Local Government Energy Audit:
Energy Audit Report

Williamstown High School

Monroe Township Board of Education

700 North Tuckahoe Road
Williamstown, NJ 08094

February 1, 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 High School. The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist 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 High School is a 338,067 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, theater, cafeteria and kitchen.

Lighting at Williamstown High School consists of primarily of 4-foot linear fluorescent fixtures with T8 lamps. Fixtures with incandescent, compact fluorescent, high intensity discharge, or LED lamps make up less than 10% of the overall lighting. Space conditioning is provided primarily by fan coils throughout the campus with air handlers that provide preconditioned outside air to the fan coils. Hot water for the systems is provided by three boilers. Chilled water is provided by three air cooled scroll chillers. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated 12 measures which together represent an opportunity for Williamstown High School to reduce annual energy costs by $217,343 and annual greenhouse gas emissions by 1,637,326 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 6.1 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 High School's annual energy use by 14%.

Figure 1 – Previous 12 Month Utility Costs

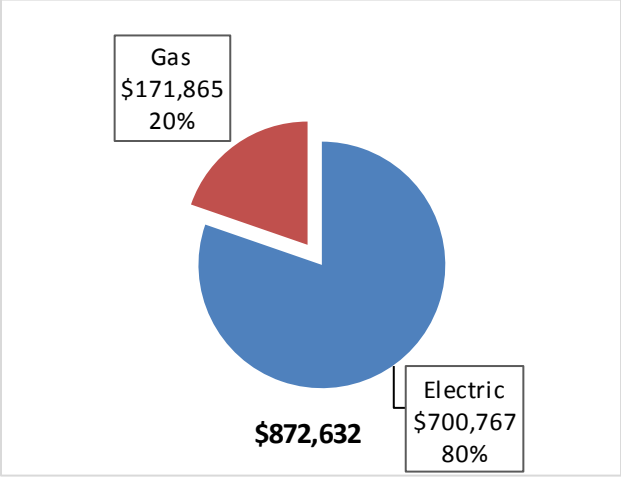
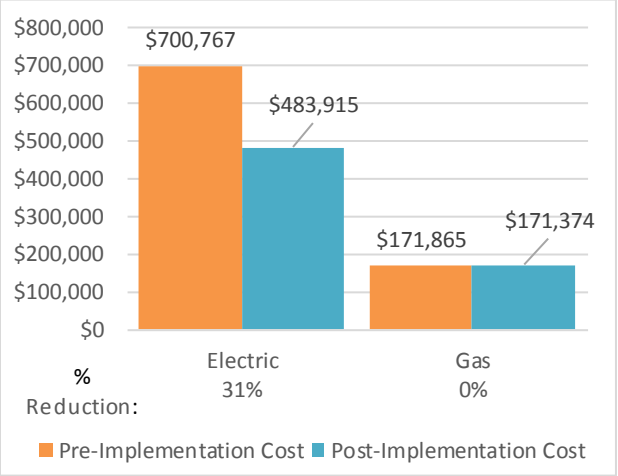


Figure 2 – Potential Post-Implementation Costs



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

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 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			**664,952**	**126.1**	**0.0**	**$89,093.69**	**$412,385.64**	**$51,350.00**	**$361,035.64**	**4.1**	**669,601**
ECM 1	Install LED Fixtures	Yes	105,458	16.4	0.0	$14,129.81	$157,933.17	$6,240.00	$151,693.17	10.7	106,195
ECM 2	Retrofit Fixtures with LED Lamps	Yes	559,494	109.7	0.0	$74,963.88	$254,452.47	$45,110.00	$209,342.47	2.8	563,406
Lighting Control Measures			**155,505**	**30.0**	**0.0**	**$20,835.38**	**$64,808.00**	**$6,190.00**	**$58,618.00**	**2.8**	**156,592**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	126,323	24.3	0.0	$16,925.39	$48,008.00	$6,190.00	$41,818.00	2.5	127,206
ECM 4	Install High/Low Lighitng Controls	Yes	29,182	5.7	0.0	$3,909.99	$16,800.00	$0.00	$16,800.00	4.3	29,386
Motor Upgrades			**40,211**	**6.0**	**0.0**	**$5,387.71**	**$71,520.70**	**$0.00**	**$71,520.70**	**13.3**	**40,492**
ECM 5	Premium Efficiency Motors	Yes	40,211	6.0	0.0	$5,387.71	$71,520.70	$0.00	$71,520.70	13.3	40,492
Variable Frequency Drive (VFD) Measures			**382,595**	**46.8**	**0.0**	**$51,262.04**	**$210,940.33**	**$30,567.50**	**$180,372.83**	**3.5**	**385,270**
ECM 6	Install VFD on Variable Air Volume (VAV) HVAC	Yes	29,606	4.3	0.0	$3,966.79	$14,628.35	$4,687.50	$9,940.85	2.5	29,813
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	285,353	42.5	0.0	$38,233.03	$152,208.43	$18,680.00	$133,528.43	3.5	287,348
ECM 8	Install VFDs on Chilled Water Pumps	Yes	41,175	0.0	0.0	$5,516.84	$28,098.15	$7,200.00	$20,898.15	3.8	41,463
ECM 9	Install VFDs on Hot Water Pumps	Yes	26,461	0.0	0.0	$3,545.38	$16,005.40	$0.00	$16,005.40	4.5	26,646
Electric Chiller Replacement			**367,151**	**223.6**	**0.0**	**$49,192.87**	**$728,632.64**	**$76,636.00**	**$651,996.64**	**13.3**	**369,719**
ECM 10	Install High Efficiency Chillers	Yes	367,151	223.6	0.0	$49,192.87	$728,632.64	$76,636.00	$651,996.64	13.3	369,719
Domestic Water Heating Upgrade			**0**	**0.0**	**64.4**	**$491.12**	**$408.69**	**$0.00**	**$408.69**	**0.8**	**7,536**
ECM 11	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	64.4	$491.12	$408.69	$0.00	$408.69	0.8	7,536
Plug Load Equipment Control - Vending Machine			**8,059**	**0.0**	**0.0**	**$1,079.81**	**$1,150.00**	**$0.00**	**$1,150.00**	**1.1**	**8,116**
ECM 12	Vending Machine Control	Yes	8,059	0.0	0.0	$1,079.81	$1,150.00	$0.00	$1,150.00	1.1	8,116
TOTALS			**1,618,473**	**432.5**	**64.4**	**$217,342.63**	**$1,489,846.00**	**$164,743.50**	**$1,325,102.50**	**6.1**	**1,637,326**

* - 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.

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

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.

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

Energy Efficient Practices

TRC Energy Services 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 High School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- 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)
- Demand Response Energy Aggregator

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

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

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

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	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 February 21, 2017, TRC performed an energy audit at Williamstown High 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 High School is a 338,067 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, theater, cafeteria and kitchen. The building was constructed in 1997. There have been several renovations and additions since then.

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-week breaks at the end of December and in the spring. During a typical day, the facility is occupied by approximately 188 staff and 1,840 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Williamstown High School	Weekday	7:00 am - 6:00 pm
Williamstown High 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. There are a mix of single and dual pane windows.

2.5 On-Site Generation

Williamstown High 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 High School is provided mostly by 4-foot, linear fluorescent fixtures with T8 lamps although there are a few fixtures with light emitting diode (LED) lamps. Approximately three-quarters of the 4-foot fluorescent fixtures have three lamps and the remaining fixtures have one (1), two (2), or four (4) lamps. Exit signs have all been modified to use light emitting diodes (LEDs).

Nearly all of the interior light fixtures are controlled by wall switches. Occupancy sensor controls are currently used in some restrooms and locker rooms.

Exterior lighting is provided primarily by fixtures with high pressure sodium lamps but there are also fixtures that use LED and metal halide lamps. 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 or Condenser Water System

The High School has three (3) Trane air-cooled scroll chillers. There is one (1), 155-ton chiller located on the roof and two (2), 339-ton chillers located on the ground near the tennis courts. The chillers operate throughout the entire year to provide chilled water to the fan coils and air handlers located throughout the building. Chilled water is circulated by four pumps located in the mechanical room. There are three

(3) 40 hp constant speed pumps and one (1) 15 hp variable speed pump. The variable flow pump serves the new addition. At least one (1) chilled water pump is always on.

Hot Water Heating System

The hot water system consists of three (3) Cleaver Brooks boilers rated at 5,250,000 btu/hr. There are two (2) 25 hp constant speed pumps and one (1) 20 hp variable speed pump. The variable speed pump serves the new addition. Hot water is distributed to the air handlers and fan coils throughout the building. Based on the high natural gas use in the summer, the heating boilers appear to operate all year.

