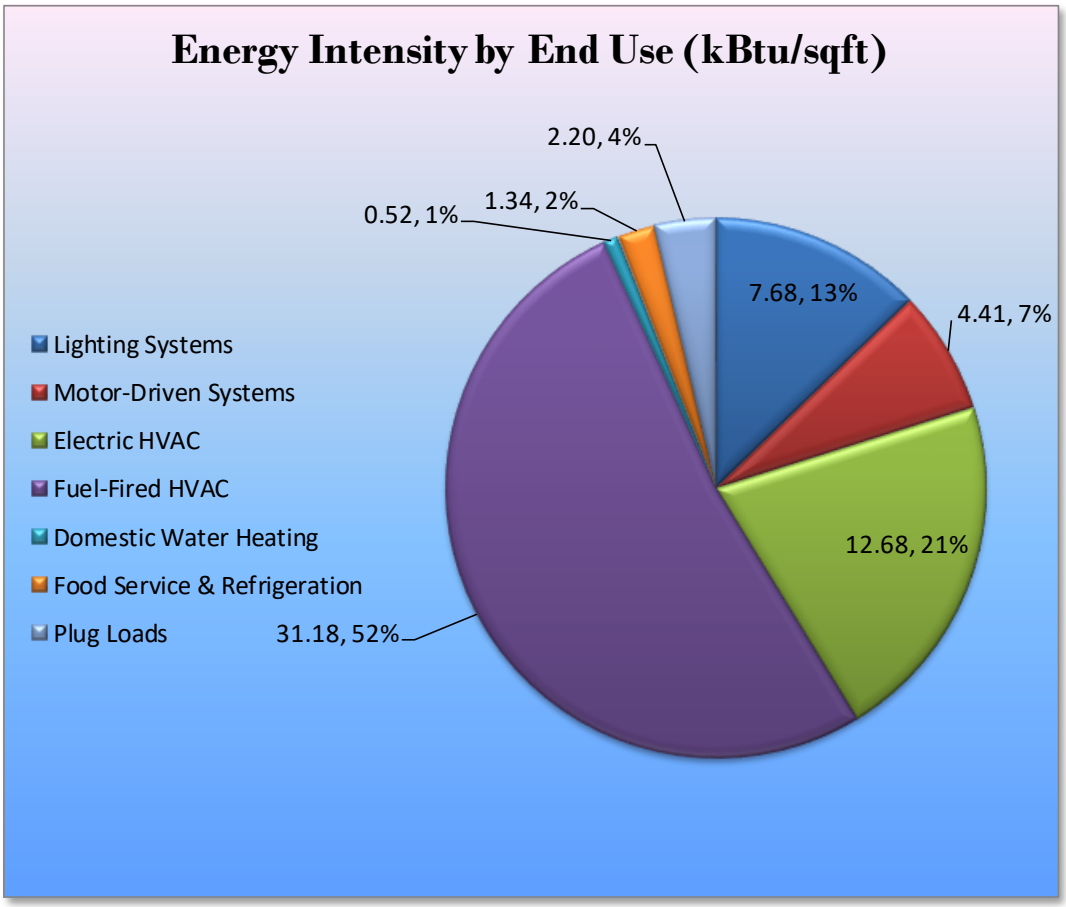
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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

Figure 15 - 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 Marlboro Middle 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 16 – 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		**244,917**	**62.9**	**0.0**	**$32,390.55**	**$253,216.34**	**$29,870.00**	**$223,346.34**	**6.9**	**246,629**
ECM 1	Install LED Fixtures	61,352	10.9	0.0	$8,113.91	$95,044.80	$3,810.00	$91,234.80	11.2	61,781
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	56	0.0	0.0	$7.36	$289.50	$15.00	$274.50	37.3	56
ECM 3	Retrofit Fixtures with LED Lamps	170,632	51.1	0.0	$22,566.25	$150,353.19	$26,045.00	$124,308.19	5.5	171,825
ECM 4	Install LED Exit Signs	12,877	0.8	0.0	$1,703.03	$7,528.85	$0.00	$7,528.85	4.4	12,967
Lighting Control Measures		**48,620**	**14.4**	**0.0**	**$6,430.02**	**$83,934.00**	**$9,925.00**	**$74,009.00**	**11.5**	**48,960**
ECM 5	Install Occupancy Sensor Lighting Controls	45,648	13.6	0.0	$6,036.95	$76,104.00	$9,925.00	$66,179.00	11.0	45,967
ECM 6	Install High/Low Lighitng Controls	2,972	0.9	0.0	$393.07	$7,830.00	$0.00	$7,830.00	19.9	2,993
Variable Frequency Drive (VFD) Measures		**58,676**	**12.9**	**0.0**	**$7,759.93**	**$32,527.45**	**$4,800.00**	**$27,727.45**	**3.6**	**59,086**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	7,430	3.5	0.0	$982.62	$5,194.45	$1,200.00	$3,994.45	4.1	7,482
ECM 8	Install VFDs on Chilled Water Pumps	20,282	6.2	0.0	$2,682.28	$16,944.10	$3,600.00	$13,344.10	5.0	20,424
ECM 9	Install VFDs on Hot Water Pumps	30,964	3.2	0.0	$4,095.03	$10,388.90	$0.00	$10,388.90	2.5	31,181
Electric Chiller Replacement		**176,523**	**118.3**	**0.0**	**$23,345.34**	**$272,190.40**	**$31,280.00**	**$240,910.40**	**10.3**	**177,757**
ECM 10	Install High Efficiency Chillers	176,523	118.3	0.0	$23,345.34	$272,190.40	$31,280.00	$240,910.40	10.3	177,757
Plug Load Equipment Control - Vending Machine		**4,836**	**0.0**	**0.0**	**$639.50**	**$690.00**	**$0.00**	**$690.00**	**1.1**	**4,869**
ECM 11	Vending Machine Control	4,836	0.0	0.0	$639.50	$690.00	$0.00	$690.00	1.1	4,869
TOTALS		**533,570**	**208.5**	**0.0**	**$70,565.35**	**$642,558.19**	**$75,875.00**	**$566,683.19**	**8.0**	**537,301**

* - 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).

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 17 below.

Figure 17 – 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		**244,917**	**62.9**	**0.0**	**$32,390.55**	**$253,216.34**	**$29,870.00**	**$223,346.34**	**6.9**	**246,629**
ECM 1	Install LED Fixtures	61,352	10.9	0.0	$8,113.91	$95,044.80	$3,810.00	$91,234.80	11.2	61,781
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	56	0.0	0.0	$7.36	$289.50	$15.00	$274.50	37.3	56
ECM 3	Retrofit Fixtures with LED Lamps	170,632	51.1	0.0	$22,566.25	$150,353.19	$26,045.00	$124,308.19	5.5	171,825
ECM 4	Install LED Exit Signs	12,877	0.8	0.0	$1,703.03	$7,528.85	$0.00	$7,528.85	4.4	12,967

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 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	17,355	5.2	0.0	$2,295.23	$73,944.80	$880.00	$73,064.80	31.8	17,476
Exterior	43,997	5.7	0.0	$5,818.68	$21,100.00	$2,930.00	$18,170.00	3.1	44,305

Measure Description

We recommend replacing gym interior fixtures containing multiple pin base CFLs, and high intensity discharge (HID) fixtures in the main hallway and auditorium with new LED light fixtures. We similarly recommend replacing the exterior pole and building mounted HID fixtures 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 which are more than twice that of fluorescent or HID sources.

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	56	0.0	0.0	$7.36	$289.50	$15.00	$274.50	37.3	56
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T12 fluorescent fixtures 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. There are very few T12 fixtures which were likely overlooked during a past retrofit project. We located T12 lamps in the men's restroom and electrical closet.

