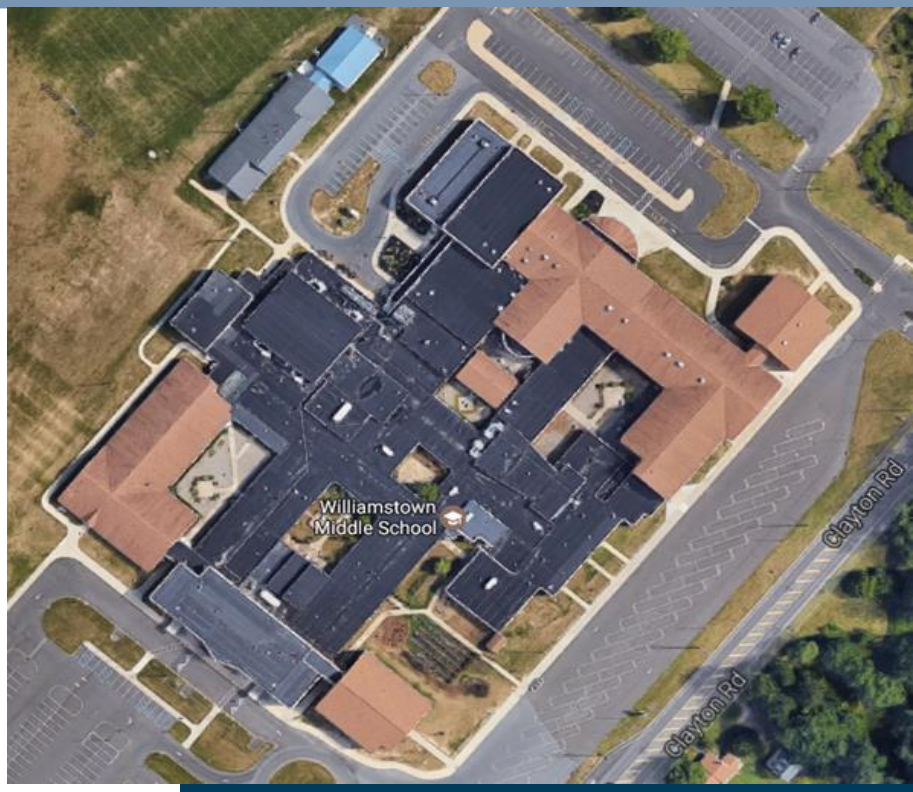
Local Government Energy Audit:
Energy Audit Report



Williamstown Middle School

Monroe Township Board of Education

561 Clayton Road
Williamstown, NJ 08094

January 22, 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 Williamstown 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 Monroe Township Board of Education in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Williamstown Middle School is a 313,512 square foot facility comprised of various space types within a single building. The building is a mix of single and two (2) story sections that includes classrooms, offices, gymnasium, auditorium, library, media center and kitchen.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated ten (10) measures which together represent an opportunity for Williamstown Middle School to reduce annual energy costs by $107,182 and annual greenhouse gas emissions by 776,808 lbs CO2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 4.5 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 Williamstown Middle School's annual energy use by 10%.

Figure 1 – Previous 12 Month Utility Costs

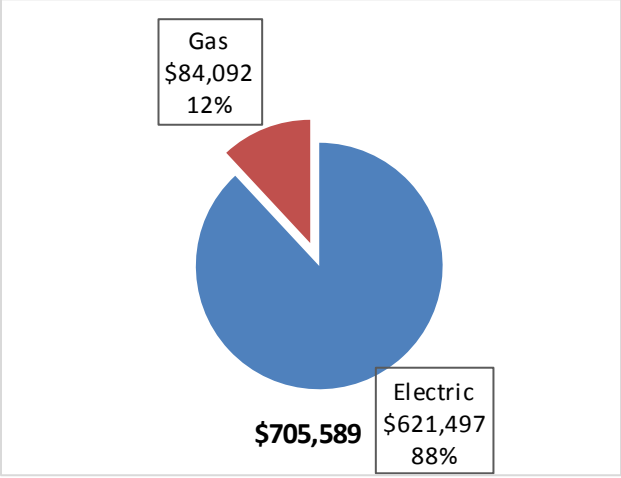
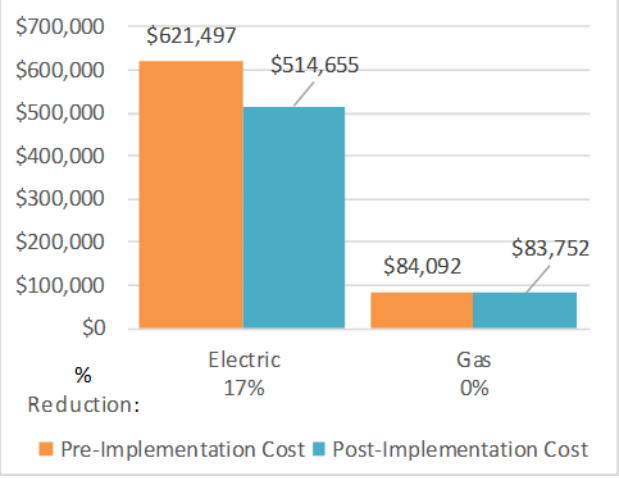


Figure 2 – Potential Post-Implementation Costs



A detailed description of Williamstown 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			**490,864**	**101.2**	**0.0**	**$68,430.51**	**$342,997.43**	**$54,400.00**	**$288,597.43**	**4.2**	**494,297**
ECM 1	Install LED Fixtures	Yes	94,818	16.4	0.0	$13,218.43	$124,557.27	$15,000.00	$109,557.27	8.3	95,481
ECM 2	Retrofit Fixtures with LED Lamps	Yes	396,046	84.7	0.0	$55,212.08	$218,440.17	$39,400.00	$179,040.17	3.2	398,815
Lighting Control Measures			**95,324**	**18.6**	**0.0**	**$13,288.97**	**$45,024.00**	**$4,430.00**	**$40,594.00**	**3.1**	**95,991**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	84,199	16.4	0.0	$11,738.10	$36,424.00	$4,430.00	$31,994.00	2.7	84,788
ECM 4	Install High/Low Lighitng Controls	Yes	11,125	2.2	0.0	$1,550.88	$8,600.00	$0.00	$8,600.00	5.5	11,203
Motor Upgrades			**36,534**	**3.4**	**0.0**	**$5,093.12**	**$68,652.71**	**$0.00**	**$68,652.71**	**13.5**	**36,789**
ECM 5	Premium Efficiency Motors	Yes	36,534	3.4	0.0	$5,093.12	$68,652.71	$0.00	$68,652.71	13.5	36,789
Variable Frequency Drive (VFD) Measures			**125,147**	**0.0**	**0.0**	**$17,446.51**	**$90,303.10**	**$15,000.00**	**$75,303.10**	**4.3**	**126,022**
ECM 6	Install VFDs on Chilled Water Pumps	Yes	112,704	0.0	0.0	$15,711.86	$66,295.00	$15,000.00	$51,295.00	3.3	113,492
ECM 7	Install VFDs on Hot Water Pumps	Yes	12,443	0.0	0.0	$1,734.66	$24,008.10	$0.00	$24,008.10	13.8	12,530
Domestic Water Heating Upgrade			**0**	**0.0**	**43.1**	**$339.90**	**$1,015.54**	**$0.00**	**$1,015.54**	**3.0**	**5,050**
ECM 8	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	43.1	$339.90	$1,015.54	$0.00	$1,015.54	3.0	5,050
Food Service Equipment & Refrigeration Measures			**10,471**	**0.8**	**0.0**	**$1,459.75**	**$2,123.10**	**$0.00**	**$2,123.10**	**1.5**	**10,544**
ECM 9	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	10,471	0.8	0.0	$1,459.75	$2,123.10	$0.00	$2,123.10	1.5	10,544
Plug Load Equipment Control - Vending Machine			**8,059**	**0.0**	**0.0**	**$1,123.52**	**$1,610.00**	**$0.00**	**$1,610.00**	**1.4**	**8,116**
ECM 10	Vending Machine Control	Yes	8,059	0.0	0.0	$1,123.52	$1,610.00	$0.00	$1,610.00	1.4	8,116
TOTALS			**766,400**	**124.0**	**43.1**	**$107,182.29**	**$551,725.88**	**$73,830.00**	**$477,895.88**	**4.5**	**776,808**

* - 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).

Retro-commissioning is highly recommended for all of the schools in the district. Savings were not evaluated for this measure, however, based on historical utility bills the summer electricity use is much higher than expected for schools that are not in session during the summer (see Section 4.1.8).

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 (IHP 2014). 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 than using 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.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can

provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

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

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

Energy Efficient Practices

TRC also identified 16 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 Williamstown Middle School include:

- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Perform Routine Motor Maintenance
- Ensure Economizers are Functioning Properly
- Assess Chillers & Request Tune-Ups
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Install Plug Load Controls
- Replace Computer Monitors
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

The district staff informed the TRC auditor that the district is committed to the installation of PV for on-site generation. Based on the configuration of the site and its loads there is a low potential for installing combined heat and power self-generation measures.

For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

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

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

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

- SmartStart
- Pay for Performance - Existing Building (P4P)
- 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.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this 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 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
David Sullivan	Director of Plant Operations	dsullivan@monroetwp.k12.nj.us	856-629-6400
Designated Representative			
Annina Hogan	Director Engineering for Municipal Services	annina.hogan@rve.com	856-216-1890
TRC Energy Services			
Smruti Srinivasan	Auditor	SSrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On March 9, 2017 TRC performed an energy audit at Williamstown Middle School located in Williamstown, New Jersey. TRC's team met with David Sullivan, Director of Plant Operations to review the facility operations and help focus our investigation on specific energy-using systems.

Williamstown Middle School is a 313,512 square foot facility comprised of various space types within a single building. The building is a mix of single and two story sections that includes classrooms, offices, gymnasium, auditorium, library, media center and kitchen.