Ventilation System

Conditioning is provided to most of the campus by 285 four-pipe fan coils. The fan coils have fans that range from 1/6 hp to 1/2 hp. There are 19 air handlers that supply outside air to the fan coils. The supply fans for the air handlers range from 2 to 15 hp. Only the cafeteria, stage, and auditorium air handlers have return fans. Air handlers seven (7), eight (8), nine (9) and ten (10) serving the library and offices are variable air volume. All of the air handlers have heating and cooling coils to precondition the outside air being delivered to the fan coils. The supply air temperature from the air handlers is reset based on the outside air temperature. The supply air temperature reset varies for different air handlers but ranges from 50°F to 70°F at 30°F outside air and 50°F to 60°F at 67°F outside air. There are 12 heating and ventilating units that serve the gymnasium and associated areas. The heating and ventilating units have supply fans that range from 1.5 to 10 hp and return fans that range from 1 to 7.5 hp. There are also approximately 40 unit heaters throughout the building. The air handlers are on from 6:00 AM to 11:00 PM. **It was assumed that all of the HVAC fans operate 365 days per year in order to balance the calculated electricity use with the historical utility bills and to be consistent with the historical energy use profile**.

Because of the configuration of air handlers supplying outside ventilation air to the fan coils, there are times that the fan coils operate as reheat units.

Direct Expansion Air Conditioning System (DX)

There are two (2) split system air conditioners rated at 1 ton and 2 tons that condition locker rooms. There are also two (2) 3.5 ton split system heat pumps that condition the weight room.

Building Management System (BMS)

The campus has a Tracer Summit building management system (BMS) that monitors and controls the chilled water, heating water, and ventilation systems.

Domestic Hot Water Heating System

There are four (4) 199,000 Btu/hr tankless natural gas fired water heaters that provide domestic hot water for the campus.

Food Service & Laundry Equipment

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

Refrigeration

The kitchen has freestanding refrigerators, a freestanding freezer, 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 2,300 computers including desktop and laptop units. There are four (4) refrigerated, one (1) iced and one (1) non-refrigerated vending machine at the facility.

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

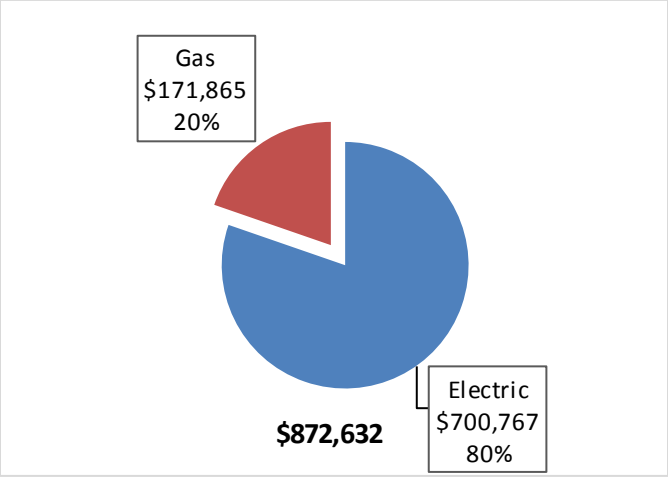
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Williamstown High School		
Fuel	**Usage**	**Cost**
Electricity	5,230,182 kWh	$700,767
Natural Gas	225,248 Therms	$171,865
Total		**$872,632**

The current annual energy cost for this facility is $872,632 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 (ACE). The average electric cost over the past 12 months was $0.134/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

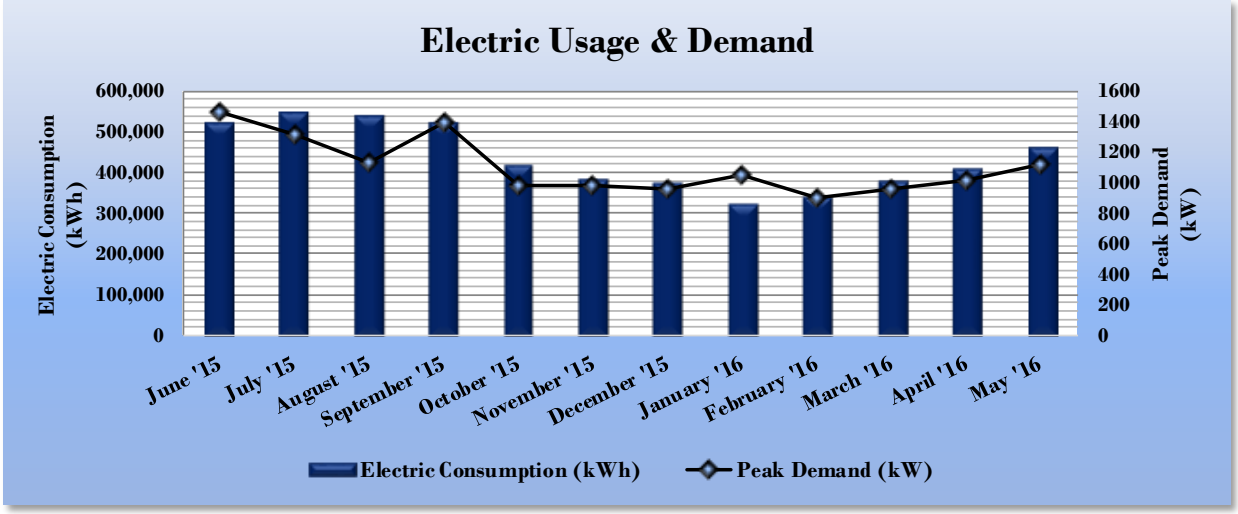


Figure 9 - Electric Usage & Demand

Electric Billing Data for Williamstown High School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/30/15	30	524,801	1,460	$1,460	$41,518
7/31/15	31	550,305	1,317	$1,317	$61,334
8/31/15	31	541,151	1,126	$1,168	$73,956
9/30/15	30	525,451	1,392	$1,392	$74,057
10/31/15	31	419,387	976	$1,168	$67,058
11/30/15	30	385,292	980	$1,168	$56,927
12/31/15	31	378,056	957	$1,168	$54,264
1/31/16	31	323,624	1,046	$1,168	$51,787
2/29/16	29	344,001	898	$1,168	$47,148
4/1/16	32	379,118	957	$1,168	$53,799
4/30/16	29	409,174	1,018	$1,168	$57,088
5/31/16	31	464,151	1,114	$1,168	$63,751
Totals	**366**	**5,244,511**	**1459.62**	**$14,679**	**$702,687**
Annual	**365**	**5,230,182**	**1459.62**	**$14,639**	**$700,767**

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 $0.763/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. **The summer natural gas use is unusually high for a site that does not have summer school**. The profile for the remainder of the year is consistent with the primary natural gas use being space heating.

Figure 10 - Months Natural Gas Usage & Demand

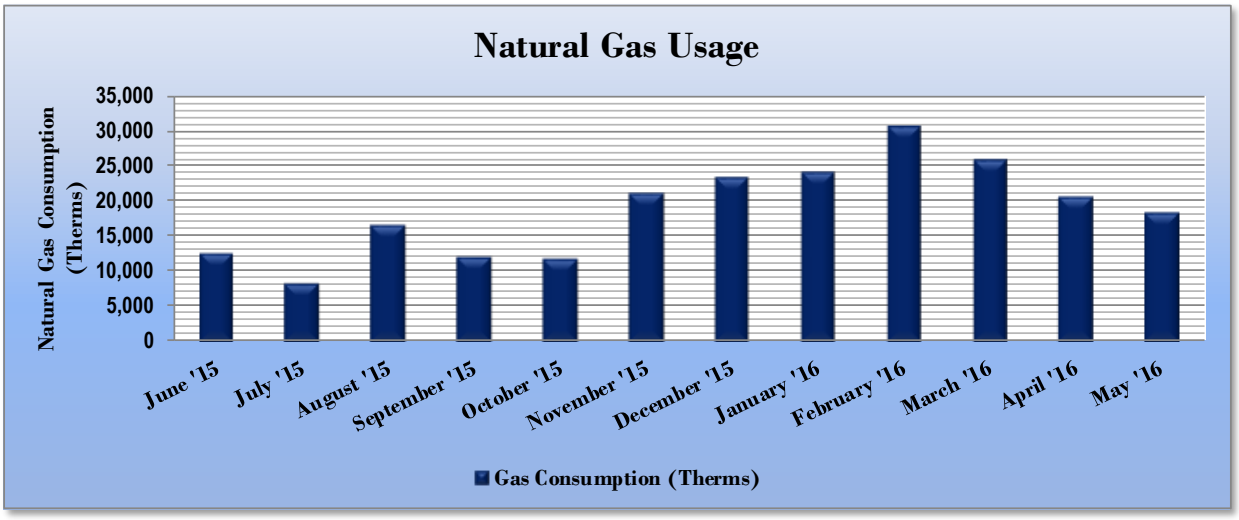


Figure 11 - Natural Gas Usage & Demand

Gas Billing Data for Williamstown High School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
6/15/15	31	12,753	$10,628
7/17/15	32	8,352	$7,412
8/17/15	31	16,698	$13,261
9/17/15	31	12,102	$9,999
10/15/15	28	11,880	$9,555
11/16/15	32	21,108	$15,953
12/14/15	28	23,375	$17,354
1/14/16	31	24,326	$18,138
2/12/16	29	30,864	$22,580
3/14/16	31	25,878	$19,213
4/14/16	31	20,823	$15,581
5/16/16	32	18,324	$13,132
Totals	**367**	**226,482**	**$172,807**
Annual	**365**	**225,248**	**$171,865**

3.4 Benchmarking

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

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 High School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	235.7	141.4
Site Energy Use Intensity (kBtu/ft^2)	119.4	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 High School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	184.2	141.4
Site Energy Use Intensity (kBtu/ft^2)	102.9	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 44.