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

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	167,983	50.8	0.0	$22,215.92	$148,913.19	$26,045.00	$122,868.19	5.5	169,157
Exterior	2,649	0.3	0.0	$350.34	$1,440.00	$0.00	$1,440.00	4.1	2,668

Measure Description

We recommend retrofitting existing incandescent, CFL, and linear fluorescent lamps 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 which are more than twice that of a fluorescent tube and more than 10 times longer than many incandescent lamps.

ECM 4: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	12,877	0.8	0.0	$1,703.03	$7,528.85	$0.00	$7,528.85	4.4	12,967
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 18 below.

Figure 18 – 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		**48,620**	**14.4**	**0.0**	**$6,430.02**	**$83,934.00**	**$9,925.00**	**$74,009.00**	**11.5**	**48,960**
ECM 5	Install Occupancy Sensor Lighting Controls	45,648	13.6	0.0	$6,036.95	$76,104.00	$9,925.00	$66,179.00	11.0	45,967
ECM 6	Install High/Low Lighitng Controls	2,972	0.9	0.0	$393.07	$7,830.00	$0.00	$7,830.00	19.9	2,993

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

ECM 5: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
45,648	13.6	0.0	$6,036.95	$76,104.00	$9,925.00	$66,179.00	11.0	45,967

Measure Description

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

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

ECM 6: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,972	0.9	0.0	$393.07	$7,830.00	$0.00	$7,830.00	19.9	2,993

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 measure for Marlboro Middle School's interior hallways. Other typical areas for this type of control are stairwells, parking lots, and parking garages.

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

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

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

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 19 below. Prior to installing a VFD, it is recommended to verify that the motor identified for control is inverter duty rated and assessed for compatibility with the VFD. In some cases, motors may need to be replaced.

Figure 19 – 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		**58,676**	**12.9**	**0.0**	**$7,759.93**	**$32,527.45**	**$4,800.00**	**$27,727.45**	**3.6**	**59,086**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	7,430	3.5	0.0	$982.62	$5,194.45	$1,200.00	$3,994.45	4.1	7,482
ECM 8	Install VFDs on Chilled Water Pumps	20,282	6.2	0.0	$2,682.28	$16,944.10	$3,600.00	$13,344.10	5.0	20,424
ECM 9	Install VFDs on Hot Water Pumps	30,964	3.2	0.0	$4,095.03	$10,388.90	$0.00	$10,388.90	2.5	31,181

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

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
7,430	3.5	0.0	$982.62	$5,194.45	$1,200.00	$3,994.45	4.1	7,482

Measure Description

We recommend installing a variable frequency drive (VFD) to control the main gym supply fan motor speed. This will enable the constant-volume, single-zone air handling system to be converted 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. For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing will have to be determined during the final project design. The control system should be programmed to maintain the minimum air flow whenever the compressor is operating.

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)
20,282	6.2	0.0	$2,682.28	$16,944.10	$3,600.00	$13,344.10	5.0	20,424

Measure Description

We recommend installing a variable frequency drives (VFD) to control the chilled water pumps. 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)
30,964	3.2	0.0	$4,095.03	$10,388.90	$0.00	$10,388.90	2.5	31,181

Measure Description

We recommend installing variable frequency drives (VFDs) to control the two 15 HP hot water pumps. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.4 Electric Chiller Replacement

Our recommendations for electric chiller replacements are summarized in Figure 20 below.

Figure 20-Summary of Electric Chiller Replacement 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)
Electric Chiller Replacement		**176,523**	**118.3**	**0.0**	**$23,345.34**	**$272,190.40**	**$31,280.00**	**$240,910.40**	**10.3**	**177,757**
ECM 10	Install High Efficiency Chillers	176,523	118.3	0.0	$23,345.34	$272,190.40	$31,280.00	$240,910.40	10.3	177,757

ECM 10: Install High Efficiency Chillers

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)
176,523	118.3	0.0	$23,345.34	$272,190.40	$31,280.00	$240,910.40	10.3	177,757

Measure Description

We typically recommend replacing older inefficient electric chillers with new high efficiency chillers. This measure pertains to the air-cooled screw chiller that serves the D Wing. The type of chiller to be installed depends on the magnitude of the cooling load and variability of the cooling load profile. Positive displacement chillers are usually under 600 tons of cooling capacity and centrifugal chillers generally start at 150 tons of cooling capacity. Constant speed chillers should be used to meet cooling loads with little or no variation while variable speed chillers are more efficient for variable cooling load profiles. Water cooled chillers are more efficient than air cooled chillers but require cooling towers and additional pumps to circulate the cooling water. In any given size range variable speed chillers tend to have better partial load efficiency, but worse full load efficiency, than constant speed chillers.

The savings result from the improvement in chiller efficiency and matching the right type of chiller to the cooling load. The energy savings associated with this measure is based on the cooling capacity of the new chiller, the improvement in efficiency compared with the base case equipment, the cooling load profile, and the estimated annual operating hours of the chiller before and after the upgrade. Energy savings are maximized by proper selection of new equipment based on the cooling load profile.

4.1.5 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 21 below.

Figure 21-Summary of Plug Load Equipment Controls 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		**4,836**	**0.0**	**0.0**	**$639.50**	**$690.00**	**$0.00**	**$690.00**	**1.1**	**4,869**
ECM 11	Vending Machine Control	4,836	0.0	0.0	$639.50	$690.00	$0.00	$690.00	1.1	4,869

ECM 11: 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)
4,836	0.0	0.0	$639.50	$690.00	$0.00	$690.00	1.1	4,869

Measure Description

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

4.2 ECMs Evaluated But Not Recommended

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

Figure 22 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades	**2,448**	**1.3**	**0.0**	**$323.77**	**$11,836.46**	**$0.00**	**$11,836.46**	**36.6**	**2,465**
Premium Efficiency Motors	2,448	1.3	0.0	$323.77	$11,836.46	$0.00	$11,836.46	36.6	2,465
Electric Unitary HVAC Measures	**48,483**	**19.4**	**0.0**	**$6,411.99**	**$368,955.58**	**$21,798.00**	**$347,157.58**	**54.1**	**48,822**
Install High Efficiency Electric AC	48,483	19.4	0.0	$6,411.99	$368,955.58	$21,798.00	$347,157.58	54.1	48,822
Gas Heating (HVAC/Process) Replacement	**0**	**0.0**	**311.9**	**$3,421.51**	**$220,882.84**	**$1,200.00**	**$219,682.84**	**64.2**	**36,519**
Install High Efficiency Hot Water Boilers	0	0.0	278.4	$3,053.63	$215,082.56	$0.00	$215,082.56	70.4	32,592
Install High Efficiency Furnaces	0	0.0	33.5	$367.88	$5,800.28	$1,200.00	$4,600.28	12.5	3,926
TOTALS	**50,932**	**20.6**	**311.9**	**$10,157.27**	**$601,674.87**	**$22,998.00**	**$578,676.87**	**57.0**	**87,806**

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

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

Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,448	1.3	0.0	$323.77	$11,836.46	$0.00	$11,836.46	36.6	2,465

Measure Description

We evaluated replacing standard efficiency motors 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.

Reasons for not Recommending

The simple payback for replacing the existing electric motors at this site with new premium efficiency motors, at over 40 years, exceeds the expected useful life of the equipment and is therefore not recommended on the basis of energy savings. Fortunately, if the VFD measure requires that new motors be installed, the VFD measures in combination with motor replacements remain cost effective in combination.

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)
48,483	19.4	0.0	$6,411.99	$368,955.58	$21,798.00	$347,157.58	54.1	48,822

Measure Description

We evaluated replacement of the older (20 year+) standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Reasons for not Recommending

The simple payback for replacing the older AC units at this site with new high efficiency units, at over 50 years, exceeds the expected useful life of the equipment and is therefore not recommended on the basis of energy savings alone. However, the site may wish to consider replacement for other reasons, including for maintenance savings and reliability.