The building was constructed in 1958. There have been several renovations and additions since then. The facility has replaced most of its T12 fluorescent fixtures with T8 fluorescent fixtures.

2.3 Building Occupancy

The school is open Monday through Friday and has very minimal weekend activity. The typical schedule is presented in the table below. School is in session from early September through the end of June. There are one (1) week breaks at the end of December and in the spring. During a typical day, the facility is occupied by approximately 220 staff and 1,970 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Williamstown Middle School	Weekday	8:00 am - 3:00 pm
Williamstown Middle School	Weekend	unoccupied

2.4 Building Envelope

The building is constructed of concrete and structural steel with a brick facade. The building has a mix of pitched and flat roofs.

2.5 On-Site Generation

Williamstown Middle School does not have any on-site electric generation capacity. The Monroe Township school district has been evaluating the use of photovoltaic arrays for on-site generation of electricity and is planning to install them throughout the district.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided mostly by 4-foot, linear fluorescent fixtures with T8 lamps although there are a few fixtures with T5 and T12 lamps. There is a fairly even mixture of fixtures with two (2), three (3) and four (4) lamps and a few fixtures with one (1) or six (6) lamps. Exit signs have all been modified to use light emitting diodes (LEDs).

Approximately 75% of the interior light fixtures are controlled by wall switches and approximately 25% of the fixtures have occupancy sensor controls. Occupancy sensor controls are currently used in offices, classrooms, and hallways.

Exterior lighting is provided primarily by fixtures with high pressure sodium lamps but there are also fixtures that use compact fluorescent and metal halide lamps. The exterior fixtures are controlled by either photocells or timers.

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

Chilled Water and Condenser Water System

The facility is served by two (2) sets of chillers that supply a common chilled water distribution loop. There are three (3) 50 ton Napps variable speed, water cooled scroll chillers in the mechanical room. There is also a 400 ton Trane constant speed, air cooled chiller on the roof. All of the chillers are less than five (5) years old. The chillers are configured in a primary distribution loop with three 50 hp constant speed pumps

in the mechanical room and two 40 hp variable speed pumps mounted on the Trane chiller skid. Two (2) of the 50 hp chilled water pumps operate continuously – the pumps are operated during winter months for freeze protection.

The cooling season is typically from mid-April through mid-October. The chillers supply water to the fan coils located throughout the building and to the air handlers on the roof. The Trane chiller has a chilled water setpoint of 41°F.

The Trane chiller has twenty-four 1.25 hp and four (4) 1.5 hp condenser fans. A two (2) cell BAC cooling tower with two (2) variable speed 20 hp fans serves the Napps chillers. There are two (2) constant speed 50 hp condenser water pumps. The setpoint of the condenser water supply temperature to the chillers is 75°F.

Hot Water Heating System

The hot water system consists of two (2) Hydrotherm 3,000 MBh condensing boilers with a nominal combustion efficiency of 92.7%. The boilers are configured in a constant flow primary distribution loop with three (3) 25 hp pumps. The typical heating season is mid-October through mid-April. During that time one (1) heating water pump operates continuously. Hot water is supplied at 180°F when the outside air temperature is below 40°F and the setpoint is reset to 110°F when the outside air is above 60°F. The boilers provide hot water to the fan coils located throughout the building and to the air handlers on the roof. The boilers are about three (3) years old.

Direct Expansion Air Conditioning System (DX)

There are two (2) 20 ton and one (1) 10 ton Trane package units on the roof. The package units have direct expansion cooling coils and natural gas fired furnaces.

Ventilation System

Ventilation is provided by a mix of equipment. There are four (4) heating only air handlers on the roof for the gymnasium. There are also three (3) McQuay air handlers and three (3) Trane package units on the roof that condition various areas in the building. Most of the building is conditioned by 44 fan coil units located in the ceiling space and 41 unit ventilators located in rooms throughout the building. The fan coils and unit ventilators provide both heating and cooling. The supply air temperature of the fan coils and air handlers is reset based on outside air temperature. **Nearly continuous fan operation was assumed in order to balance the calculated electricity use with the historical utility bills and to be consistent with the historical energy use profile.**

Building Management System (BMS)

Most of the HVAC equipment is controlled by a CM3 building management system (BMS). The BMS controls occupied and unoccupied settings for the air handlers and conditioned spaces, controls the chillers and boilers, and provides current status of most of the operating parameters of the HVAC equipment.

Domestic Hot Water Heating System

Most of the domestic hot water for the campus is supplied by a heat exchanger that uses hot water from the boilers to produce domestic hot water. There is also a 67 gallon electric water heater in the mechanical room.

Food Service

The school has a kitchen to prepare meals for the students and staff. The kitchen equipment includes gas fired ovens, gas cook top, food warmers, steamers, kettles, and a dishwasher.

Refrigeration

The kitchen has free standing refrigerators, and a walk in refrigerator and freezer for food storage.

Building Plug Load

The school has a typical range of office/education equipment. This includes televisions, projectors, printers, and approximately 225 computers including desktop and laptop units.

2.7 Water-Using Systems

A sampling of restroom and kitchen faucets found that many of the faucets are rated for 2.5 gallons per minute (gpm) or higher.

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

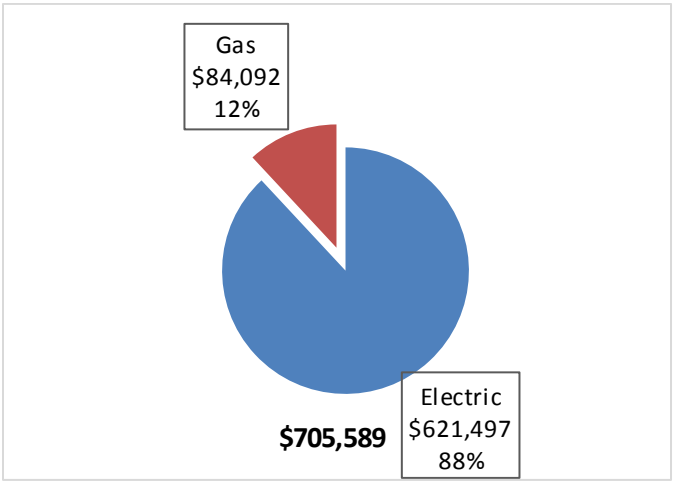
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Williamstown Middle School		
Fuel	**Usage**	**Cost**
Electricity	4,458,114 kWh	$621,497
Natural Gas	106,700 Therms	$84,092
Total		**$705,589**

The current annual energy cost for this facility is $705,589 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

The site purchases electricity from Constellation Electric and electric delivery is provided by Atlantic City Electric. The average electric cost over the past 12 months was $0.139/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below. **The summer electricity use is unusually high for a site that does not have summer school. The use profile indicates that lighting and HVAC equipment are operating during summer vacation much in the same way that they operate at the beginning and end of the school year**.

Figure 8 - Electric Usage & Demand

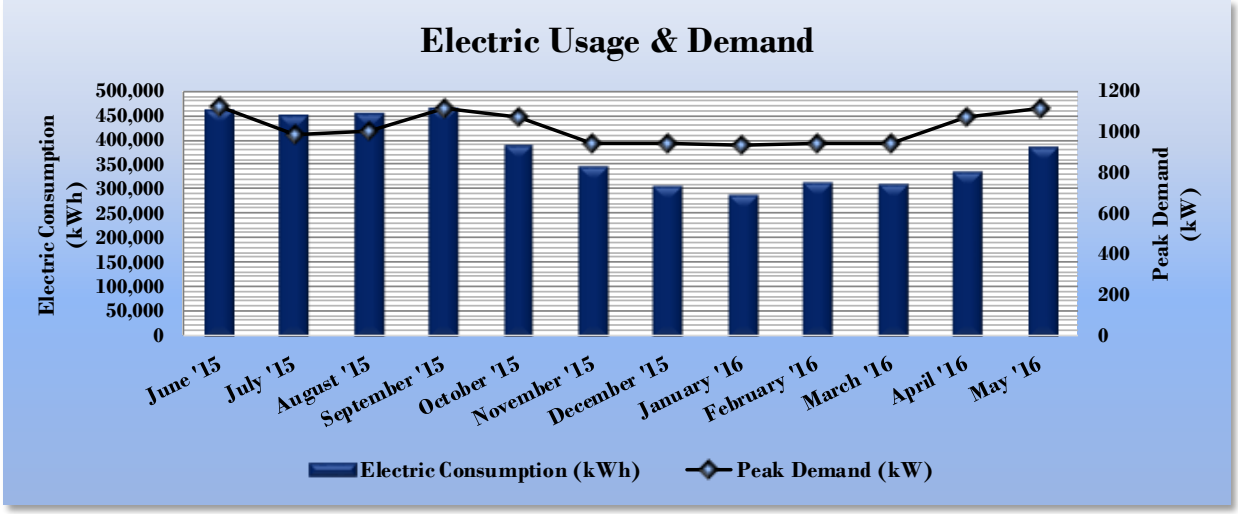


Figure 9 - Electric Usage & Demand

Electric Billing Data for Williamstown Middle School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/29/15	32	461,859	1,127	9,204	50,039
7/30/15	31	450,274	989	8,080	59,557
8/30/15	31	455,807	1,007	8,226	58,592
9/29/15	30	465,575	1,115	9,108	62,377
10/29/15	30	391,183	1,075	8,785	63,649
11/29/15	31	345,026	946	7,732	55,404
12/30/15	31	304,991	939	7,673	46,146
1/28/16	29	287,663	937	7,654	43,773
2/28/16	31	313,399	942	7,693	41,592
3/30/16	31	311,995	944	7,712	45,203
4/28/16	29	334,385	1,076	8,788	47,500
5/31/16	33	384,813	1,113	9,091	54,475
Totals	**369**	**4,506,970**	**1126.6**	**$99,748**	**$628,308**
Annual	**365**	**4,458,114**	**1126.6**	**$98,667**	**$621,497**

3.3 Natural Gas Usage

The campus purchases natural gas from Direct Energy and natural gas delivery is provided by South Jersey Gas. The average gas cost for the past 12 months is $0.788/therm, which is the blended rate used throughout the analyses in this report. Natural gas is used primarily for space heating at this campus which is reflected in the use profile below. The monthly gas consumption is shown in the chart below.