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

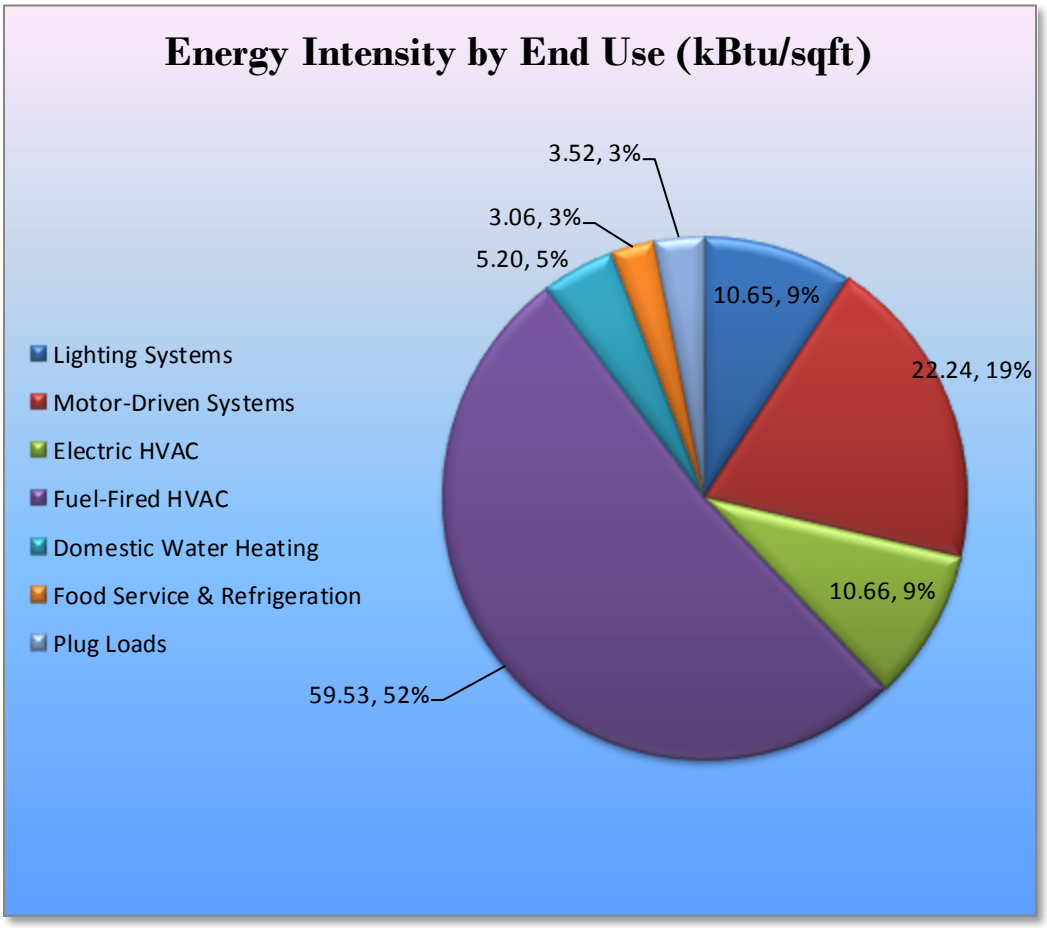
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 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		**664,952**	**126.1**	**0.0**	**$89,093.69**	**$412,385.64**	**$51,350.00**	**$361,035.64**	**4.1**	**669,601**
ECM 1	Install LED Fixtures	105,458	16.4	0.0	$14,129.81	$157,933.17	$6,240.00	$151,693.17	10.7	106,195
ECM 2	Retrofit Fixtures with LED Lamps	559,494	109.7	0.0	$74,963.88	$254,452.47	$45,110.00	$209,342.47	2.8	563,406
Lighting Control Measures		**155,505**	**30.0**	**0.0**	**$20,835.38**	**$64,808.00**	**$6,190.00**	**$58,618.00**	**2.8**	**156,592**
ECM 3	Install Occupancy Sensor Lighting Controls	126,323	24.3	0.0	$16,925.39	$48,008.00	$6,190.00	$41,818.00	2.5	127,206
ECM 4	Install High/Low Lighitng Controls	29,182	5.7	0.0	$3,909.99	$16,800.00	$0.00	$16,800.00	4.3	29,386
Motor Upgrades		**40,211**	**6.0**	**0.0**	**$5,387.71**	**$71,520.70**	**$0.00**	**$71,520.70**	**13.3**	**40,492**
ECM 5	Premium Efficiency Motors	40,211	6.0	0.0	$5,387.71	$71,520.70	$0.00	$71,520.70	13.3	40,492
Variable Frequency Drive (VFD) Measures		**382,595**	**46.8**	**0.0**	**$51,262.04**	**$210,940.33**	**$30,567.50**	**$180,372.83**	**3.5**	**385,270**
ECM 6	Install VFD on Variable Air Volume (VAV) HVAC	29,606	4.3	0.0	$3,966.79	$14,628.35	$4,687.50	$9,940.85	2.5	29,813
ECM 7	Install VFDs on Constant Volume (CV) HVAC	285,353	42.5	0.0	$38,233.03	$152,208.43	$18,680.00	$133,528.43	3.5	287,348
ECM 8	Install VFDs on Chilled Water Pumps	41,175	0.0	0.0	$5,516.84	$28,098.15	$7,200.00	$20,898.15	3.8	41,463
ECM 9	Install VFDs on Hot Water Pumps	26,461	0.0	0.0	$3,545.38	$16,005.40	$0.00	$16,005.40	4.5	26,646
Electric Chiller Replacement		**367,151**	**223.6**	**0.0**	**$49,192.87**	**$728,632.64**	**$76,636.00**	**$651,996.64**	**13.3**	**369,719**
ECM 10	Install High Efficiency Chillers	367,151	223.6	0.0	$49,192.87	$728,632.64	$76,636.00	$651,996.64	13.3	369,719
Domestic Water Heating Upgrade		**0**	**0.0**	**64.4**	**$491.12**	**$408.69**	**$0.00**	**$408.69**	**0.8**	**7,536**
ECM 11	Install Low-Flow Domestic Hot Water Devices	0	0.0	64.4	$491.12	$408.69	$0.00	$408.69	0.8	7,536
Plug Load Equipment Control - Vending Machine		**8,059**	**0.0**	**0.0**	**$1,079.81**	**$1,150.00**	**$0.00**	**$1,150.00**	**1.1**	**8,116**
ECM 12	Vending Machine Control	8,059	0.0	0.0	$1,079.81	$1,150.00	$0.00	$1,150.00	1.1	8,116
TOTALS		**1,618,473**	**432.5**	**64.4**	**$217,342.63**	**$1,489,846.00**	**$164,743.50**	**$1,325,102.50**	**6.1**	**1,637,326**

* - 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		**664,952**	**126.1**	**0.0**	**$89,093.69**	**$412,385.64**	**$51,350.00**	**$361,035.64**	**4.1**	**669,601**
ECM 1	Install LED Fixtures	105,458	16.4	0.0	$14,129.81	$157,933.17	$6,240.00	$151,693.17	10.7	106,195
ECM 2	Retrofit Fixtures with LED Lamps	559,494	109.7	0.0	$74,963.88	$254,452.47	$45,110.00	$209,342.47	2.8	563,406

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	40,521	7.9	0.0	$5,429.21	$41,914.60	$2,230.00	$39,684.60	7.3	40,804
Exterior	64,937	8.5	0.0	$8,700.60	$116,018.57	$4,010.00	$112,008.57	12.9	65,391

Measure Description

We recommend replacing existing fixtures containing metal halide and high-pressure sodium lamps with new high-performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

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	559,494	109.7	0.0	$74,963.88	$254,452.47	$45,110.00	$209,342.47	2.8	563,406
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing fluorescent, incandescent, and halogen, lighting technologies 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 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		155,505	30.0	0.0	$20,835.38	$64,808.00	$6,190.00	$58,618.00	2.8	156,592
ECM 3	Install Occupancy Sensor Lighting Controls	126,323	24.3	0.0	$16,925.39	$48,008.00	$6,190.00	$41,818.00	2.5	127,206
ECM 4	Install High/Low Lighting Controls	29,182	5.7	0.0	$3,909.99	$16,800.00	$0.00	$16,800.00	4.3	29,386

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)
126,323	24.3	0.0	$16,925.39	$48,008.00	$6,190.00	$41,818.00	2.5	127,206

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches throughout the campus. Due to the long restart time for high intensity discharge (HID) lamps, occupancy sensors should not be used in areas that are illuminated with HID fixtures unless the fixtures are going to be replaced with LED fixtures. 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)
29,182	5.7	0.0	$3,909.99	$16,800.00	$0.00	$16,800.00	4.3	29,386

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. For the high school such lighting controls are recommended for stairwells and hallways.