Install High Efficiency Hot Water Boilers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	278.4	$3,053.63	$215,082.56	$0.00	$215,082.56	70.4	32,592

Measure Description

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

The most notable efficiency improvement is condensing hydronic boilers that can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F. Therefore, condensing hydronic boilers should only be considered when the return water temperature can be less than 130°F during most of the operating hours. An evaluation of the boiler heating loop, including return water temperature, should be conducted as part of a boiler system replacement design.

Reasons for not Recommending

The simple payback for replacing the existing boilers at this site with new high efficiency boilers, at approximately 70 years, exceeds the expected useful life of the equipment and is therefore not recommended on the basis of energy savings alone. However, the site may wish to consider replacement for other reasons, including for maintenance savings and reliability.

Install High Efficiency Furnaces

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	33.5	$367.88	$5,800.28	$1,200.00	$4,600.28	12.5	3,926

Measure Description

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

Reasons for not Recommending

These furnaces are part of the packaged AC units and the simple payback for replacing the existing packaged AC units at this site with new high efficiency packaged AC units, at over 50 years, exceeds the expected useful life of the equipment and is therefore not recommended based on energy savings alone. However, the site may wish to consider replacement for other reasons, including for maintenance savings and reliability.

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.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

Perform Routine Motor Maintenance

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

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.

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 Furnace Maintenance

Preventative furnace maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should include tasks such as checking for gas / carbon monoxide leaks; changing the air and fuel filters; checking components for cracks, corrosion, dirt, or debris build-up; ensuring the ignition system is working properly; testing and adjusting operation and safety controls; inspecting the electrical connections; and ensuring proper lubrication for motors and bearings.

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.

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 gpf and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

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.

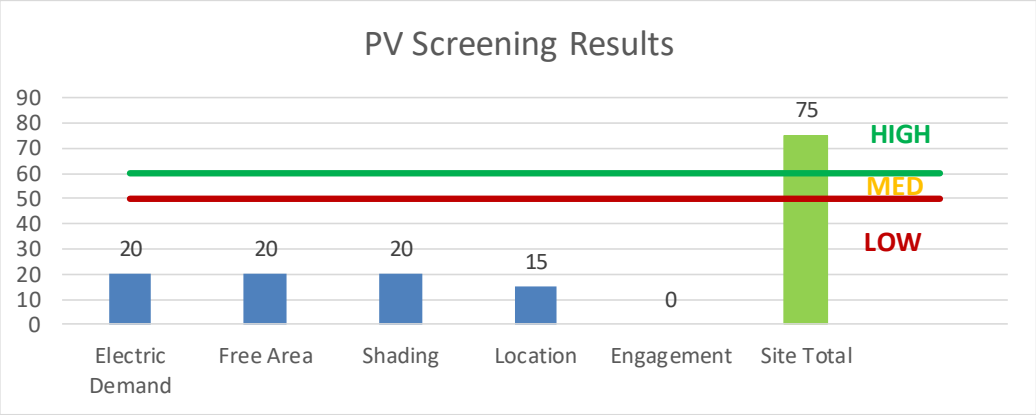
6.1 Photovoltaic

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 may be feasible. If Marlboro Middle School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 23 - 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:

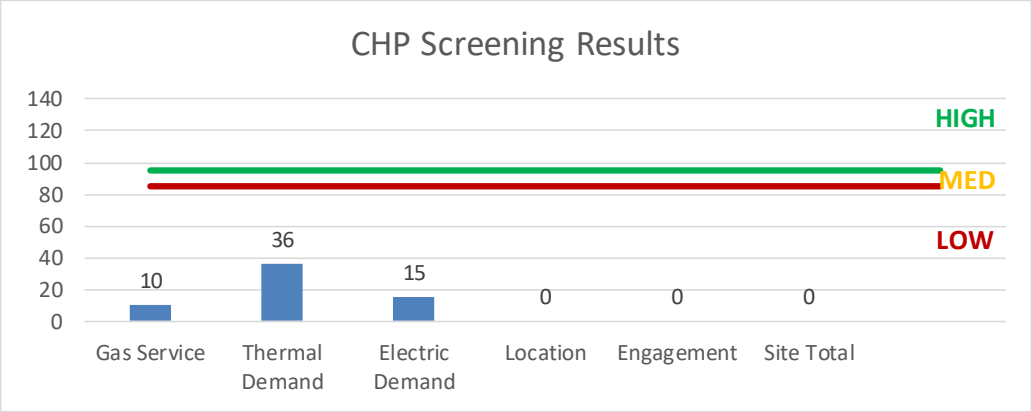
- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-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 **Low** potential for installing a cost-effective CHP system. Low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

Figure 24 - Combined Heat and Power Screening



7 DEMAND RESPONSE

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

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

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

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

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

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (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 site is not a good candidate for DR.

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

Figure 25 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	X	X
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X	X
ECM 3	Retrofit Fixtures with LED Lamps	X	X
ECM 4	Install LED Exit Signs		X
ECM 5	Install Occupancy Sensor Lighting Controls	X	X
ECM 6	Install High/Low Lighitng Controls		X
ECM 7	Install VFDs on Constant Volume (CV) HVAC	X	X
ECM 8	Install VFDs on Chilled Water Pumps	X	X
ECM 9	Install VFDs on Hot Water Pumps		X
ECM 10	Install High Efficiency Chillers	X	X
ECM 11	Vending Machine Control		X

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 Pay for Performance - Existing Buildings

Overview

The Pay for Performance – Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

Incentives

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

How to Participate

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors) or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

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

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.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

If your facility is not purchasing electricity from a third-party supplier, consider shopping for a reduced rate from third-party electric suppliers. If your facility is purchasing electricity from a third-party supplier, review and compare prices at the end of the current contract or every couple years.

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

9.2 Retail Natural Gas Supply Options

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

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

If your facility is not purchasing natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility is purchasing natural gas from a third-party supplier, review and compare prices at the end of the current contract or every couple years.