Figure 10 - Natural Gas Usage

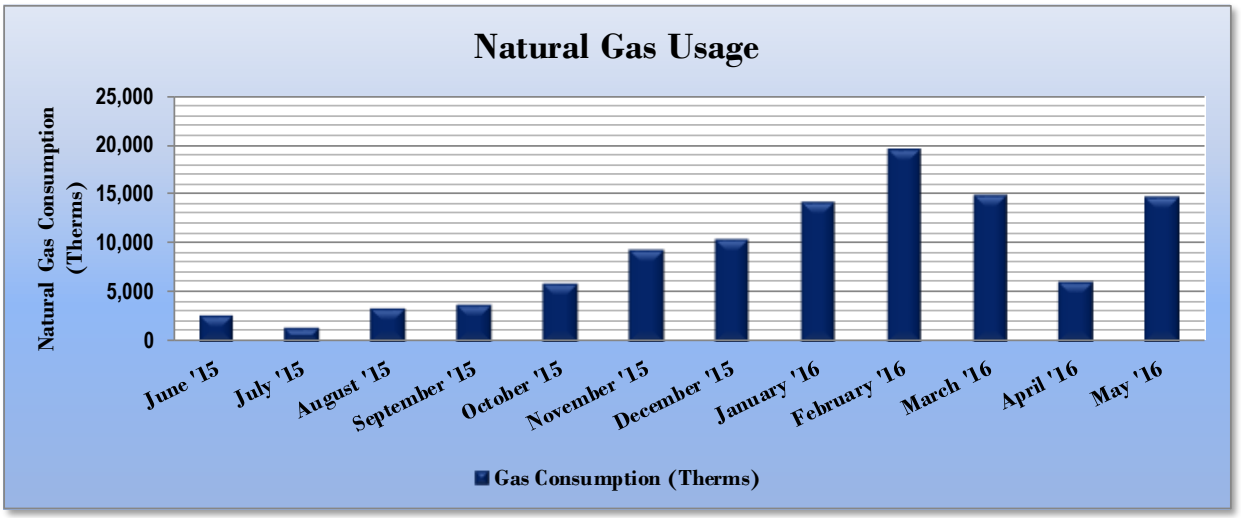


Figure 11 - Natural Gas Usage

Gas Billing Data for Williamstown Middle School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
6/15/15	31	2,688	$2,837
7/17/15	32	1,518	$2,003
8/17/15	31	3,400	$3,306
9/17/15	31	3,858	$3,669
10/15/15	28	5,924	$4,963
11/16/15	32	9,371	$7,381
12/14/15	28	10,482	$8,037
1/14/16	31	14,310	$10,769
2/12/16	29	19,734	$14,463
3/14/16	31	14,989	$11,238
4/14/16	31	6,181	$5,107
5/16/16	32	14,829	$10,780
Totals	**367**	**107,284**	**$84,552**
Annual	**365**	**106,700**	**$84,092**

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 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Williamstown Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	188.1	141.4
Site Energy Use Intensity (kBtu/ft^2)	82.6	58.2

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

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

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Williamstown Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	161.7	141.4
Site Energy Use Intensity (kBtu/ft^2)	74.1	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Your building is one of the building categories that are eligible to receive a score. This facility has a current score of 59.

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

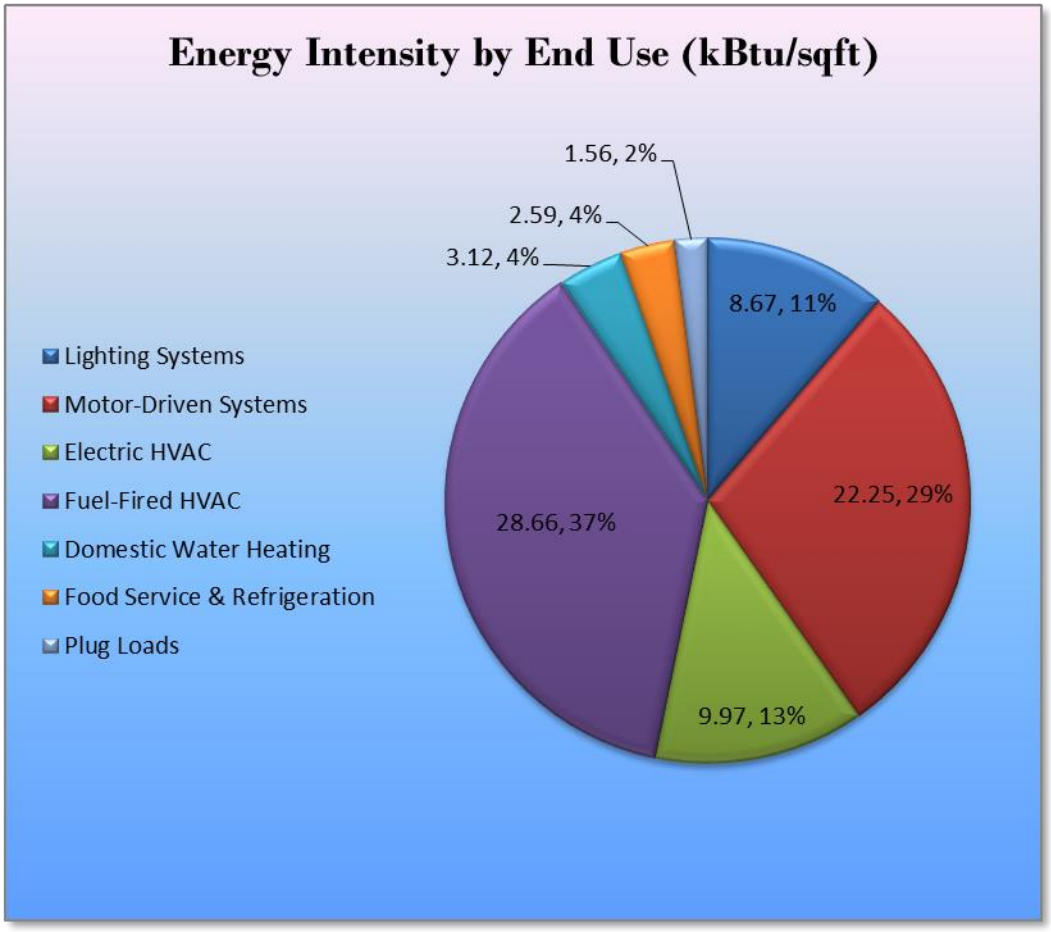
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 14 - 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 Williamstown 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 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**490,864**	**101.2**	**0.0**	**$68,430.51**	**$342,997.43**	**$54,400.00**	**$288,597.43**	**4.2**	**494,297**
ECM 1	Install LED Fixtures	94,818	16.4	0.0	$13,218.43	$124,557.27	$15,000.00	$109,557.27	8.3	95,481
ECM 2	Retrofit Fixtures with LED Lamps	396,046	84.7	0.0	$55,212.08	$218,440.17	$39,400.00	$179,040.17	3.2	398,815
Lighting Control Measures		**95,324**	**18.6**	**0.0**	**$13,288.97**	**$45,024.00**	**$4,430.00**	**$40,594.00**	**3.1**	**95,991**
ECM 3	Install Occupancy Sensor Lighting Controls	84,199	16.4	0.0	$11,738.10	$36,424.00	$4,430.00	$31,994.00	2.7	84,788
ECM 4	Install High/Low Lighting Controls	11,125	2.2	0.0	$1,550.88	$8,600.00	$0.00	$8,600.00	5.5	11,203
Motor Upgrades		**36,534**	**3.4**	**0.0**	**$5,093.12**	**$68,652.71**	**$0.00**	**$68,652.71**	**13.5**	**36,789**
ECM 5	Premium Efficiency Motors	36,534	3.4	0.0	$5,093.12	$68,652.71	$0.00	$68,652.71	13.5	36,789
Variable Frequency Drive (VFD) Measures		**125,147**	**0.0**	**0.0**	**$17,446.51**	**$90,303.10**	**$15,000.00**	**$75,303.10**	**4.3**	**126,022**
ECM 6	Install VFDs on Chilled Water Pumps	112,704	0.0	0.0	$15,711.86	$66,295.00	$15,000.00	$51,295.00	3.3	113,492
ECM 7	Install VFDs on Hot Water Pumps	12,443	0.0	0.0	$1,734.66	$24,008.10	$0.00	$24,008.10	13.8	12,530
Domestic Water Heating Upgrade		**0**	**0.0**	**43.1**	**$339.90**	**$1,015.54**	**$0.00**	**$1,015.54**	**3.0**	**5,050**
ECM 8	Install Low-Flow Domestic Hot Water Devices	0	0.0	43.1	$339.90	$1,015.54	$0.00	$1,015.54	3.0	5,050
Food Service Equipment & Refrigeration Measures		**10,471**	**0.8**	**0.0**	**$1,459.75**	**$2,123.10**	**$0.00**	**$2,123.10**	**1.5**	**10,544**
ECM 9	Refrigerator/Freezer Case Electrically Commutated Motors	10,471	0.8	0.0	$1,459.75	$2,123.10	$0.00	$2,123.10	1.5	10,544
Plug Load Equipment Control - Vending Machine		**8,059**	**0.0**	**0.0**	**$1,123.52**	**$1,610.00**	**$0.00**	**$1,610.00**	**1.4**	**8,116**
ECM 10	Vending Machine Control	8,059	0.0	0.0	$1,123.52	$1,610.00	$0.00	$1,610.00	1.4	8,116
TOTALS		**766,400**	**124.0**	**43.1**	**$107,182.29**	**$551,725.88**	**$73,830.00**	**$477,895.88**	**4.5**	**776,808**