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)
40,211	6.0	0.0	$5,387.71	$71,520.70	$0.00	$71,520.70	13.3	40,492

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		**382,595**	**46.8**	**0.0**	**$51,262.04**	**$210,940.33**	**$30,567.50**	**$180,372.83**	**3.5**	**385,270**
ECM 6	Install VFD on Variable Air Volume (VAV) HVAC	29,606	4.3	0.0	$3,966.79	$14,628.35	$4,687.50	$9,940.85	2.5	29,813
ECM 7	Install VFDs on Constant Volume (CV) HVAC	285,353	42.5	0.0	$38,233.03	$152,208.43	$18,680.00	$133,528.43	3.5	287,348
ECM 8	Install VFDs on Chilled Water Pumps	41,175	0.0	0.0	$5,516.84	$28,098.15	$7,200.00	$20,898.15	3.8	41,463
ECM 9	Install VFDs on Hot Water Pumps	26,461	0.0	0.0	$3,545.38	$16,005.40	$0.00	$16,005.40	4.5	26,646

ECM 6: Install VFD on Variable Air Volume (VAV) HVAC

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
29,606	4.3	0.0	$3,966.79	$14,628.35	$4,687.50	$9,940.85	2.5	29,813

Measure Description

We recommend replacing existing air volume control devices on air handlers, such as inlet vanes and variable pitch fan blades, with VFDs. Inlet guide vanes and variable pitch fan blades are an inefficient means of controlling the air volume compared to VFDs. The existing volume control device would be removed, or permanently disabled, and the control signal would be redirected to the VFD to determine proper fan motor speed. Energy savings results from more efficient control of motor energy usage when fan motors are operated at partial load. The magnitude of energy savings is based on the estimated amount of time that fan motors would be operated at partial load. This measure applies to the air handlers seven (7), eight (8), nine (9), and ten (10) serving the library and some offices.

Additional maintenance savings may result from this measure as well, since VFDs are solid state electronic device, which generally requires less maintenance than mechanical air volume control devices.

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

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
285,353	42.5	0.0	$38,233.03	$152,208.43	$18,680.00	$133,528.43	3.5	287,348

Measure Description

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

VAV systems should not be controlled such that the supply air temperature is raised at the expense of the fan power. A common mistake is to reset the supply air temperature to achieve chiller energy savings, which can lead to additional air flow requirements. Supply air temperature should be kept low, e.g. 55°F, until the minimum fan speed (typically about 50%) is met. At this point, it is efficient to raise the supply air temperature as the load decreases, but not such that additional air flow and thus fan energy is required.

ECM 8: Install VFDs on Chilled Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
41,175	0.0	0.0	$5,516.84	$28,098.15	$7,200.00	$20,898.15	3.8	41,463

Measure Description

At least one chilled water pump is always operating even when the building is unoccupied. We recommend installing VFDs to control the constant speed chilled water pumps. 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 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.

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. Differential pressure control will need to be added for the chilled water distribution. The minimum flow to prevent the chiller from tripping off will also have to be determined.

ECM 9: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
26,461	0.0	0.0	$3,545.38	$16,005.40	$0.00	$16,005.40	4.5	26,646

Measure Description

At least one heating water pump runs even when the building is unoccupied. We recommend installing VFDs to control the constant speed 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 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 Electric Chiller Replacement

ECM 10: Install High Efficiency Chillers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
367,151	223.6	0.0	$49,192.87	$728,632.64	$76,636.00	$651,996.64	13.3	369,719

Measure Description

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

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

4.1.6 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**	**64.4**	**$491.12**	**$408.69**	**$0.00**	**$408.69**	**0.8**	**7,536**
ECM 11	Install Low-Flow Domestic Hot Water Devices	0	0.0	64.4	$491.12	$408.69	$0.00	$408.69	0.8	7,536

ECM 11: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	64.4	$491.12	$408.69	$0.00	$408.69	0.8	7,536

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy.

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.7 Plug Load Equipment Control - Vending Machines

ECM 12: 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	$1,079.81	$1,150.00	$0.00	$1,150.00	1.1	8,116

Measure Description

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

4.1.8 ECMs for Further Evaluation

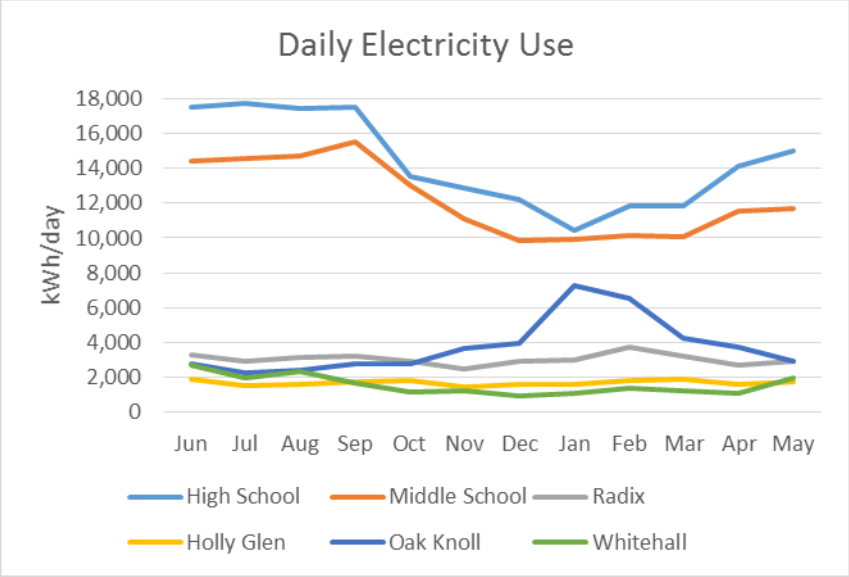
Summer electricity usage is higher than expected for all of the Monroe Township sites included in the audit scope. School is not in session July through August; however, the daily electricity usage during those months ranges from 84% to 101% of the daily use in June and September. These use patterns are shown in the graph below. Even accounting for summer maintenance and community activities, the electricity usage should decrease when school is not in session. In addition, the lighting, heating, ventilating, and

HVAC operating hours at 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 usage to the historical electric bills. The longer operating hours also adversely affects natural gas usage by requiring heating operation during night and weekends. There also appears to be excess reheating operation at the high school during July and August, possibly due to the air conditioning operating when there is minimal internal building load.

All of the above indicate that equipment---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 to turn 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.

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.

Figure 20 – 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.

Reduce Air Leakage

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

Close Doors and Windows

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

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.

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 4.1.6 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.

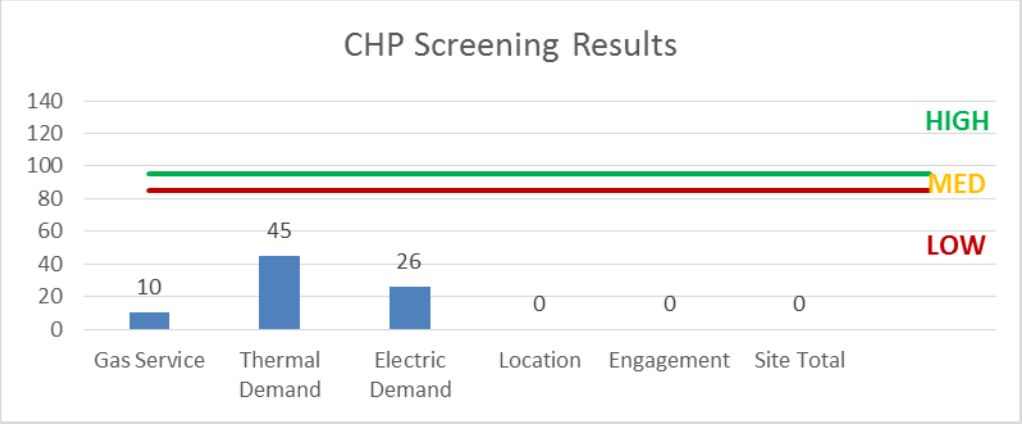
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

Figure 21 – CHP Screening



7 DEMAND RESPONSE

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

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

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

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

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

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

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

In our opinion, Williamstown High 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 Figure 21 for a list of the eligible programs identified for each recommended ECM.