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	30	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,920	Relamp	No	30	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,920	0.30	1,008	0.0	$133.31	$1,077.00	$150.00	6.95
Wall pack	11	Compact Fluorescent: CFL Pin Base 42 W - 2 L	Wall Switch	84	4,380	Relamp	No	11	LED Screw-In Lamps: Outdoor Porch Wall Mount	Wall Switch	59	4,380	0.18	1,396	0.0	$184.66	$660.00	$0.00	3.57
Pole with double	12	Mercury Vapor: (2) 250W Lamp	Wall Switch	580	4,380	Fixture Replacement	No	12	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	174	4,380	3.19	24,540	0.0	$3,245.48	$8,400.00	$1,200.00	2.22
Pole with single	15	Mercury Vapor: (1) 250W Lamp	Wall Switch	290	4,380	Fixture Replacement	No	15	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	87	4,380	2.00	15,338	0.0	$2,028.43	$7,500.00	$1,500.00	2.96
Pole with double	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	156	4,380	None	No	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	156	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pole with single	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	78	4,380	None	No	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	78	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Flood lights on walls	4	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	295	4,380	Fixture Replacement	No	4	LED - Fixtures: Outdoor Porch Wall Mount	Wall Switch	89	4,380	0.54	4,161	0.0	$550.24	$2,000.00	$20.00	3.60
Canopy fixtures	16	Compact Fluorescent: CFL Pin Base 42 W - 1 L	Wall Switch	42	4,380	Relamp	No	16	LED Screw-In Lamps: Outdoor Porch Wall Mount	Wall Switch	29	4,380	0.13	1,015	0.0	$134.30	$480.00	$0.00	3.57
Dec pole fixtures	7	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	78	4,380	None	No	7	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	78	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Wall pack main entrance	10	Compact Fluorescent: CFL Pin Base 42 W - 1 L	Wall Switch	42	4,380	Relamp	No	10	LED Screw-In Lamps: Outdoor Porch Wall Mount	Wall Switch	29	4,380	0.08	635	0.0	$83.93	$300.00	$0.00	3.57
Flood lights on walls	2	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	4,380	Fixture Replacement	No	2	LED - Fixtures: Outdoor Porch Wall Mount	Wall Switch	140	4,380	0.43	3,279	0.0	$433.66	$1,600.00	$10.00	3.67
Pole with single	2	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	4,380	Fixture Replacement	No	2	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	140	4,380	0.43	3,279	0.0	$433.66	$1,600.00	$200.00	3.23
Cafeteria A	25	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	25	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	1.20	4,052	0.0	$535.84	$3,188.33	$605.00	4.82
Cafeteria A counters	7	Incandescent: 75 W - 1 L	Wall Switch	75	1,920	Relamp	Yes	7	LED Screw-In Lamps: Downlight Recessed	Occupancy Sensor	11	1,344	0.31	1,037	0.0	$137.21	$646.27	$70.00	4.20
kitchen	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,920	0.04	124	0.0	$16.35	$95.13	$20.00	4.59
kitchen	3	Linear Fluorescent - T8: 2' T8 (17W) - 4L	Wall Switch	63	1,920	Relamp	Yes	3	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	1,344	0.08	260	0.0	$34.34	$499.60	$95.00	11.78
Cafeteria B	25	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	25	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	1.20	4,052	0.0	$535.84	$3,188.33	$605.00	4.82
Cafeteria B counters	7	Incandescent: 75 W - 1 L	Wall Switch	75	1,920	Relamp	Yes	7	LED Screw-In Lamps: Downlight Recessed	Occupancy Sensor	11	1,344	0.31	1,037	0.0	$137.21	$646.27	$70.00	4.20
Café b kitchen	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,920	0.04	124	0.0	$16.35	$95.13	$20.00	4.59
Café b kitchen	3	Linear Fluorescent - T8: 2' T8 (17W) - 4L	Wall Switch	63	1,920	Relamp	Yes	3	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	1,344	0.08	260	0.0	$34.34	$499.60	$95.00	11.78
main kitchen	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.33	1,105	0.0	$146.12	$1,242.00	$190.00	7.20
main kitchen	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	0.19	648	0.0	$85.73	$650.53	$115.00	6.25
Main office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$266.40	$50.00	5.92
Locker room office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.05	184	0.0	$24.35	$233.00	$40.00	7.92
Main entrance	7	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	7	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,344	0.18	601	0.0	$79.51	$712.40	$35.00	8.52

	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
Main hallway	7	Metal Halide: (1) 250W Lamp	Wall Switch	295	1,920	Fixture Replacement	Yes	7	LED - Fixtures: Stairwell/Passageway Lighting	High/Low Control	89	1,344	1.07	3,602	0.0	$476.37	$3,770.00	$280.00	7.33
Main hallway	19	Incandescent: 100 W - 1 L	Wall Switch	100	1,920	Relamp	Yes	19	LED Screw-In Lamps: Stairwell/Passageway Lighting	High/Low Control	15	1,344	1.11	3,755	0.0	$496.56	$1,561.31	$95.00	2.95
Gym	24	Compact Fluorescent: CFL Pin Base 42 W - 9 L	Wall Switch	378	1,920	Fixture Replacement	Yes	24	LED - Fixtures: High-Bay	Occupancy Sensor	265	1,344	3.03	10,216	0.0	$1,351.05	$64,444.80	$840.00	47.08
Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	380	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	380	0.05	31	0.0	$4.05	$143.60	$20.00	30.55
Gym office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73
Gym RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,920	0.03	109	0.0	$14.45	$75.20	$15.00	4.16
Locker room hallway	7	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	7	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	1,344	0.18	601	0.0	$79.51	$712.40	$0.00	8.96
Girls locker room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.14	460	0.0	$60.88	$562.50	$85.00	7.84
Boys locker room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.14	460	0.0	$60.88	$562.50	$85.00	7.84
Custodian office	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	0.24	810	0.0	$107.17	$745.67	$135.00	5.70
Custodian office hallway	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	1,344	0.05	172	0.0	$22.72	$396.40	$0.00	17.45
custodian office	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,344	0.05	172	0.0	$22.72	$242.40	$20.00	9.79
mens RR	1	Linear Fluorescent - T12: 2' T12 (20W) - 1L	Wall Switch	25	1,920	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,920	0.01	36	0.0	$4.82	$93.50	$5.00	18.37
mens RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,920	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,920	0.01	39	0.0	$5.11	$35.90	$5.00	6.05
Supply room	23	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,920	Relamp	No	23	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,920	0.26	889	0.0	$117.53	$825.70	$115.00	6.05
Supply room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.06	219	0.0	$28.91	$175.50	$30.00	5.03
Custodian office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.05	184	0.0	$24.35	$233.00	$40.00	7.92
Alternate gym entrance	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,920	0.02	64	0.0	$8.47	$63.20	$0.00	7.46
stock room	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,920	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,920	0.03	116	0.0	$15.33	$107.70	$15.00	6.05
GRR + BRR	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,344	0.15	515	0.0	$68.16	$649.20	$35.00	9.01
Janitor closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	380	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	380	0.02	15	0.0	$2.02	$71.80	$10.00	30.55
122 CR	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.74	2,486	0.0	$328.78	$1,893.60	$340.00	4.73
CR 121	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.66	2,210	0.0	$292.24	$1,743.20	$310.00	4.90
CR 124 - lecture hall	50	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	50	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	1.37	4,604	0.0	$608.84	$4,275.00	$675.00	5.91
CR 124 - lecture hall	12	Halogen Incandescent: 100 W - 1 L	Wall Switch	100	1,920	Relamp	Yes	12	LED Screw-In Lamps: High-Bay	Occupancy Sensor	15	1,344	0.70	2,371	0.0	$313.62	$1,185.04	$70.00	3.56

	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
CR 124 mini theater hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.11	368	0.0	$48.71	$504.00	$40.00	9.53
supply room by mini theater	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.04	146	0.0	$19.27	$117.00	$20.00	5.03
supply room by mini theater	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,920	0.02	64	0.0	$8.47	$63.20	$0.00	7.46
stairwell - by mini theater	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.19	645	0.0	$85.24	$679.50	$105.00	6.74
office - special services	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.25	829	0.0	$109.59	$721.20	$125.00	5.44
special services hall	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.02	73	0.0	$9.64	$58.50	$10.00	5.03
special services office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73
special services office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.08	276	0.0	$36.53	$445.50	$65.00	10.42
main hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.16	552	0.0	$73.06	$621.00	$60.00	7.68
nurses' office suite	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	1,344	Relamp	No	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,344	0.09	216	0.0	$28.62	$287.20	$40.00	8.64
nurses's RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,920	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,920	0.01	39	0.0	$5.11	$35.90	$5.00	6.05
nurse's supply	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	1,344	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,344	0.05	108	0.0	$14.31	$143.60	$20.00	8.64
nurse's closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	380	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	380	0.01	8	0.0	$1.01	$35.90	$5.00	30.55
main office	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.21	691	0.0	$91.33	$646.00	$110.00	5.87
main offcie suite	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.37	1,243	0.0	$164.39	$946.80	$170.00	4.73
VP office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.16	552	0.0	$73.06	$570.80	$95.00	6.51
secret office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.16	552	0.0	$73.06	$570.80	$95.00	6.51
VP office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73
conference office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.16	552	0.0	$73.06	$570.80	$95.00	6.51
Principal's office	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.29	967	0.0	$127.86	$796.40	$140.00	5.13
Principal's office	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,344	0.03	93	0.0	$12.32	$212.40	$40.00	13.99
Principal's RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.02	73	0.0	$9.64	$58.50	$10.00	5.03
Guidance office hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,344	0.08	276	0.0	$36.53	$420.40	$30.00	10.69
Guidance office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.12	414	0.0	$54.80	$495.60	$80.00	7.58
Guidance office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73