* - 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

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

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**490,864**	**101.2**	**0.0**	**$68,430.51**	**$342,997.43**	**$54,400.00**	**$288,597.43**	**4.2**	**494,297**
ECM 1	Install LED Fixtures	94,818	16.4	0.0	$13,218.43	$124,557.27	$15,000.00	$109,557.27	8.3	95,481
ECM 2	Retrofit Fixtures with LED Lamps	396,046	84.7	0.0	$55,212.08	$218,440.17	$39,400.00	$179,040.17	3.2	398,815

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	63,010	12.3	0.0	$8,784.04	$106,976.80	$10,500.00	$96,476.80	11.0	63,450
Exterior	31,809	4.1	0.0	$4,434.39	$17,580.47	$4,500.00	$13,080.47	2.9	32,031

Measure Description

We recommend replacing existing fixtures containing HID lamps with new high performance LED light fixtures. This measure includes fixtures in the gymnasium, cafeteria, library, and exterior fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

ECM 2: 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	393,432	84.4	0.0	$54,847.64	$217,330.17	$39,400.00	$177,930.17	3.2	396,183
Exterior	2,614	0.3	0.0	$364.44	$1,110.00	$0.00	$1,110.00	3.0	2,632

Measure Description

We recommend retrofitting existing incandescent, halogen, and fluorescent fixtures with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		95,324	18.6	0.0	$13,288.97	$45,024.00	$4,430.00	$40,594.00	3.1	95,991
ECM 3	Install Occupancy Sensor Lighting Controls	84,199	16.4	0.0	$11,738.10	$36,424.00	$4,430.00	$31,994.00	2.7	84,788
ECM 4	Install High/Low Lighting Controls	11,125	2.2	0.0	$1,550.88	$8,600.00	$0.00	$8,600.00	5.5	11,203

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 3: 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)
84,199	16.4	0.0	$11,738.10	$36,424.00	$4,430.00	$31,994.00	2.7	84,788

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches throughout most of the campus. 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 4: 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)
11,125	2.2	0.0	$1,550.88	$8,600.00	$0.00	$8,600.00	5.5	11,203

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are stairwells, interior corridors, parking lots, and parking garages. This measure is recommended for hallways and stairwells at Williamstown Middle school.

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

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

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

4.1.3 Motor Upgrades

ECM 5: 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)
36,534	3.4	0.0	$5,093.12	$68,652.71	$0.00	$68,652.71	13.5	36,789

Measure Description

We recommend replacing standard efficiency motors with IHP 2014 efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New*

Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016). Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

4.1.4 Variable Frequency Drive Measures

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

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**125,147**	**0.0**	**0.0**	**$17,446.51**	**$90,303.10**	**$15,000.00**	**$75,303.10**	**4.3**	**126,022**
ECM 6	Install VFDs on Chilled Water Pumps	112,704	0.0	0.0	$15,711.86	$66,295.00	$15,000.00	$51,295.00	3.3	113,492
ECM 7	Install VFDs on Hot Water Pumps	12,443	0.0	0.0	$1,734.66	$24,008.10	$0.00	$24,008.10	13.8	12,530

ECM 6: Install VFDs on Chilled and Condenser 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)
112,704	0.0	0.0	$15,711.86	$66,295.00	$15,000.00	$51,295.00	3.3	113,492

Measure Description

The chilled water pumps operate even when the building is unoccupied to provide freeze protection for the chilled water distribution. We recommend installing variable frequency drives (VFD) to control the chilled water pumps located in the mechanical room. The recommendation is to reduce the speed of the chilled water pumps when the school is not occupied. This will maintain flow in the chilled water distribution for freeze protection but will require significantly less pump energy to do so. Some experimentation will be required to determine the optimal reduced pump speed for non-occupancy periods. We recommend starting at 80% speed and adjusting down from there until the minimum speed that maintains flow throughout the entire chilled water distribution loop is determined.

The savings for this measure were conservatively estimated by calculating the energy use for operating the pumps at 90% speed at all times. It is likely that additional savings will be achieved, especially if the pumps can be operated below 80% speed when the school is not occupied. It is also recommended that VFDs be installed to control the condenser water pumps so that the condenser water flow can be matched to the number of chillers operating.

If the District is interested in converting to a fully variable flow chilled water system several additional steps will be required. First, any 3-way control valves will have to be replaced with 2-way valves. The appropriate chilled water distribution differential pressure control setting will need to be determined. The minimum flow to prevent the chiller from tripping off will also have to be determined.

ECM 7: 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)
12,443	0.0	0.0	$1,734.66	$24,008.10	$0.00	$24,008.10	13.8	12,530

Measure Description

During the heating season the heating water pumps operate even when the building is unoccupied to provide freeze protection. We recommend installing variable frequency drives (VFD) to control the heating water pumps. The recommendation is to reduce the speed of the heating water pumps when the school is not occupied. This will maintain flow in the heating water distribution for freeze protection but will require significantly less pump energy to do so. Some experimentation will be required to determine the optimal reduced pump speed for non-occupancy periods. We recommend starting at 80% speed and adjusting down from there until the minimum speed that maintains adequate flow throughout the entire heating water distribution loop to maintain basic heating in the entire building is determined.

The savings were conservatively estimated by calculating the energy use for operating the pumps at 90% speed at all times. It is likely that additional savings will be achieved, especially if the pumps can be operated below 80% speed when the school is not occupied.

If the district is interested in converting to a fully variable flow heating water system several additional steps will be required. First, any 3-way control valves will have to be replaced with 2-way valves. Differential pressure control will need to be added for the heating water distribution. The minimum flow through the boilers will also have to be determined.

4.1.5 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 19 below.

Figure 19 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**43.1**	**$339.90**	**$1,015.54**	**$0.00**	**$1,015.54**	**3.0**	**5,050**
ECM 8	Install Low-Flow Domestic Hot Water Devices	0	0.0	43.1	$339.90	$1,015.54	$0.00	$1,015.54	3.0	5,050

ECM 8: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	43.1	$339.90	$1,015.54	$0.00	$1,015.54	3.0	5,050

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water consumption. Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general.

4.1.6 Food Service Equipment & Refrigeration Measures

Food service and refrigeration measures recommendations are summarized in Figure 20 below.

Figure 20 - Summary of Food Service Equipment & Refrigeration 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)
Food Service Equipment & Refrigeration Measures		**10,471**	**0.8**	**0.0**	**$1,459.75**	**$2,123.10**	**$0.00**	**$2,123.10**	**1.5**	**10,544**
ECM 9	Refrigerator/Freezer Case Electrically Commutated Motors	10,471	0.8	0.0	$1,459.75	$2,123.10	$0.00	$2,123.10	1.5	10,544

ECM 9: Refrigerator/Freezer Case Electrically Commutated 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)
10,471	0.8	0.0	$1,459.75	$2,123.10	$0.00	$2,123.10	1.5	10,544

Measure Description

We recommend replacing shaded pole or permanent split capacitor (PSC) motors with electronically commutated (EC) motors in existing walk-in coolers and freezers. These fractional horsepower EC motors are significantly more efficient than mechanically commutated, brushed motors, particularly at low speeds or partial load. By employing variable-speed technology, EC motors are able to optimize fan usage. Because these motors are brushless and utilize DC power, losses due to friction and phase shifting are eliminated. Savings for this measure take into account both the increased efficiency of the motor as well as the reduction in refrigeration load due to motor heat loss.

4.1.7 Plug Load Equipment Control - Vending Machines

ECM 10: 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)
8,059	0.0	0.0	$1,123.52	$1,610.00	$0.00	$1,610.00	1.4	8,116

Measure Description

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

4.1.8 ECMs for Further Evaluation

Summer electricity use is higher than expected for all of the Monroe Township schools included in the LGEA Program. School is not in session July through August, however, the daily electricity use during those months ranges from 84% to 101% of the daily use in June and September. These use patterns are shown in the graph below. Even accounting for summer maintenance and community activities at the schools the electricity use should decrease when school is not in session. In addition, the lighting, and heating, ventilating, and air conditioning (HVAC) operating hours at the Williamstown High School and Williamstown Middle School had to be set considerably higher than the normal school occupancy schedule in order to balance the calculated electricity use to the historical electric bills. The longer operating hours also adversely effects natural gas use by requiring heating operation during the night and weekends. There also appears to be excess reheating operation at the high school during July and August, which makes sense if air conditioning is operating when there is minimal internal building load, which further unnecessarily increases natural gas use.

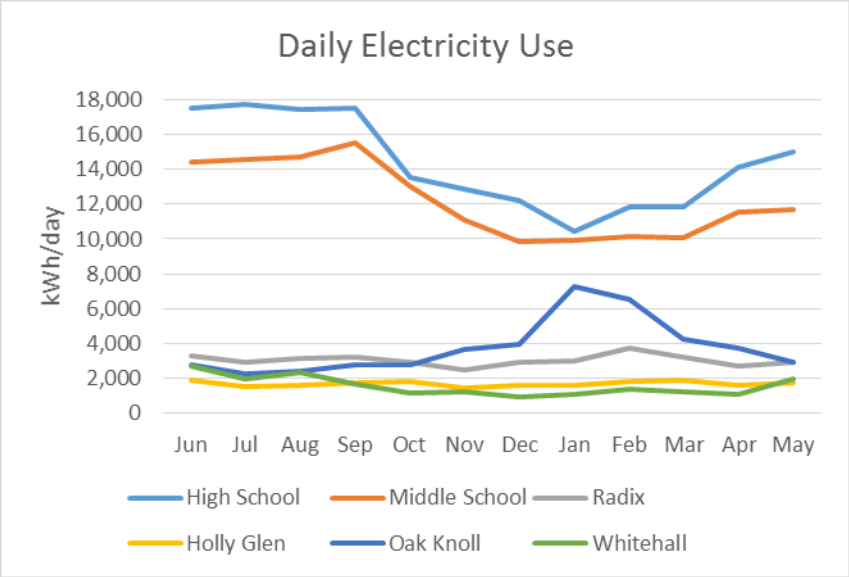
All of the above indicate that equipment, and in particular HVAC equipment, are operating longer than necessary. It is recommended that a retro-commissioning study be conducted district wide with particular focus on the building management system. Several of the schools use night setback controls for the HVAC. It is also recommended that a control strategy be implemented that turns off the HVAC fans and package units when the buildings are not occupied and then uses a high/low temperature limit to turn the equipment back on if the interior temperature exceeds the limits. This will reduce HVAC equipment operations while still maintaining freeze protection control.