Figure 22 - 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 VFD on Variable Air Volume (VAV) HVAC	x	x
ECM 7	Install VFDs on Constant Volume (CV) HVAC	x	x
ECM 8	Install VFDs on Chilled Water Pumps	x	x
ECM 9	Install VFDs on Hot Water Pumps		x
ECM 10	Install High Efficiency Chillers	x	x
ECM 11	Install Low-Flow Domestic Hot Water Devices		x
ECM 12	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
Assoc Locker Rm	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,920	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,920	0.10	499	0.0	$66.81	$225.60	$45.00	2.70
Assoc Locker Rm	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	2,044	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.04	136	0.0	$18.27	$126.40	$0.00	6.92
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	$84.43	$425.60	$150.00	3.26
Maint Office	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	$140.71	$492.00	$95.00	2.82
Boiler	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	$450.28	$1,944.00	$310.00	3.63
Kitchen	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	$112.57	$351.00	$60.00	2.59
Kitchen	65	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	65	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	2.67	13,653	0.0	$1,829.27	$5,428.00	$1,045.00	2.40
Dining	82	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	82	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	3.36	17,224	0.0	$2,307.70	$6,706.40	$1,300.00	2.34
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.53	2,731	0.0	$365.85	$1,177.60	$650.00	1.44
Wood Shop	48	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	48	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	1.31	6,721	0.0	$900.56	$3,348.00	$550.00	3.11
Manuf Tech	54	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	54	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	1.48	7,562	0.0	$1,013.14	$3,699.00	$610.00	3.05
Men RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,044	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,044	0.01	41	0.0	$5.51	$35.90	$5.00	5.61
Women RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,044	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,044	0.01	41	0.0	$5.51	$35.90	$5.00	5.61
Auto CAD	26	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	26	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.07	5,461	0.0	$731.71	$2,225.20	$425.00	2.46
H105 Tech Ofc	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	$84.43	$341.60	$65.00	3.28
H102 Lab	53	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	53	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	2.17	11,132	0.0	$1,491.56	$4,525.60	$865.00	2.45
H102 Lab	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	$75.05	$504.00	$75.00	5.72
Custodial	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.02	14	0.0	$1.83	$58.50	$10.00	26.50
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.41	2,100	0.0	$281.43	$952.00	$500.00	1.61
Hallway	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	$52.51	$389.60	$105.00	5.42
Trainer Ofc	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	$253.28	$792.80	$155.00	2.52
Weight Rm	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.82	4,201	0.0	$562.85	$2,044.00	$370.00	2.97
Men RR	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	$84.43	$341.60	$65.00	3.28
Storage F-10	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	$5.49	$117.00	$20.00	17.66
Hallway	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.66	3,361	0.0	$450.28	$1,804.00	$1,080.00	1.61

	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
F1	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	$18.76	$174.50	$30.00	7.70
F11	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	$37.52	$233.00	$40.00	5.14
Aux Gym	12	Metal Halide: (1) 450W Lamp	Wall Switch	506	2,920	Fixture Replacement	Yes	12	LED - Fixtures: High-Bay	Occupancy Sensor	160	2,044	3.10	15,877	0.0	$2,127.23	$32,492.40	$1,835.00	14.41
Gym	45	LED - Fixtures: High-Bay	Wall Switch	283	2,920	None	Yes	45	LED - Fixtures: High-Bay	Occupancy Sensor	283	2,044	2.50	12,829	0.0	$1,718.93	$810.00	$105.00	0.41
Gym	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.20	1,045	0.0	$140.02	$505.60	$0.00	3.61
Gym	41	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,920	Relamp	Yes	41	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,044	0.43	2,210	0.0	$296.07	$1,307.90	$205.00	3.73
Coach Ofc	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	$56.29	$266.40	$50.00	3.84
Coach Ofc	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	$56.29	$266.40	$50.00	3.84
Custodial	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.02	14	0.0	$1.83	$58.50	$10.00	26.50
Team Room	50	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,920	Relamp	Yes	50	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,044	0.53	2,695	0.0	$361.06	$2,135.00	$320.00	5.03
Coach Ofc	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	$56.29	$266.40	$50.00	3.84
Locker Men	69	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,920	Relamp	Yes	69	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,044	0.73	3,719	0.0	$498.27	$2,741.10	$415.00	4.67
Storage	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	$18.76	$174.50	$30.00	7.70
Coach Ofc	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	$84.43	$341.60	$65.00	3.28
Custodial	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.02	14	0.0	$1.83	$58.50	$10.00	26.50
Team Room	50	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,920	Relamp	Yes	50	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,044	0.53	2,695	0.0	$361.06	$2,135.00	$320.00	5.03
Coach Ofc	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	$56.29	$266.40	$50.00	3.84
Locker Women	69	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,920	Relamp	Yes	69	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,044	0.73	3,719	0.0	$498.27	$2,741.10	$415.00	4.67
Storage	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	$18.76	$174.50	$30.00	7.70
Coach Ofc	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	$84.43	$341.60	$65.00	3.28
H101-H106	30	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	30	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.23	6,301	0.0	$844.28	$3,876.00	$660.00	3.81
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.29	1,470	0.0	$197.00	$726.40	$350.00	1.91
Hallway Gym	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	$52.51	$389.60	$105.00	5.42
Rest Rooms	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,044	Relamp	No	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.32	1,164	0.0	$155.90	$752.00	$150.00	3.86
Hallway	46	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	46	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,044	1.17	6,009	0.0	$805.09	$3,707.20	$1,610.00	2.60

	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
G101	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	$168.86	$567.20	$110.00	2.71
Display	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,920	Relamp	Yes	2	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,044	0.02	108	0.0	$14.44	$179.80	$30.00	10.37
Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.33	1,680	0.0	$225.14	$1,401.60	$400.00	4.45
D103 Lecture Hall	39	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	39	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.60	8,192	0.0	$1,097.56	$3,472.80	$655.00	2.57
D104	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	$281.43	$868.00	$170.00	2.48
Child Study	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.53	2,731	0.0	$365.85	$1,247.60	$230.00	2.78
D106	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.74	3,781	0.0	$506.57	$1,623.60	$305.00	2.60
Display	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.62	3,151	0.0	$422.14	$1,398.00	$260.00	2.70
Display	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,920	Relamp	Yes	2	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	2,044	0.02	108	0.0	$14.44	$179.80	$30.00	10.37
Athletics Ofc	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	$112.57	$416.80	$80.00	2.99
Storage D-11	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	540	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	540	0.02	20	0.0	$2.75	$58.50	$10.00	17.66
Rest Rooms	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,044	Relamp	No	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.32	1,164	0.0	$155.90	$752.00	$150.00	3.86
Custodial C-11	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.02	14	0.0	$1.83	$58.50	$10.00	26.50
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.53	2,731	0.0	$365.85	$1,777.60	$650.00	3.08
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,044	0.19	986	0.0	$132.10	$380.53	$220.00	1.22
Hallway	8	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,920	Relamp	Yes	8	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	2,044	0.11	567	0.0	$75.95	$585.60	$360.00	2.97
C14 Health Svc	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	$37.52	$117.00	$20.00	2.59
C14 Health Svc	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.49	2,521	0.0	$337.71	$1,172.40	$215.00	2.83
C14 Health Svc	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	$35.00	$126.40	$0.00	3.61
C101, 102, 107, 109	64	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	64	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	2.62	13,443	0.0	$1,801.13	$5,892.80	$1,100.00	2.66
C103, 104, 105, 106, 108	60	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	60	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	2.46	12,603	0.0	$1,688.56	$5,862.00	$1,075.00	2.83
Stairwell	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	$253.28	$876.80	$450.00	1.69
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	$619.14	$2,054.40	$1,100.00	1.54
C10 Elect Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	180	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	180	0.02	7	0.0	$0.92	$58.50	$10.00	52.99
C110	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.49	2,521	0.0	$337.71	$1,018.40	$200.00	2.42

	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
C112 Office	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	$112.57	$416.80	$80.00	2.99
C112 Office	1	Compact Fluorescent: Compact Fluorescent (2)	Wall Switch	52	2,920	Relamp	Yes	1	LED Screw-In Lamps: LED Screw In	Occupancy Sensor	36	2,044	0.02	89	0.0	$11.93	$107.51	$0.00	9.01
B103	27	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	27	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.11	5,671	0.0	$759.85	$2,300.40	$440.00	2.45
Women 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	$28.14	$191.20	$35.00	5.55
Men 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	$28.14	$191.20	$35.00	5.55
Pantry	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	$19.66	$187.80	$30.00	8.03
Pantry	2	Compact Fluorescent: Compact Fluorescent (2)	Wall Switch	52	2,920	Relamp	Yes	2	LED Screw-In Lamps: LED Screw In	Occupancy Sensor	36	2,044	0.03	178	0.0	$23.86	$215.01	$0.00	9.01
Offices	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.33	1,680	0.0	$225.14	$717.60	$140.00	2.57
Offices	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	$17.50	$179.20	$20.00	9.10
Office Principal	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.74	3,781	0.0	$506.57	$1,623.60	$305.00	2.60
Hallway	29	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	29	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	1.19	6,091	0.0	$816.14	$2,780.80	$1,450.00	1.63
Hallway	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	11	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,044	0.28	1,437	0.0	$192.52	$895.20	$385.00	2.65
Hallway B105	28	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,920	Relamp	Yes	28	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	2,044	0.40	2,054	0.0	$275.26	$1,605.20	$1,120.00	1.76
Hallway B105	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.16	840	0.0	$112.57	$300.80	$200.00	0.90
Hallway B105	84	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	84	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,044	2.14	10,973	0.0	$1,470.17	$6,908.80	$2,940.00	2.70
Hallway B105	3	High-Pressure Sodium: (1) 400W Lamp	Wall Switch	465	2,920	Fixture Replacement	Yes	3	LED - Fixtures: Ceiling Mount	High/Low Control	160	2,044	0.69	3,556	0.0	$476.47	$676.20	$135.00	1.14
Server Room	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	$150.09	$584.00	$100.00	3.22
Computer Room	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.62	3,151	0.0	$422.14	$1,398.00	$260.00	2.70
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.08	420	0.0	$56.29	$175.50	$135.00	0.72
Hallway	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.66	3,361	0.0	$450.28	$1,603.20	$800.00	1.78
Hallway	26	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	26	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	1.07	5,461	0.0	$731.71	$2,355.20	$1,300.00	1.44
B206 Office	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.10	523	0.0	$70.01	$368.80	$20.00	4.98
B207, 208, 210, 212	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	$1,350.85	$4,689.60	$860.00	2.83
Storage B21	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	$4.12	$75.20	$15.00	14.62
B209 Computer Rm	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.66	3,361	0.0	$450.28	$1,473.20	$275.00	2.66