	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
Guidance conference room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73
Guidance suite	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.25	829	0.0	$109.59	$721.20	$125.00	5.44
Guidance suite	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.01	35	0.0	$4.67	$48.20	$10.00	8.18
Guidance office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73
Guidance office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73
Guidance office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73
Guidance conference room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.16	552	0.0	$73.06	$570.80	$95.00	6.51
C wing hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,344	0.33	1,105	0.0	$146.12	$871.60	$120.00	5.14
C wing hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,344	0.12	414	0.0	$54.80	$495.60	$45.00	8.22
D wing entrance	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.04	146	0.0	$19.27	$117.00	$20.00	5.03
D wing hallway	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.14	460	0.0	$60.88	$562.50	$50.00	8.42
CR 161	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.22	737	0.0	$97.41	$738.00	$115.00	6.40
CR 161	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.01	35	0.0	$4.67	$48.20	$10.00	8.18
CR 160	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.49	1,657	0.0	$219.18	$1,442.40	$250.00	5.44
electric closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
CR 162 - music	27	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	27	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	1.11	3,729	0.0	$493.16	$2,840.40	$510.00	4.73
Teacher's lounge	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.29	967	0.0	$127.86	$796.40	$140.00	5.13
kitchen office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.16	552	0.0	$73.06	$570.80	$95.00	6.51
D wing main entrance	10	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	Yes	10	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,344	0.14	466	0.0	$61.61	$752.00	$135.00	10.01
D wing main entrance	21	Compact Fluorescent: CFL Pin Base 42 W - 2 L	Wall Switch	84	1,920	Relamp	Yes	21	LED Screw-In Lamps: Downlight Pendant	Occupancy Sensor	59	1,344	0.59	1,986	0.0	$262.70	$1,860.00	$105.00	6.68
D wing vestibule	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.02	71	0.0	$9.34	$96.40	$20.00	8.18
GRR+BRR	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.16	552	0.0	$73.06	$621.00	$95.00	7.20
electric closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
LAN room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.02	73	0.0	$9.64	$58.50	$10.00	5.03
driving hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.16	552	0.0	$73.06	$621.00	$60.00	7.68

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
CR 166	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	1.31	4,420	0.0	$584.49	$3,486.40	$620.00	4.90
CR 164	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.98	3,315	0.0	$438.37	$2,614.80	$465.00	4.90
CR 167	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	1.31	4,420	0.0	$584.49	$3,486.40	$620.00	4.90
CR 167 closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43
CR 167 closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
D wing side exit vestibule	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.04	146	0.0	$19.27	$117.00	$20.00	5.03
D wing stairwell	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.14	460	0.0	$60.88	$562.50	$85.00	7.84
auditorium stage	27	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	27	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.74	2,486	0.0	$328.78	$2,389.50	$375.00	6.13
auditorium	17	Compact Fluorescent: CFL Pin Base 42 W - 3 L	Wall Switch	126	1,920	Relamp	Yes	17	LED Screw-In Lamps: Downlight Pendant	Occupancy Sensor	88	1,344	0.72	2,412	0.0	$319.00	$1,560.00	$70.00	4.67
auditorium	12	Mercury Vapor: (2) 250W Lamp	Wall Switch	580	1,920	Fixture Replacement	Yes	12	LED - Fixtures: Architectural Flood/Spot Luminaire	Occupancy Sensor	174	1,344	3.60	12,140	0.0	$1,605.59	$6,540.00	$670.00	3.66
auditorium	12	Compact Fluorescent: CFL Pin Base 26 W - 2 L	Wall Switch	52	1,920	Relamp	Yes	12	LED Screw-In Lamps: Downlight Pendant	Occupancy Sensor	36	1,344	0.21	703	0.0	$92.93	$900.00	$70.00	8.93
lighiting control room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.05	184	0.0	$24.35	$233.00	$40.00	7.92
D wing stairwell	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.14	460	0.0	$60.88	$562.50	$85.00	7.84
A wing	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.08	276	0.0	$36.53	$445.50	$65.00	10.42
BRR+GRR	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,344	0.15	515	0.0	$68.16	$649.20	$35.00	9.01
Rec RR(2)	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	1,920	Relamp	Yes	2	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,344	0.02	71	0.0	$9.37	$333.80	$45.00	30.81
Rec RR(2)	4	Compact Fluorescent: CFL Pin Base 26 W - 1 L	Wall Switch	26	1,920	Relamp	Yes	2	LED Screw-In Lamps: Downlight Recessed	Occupancy Sensor	18	1,344	0.05	173	0.0	$22.93	$330.00	$35.00	12.87
A wing stiarwell	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.33	1,105	0.0	$146.12	$1,242.00	$190.00	7.20
A wing elec closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
A wing locker room	37	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	37	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	1.01	3,407	0.0	$450.54	$3,244.50	$510.00	6.07
A wing closet	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	380	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	380	0.05	31	0.0	$4.05	$143.60	$20.00	30.55
A wing cafeteria	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.12	414	0.0	$54.80	$495.60	$80.00	7.58
A wing hallway	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.02	71	0.0	$9.34	$96.40	$20.00	8.18
A wing cafeteria	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.33	1,105	0.0	$146.12	$1,242.00	$190.00	7.20
A wing gym hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.16	552	0.0	$73.06	$621.00	$60.00	7.68

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Girls locker room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.08	276	0.0	$36.53	$445.50	$65.00	10.42
Boys locker room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.11	368	0.0	$48.71	$504.00	$75.00	8.81
A wing gym	8	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	Yes	8	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,344	0.11	373	0.0	$49.29	$655.60	$115.00	10.97
A wing supply closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43
Office 134	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.22	737	0.0	$97.41	$738.00	$115.00	6.40
Office RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.02	73	0.0	$9.64	$58.50	$10.00	5.03
CR 133	34	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	34	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.93	3,131	0.0	$414.01	$3,069.00	$480.00	6.25
CR 133 supply	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.04	146	0.0	$19.27	$117.00	$20.00	5.03
CR 133 supply entrance	2	Compact Fluorescent: CFL Pin Base 26 W - 1 L	Wall Switch	26	1,920	Relamp	No	2	LED Screw-In Lamps: Downlight Recessed	Wall Switch	18	1,920	0.01	34	0.0	$4.56	$60.00	$0.00	13.17
CR 133 supply entrance	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.01	35	0.0	$4.67	$48.20	$10.00	8.18
CR 132	45	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	45	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	1.23	4,143	0.0	$547.96	$3,982.50	$625.00	6.13
CR 132 closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
CR 132 closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43
CR 132 office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.11	368	0.0	$48.71	$504.00	$75.00	8.81
CR 131 eng design	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.57	1,934	0.0	$255.71	$2,038.50	$315.00	6.74
CR 131closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	380	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	380	0.01	8	0.0	$1.01	$35.90	$5.00	30.55
Curing elec	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.02	73	0.0	$9.64	$58.50	$10.00	5.03
curing 117 (tech)	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.05	184	0.0	$24.35	$387.00	$55.00	13.63
Bwing stiarwell	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.33	1,105	0.0	$146.12	$1,242.00	$190.00	7.20
B wing elec closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
B wing locker room	37	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	37	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	1.01	3,407	0.0	$450.54	$3,244.50	$510.00	6.07
B wing closet	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	380	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	380	0.05	31	0.0	$4.05	$143.60	$20.00	30.55
B wing cafeteria	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.12	414	0.0	$54.80	$495.60	$80.00	7.58
Bwing hallway	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.02	71	0.0	$9.34	$96.40	$20.00	8.18
B wing cafeteria	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.33	1,105	0.0	$146.12	$1,242.00	$190.00	7.20