The chilled water and condenser water pumps seem to be oversized for the existing chilled water plant. The chiller plant originally had an absorption chiller and the pumps are probably from the original plant. As part of the retro-commissioning project we recommend evaluating optimization of the entire chilled water production and distribution systems.

We estimate that a retro-commissioning study will identify opportunities for reducing HVAC energy use in the range of 20% at this campus which corresponds to an additional 12% electricity savings and 2%

natural gas savings above what is tabulated in the Executive Summary. The projected savings from energy conservation measures identified in this report is 10% which is below the threshold for participating in the P4P Program. **Participation in the P4P Program should be reassessed once the retro-commissioning study is completed since additional measures that qualify for the P4P Program may be identified at that time.**

Figure 21 – Daily Electricity Use



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.

Close Doors and Windows

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

Use Window Treatments/Coverings

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

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.

Turn Off Unneeded Motors

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Reducing run hours for these motors can result in significant energy savings. Whenever possible, use automatic devices such as twist timers or occupancy sensors to ensure that motors are turned off when not needed.

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.

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

Assess Chillers & Request Tune-Ups

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

Clean Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

Check for and Seal Duct Leakage

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

Perform Proper Boiler Maintenance

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

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.

Replace Computer Monitors

Replacing old computer monitors or displays with efficient monitors will reduce energy use. ENERGY STAR® rated monitors have specific requirements for on mode power consumption as well as idle and sleep mode power. According to the ENERGY STAR® website monitors that have earned the ENERGY STAR® label are 25% more efficient than standard monitors.

Water Conservation

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

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.5 for any low-flow ECM recommendations.

6 On-Site Generation Measures

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

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

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

6.1 Photovoltaic

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

The district staff informed the TRC auditor that the district is committed to the installation of PV for on-site generation.

Solar projects must register their projects in the SREC Registration Program 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 and infrequent thermal load combined with the districts intent to install PV are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

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

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 Williamstown Middle School is not a good candidate for DR due to the limited loads that could be shed or the automated control capability to easily shed load.

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

Figure 21 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	x	x
ECM 2	Retrofit Fixtures with LED Lamps	x	x
ECM 3	Install Occupancy Sensor Lighting Controls	x	x
ECM 4	Install High/Low Lighitng Controls		x
ECM 5	Premium Efficiency Motors		x
ECM 6	Install VFDs on Chilled Water Pumps	x	x
ECM 7	Install VFDs on Hot Water Pumps	x	x
ECM 8	Install Low-Flow Domestic Hot Water Devices		x
ECM 9	Refrigerator/Freezer Case Electrically Commutated Motors		x
ECM 10	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 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 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
Gym	6	Metal Halide: (1) 1000W Lamp	Wall Switch	1,080	2,920	Fixture Replacement	Yes	6	LED - Fixtures: High-Bay	Occupancy Sensor	300	2,044	3.42	17,529	0.0	$2,443.65	$16,381.20	$935.00	6.32
Gym	4	LED - Fixtures: High-Bay	Wall Switch	183	2,920	None	Yes	4	LED - Fixtures: High-Bay	Occupancy Sensor	183	2,044	0.14	737	0.0	$102.80	$270.00	$35.00	2.29
Boy's locker room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.16	840	0.0	$117.13	$300.80	$60.00	2.06
Girl's locker room	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,920	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,044	0.06	293	0.0	$40.91	$143.60	$20.00	3.02
B109 office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.11	560	0.0	$78.08	$350.00	$60.00	3.71
Auxillary gym - 5&6	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.05	280	0.0	$39.04	$117.00	$20.00	2.48
Girl's locker room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.16	840	0.0	$117.13	$621.00	$95.00	4.49
Auxillary gym - 5&6	32	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	176	2,920	Relamp	Yes	32	LED - Linear Tubes: (6) 4' Lamps	Occupancy Sensor	87	2,044	2.41	12,368	0.0	$1,724.23	$4,835.15	$1,030.00	2.21
Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	540	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	540	0.09	82	0.0	$11.43	$234.00	$40.00	16.98
Boy's locker room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.19	980	0.0	$136.65	$679.50	$105.00	4.20
Cafeteria	12	Metal Halide: (1) 400W Lamp	Wall Switch	458	2,920	Fixture Replacement	Yes	12	LED - Fixtures: Low-Bay	Occupancy Sensor	146	2,044	2.80	14,337	0.0	$1,998.74	$17,577.30	$1,870.00	7.86
Cafeteria 5&6	45	Compact Fluorescent: Recessed fixture - 2 lamp	Wall Switch	52	2,920	Relamp	Yes	45	LED Screw-In Lamps: LED Screw In (2)	Occupancy Sensor	36	2,044	0.79	4,050	0.0	$564.57	$2,790.00	$70.00	4.82
Cafeteria exterior	4	Compact Fluorescent: Ceiling mount fixture - 2 lamps	Wall Switch	84	2,920	Relamp	No	4	LED Screw-In Lamps: LED Screw In (2)	Wall Switch	59	2,920	0.07	336	0.0	$46.81	$200.00	$0.00	4.27
Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	540	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	540	0.10	92	0.0	$12.86	$225.60	$45.00	14.05
Storage	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	540	Relamp	No	11	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	540	0.21	198	0.0	$27.62	$695.20	$0.00	25.17
Kitchen	28	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	28	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	1.35	6,901	0.0	$962.11	$3,203.73	$630.00	2.68
Kitchen office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.11	560	0.0	$78.08	$350.00	$60.00	3.71
Cafeteria 7&8	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.37	1,890	0.0	$263.54	$676.80	$135.00	2.06
Cafeteria 7&8	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.55	2,801	0.0	$390.42	$1,170.00	$200.00	2.48
Cafeteria 7&8	48	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,920	Relamp	Yes	48	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,044	0.66	3,401	0.0	$474.12	$2,853.60	$550.00	4.86
Cafeteria 7&8	6	Compact Fluorescent: Recessed fixture - 2 lamp	Wall Switch	52	2,920	Relamp	Yes	6	LED Screw-In Lamps: LED Screw In (2)	Occupancy Sensor	36	2,044	0.11	540	0.0	$75.28	$300.00	$0.00	3.99
Door 1	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,920	0.19	997	0.0	$139.04	$451.20	$90.00	2.60
Door 1	7	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,920	Relamp	No	7	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,920	0.07	376	0.0	$52.43	$337.40	$70.00	5.10
Boiler Room	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	No	17	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,920	0.37	1,884	0.0	$262.62	$994.50	$170.00	3.14
Library 5&6	24	Metal Halide: (1) 250W Lamp	Wall Switch	295	2,920	Fixture Replacement	Yes	24	LED - Fixtures: Low-Bay	Occupancy Sensor	86	2,044	3.69	18,923	0.0	$2,638.02	$34,614.60	$3,670.00	11.73

	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
Library 5&6	16	Metal Halide: (1) 250W Lamp	Wall Switch	295	2,920	Fixture Replacement	Yes	16	LED - Fixtures: Low-Bay	Occupancy Sensor	86	2,044	2.46	12,615	0.0	$1,758.68	$22,716.40	$2,400.00	11.55
Library office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,044	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.13	465	0.0	$64.88	$351.00	$60.00	4.48
Boy's locker room	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.46	2,380	0.0	$331.86	$1,264.50	$205.00	3.19
Boy's locker room	3	LED - Fixtures: High-Bay	Wall Switch	40	2,920	None	Yes	3	LED - Fixtures: High-Bay	Occupancy Sensor	40	2,044	0.02	121	0.0	$16.85	$0.00	$0.00	0.00
Gym	30	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	176	2,920	Relamp	Yes	30	LED - Linear Tubes: (6) 4' Lamps	Occupancy Sensor	87	2,044	2.26	11,595	0.0	$1,616.46	$4,566.70	$970.00	2.23
Gym	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.16	840	0.0	$117.13	$351.00	$60.00	2.48
Gym	1	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	42	2,920	Relamp	Yes	1	LED Screw-In Lamps: LED Screw In (1)	Occupancy Sensor	29	2,044	0.01	73	0.0	$10.16	$50.00	$0.00	4.92
Auxillary gym 7&8	18	Linear Fluorescent - T8: 4' T8 (32W) - 6L	High/Low Control	176	2,044	Relamp	No	18	LED - Linear Tubes: (6) 4' Lamps	High/Low Control	87	2,044	1.05	3,766	0.0	$524.96	$2,416.02	$540.00	3.57
Coacher's office	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.55	2,801	0.0	$390.42	$1,440.00	$235.00	3.09
Gym hallway	10	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	2,920	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.26	1,333	0.0	$185.85	$785.00	$450.00	1.80
Library 7&8	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.52	2,661	0.0	$370.90	$1,111.50	$190.00	2.48
Library 7&8	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,920	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,044	0.06	293	0.0	$40.91	$143.60	$20.00	3.02
Library 7&8	28	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	28	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.15	5,881	0.0	$819.89	$2,105.60	$420.00	2.06
Library 7&8	54	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	54	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	1.38	7,054	0.0	$983.36	$3,412.80	$0.00	3.47
Storage	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.22	1,120	0.0	$156.17	$816.00	$140.00	4.33
Storage	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.15	784	0.0	$109.26	$495.20	$20.00	4.35
Mail room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.25	1,260	0.0	$175.69	$567.20	$110.00	2.60
F-hallway	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.44	2,240	0.0	$312.34	$1,336.00	$720.00	1.97
F217 CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.44	1,580	0.0	$220.21	$1,141.60	$240.00	4.09
F218 CR	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.18	658	0.0	$91.75	$475.67	$100.00	4.09
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,044	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.04	155	0.0	$21.63	$117.00	$20.00	4.48
Office	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.03	131	0.0	$18.21	$179.20	$20.00	8.74
Stairwell	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.05	280	0.0	$39.04	$117.00	$90.00	0.69
F214 CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.33	1,680	0.0	$234.25	$972.00	$155.00	3.49
F213 CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.33	1,680	0.0	$234.25	$972.00	$155.00	3.49