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
B211 Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.33	1,680	0.0	$225.14	$717.60	$140.00	2.57
B213	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.82	4,201	0.0	$562.85	$1,774.00	$335.00	2.56
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,044	0.19	986	0.0	$132.10	$580.53	$220.00	2.73
Hallway Eng	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.98	5,041	0.0	$675.42	$2,204.80	$1,200.00	1.49
C211	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.49	2,521	0.0	$337.71	$1,018.40	$200.00	2.42
C212	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	$140.71	$492.00	$95.00	2.82
C201, 202	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.66	3,361	0.0	$450.28	$1,743.20	$310.00	3.18
C203, 204, 205, 206, 207, 208, 209, 210	96	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	96	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	3.94	20,164	0.0	$2,701.69	$9,379.20	$1,720.00	2.83
C20 Mech/Elec	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	$253.28	$792.80	$155.00	2.52
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.53	2,731	0.0	$365.85	$1,177.60	$650.00	1.44
C22	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	$28.14	$191.20	$35.00	5.55
C21	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	$28.14	$191.20	$35.00	5.55
Rest Rooms	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,044	Relamp	No	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.32	1,164	0.0	$155.90	$752.00	$150.00	3.86
C23	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	$140.71	$492.00	$95.00	2.82
Mesany	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	$56.29	$291.50	$50.00	4.29
Stairwell	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	$253.28	$876.80	$450.00	1.69
Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.45	2,310	0.0	$309.57	$1,027.20	$550.00	1.54
K250B	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	$56.29	$266.40	$50.00	3.84
K205	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	$394.00	$1,322.80	$245.00	2.74
K205	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	$35.00	$126.40	$0.00	3.61
K103, 203, 204	27	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	27	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.11	5,671	0.0	$759.85	$2,378.40	$465.00	2.52
Stairwell	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	$253.28	$876.80	$450.00	1.69
K101, 102, 105, 106, 201, 202	54	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	54	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	2.21	11,342	0.0	$1,519.70	$5,680.80	$1,020.00	3.07
K104	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	$112.57	$416.80	$80.00	2.99
K104	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.10	523	0.0	$70.01	$252.80	$0.00	3.61

	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	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	$131.33	$609.50	$315.00	2.24
Rest Rooms	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,044	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.09	310	0.0	$41.57	$234.00	$40.00	4.67
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	$75.05	$434.00	$180.00	3.38
D25	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	$75.05	$350.00	$60.00	3.86
Mech Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.04	27	0.0	$3.66	$117.00	$20.00	26.50
Hallway	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.82	4,201	0.0	$562.85	$1,904.00	$1,000.00	1.61
D24	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	$56.29	$266.40	$50.00	3.84
D217	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.74	3,781	0.0	$506.57	$1,469.60	$290.00	2.33
Storage	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	$187.62	$701.00	$120.00	3.10
D211	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.66	3,361	0.0	$450.28	$1,473.20	$275.00	2.66
D211 Lab	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	$37.52	$233.00	$40.00	5.14
D211 Lab	2	Compact Fluorescent: Compact Fluorescent (2)	Wall Switch	52	2,920	Relamp	Yes	2	LED Screw-In Lamps: LED Screw In	Occupancy Sensor	36	2,044	0.03	178	0.0	$23.86	$215.01	$0.00	9.01
D23	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	$18.76	$174.50	$30.00	7.70
D207 Lab	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	$394.00	$1,322.80	$245.00	2.74
D207 Lab	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	$37.52	$117.00	$20.00	2.59
D222 Lab	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	$787.99	$2,645.60	$490.00	2.74
D222 Lab	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	$112.57	$351.00	$60.00	2.59
D218	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.82	4,201	0.0	$562.85	$1,774.00	$335.00	2.56
D218	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	$37.52	$117.00	$20.00	2.59
D216	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.14	700	0.0	$93.81	$408.50	$70.00	3.61
D212	27	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	27	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.11	5,671	0.0	$759.85	$2,300.40	$440.00	2.45
D212	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	$56.29	$175.50	$30.00	2.59
D210	29	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	29	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.19	6,091	0.0	$816.14	$2,450.80	$470.00	2.43
D210	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	$112.57	$351.00	$60.00	2.59
Cafeteria	66	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	66	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	2.71	13,863	0.0	$1,857.41	$5,503.20	$1,060.00	2.39

	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
E105	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.86	4,411	0.0	$591.00	$1,849.20	$350.00	2.54
E104	22	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	22	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.90	4,621	0.0	$619.14	$1,924.40	$365.00	2.52
Hallway E Wing	27	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	27	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	1.11	5,671	0.0	$759.85	$2,630.40	$1,350.00	1.69
G105	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.86	4,411	0.0	$591.00	$1,849.20	$350.00	2.54
G103	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.31	6,721	0.0	$900.56	$2,676.40	$515.00	2.40
G104 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	$84.43	$341.60	$65.00	3.28
Storage G104	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.02	14	0.0	$1.83	$58.50	$10.00	26.50
E102	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.82	4,201	0.0	$562.85	$1,774.00	$335.00	2.56
E102	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	$75.05	$234.00	$40.00	2.59
Storage	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	$262.66	$935.00	$160.00	2.95
E103	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	$75.05	$350.00	$60.00	3.86
Hallway Theater	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.41	2,100	0.0	$281.43	$952.00	$500.00	1.61
Hallway Theater	52	Compact Fluorescent: Compact Fluorescent (2)	Wall Switch	26	2,920	Relamp	Yes	52	LED Screw-In Lamps: LED Screw In	High/Low Control	18	2,044	0.45	2,315	0.0	$310.23	$6,590.31	$1,820.00	15.38
Rest Rooms	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	$124.72	$601.60	$120.00	3.86
Rest Rooms	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	$20.79	$117.00	$20.00	4.67
Theater Lobby	24	Compact Fluorescent: Compact Fluorescent (2)	Wall Switch	56	8,760	Relamp	Yes	24	LED Screw-In Lamps: LED Screw In	Occupancy Sensor	39	6,132	0.45	6,905	0.0	$925.18	$3,120.14	$70.00	3.30
Theater Lobby	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	$19.66	$71.80	$10.00	3.14
Theater Lobby	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	$37.52	$117.00	$20.00	2.59
Theater Vestibule	5	Compact Fluorescent: Compact Fluorescent (2)	Wall Switch	26	2,920	Relamp	Yes	5	LED Screw-In Lamps: LED Screw In	Occupancy Sensor	18	2,044	0.04	223	0.0	$29.83	$807.53	$35.00	25.90
Theater Ticket	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	$112.57	$416.80	$80.00	2.99
Theater Lobby	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	$394.00	$1,322.80	$245.00	2.74
Theater	70	Halogen Incandescent: Halogen Incandescent	Wall Switch	250	2,920	Relamp	Yes	70	LED Screw-In Lamps: LED Screw In	Occupancy Sensor	38	2,044	10.27	52,595	0.0	$7,046.91	$3,886.71	$455.00	0.49
Theater	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.33	1,680	0.0	$225.14	$601.60	$120.00	2.14
Theater	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	$37.52	$117.00	$20.00	2.59
E120 Dance Studio	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	0.29	1,479	0.0	$198.15	$570.80	$120.00	2.28