	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
B wing gym hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.16	552	0.0	$73.06	$621.00	$60.00	7.68
Girls locker room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.08	276	0.0	$36.53	$445.50	$65.00	10.42
Boys locker room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.11	368	0.0	$48.71	$504.00	$75.00	8.81
B wing gym	8	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	Yes	8	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,344	0.11	373	0.0	$49.29	$655.60	$115.00	10.97
B wing supply closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43
Office 113	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.25	829	0.0	$109.59	$721.20	$125.00	5.44
CR 112	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.25	829	0.0	$109.59	$721.20	$125.00	5.44
Office 134	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.22	737	0.0	$97.41	$738.00	$115.00	6.40
Office RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.02	73	0.0	$9.64	$58.50	$10.00	5.03
CR 133	34	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	34	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.93	3,131	0.0	$414.01	$3,069.00	$480.00	6.25
CR 133 supply	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.04	146	0.0	$19.27	$117.00	$20.00	5.03
CR 133 supply entrance	2	Compact Fluorescent: CFL Pin Base 26 W - 1 L	Wall Switch	26	1,920	Relamp	No	2	LED Screw-In Lamps: Downlight Recessed	Wall Switch	18	1,920	0.01	34	0.0	$4.56	$60.00	$0.00	13.17
CR 133 supply entrance	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.01	35	0.0	$4.67	$48.20	$10.00	8.18
CR 132	45	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	45	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	1.23	4,143	0.0	$547.96	$3,982.50	$625.00	6.13
CR 132 closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
CR 132 closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43
CR 132 office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.11	368	0.0	$48.71	$504.00	$75.00	8.81
CR 131 eng design	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.57	1,934	0.0	$255.71	$2,038.50	$315.00	6.74
CR 131closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	380	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	380	0.01	8	0.0	$1.01	$35.90	$5.00	30.55
B wing second	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.16	552	0.0	$73.06	$570.80	$95.00	6.51
GRR+BRR	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,344	0.15	515	0.0	$68.16	$649.20	$35.00	9.01
RecRR	2	Compact Fluorescent: CFL Pin Base 26 W - 1 L	Wall Switch	26	1,920	Relamp	Yes	2	LED Screw-In Lamps: Downlight Recessed	Occupancy Sensor	18	1,344	0.02	59	0.0	$7.74	$179.80	$35.00	18.70
RecRR	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,344	0.03	93	0.0	$12.32	$366.40	$55.00	25.27
CR 218 hallway	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.14	460	0.0	$60.88	$562.50	$50.00	8.42
CR 221 - teacher slounge	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.25	829	0.0	$109.59	$796.50	$125.00	6.13

	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
CR 221 closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	380	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	380	0.01	8	0.0	$1.01	$35.90	$5.00	30.55
CR 218,209,205	48	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	48	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	1.31	4,420	0.0	$584.49	$4,158.00	$655.00	5.99
CR 220,221	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	30	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.82	2,762	0.0	$365.31	$2,565.00	$405.00	5.91
CR 219	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.33	1,105	0.0	$146.12	$1,242.00	$190.00	7.20
CR 217,216	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	28	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.77	2,578	0.0	$340.95	$2,448.00	$385.00	6.05
CR 215,214	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.71	2,394	0.0	$316.60	$2,331.00	$365.00	6.21
CR212	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.27	921	0.0	$121.77	$855.00	$135.00	5.91
CR 213	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.53	1,795	0.0	$237.45	$1,517.60	$265.00	5.28
CR 214 hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.19	645	0.0	$85.24	$679.50	$70.00	7.15
CR 212-1	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.22	737	0.0	$97.41	$738.00	$115.00	6.40
closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43
CR 210 hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.16	552	0.0	$73.06	$621.00	$60.00	7.68
206, CR 210, 209, 208	60	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	60	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	1.64	5,524	0.0	$730.61	$5,130.00	$810.00	5.91
CR 222	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	0.29	972	0.0	$128.60	$840.80	$155.00	5.33
CR 222 closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43
CR 222 hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.11	368	0.0	$48.71	$504.00	$40.00	9.53
media center	65	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	65	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	3.13	10,534	0.0	$1,393.18	$8,073.67	$1,545.00	4.69
media center closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
media center closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43
media tech clsoet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.04	146	0.0	$19.27	$117.00	$20.00	5.03
media center closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	380	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	380	0.06	43	0.0	$5.72	$150.40	$30.00	21.04
IT supply	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,920	0.39	1,312	0.0	$173.45	$902.40	$180.00	4.16
IT office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73
IT office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73
IT office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73

	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
IT office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.08	276	0.0	$36.53	$420.40	$65.00	9.73
CR 225, 227	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	0.29	972	0.0	$128.60	$840.80	$155.00	5.33
CR 223	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	0.19	648	0.0	$85.73	$650.53	$115.00	6.25
office 226	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	0.10	324	0.0	$42.87	$460.27	$75.00	8.99
office 226 hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.16	552	0.0	$73.06	$621.00	$60.00	7.68
CR 228	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	0.19	648	0.0	$85.73	$650.53	$115.00	6.25
CR 228 closet	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.06	43	0.0	$5.72	$175.50	$30.00	25.43
Dining 2nd floor hall	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.41	1,381	0.0	$182.65	$1,417.50	$220.00	6.56
CR 250, 251, 252, 253	48	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	48	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	1.97	6,629	0.0	$876.73	$4,959.60	$895.00	4.64
Catwalk	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.02	73	0.0	$9.64	$58.50	$10.00	5.03
CR 254-art	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	0.77	2,593	0.0	$342.94	$2,062.13	$390.00	4.88
CR 254 closet	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.13	87	0.0	$11.44	$351.00	$60.00	25.43
CR 255-art	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,920	Relamp	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,344	0.77	2,593	0.0	$342.94	$2,062.13	$390.00	4.88
229 teacher's lounge	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.25	829	0.0	$109.59	$796.50	$125.00	6.13
elevator hall	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.08	276	0.0	$36.53	$445.50	$65.00	10.42
room 229 hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.16	552	0.0	$73.06	$621.00	$60.00	7.68
CR 230	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.30	1,013	0.0	$133.95	$1,183.50	$180.00	7.49
CR 231, 232, 233, 234 236, 238	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.36	1,197	0.0	$158.30	$1,300.50	$200.00	6.95
CR 235	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.38	1,289	0.0	$170.48	$1,359.00	$210.00	6.74
CR 237/238	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.49	1,657	0.0	$219.18	$1,593.00	$250.00	6.13
CR 239	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.41	1,381	0.0	$182.65	$1,417.50	$220.00	6.56
CR 239 hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.04	146	0.0	$19.27	$117.00	$20.00	5.03
CR 237-2 hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.11	368	0.0	$48.71	$504.00	$40.00	9.53
CR 240 hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.16	552	0.0	$73.06	$621.00	$60.00	7.68
elec closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43