	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
F211 CR	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.36	1,820	0.0	$253.77	$1,030.50	$165.00	3.41
F212 CR	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.36	1,820	0.0	$253.77	$1,030.50	$165.00	3.41
F210 CR	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.36	1,820	0.0	$253.77	$1,030.50	$165.00	3.41
F209 CR	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.36	1,820	0.0	$253.77	$1,030.50	$165.00	3.41
F 208 CR	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.27	1,400	0.0	$195.21	$855.00	$135.00	3.69
F 207 CR	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.36	1,820	0.0	$253.77	$1,030.50	$165.00	3.41
Girl's restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.16	840	0.0	$117.13	$416.80	$80.00	2.88
Boy's restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.16	840	0.0	$117.13	$416.80	$80.00	2.88
Hallway and stairwell	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.11	560	0.0	$78.08	$434.00	$180.00	3.25
Faculty Men's restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.04	210	0.0	$29.28	$191.20	$35.00	5.33
Faculty Women's restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.04	210	0.0	$29.28	$191.20	$35.00	5.33
F 201 CR	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.57	2,941	0.0	$409.94	$1,322.80	$245.00	2.63
Hallway	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.33	1,680	0.0	$234.25	$1,102.00	$540.00	2.40
J201, J202 CR	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,044	Relamp	No	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.78	2,793	0.0	$389.30	$1,804.80	$360.00	3.71
J203 Science	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.57	2,941	0.0	$409.94	$1,322.80	$245.00	2.63
J203 Science	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.03	140	0.0	$19.52	$58.50	$10.00	2.48
J204, J205 CR	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,044	Relamp	No	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.78	2,793	0.0	$389.30	$1,804.80	$360.00	3.71
J206 CR	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,044	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.26	931	0.0	$129.77	$601.60	$120.00	3.71
Electrical closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	90	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	90	0.02	3	0.0	$0.48	$58.50	$10.00	101.86
Stairwell	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,044	0.08	392	0.0	$54.63	$389.60	$105.00	5.21
J101, 103, 105,106,104	60	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,044	Relamp	No	60	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.95	6,981	0.0	$973.25	$4,512.00	$900.00	3.71
J102 - Science	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.57	2,941	0.0	$409.94	$1,322.80	$245.00	2.63
J102 - Science	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.03	131	0.0	$18.21	$63.20	$0.00	3.47
Lavatory	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.03	131	0.0	$18.21	$179.20	$20.00	8.74
Coacher's office	6	Incandescent: Ceiling mount fixture - 1 lamps	Wall Switch	60	2,920	Relamp	Yes	6	LED Screw-In Lamps: LED Screw-in (1)	Occupancy Sensor	9	2,044	0.21	1,082	0.0	$150.83	$206.00	$50.00	1.03

	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	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.36	1,820	0.0	$253.77	$1,160.50	$585.00	2.27
F142 Science	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.38	1,960	0.0	$273.30	$1,089.00	$175.00	3.34
Girl's restroom	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.21	1,050	0.0	$146.41	$492.00	$95.00	2.71
Boy's restroom	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.21	1,050	0.0	$146.41	$492.00	$95.00	2.71
Hallway	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.57	2,941	0.0	$409.94	$1,628.50	$945.00	1.67
Hallway	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,044	0.05	261	0.0	$36.42	$326.40	$70.00	7.04
Main office 7&8	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.08	420	0.0	$58.56	$175.50	$30.00	2.48
Main office 7&8	14	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,920	Relamp	Yes	14	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,044	0.19	992	0.0	$138.29	$944.80	$175.00	5.57
VP office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.08	420	0.0	$58.56	$291.50	$50.00	4.12
Conference room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.16	840	0.0	$117.13	$416.80	$80.00	2.88
Conference room	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,044	0.03	142	0.0	$19.76	$212.40	$40.00	8.73
VP office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.08	420	0.0	$58.56	$291.50	$50.00	4.12
Health office	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.29	1,470	0.0	$204.97	$642.40	$125.00	2.52
Health office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.08	420	0.0	$58.56	$175.50	$30.00	2.48
Health office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,044	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.02	78	0.0	$10.81	$58.50	$10.00	4.48
F151, F142 - Science	28	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	28	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	1.35	6,901	0.0	$962.11	$3,203.73	$630.00	2.68
Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.16	840	0.0	$117.13	$551.00	$270.00	2.40
F153, F155, F157, F161 - CR	48	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	48	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	1.76	6,318	0.0	$880.84	$4,566.40	$960.00	4.09
F161 A	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.15	527	0.0	$73.40	$380.53	$80.00	4.09
F163 CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.44	1,580	0.0	$220.21	$1,141.60	$240.00	4.09
F162 CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.58	2,958	0.0	$412.33	$1,411.60	$275.00	2.76
F162 CR	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,044	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.13	465	0.0	$64.88	$300.80	$60.00	3.71
F162 CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.58	2,958	0.0	$412.33	$1,411.60	$275.00	2.76
Boy's restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.08	420	0.0	$58.56	$291.50	$50.00	4.12
Girl's restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.08	420	0.0	$58.56	$291.50	$50.00	4.12

	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	19	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	2,920	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.49	2,533	0.0	$353.11	$1,511.50	$855.00	1.86
Boy's restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.08	420	0.0	$58.56	$291.50	$50.00	4.12
Girl's restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.08	420	0.0	$58.56	$291.50	$50.00	4.12
Supplies	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.11	560	0.0	$78.08	$350.00	$60.00	3.71
F166, F167, F168 - CR	36	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	36	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	1.32	4,739	0.0	$660.63	$3,424.80	$720.00	4.09
F130A - Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	540	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	540	0.04	41	0.0	$5.71	$117.00	$20.00	16.98
Hallway	23	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	2,920	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.60	3,066	0.0	$427.45	$1,745.50	$1,035.00	1.66
F128, F130,F132	36	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	36	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	1.32	4,739	0.0	$660.63	$3,424.80	$720.00	4.09
F127, F129, F131 - CR	54	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,044	Relamp	No	54	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	1.17	4,189	0.0	$583.95	$3,159.00	$540.00	4.48
F138	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.33	1,185	0.0	$165.16	$856.20	$180.00	4.09
F137, F139, F141	36	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	36	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	1.32	4,739	0.0	$660.63	$3,424.80	$720.00	4.09
Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,044	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.19	698	0.0	$97.32	$526.50	$90.00	4.48
Hallway	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	2,044	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,044	0.04	150	0.0	$20.97	$192.80	$40.00	7.29
Hallway	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	2,044	Relamp	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.06	205	0.0	$28.51	$189.60	$0.00	6.65
Hallway	14	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	60	2,044	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.28	1,020	0.0	$142.22	$819.00	$140.00	4.77
C101,102,103,104,105	60	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	60	2,044	Relamp	No	60	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	1.22	4,372	0.0	$609.51	$3,510.00	$600.00	4.77
C107,109,111,113,115,117,119,121	96	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	60	2,044	Relamp	No	96	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	1.95	6,995	0.0	$975.21	$5,616.00	$960.00	4.77
Hallway	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.41	2,100	0.0	$292.82	$1,277.50	$675.00	2.06
Hallway	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.14	700	0.0	$97.61	$492.50	$225.00	2.74
Boy's restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Occupancy Sensor	53	2,044	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	2,044	0.04	129	0.0	$18.02	$123.40	$30.00	5.18
Girl's restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Occupancy Sensor	53	2,044	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	2,044	0.04	129	0.0	$18.02	$123.40	$30.00	5.18
C112,114,116	36	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	60	2,044	Relamp	No	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.73	2,623	0.0	$365.71	$2,106.00	$360.00	4.77
C118 - Science	18	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Occupancy Sensor	60	2,044	Relamp	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.37	1,312	0.0	$182.85	$1,053.00	$180.00	4.77
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.12	630	0.0	$87.85	$425.60	$150.00	3.14
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.05	280	0.0	$39.04	$317.00	$90.00	5.81