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
E120 Dance Studio	40	Metal Halide: (1) 175W Lamp	Wall Switch	215	2,920	Fixture Replacement	Yes	40	LED - Fixtures: Ceiling Mount	Occupancy Sensor	40	2,044	4.90	25,118	0.0	$3,365.42	$9,556.00	$470.00	2.70
E123	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	$56.29	$266.40	$50.00	3.84
E123	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	$18.99	$96.40	$20.00	4.02
Dance Locker	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	$131.33	$525.50	$90.00	3.32
E107	26	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	26	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.07	5,461	0.0	$731.71	$2,225.20	$425.00	2.46
E107	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	$56.29	$175.50	$30.00	2.59
E109	22	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	22	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.90	4,621	0.0	$619.14	$1,924.40	$365.00	2.52
E109	2	Incandescent: Incandescent	Wall Switch	100	2,920	Relamp	Yes	2	LED Screw-In Lamps: LED Screw In	Occupancy Sensor	15	2,044	0.12	601	0.0	$80.54	$107.51	$10.00	1.21
Storage E17	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.25	1,260	0.0	$168.86	$642.50	$110.00	3.15
D103	47	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	47	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.93	9,872	0.0	$1,322.70	$4,074.40	$775.00	2.49
D103	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	$105.01	$379.20	$0.00	3.61
Hallway D103	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.57	2,941	0.0	$394.00	$1,252.80	$700.00	1.40
D102	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.45	2,310	0.0	$309.57	$943.20	$185.00	2.45
D10 Lobby	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	$394.00	$1,322.80	$245.00	2.74
D10 Lobby	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	$37.52	$117.00	$20.00	2.59
J Wing Lobby	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.30	1,540	0.0	$206.38	$913.50	$145.00	3.72
J106	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	$18.99	$212.40	$40.00	9.08
J106A	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	$37.52	$233.00	$40.00	5.14
J106B	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	$37.52	$233.00	$40.00	5.14
J106C	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	$37.52	$233.00	$40.00	5.14
RR J100B	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	2,044	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,044	0.01	38	0.0	$5.04	$48.20	$10.00	7.58
J105	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,044	0.30	1,540	0.0	$206.38	$759.50	$130.00	3.05
J104	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	$330.24	$1,067.33	$220.00	2.57
J104C	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	$18.76	$58.50	$10.00	2.59
J104C	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	$18.99	$212.40	$40.00	9.08

	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
RR J104E	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	2,044	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,044	0.01	38	0.0	$5.04	$48.20	$10.00	7.58
J101, 102, 103	27	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	27	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	1.30	6,655	0.0	$891.66	$3,378.60	$645.00	3.07
Stairwell	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.08	420	0.0	$56.29	$350.40	$100.00	4.45
RR A Wing	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,044	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.39	1,396	0.0	$187.08	$902.40	$180.00	3.86
Storage A Wing	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.09	55	0.0	$7.32	$234.00	$40.00	26.50
Storage A12	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.04	27	0.0	$3.66	$117.00	$20.00	26.50
D Wing Lobby	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.53	2,731	0.0	$365.85	$1,247.60	$230.00	2.78
A104, 106, 109, 111	56	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	56	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	2.30	11,762	0.0	$1,575.99	$5,291.20	$980.00	2.74
A103, 105, 107	36	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	36	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.48	7,562	0.0	$1,013.14	$3,517.20	$645.00	2.83
Hallway A Wing	26	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	26	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	1.07	5,461	0.0	$731.71	$2,555.20	$1,300.00	1.72
A101, 102	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	$394.00	$1,592.80	$280.00	3.33
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.02	14	0.0	$1.83	$58.50	$10.00	26.50
A10 Elect	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	180	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	180	0.04	14	0.0	$1.83	$117.00	$20.00	52.99
A108, 110	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	$450.28	$1,944.00	$310.00	3.63
A112	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	$112.57	$416.80	$80.00	2.99
A112	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	$18.76	$58.50	$10.00	2.59
A Wing Entrance	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	$112.57	$416.80	$80.00	2.99
A Wing Entrance	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	$132.10	$380.53	$80.00	2.28
Testing	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	$56.29	$150.40	$30.00	2.14
Testing	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	$197.00	$642.40	$125.00	2.63
RR	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	$20.79	$117.00	$20.00	4.67
Counselor Ofc	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	$394.00	$1,322.80	$245.00	2.74
Computer Room	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	$56.29	$266.40	$50.00	3.84
Vault	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	$28.14	$191.20	$35.00	5.55
Vault	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	$17.50	$63.20	$0.00	3.61

	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
Lobby	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	$168.86	$567.20	$110.00	2.71
Conference Rm	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.33	1,680	0.0	$225.14	$717.60	$140.00	2.57
Main Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.33	1,680	0.0	$225.14	$871.60	$155.00	3.18
Printer 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	$112.57	$416.80	$80.00	2.99
D205	26	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	26	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.07	5,461	0.0	$731.71	$2,225.20	$425.00	2.46
D203	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	$84.43	$341.60	$65.00	3.28
D208	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	$112.57	$416.80	$80.00	2.99
D208	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	$18.76	$58.50	$10.00	2.59
D206	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	$168.86	$567.20	$110.00	2.71
D206	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	$37.52	$117.00	$20.00	2.59
D201	26	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	26	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.07	5,461	0.0	$731.71	$2,071.20	$410.00	2.27
D202, 204	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.49	2,521	0.0	$337.71	$1,134.40	$220.00	2.71
D202, 204	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	$75.05	$234.00	$40.00	2.59
J200B	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,920	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,044	0.01	71	0.0	$9.49	$164.20	$30.00	14.14
J204, 205	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	$450.28	$1,944.00	$310.00	3.63
J201, 202, 203	27	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,920	Relamp	Yes	27	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,044	1.30	6,655	0.0	$891.66	$2,916.60	$600.00	2.60
Stairwell	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.25	1,260	0.0	$168.86	$651.20	$300.00	2.08
Mrs Miller	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.33	1,680	0.0	$225.14	$717.60	$140.00	2.57
ER	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	180	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	180	0.01	3	0.0	$0.44	$48.20	$10.00	86.08
Hallway Guidance	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.74	3,781	0.0	$506.57	$1,753.60	$900.00	1.69
Hallway Guidance	9	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	9	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,044	0.23	1,176	0.0	$157.52	$768.80	$315.00	2.88
Stairwell	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.25	1,260	0.0	$168.86	$651.20	$300.00	2.08
Hallway B Wing	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.74	3,781	0.0	$506.57	$1,753.60	$900.00	1.69
B202, 205	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.98	5,041	0.0	$675.42	$2,344.80	$430.00	2.83
B206	9	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,044	0.23	1,176	0.0	$157.52	$684.80	$20.00	4.22

	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
B206	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	$18.76	$58.50	$10.00	2.59
B204	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	$394.00	$1,168.80	$230.00	2.38
B201, 203	40	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	40	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.64	8,402	0.0	$1,125.71	$3,548.00	$670.00	2.56
A203, 204, 205, 206, 207, 208, 208B, 209, 211	108	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	108	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	4.43	22,685	0.0	$3,039.41	$10,551.60	$1,935.00	2.83
A210 Office	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	$112.57	$416.80	$80.00	2.99
A201, 202	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	0.66	3,361	0.0	$450.28	$1,435.20	$280.00	2.57
Hallway A Wing	31	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	31	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	1.27	6,511	0.0	$872.42	$2,931.20	$1,550.00	1.58
Hallway A Wing	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	0.86	4,411	0.0	$591.00	$1,979.20	$1,050.00	1.57
Hallway J Wing	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,920	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,044	0.38	1,960	0.0	$262.66	$1,019.00	$630.00	1.48
Hallway D Wing	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	32	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,044	1.31	6,721	0.0	$900.56	$3,006.40	$1,600.00	1.56
D216	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	$112.57	$467.00	$80.00	3.44
D214	25	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,920	Relamp	Yes	25	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,044	1.03	5,251	0.0	$703.57	$2,150.00	$410.00	2.47
D214	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	$56.29	$175.50	$30.00	2.59
D212	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	$197.00	$642.40	$125.00	2.63
D210	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	$56.29	$266.40	$50.00	3.84
Storage D21	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	360	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	360	0.04	27	0.0	$3.66	$117.00	$20.00	26.50
Various	99	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	99	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Doorway	1	High-Pressure Sodium: (1) 150W Lamp	Daylight Dimming	188	4,380	Fixture Replacement	No	1	LED - Fixtures: Ceiling Mount	Daylight Dimming	40	4,380	0.10	745	0.0	$99.88	$225.40	$10.00	2.16
Exterior	12	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	40	4,380	None	No	12	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	40	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	12	High-Pressure Sodium: (1) 150W Lamp	Daylight Dimming	188	4,380	Fixture Replacement	No	12	LED - Fixtures: Bollard Fixture	Daylight Dimming	40	4,380	1.16	8,946	0.0	$1,198.59	$18,480.25	$600.00	14.92
Exterior	19	High-Pressure Sodium: (1) 150W Lamp	Daylight Dimming	188	4,380	Fixture Replacement	No	19	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	40	4,380	1.84	14,164	0.0	$1,897.77	$7,422.86	$1,900.00	2.91
Exterior	11	Metal Halide: (1) 100W Lamp	Daylight Dimming	128	4,380	Fixture Replacement	No	11	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	20	4,380	0.78	5,984	0.0	$801.76	$4,297.45	$1,100.00	3.99
Exterior	1	High-Pressure Sodium: (1) 400W Lamp	Daylight Dimming	465	4,380	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	160	4,380	0.20	1,536	0.0	$205.84	$390.68	$100.00	1.41
Parking Lot	6	High-Pressure Sodium: (1) 100W Lamp	Daylight Dimming	138	4,380	Fixture Replacement	No	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Daylight Dimming	20	4,380	0.46	3,566	0.0	$477.82	$2,077.11	$300.00	3.72
Parking Lot	6	High-Pressure Sodium: (1) 200W Lamp	Daylight Dimming	250	4,380	Fixture Replacement	No	6	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	46	4,380	0.80	6,165	0.0	$826.06	$19,949.96	$0.00	24.15