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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
CR 240, 242, 243, 244	60	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	60	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	1.64	5,524	0.0	$730.61	$5,130.00	$810.00	5.91
CR 241, 245	32	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	32	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.87	2,946	0.0	$389.66	$2,952.00	$460.00	6.40
outside hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.16	552	0.0	$73.06	$621.00	$60.00	7.68
GRR+BRR	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.16	552	0.0	$73.06	$621.00	$95.00	7.20
elec closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
CR 316	25	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	25	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.68	2,302	0.0	$304.42	$2,272.50	$355.00	6.30
CR 316 prep	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.12	414	0.0	$54.80	$495.60	$80.00	7.58
CR 315	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	22	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.60	2,026	0.0	$267.89	$2,097.00	$325.00	6.61
CR 315 prep	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.08	276	0.0	$36.53	$445.50	$65.00	10.42
CR 314	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.57	1,934	0.0	$255.71	$2,038.50	$315.00	6.74
CR 314 prep	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.05	184	0.0	$24.35	$387.00	$55.00	13.63
CR 313	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.57	1,934	0.0	$255.71	$2,038.50	$315.00	6.74
CR 312 prep	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.05	184	0.0	$24.35	$387.00	$55.00	13.63
CR 312	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.55	1,841	0.0	$243.54	$1,710.00	$270.00	5.91
CR 311	28	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	28	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	1.15	3,867	0.0	$511.43	$2,915.60	$525.00	4.67
CR 311 closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
CR 311 closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
CR 311 closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	380	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	380	0.03	22	0.0	$2.86	$75.20	$15.00	21.04
CR 311 hallway	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.14	460	0.0	$60.88	$562.50	$50.00	8.42
elec closet	2	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	380	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	380	0.04	28	0.0	$3.64	$196.00	$10.00	51.08
GRR+BRR	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,344	0.15	515	0.0	$68.16	$649.20	$35.00	9.01
PAC RR	2	Incandescent: 40 W - 1 L	Wall Switch	40	1,920	Relamp	Yes	2	LED Screw-In Lamps: Downlight Recessed	Occupancy Sensor	6	1,344	0.05	158	0.0	$20.91	$377.51	$45.00	15.90
PAC RR	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	1,920	Relamp	Yes	2	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,344	0.02	71	0.0	$9.37	$333.80	$45.00	30.81
Janitor closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	380	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	380	0.02	15	0.0	$2.02	$71.80	$10.00	30.55
RR hallways	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.11	368	0.0	$48.71	$504.00	$40.00	9.53

	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
hallway	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.46	1,565	0.0	$207.01	$1,534.50	$170.00	6.59
CR 320, 321, 322, 323, 324, 325	72	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	72	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	2.95	9,944	0.0	$1,315.10	$7,574.40	$1,360.00	4.73
CR 326, 327	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.66	2,210	0.0	$292.24	$1,743.20	$310.00	4.90
Connector hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.08	276	0.0	$36.53	$445.50	$30.00	11.37
elec closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43
GRR+BRR	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.16	552	0.0	$73.06	$621.00	$95.00	7.20
Fac RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.05	184	0.0	$24.35	$387.00	$55.00	13.63
Fac RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.05	184	0.0	$24.35	$387.00	$55.00	13.63
RR hallways	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.04	146	0.0	$19.27	$117.00	$20.00	5.03
elec closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.04	29	0.0	$3.81	$117.00	$20.00	25.43
CR 310 hallway	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,344	0.14	460	0.0	$60.88	$562.50	$50.00	8.42
CR 310	28	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	28	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	1.15	3,867	0.0	$511.43	$2,915.60	$525.00	4.67
CR 309	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.52	1,749	0.0	$231.36	$1,651.50	$260.00	6.01
CR 309 prep	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.05	184	0.0	$24.35	$233.00	$40.00	7.92
CR 308	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.57	1,934	0.0	$255.71	$2,038.50	$315.00	6.74
CR 307	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.57	1,934	0.0	$255.71	$2,038.50	$315.00	6.74
CR 305 hall	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.05	184	0.0	$24.35	$233.00	$40.00	7.92
CR 306	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	28	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.77	2,578	0.0	$340.95	$2,448.00	$385.00	6.05
CR 305	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,344	0.66	2,210	0.0	$292.24	$2,214.00	$345.00	6.40
CR 305 prep	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,920	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,344	0.12	414	0.0	$54.80	$495.60	$80.00	7.58
elec closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	380	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	380	0.02	14	0.0	$1.91	$58.50	$10.00	25.43
Various	35	Exit Signs: Incandescent	None	40	8,760	Fixture Replacement	No	35	LED Exit Signs: 2 W Lamp	None	6	8,760	0.78	11,988	0.0	$1,585.44	$3,764.43	$0.00	2.37
Various	35	Exit Signs: Fluorescent	None	14	8,760	Fixture Replacement	No	35	LED Exit Signs: 2 W Lamp	None	6	8,760	0.18	2,821	0.0	$373.04	$3,764.43	$0.00	10.09

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	Building	1	Heating Hot Water Pump	15.0	91.0%	No	3,391	Yes	92.4%	Yes	1	1.66	15,852	0.0	$2,096.40	$7,085.87	$0.00	3.38
Boiler Room	Building - A, B, & C Wings	1	Heating Hot Water Pump	15.0	91.0%	No	3,391	Yes	92.4%	Yes	1	1.66	15,852	0.0	$2,096.40	$7,085.87	$0.00	3.38
Boiler Room	Gym	2	Heating Hot Water Pump	1.5	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Chiller	2	Chilled Water Pump	30.0	89.5%	No	1,131	Yes	94.1%	Yes	2	7.27	21,899	0.0	$2,896.20	$23,151.00	$3,600.00	6.75
Boiler Room	AHU supply	2	Heating Hot Water Pump	5.0	85.5%	No	2,000	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	D Wing	2	Heating Hot Water Pump	5.0	85.5%	No	2,000	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	D Wing Glycol pump	2	Other	15.0	90.2%	No	900	No	90.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooms 310 & 311	AHU 1 & AHU 2	2	Supply Fan	1.5	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 5 & 6	Guidance Office	2	Supply Fan	3.0	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 5 & 6	Main Office	2	Return Fan	3.0	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 7 & 9	B Wing	2	Supply Fan	3.0	87.5%	No	2,000	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 7 & 9	B Wing	2	Return Fan	3.0	87.5%	No	2,000	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 8 & 10	A Wing	2	Supply Fan	3.0	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 8 & 10	A Wing	2	Return Fan	3.0	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 4	D Wing	2	Supply Fan	3.0	87.5%	No	2,000	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 4	D Wing	2	Return Fan	3.0	87.5%	No	2,000	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gym	1	Supply Fan	15.0	92.4%	No	2,000	Yes	93.0%	Yes	1	3.54	7,521	0.0	$994.71	$7,041.17	$1,200.00	5.87
Roof	RTU 21 Music	1	Supply Fan	3.0	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	RTU 21 Music	1	Return Fan	3.0	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	RTU 22 & 23	2	Supply Fan	3.0	87.5%	No	2,000	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU 22 & 23	2	Return Fan	3.0	87.5%	No	2,000	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Attic	Gym AHU 5 & 6	2	Supply Fan	3.0	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Attic	Gym AHU 5 & 6	2	Return Fan	3.0	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Attic	Cafeteria AHU 3 & 4	2	Supply Fan	1.5	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Attic	Cafeteria AHU 3 & 4	2	Return Fan	1.5	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Mini Theater	1	Supply Fan	5.0	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Mini Theater	1	Return Fan	3.0	86.5%	No	2,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Locker Rooms	1	Makeup Air Fan	0.8	82.0%	No	2,000	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Locker Rooms	1	Exhaust Fan	1.5	84.0%	No	2,000	No	84.0%	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	Library	3	Split-System AC	5.00		Yes	3	Split-System AC	5.00		14.00		No	0.40	989	0.0	$130.80	$22,443.30	$1,380.00	161.04
Roof	IT Closet	1	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Room 222	1	Split-System AC	3.00		Yes	1	Split-System AC	3.00		14.00		No	0.08	198	0.0	$26.16	$4,488.66	$276.00	161.04
Roof	Teacher's Lounge 2nd Flr	1	Split-System AC	2.50		Yes	1	Split-System AC	2.50		14.00		No	0.07	165	0.0	$21.80	$3,740.55	$230.00	161.04
Roof	B Wing Classrooms	4	Split-System AC	2.50		Yes	4	Split-System AC	2.50		14.00		No	0.94	2,338	0.0	$309.16	$14,962.20	$920.00	45.42
Roof	B Wing Classrooms	1	Split-System AC	2.50		Yes	1	Split-System AC	2.50		14.00		No	0.07	165	0.0	$21.80	$3,740.55	$230.00	161.04
Roof	B Wing Science Labs	4	Split-System AC	5.00		Yes	4	Split-System AC	5.00		14.00		No	1.87	4,675	0.0	$618.32	$29,924.40	$1,840.00	45.42
Roof	B Wing Classrooms	2	Split-System AC	3.50		Yes	2	Split-System AC	3.50		14.00		No	0.65	1,636	0.0	$216.41	$10,473.54	$644.00	45.42
Roof	A Wing Classrooms	5	Split-System AC	2.50		Yes	5	Split-System AC	2.50		14.00		No	1.17	2,922	0.0	$386.45	$18,702.75	$1,150.00	45.42
Roof	A Wing Science Labs	3	Split-System AC	5.00		Yes	3	Split-System AC	5.00		14.00		No	1.40	3,506	0.0	$463.74	$22,443.30	$1,380.00	45.42
Roof	A Wing Classrooms	2	Split-System AC	3.50		Yes	2	Split-System AC	3.50		14.00		No	0.65	1,636	0.0	$216.41	$10,473.54	$644.00	45.42
Roof	A Wing Science	1	Split-System AC	5.00		Yes	1	Split-System AC	5.00		14.00		No	0.13	330	0.0	$43.60	$7,481.10	$460.00	161.04
Roof	A Wing Teacher's Lounge	1	Split-System AC	2.50		Yes	1	Split-System AC	2.50		14.00		No	0.07	165	0.0	$21.80	$3,740.55	$230.00	161.04
Roof	B Wing 1st Flr Classrooms	5	Split-System AC	3.50		Yes	5	Split-System AC	3.50		14.00		No	1.64	4,091	0.0	$541.03	$26,183.85	$1,610.00	45.42
Roof	B Wing 1st Flr Classrooms	3	Split-System AC	2.50		Yes	3	Split-System AC	2.50		14.00		No	0.70	1,753	0.0	$231.87	$11,221.65	$690.00	45.42
Roof	A Wing 1st Flr Classrooms	10	Split-System AC	3.50		Yes	10	Split-System AC	3.50		14.00		No	3.27	8,182	0.0	$1,082.06	$52,367.70	$3,220.00	45.42
Roof	A Wing 1st Flr Classrooms	4	Split-System AC	2.50		Yes	4	Split-System AC	2.50		14.00		No	0.94	2,338	0.0	$309.16	$14,962.20	$920.00	45.42
Roof	1st Flr A Wing Computer Room	1	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1st Flr A Wing Tech Labs	2	Split-System AC	5.00		Yes	2	Split-System AC	5.00		14.00		No	0.94	2,338	0.0	$309.16	$14,962.20	$920.00	45.42
Roof	Nurses' Office	1	Split-System AC	3.00		Yes	1	Split-System AC	3.00		14.00		No	0.08	198	0.0	$26.16	$4,488.66	$276.00	161.04