	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	6	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	2,920	Relamp	Yes	6	LED - Linear Tubes: (3) 2' Lamps	High/Low Control	26	2,044	0.14	708	0.0	$88.73	$570.20	$300.00	2.74
E178	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.57	2,941	0.0	$409.94	$1,498.50	$245.00	3.06
Hallway	8	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	2,920	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.21	1,067	0.0	$148.68	$668.00	$360.00	2.07
E177	25	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	25	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.68	3,501	0.0	$488.03	$1,732.50	$285.00	2.97
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.11	560	0.0	$78.08	$434.00	$180.00	3.25
E176	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.38	1,960	0.0	$273.30	$1,089.00	$175.00	3.34
E175	25	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	25	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.68	3,501	0.0	$488.03	$1,732.50	$285.00	2.97
E175	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,920	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,044	0.03	147	0.0	$20.46	$71.80	$10.00	3.02
E105	32	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	32	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.87	4,481	0.0	$624.68	$2,412.00	$390.00	3.24
E104	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.16	840	0.0	$117.13	$351.00	$60.00	2.48
E104	12	Metal Halide: (1) 175W Lamp	Wall Switch	215	2,920	Fixture Replacement	Yes	12	LED - Fixtures: Low-Bay	Occupancy Sensor	50	2,044	1.42	7,253	0.0	$1,011.17	$17,307.30	$1,835.00	15.30
E104	8	Compact Fluorescent: (2) 13W	Wall Switch	26	2,920	Relamp	Yes	8	LED Screw-In Lamps: LED Screw-in (2)	Occupancy Sensor	18	2,044	0.07	360	0.0	$50.18	$160.00	$0.00	3.19
E106B	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.14	739	0.0	$103.08	$401.40	$80.00	3.12
E Wing Hall	29	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,044	Relamp	No	29	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.63	2,250	0.0	$313.60	$1,696.50	$290.00	4.48
E103	38	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	38	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	1.04	5,321	0.0	$741.80	$2,763.00	$450.00	3.12
E108	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	28	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.77	3,921	0.0	$546.59	$1,908.00	$315.00	2.91
E109	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.66	3,361	0.0	$468.51	$1,674.00	$275.00	2.99
RR 114	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.04	210	0.0	$29.28	$191.20	$35.00	5.33
RR 114	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.03	131	0.0	$18.21	$179.20	$20.00	8.74
Auditorium	36	Halogen Incandescent: Halogen	Wall Switch	70	2,920	Relamp	Yes	36	LED Screw-In Lamps: LED Screw-in (1)	Occupancy Sensor	11	2,044	1.47	7,531	0.0	$1,049.93	$1,080.00	$250.00	0.79
Maint	43	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,920	Relamp	Yes	43	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	2,044	3.03	15,537	0.0	$2,165.96	$5,270.00	$70.00	2.40
Maint Ofc	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.11	560	0.0	$78.08	$350.00	$60.00	3.71
E101	29	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	29	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.79	4,061	0.0	$566.11	$1,966.50	$325.00	2.90
E101 storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	540	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	540	0.06	61	0.0	$8.57	$175.50	$30.00	16.98
Boys RR	1	Linear Fluorescent - T12: 3' T12 (30W) - 2L	Wall Switch	79	2,920	Relamp	Yes	1	LED - Linear Tubes: (2) 3' Lamps	Occupancy Sensor	21	2,044	0.04	216	0.0	$30.10	$169.40	$20.00	4.96

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A Hall	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.62	3,151	0.0	$439.23	$1,528.00	$750.00	1.77
A101	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.22	790	0.0	$110.10	$570.80	$120.00	4.09
A102	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.44	1,580	0.0	$220.21	$1,141.60	$240.00	4.09
A Wing Stair	4	Compact Fluorescent: (2) 13W	Wall Switch	26	2,920	Relamp	Yes	4	LED Screw-In Lamps: LED Screw-in (2)	High/Low Control	18	2,044	0.04	180	0.0	$25.09	$80.00	$140.00	-2.39
A103, 104, 105, 106, 107, 108, 109	84	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,044	Relamp	No	84	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	3.08	11,057	0.0	$1,541.47	$7,991.20	$1,680.00	4.09
S2 Stair	2	Compact Fluorescent: (2) 13W	Wall Switch	26	2,920	Relamp	Yes	2	LED Screw-In Lamps: LED Screw-in (2)	High/Low Control	18	2,044	0.02	90	0.0	$12.55	$40.00	$70.00	-2.39
A111	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.58	2,958	0.0	$412.33	$1,411.60	$275.00	2.76
Nurse's Office	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.36	1,820	0.0	$253.77	$1,030.50	$165.00	3.41
B103E	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.05	280	0.0	$39.04	$233.00	$40.00	4.94
RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.03	140	0.0	$19.52	$174.50	$30.00	7.40
B107	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.38	1,972	0.0	$274.89	$877.07	$180.00	2.54
S4 Stair	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.12	630	0.0	$87.85	$225.60	$150.00	0.86
S4 Stair	1	Compact Fluorescent: (2) 13W	Wall Switch	26	2,920	Relamp	Yes	1	LED Screw-In Lamps: LED Screw-in (2)	High/Low Control	18	2,044	0.01	45	0.0	$6.27	$20.00	$35.00	-2.39
B Wing Hall	17	Compact Fluorescent: (2) 17W	Wall Switch	34	2,920	Relamp	Yes	17	LED Screw-In Lamps: LED Screw-in (2)	High/Low Control	26	2,044	0.18	902	0.0	$125.74	$995.00	$595.00	3.18
Café Hall	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.70	3,571	0.0	$497.79	$1,678.40	$850.00	1.66
Teacher Lounge	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.29	1,470	0.0	$204.97	$642.40	$125.00	2.52
RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.05	280	0.0	$39.04	$233.00	$40.00	4.94
D103 Faculty Dining	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.49	2,521	0.0	$351.38	$1,323.00	$215.00	3.15
D103C	4	Compact Fluorescent: (2) 17W	Wall Switch	34	2,920	Relamp	Yes	4	LED Screw-In Lamps: LED Screw-in (2)	Occupancy Sensor	26	2,044	0.04	212	0.0	$29.59	$256.00	$20.00	7.98
Café Hall	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.46	2,380	0.0	$331.86	$1,194.50	$765.00	1.29
Admin Offices	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.63	3,221	0.0	$448.99	$1,615.50	$265.00	3.01
Admin Offices	13	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	13	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.33	1,698	0.0	$236.73	$1,091.60	$35.00	4.46
Guidance Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.12	630	0.0	$87.85	$341.60	$65.00	3.15
Conference room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.25	1,260	0.0	$175.69	$567.20	$110.00	2.60
SAC Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.11	560	0.0	$78.08	$350.00	$60.00	3.71

	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 Hall	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.19	980	0.0	$136.65	$609.50	$315.00	2.16
Meeting Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.19	980	0.0	$136.65	$525.50	$90.00	3.19
Meeting Room	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.05	261	0.0	$36.42	$242.40	$20.00	6.11
RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.03	140	0.0	$19.52	$174.50	$30.00	7.40
Back Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.05	280	0.0	$39.04	$233.00	$40.00	4.94
Book Storage	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.33	1,680	0.0	$234.25	$972.00	$155.00	3.49
Art Room A130	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.55	2,801	0.0	$390.42	$1,440.00	$235.00	3.09
Kiln Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.19	986	0.0	$137.44	$496.53	$100.00	2.89
Hallway A	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.62	3,151	0.0	$439.23	$1,528.00	$750.00	1.77
A127, 128, 129	36	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	36	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	1.73	8,873	0.0	$1,236.99	$4,234.80	$825.00	2.76
S3 stair	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.37	1,890	0.0	$263.54	$876.80	$450.00	1.62
B206	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.11	560	0.0	$78.08	$350.00	$60.00	3.71
Storage	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.13	82	0.0	$11.43	$351.00	$60.00	25.46
B204 Faculty Office	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.19	980	0.0	$136.65	$525.50	$90.00	3.19
RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.04	210	0.0	$29.28	$191.20	$35.00	5.33
B201, 203, 205, 207, 208	60	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	60	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	2.89	14,789	0.0	$2,061.66	$7,058.00	$1,375.00	2.76
B Hallway	22	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	22	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.90	4,621	0.0	$644.20	$2,054.40	$1,100.00	1.48
B Hallway	6	Compact Fluorescent: (2) 17W	Wall Switch	34	2,920	Relamp	Yes	6	LED Screw-In Lamps: LED Screw-in (2)	High/Low Control	26	2,044	0.06	318	0.0	$44.38	$410.00	$210.00	4.51
A203, 205, 207, 209, 211, 215, 217, 219, 221, 223	120	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	120	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	5.77	29,577	0.0	$4,123.31	$14,116.00	$2,750.00	2.76
A202 Electrical	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	90	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	90	0.04	7	0.0	$0.95	$117.00	$20.00	101.86
A204	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.11	560	0.0	$78.08	$234.00	$40.00	2.48
A204	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.77	3,944	0.0	$549.77	$1,792.13	$355.00	2.61
A208	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.77	3,944	0.0	$549.77	$1,792.13	$355.00	2.61
A111A Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	540	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	540	0.03	31	0.0	$4.29	$75.20	$15.00	14.05
A111B Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.08	420	0.0	$58.56	$266.40	$50.00	3.70