		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	B Wing 1st & 2nd Flr	5	Split-System AC	3.50		Yes	5	Split-System AC	3.50		14.00		No	1.64	4,091	0.0	$541.03	$26,183.85	$1,610.00	45.42
Roof	B Wing 1st & 2nd Flr	1	Split-System AC	2.50		Yes	1	Split-System AC	2.50		14.00		No	0.23	584	0.0	$77.29	$3,740.55	$230.00	45.42
Roof	B Wing Ships	2	Split-System AC	5.00		Yes	2	Split-System AC	5.00		14.00		No	0.94	2,338	0.0	$309.16	$14,962.20	$920.00	45.42
Roof	Old Nurses' Office	1	Split-System AC	3.00		Yes	1	Split-System AC	3.00		14.00		No	0.08	198	0.0	$26.16	$4,488.66	$276.00	161.04
Roof	Mini Theater	1	Packaged AC	10.00		Yes	1	Packaged AC	10.00		11.50		No	0.88	2,197	0.0	$290.53	$17,821.06	$730.00	58.83
Roof	Rooms 121 & 122	2	Packaged AC	4.00		Yes	2	Packaged AC	4.00		14.00		No	0.46	1,143	0.0	$151.14	$18,151.68	$736.00	115.23
Roof	Gym	1	Packaged AC	50.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Locker Rooms	1	Packaged AC	3.00		Yes	1	Packaged AC	3.00		14.00		No	0.12	309	0.0	$40.81	$6,806.88	$276.00	160.04

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
Grounds	D Wing	1	Air-Cooled Screw Chiller	340.00	Yes	1	Air-Cooled Reciprocating Chiller	Variable	340.00	1.24	0.73	118.27	176,523	0.0	$23,345.34	$272,190.40	$31,280.00	10.32

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
Roof	CR 121 & 122	2	Furnace	96.00	Yes	2	Furnace	96.00	95.00%	AFUE	0.00	0	25.2	$275.91	$4,350.21	$800.00	12.87
Roof	Locker Rooms	1	Furnace	64.00	Yes	1	Furnace	64.00	95.00%	AFUE	0.00	0	8.4	$91.97	$1,450.07	$400.00	11.42
Boiler Room	Building	3	Non-Condensing Hot Water Boiler	4,184.00	Yes	3	Non-Condensing Hot Water Boiler	4,184.00	85.00%	Ec	0.00	0	278.4	$3,053.63	$215,082.56	$0.00	70.44

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	Building	1	Indirect System	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Main Kitchen	1	Medium Temp Freezer (0F to 30F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Kitchen	1	Cooler (35F to 55F)	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 A & B	2	Freezer Chest	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen A & B	2	Refrigerator Chest	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen A & B	2	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Kitchen	1	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main 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
Main Kitchen	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen A & B	4	Insulated Food Holding Cabinet (1/2 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen A & B	2	Electric Convection Oven (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Kitchen	1	Electric Griddle (4 Feet Width)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Kitchen	1	Electric Convection Oven (Half Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Classrooms & Offices	230	Desktop computer	200.0	
Laptops	2	laptop	70.0	
Classrooms	1,050	Chromebook	9.4	
Classrooms & Offices	56	Small printer/copier	40.0	
Offices	18	medium printer/copier	80.0	
Printer room/main office	5	large printer/copier	120.0	
Classrooms	77	projector	350.0	
Classrooms	77	smart board	2.0	
Offices	2	paper shredder	146.0	
break rooms / faculty lounges	16	microwave	1,200.0	
break rooms / faculty lounges	2	small refrigerator	126.0	
break rooms / faculty lounges	7	medium refrigertor	226.0	
break rooms / faculty lounges	8	large refrigerator	509.0	
break rooms / faculty lounges	5	coffee machine	900.0	
Laundry	1	Clothes washer	1,200.0	
Laundry	1	Clothes dryer	5,000.0	
Conference	1	50" LED TV	220.0	
classroom	8	oven w/Induction cooking range	7,400.0	
Kitchen A & B	4	cash registers	100.0	

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	3	Refrigerated	Yes	0.00	4,836	0.0	$639.50	$690.00	$0.00	1.08

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Marlboro Middle School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 198,820
Built: 1976

For Year Ending: April 30, 2017
Date Generated: April 06, 2018

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Marlboro Middle School 355 County Road 520 Marlboro, New Jersey 07746	Marlboro Township Board of Education 1980 Township Drive Marlboro, NJ 07746 (732) 972-2000	Cindy Barr-Rague 1980 Township Drive Marlboro, NJ 07746 (732) 972-2000 Ext. 2010 cbarr-rague@mtps.org

Property ID: 6277832

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
58.4 kBtu/ft²

Source EUI
117.8 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	5,377,312 (46%)
Natural Gas (kBtu)	6,224,931 (54%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	61.7
National Median Source EUI (kBtu/ft²)	124.6
% Diff from National Median Source EUI	-6%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	927

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)