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
K101, 102, 103, 104	48	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	48	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.97	10,082	0.0	$1,405.52	$4,689.60	$860.00	2.72
K106 Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	540	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	540	0.04	41	0.0	$5.71	$117.00	$20.00	16.98
Stairwell	3	Compact Fluorescent: (2) 13W	Wall Switch	26	2,920	Relamp	Yes	3	LED Screw-In Lamps: LED Screw-in (2)	High/Low Control	18	2,044	0.03	135	0.0	$18.82	$60.00	$105.00	-2.39
K105	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.41	2,100	0.0	$292.82	$868.00	$170.00	2.38
A Wing Hallway	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.49	2,521	0.0	$351.38	$1,302.40	$600.00	2.00
A115, 116, 117, 118, 119, 120, 121, 123	96	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	96	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	4.62	23,662	0.0	$3,298.65	$11,292.80	$2,200.00	2.76
B101D Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.05	280	0.0	$39.04	$233.00	$40.00	4.94
B101B	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.10	493	0.0	$68.72	$306.27	$60.00	3.58
B101A	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.19	986	0.0	$137.44	$496.53	$100.00	2.89
Open Office	13	Compact Fluorescent: (2) 17W	Wall Switch	34	2,920	Relamp	Yes	13	LED Screw-In Lamps: LED Screw-in (2)	Occupancy Sensor	26	2,044	0.13	690	0.0	$96.15	$995.00	$70.00	9.62
RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.05	280	0.0	$39.04	$233.00	$40.00	4.94
B101C	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.08	420	0.0	$58.56	$291.50	$50.00	4.12
Door 1 Lobby	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,920	0.19	997	0.0	$139.04	$451.20	$90.00	2.60
Door 1 Lobby	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,920	Relamp	No	12	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,920	0.14	705	0.0	$98.31	$430.80	$60.00	3.77
Door 1 Lobby	8	Compact Fluorescent: (2) 17W	Wall Switch	34	2,920	Relamp	No	8	LED Screw-In Lamps: LED Screw-in (2)	Wall Switch	26	2,920	0.04	215	0.0	$29.96	$280.00	$0.00	9.35
A216	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	18	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.87	4,437	0.0	$618.50	$1,982.40	$395.00	2.57
A220	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.77	3,944	0.0	$549.77	$1,792.13	$355.00	2.61
A222	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.58	2,958	0.0	$412.33	$1,411.60	$275.00	2.76
B202	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.58	2,958	0.0	$412.33	$1,411.60	$275.00	2.76
B204	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.48	2,465	0.0	$343.61	$1,067.33	$220.00	2.47
K210, 202, 203, 204	48	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	48	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.97	10,082	0.0	$1,405.52	$4,689.60	$860.00	2.72
K205	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.41	2,100	0.0	$292.82	$868.00	$170.00	2.38
K206 Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	540	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	540	0.09	82	0.0	$11.43	$234.00	$40.00	16.98
K Hallway	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.41	2,100	0.0	$292.82	$1,277.50	$675.00	2.06
A211B Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.08	420	0.0	$58.56	$266.40	$50.00	3.70

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
General	85	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	85	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ceiling mount canopy	15	Compact Fluorescent: (2) 42W	Daylight Dimming	84	4,380	Relamp	No	15	LED Screw-In Lamps: LED Screw-in (2)	Daylight Dimming	59	4,380	0.25	1,889	0.0	$263.32	$750.00	$0.00	2.85
Wall Pack	43	High-Pressure Sodium: (1) 150W Lamp	Daylight Dimming	188	4,380	Fixture Replacement	No	43	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	45	4,380	4.03	30,973	0.0	$4,317.82	$16,799.11	$4,300.00	2.89
Wall mount	18	Compact Fluorescent: (1) 26W	Daylight Dimming	26	4,380	Relamp	No	18	LED Screw-In Lamps: LED Screw In (1)	Daylight Dimming	18	4,380	0.09	725	0.0	$101.12	$360.00	$0.00	3.56
Wall Pack	2	Metal Halide: (1) 100W Lamp	Daylight Dimming	128	4,380	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	45	4,380	0.11	836	0.0	$116.57	$781.35	$200.00	4.99

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	Combined Payback w/ Incentives in Years
Mechanical Room	Campus	2	Water Supply Pump	50.0	94.5%	No	50	No	94.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Campus	3	Heating Hot Water Pump	25.0	94.1%	No	1,460	No	94.1%	Yes	3	0.00	12,443	0.0	$1,734.66	$24,008.10	$0.00	13.84
Mechanical Room	Campus	3	Chilled Water Pump	50.0	94.5%	No	5,840	No	94.5%	Yes	3	0.00	99,125	0.0	$13,818.83	$39,777.00	$9,000.00	2.23
Mechanical Room	Campus	2	Condenser Water Pump	50.0	94.5%	No	1,200	No	94.5%	Yes	2	0.00	13,579	0.0	$1,893.02	$26,518.00	$6,000.00	10.84
Outside	Campus	2	Cooling Tower Fan	20.0	91.0%	Yes	1,200	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outside	Campus	24	Cooling Tower Fan	1.3	85.0%	No	680	No	85.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outside	Campus	4	Cooling Tower Fan	1.5	85.0%	Yes	680	No	85.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gym	4	Supply Fan	2.0	84.0%	No	7,884	Yes	86.5%	No		0.11	1,214	0.0	$169.27	$2,128.68	$0.00	12.58
Roof	Various	1	Supply Fan	10.0	89.5%	No	7,884	Yes	91.7%	No		0.11	1,182	0.0	$164.84	$1,343.55	$0.00	8.15
Roof	Various	1	Return Fan	1.0	82.5%	No	7,884	Yes	85.5%	No		0.02	188	0.0	$26.15	$474.06	$0.00	18.13
Roof	Various	1	Supply Fan	5.0	87.5%	No	7,884	Yes	89.5%	No		0.05	563	0.0	$78.52	$800.37	$0.00	10.19
Roof	Various	1	Return Fan	2.0	84.0%	No	7,884	Yes	86.5%	No		0.03	304	0.0	$42.32	$532.17	$0.00	12.58
Roof	Various	2	Supply Fan	5.0	89.5%	No	7,884	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Various	1	Supply Fan	5.0	89.5%	No	7,884	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Various	1	Supply Fan	2.0	86.5%	No	7,884	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Various	1	Supply Fan	5.0	87.5%	No	7,884	Yes	89.5%	No		0.05	563	0.0	$78.52	$800.37	$0.00	10.19
Roof	Various	1	Return Fan	1.5	84.0%	No	7,884	Yes	86.5%	No		0.02	228	0.0	$31.74	$758.15	$0.00	23.89
Roof	Campus	2	Chilled Water Pump	40.0	94.1%	Yes	1,200	No	94.1%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ceiling	Campus	44	Supply Fan	3.0	86.5%	No	7,884	Yes	89.5%	No		2.12	22,563	0.0	$3,145.51	$38,559.84	$0.00	12.26
Ceiling	Campus	44	Return Fan	1.0	82.5%	No	7,884	Yes	85.5%	No		0.77	8,255	0.0	$1,150.77	$20,858.64	$0.00	18.13

		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
Various	Various	41	Supply Fan	0.3	65.0%	No	7,884	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Various	1	Supply Fan	5.0	87.5%	No	7,884	Yes	89.5%	No		0.05	563	0.0	$78.52	$800.37	$0.00	10.19
Various	Various	3	Supply Fan	2.0	84.0%	No	7,884	Yes	86.5%	No		0.09	911	0.0	$126.95	$1,596.51	$0.00	12.58

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	Various	2	Packaged AC	20.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Various	1	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	Campus	3	Water-Cooled Scroll Chiller	50.00	No							0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Campus	1	Air-Cooled Scroll Chiller	400.00	No							0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	Campus	2	Condensing Hot Water Boiler	2,781.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Various	2	Furnace	324.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Various	1	Furnace	200.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Mech Room	Campus	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mech Room	Campus	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Rest Rooms	20	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	26.7	$210.49	$143.40	$0.00	0.68
Locker Rooms	8	Showerhead	2.50	2.00	0.00	0	4.0	$31.18	$714.40	$0.00	22.91
Other	2	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	2.7	$21.05	$14.34	$0.00	0.68
Other	10	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	2.7	$21.05	$71.70	$0.00	3.41
Kitchen	10	Faucet Aerator (Kitchen)	3.00	2.20	0.00	0	7.1	$56.13	$71.70	$0.00	1.28

Reach-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 Energy Efficient Doors?	Install Door Heater Control?	Install Aluminum Night Covers?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	2	Cooler (35F to 55F)	No	No	No	No	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
Kitchen	1	Low Temp Freezer (-35F to -5F)	Yes	No	No	0.42	5,359	0.0	$747.12	$909.90	$0.00	1.22
Kitchen	1	Medium Temp Freezer (0F to 30F)	Yes	No	No	0.40	5,112	0.0	$712.63	$1,213.20	$0.00	1.70

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	5	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Ice Maker Inventory & Recommendations

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

Novelty Cooler Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Cooler Description	Install Automatic Shutoff Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	1	Ice Crea	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	6	Gas Convection Oven (Full Size)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Griddle (3 Feet Width)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Griddle (3 Feet Width)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	3	Gas Fryer	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Steamer	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	3	Electric Steamer	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Steamer	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Electric Steamer	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	4	Insulated Food Holding Cabinet (1/2 Size)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Door Type (Low Temp)	Electric	Electric	No	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?
General	200	Computer	270.0	No
General	25	Laptop	75.0	Yes
General	24	Printer, medium	600.0	Yes
General	9	Printer, large	800.0	Yes
General	107	Projector	50.0	Yes
General	11	Microwave	1,500.0	Yes
General	9	Refrigerator, medium	226.0	No
General	5	Refrigerator, large	572.0	No
General	5	Coffee Machine	900.0	No
General	3	Toaster Oven	1,500.0	No
General	1	Clothes washer	1,200.0	No
General	1	Clothes dryer	5,000.0	No
General	76	TV, LCD 42 inch	200.0	Yes
General	4	Dishwasher	1,000.0	No
General	3	Refrigerator, mini	100.0	Yes

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
Gym	2	Refrigerated	Yes	0.00	3,224	0.0	$449.41	$460.00	$0.00	1.02
Gym	1	Non-Refrigerated	No	0.00	0	0.0	$0.00	$230.00	$0.00	0.00
Faculty Dining	3	Refrigerated	Yes	0.00	4,836	0.0	$674.11	$690.00	$0.00	1.02
Faculty Dining	1	Non-Refrigerated	No	0.00	0	0.0	$0.00	$230.00	$0.00	0.00

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Williamstown Middle School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 313,512
Built: 1958

For Year Ending: April 30, 2016
Date Generated: May 05, 2017

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
Williamstown Middle School 561 Clayton Road Williamstown, New Jersey 08094	_____ . (___)___-_____	___ _____ . (___)___-_____ _____

Property ID: 5016225

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
82.5 kBtu/ft²

Source EUI
189.7 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	15,470,383 (60%)
Natural Gas (kBtu)	10,380,954 (40%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	89.5
National Median Source EUI (kBtu/ft²)	205.9
% Diff from National Median Source EUI	-8%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	2,326

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)