	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
Parking Lot	19	High-Pressure Sodium: (1) 250W Lamp	Daylight Dimming	295	4,380	Fixture Replacement	No	19	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	46	4,380	3.10	23,830	0.0	$3,192.87	$63,174.87	$0.00	19.79

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Campus	44	Cooling Tower Fan	1.3	80.0%	No	2,745	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Campus	2	Heating Hot Water Pump	25.0	88.5%	No	4,380	Yes	93.6%	Yes	2	1.15	33,250	0.0	$4,455.08	$21,690.46	$0.00	4.87
Boiler Room	Campus	3	Chilled Water Pump	40.0	91.0%	No	2,920	Yes	94.1%	Yes	3	1.62	47,563	0.0	$6,372.68	$40,115.40	$7,200.00	5.17
Boiler Room	Campus	1	Heating Hot Water Pump	20.0	93.0%	Yes	8,760	No	93.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Campus	1	Chilled Water Pump	15.0	93.0%	Yes	8,760	No	93.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Class Rooms & Offices	54	Supply Fan	0.2	60.0%	No	6,188	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Class Rooms & Offices	177	Supply Fan	0.3	65.0%	No	6,188	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Class Rooms & Offices	54	Supply Fan	0.5	70.0%	No	6,188	No	70.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Various	40	Supply Fan	0.1	60.0%	No	3,094	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen	1	Supply Fan	2.0	84.0%	No	6,188	Yes	86.5%	Yes	1	0.31	2,136	0.0	$286.14	$3,261.02	$160.00	10.84
Roof	Kitchen	1	Exhaust Fan	2.0	84.0%	No	6,188	Yes	86.5%	Yes	1	0.31	2,136	0.0	$286.14	$3,261.02	$160.00	10.84
Roof	Gym	4	Supply Fan	7.5	88.5%	No	6,188	Yes	91.0%	Yes	4	4.33	30,295	0.0	$4,059.07	$18,952.96	$2,400.00	4.08
Roof	Gym	4	Return Fan	5.0	87.5%	No	6,188	Yes	89.5%	Yes	4	2.89	20,160	0.0	$2,701.10	$16,304.88	$1,600.00	5.44
Roof	Boys & Girls Lockers	2	Supply Fan	2.0	84.0%	No	6,188	Yes	86.5%	No		0.06	476	0.0	$63.84	$1,064.34	$0.00	16.67
Roof	Boys & Girls Lockers	2	Return Fan	1.0	82.5%	No	6,188	Yes	85.5%	No		0.04	294	0.0	$39.46	$948.12	$0.00	24.03
Roof	Team Lockers	2	Supply Fan	3.0	86.5%	No	6,188	Yes	89.5%	No		0.10	805	0.0	$107.86	$1,752.72	$0.00	16.25
Roof	Team Lockers	2	Return Fan	1.0	82.5%	No	6,188	Yes	85.5%	No		0.04	294	0.0	$39.46	$948.12	$0.00	24.03
Roof	Auxiliary Gym	1	Supply Fan	3.0	86.5%	No	6,188	Yes	89.5%	Yes	1	0.45	3,147	0.0	$421.71	$3,884.01	$240.00	8.64
Roof	Auxiliary Gym	1	Return Fan	2.0	84.0%	No	6,188	Yes	86.5%	Yes	1	0.31	2,136	0.0	$286.14	$3,261.02	$160.00	10.84
Roof	Gym	2	Supply Fan	10.0	89.5%	No	6,188	Yes	91.7%	Yes	2	5.67	37,538	0.0	$5,029.58	$10,303.00	$1,600.00	1.73

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Gym	2	Return Fan	7.5	88.5%	No	6,188	Yes	91.0%	Yes	2	4.31	28,559	0.0	$3,826.44	$9,476.48	$1,200.00	2.16
Roof	Weight Room	1	Supply Fan	1.5	84.0%	No	6,188	Yes	86.5%	No		0.02	179	0.0	$23.94	$758.15	$0.00	31.67
Roof	Weight Room	1	Return Fan	1.0	82.5%	No	6,188	Yes	85.5%	No		0.02	147	0.0	$19.73	$474.06	$0.00	24.03
Various	Class Rooms & Offices	1	Supply Fan	2.0	84.0%	No	6,188	Yes	86.5%	Yes	1	0.31	2,136	0.0	$286.14	$3,261.02	$160.00	10.84
Various	Small Auditorium	1	Supply Fan	2.0	84.0%	No	6,188	Yes	86.5%	Yes	1	0.31	2,136	0.0	$286.14	$3,261.02	$160.00	10.84
Various	Class Rooms & Offices	5	Supply Fan	3.0	86.5%	No	6,188	Yes	89.5%	Yes	5	2.24	15,737	0.0	$2,108.57	$19,420.05	$1,200.00	8.64
Various	Class Rooms & Offices	1	Supply Fan	5.0	87.5%	No	6,188	Yes	89.5%	Yes	1	0.72	5,040	0.0	$675.28	$4,076.22	$400.00	5.44
Various	Class Rooms & Offices	2	Supply Fan	7.5	88.5%	No	6,188	Yes	91.0%	Yes	2	2.17	15,147	0.0	$2,029.54	$9,476.48	$1,200.00	4.08
Various	Offices	2	Supply Fan	7.5	88.5%	No	6,188	Yes	91.0%	Yes	2	2.17	15,147	0.0	$2,029.54	$9,476.48	$2,325.00	3.52
Various	Cafeteria	2	Supply Fan	7.5	88.5%	No	6,188	Yes	91.0%	Yes	2	2.17	15,147	0.0	$2,029.54	$9,476.48	$1,200.00	4.08
Various	Cafeteria	2	Return Fan	3.0	86.5%	No	6,188	Yes	89.5%	Yes	2	0.90	6,295	0.0	$843.43	$7,768.02	$480.00	8.64
Roof	Stage	1	Supply Fan	7.5	88.5%	No	6,188	Yes	91.0%	Yes	1	1.08	7,574	0.0	$1,014.77	$4,738.24	$600.00	4.08
Roof	Stage	1	Return Fan	5.0	87.5%	No	6,188	Yes	89.5%	Yes	1	0.72	5,040	0.0	$675.28	$4,076.22	$400.00	5.44
Various	Library	1	Supply Fan	7.5	88.5%	No	6,188	Yes	91.0%	Yes	1	1.08	7,574	0.0	$1,014.77	$4,738.24	$1,162.50	3.52
Various	Library	1	Supply Fan	10.0	89.5%	No	6,188	Yes	91.7%	Yes	1	1.42	9,897	0.0	$1,326.00	$5,151.50	$1,200.00	2.98
Roof	Auditorium	2	Supply Fan	15.0	91.0%	No	6,188	Yes	93.0%	Yes	2	8.35	55,259	0.0	$7,403.85	$14,082.34	$2,400.00	1.58
Roof	Auditorium	2	Return Fan	7.5	88.5%	No	6,188	Yes	91.0%	Yes	2	4.31	28,559	0.0	$3,826.44	$9,476.48	$1,200.00	2.16
Various	Class Rooms & Offices	2	Exhaust Fan	5.0	87.5%	No	6,188	Yes	89.5%	Yes	2	1.45	10,080	0.0	$1,350.55	$8,152.44	$800.00	5.44
Various	Class Rooms & Offices	3	Exhaust Fan	1.0	82.5%	No	6,188	Yes	85.5%	Yes	3	0.47	3,313	0.0	$443.91	$9,030.38	$240.00	19.80
Various	Class Rooms & Offices	6	Exhaust Fan	1.5	84.0%	No	6,188	Yes	86.5%	Yes	6	1.37	9,610	0.0	$1,287.65	$20,343.64	$720.00	15.24

		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	2	Exhaust Fan	0.8	70.0%	No	6,188	No	70.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Air Handler Freeze Protection	17	Heating Hot Water Pump	0.3	65.0%	No	1,050	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Air Handler Freeze Protection	9	Heating Hot Water Pump	0.3	65.0%	No	1,050	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Air Handler Freeze Protection	2	Heating Hot Water Pump	0.5	70.0%	No	1,050	No	70.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Locker Rooms	1	Split-System AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Locker Rooms	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Weight Room	2	Split-System Air-Source HP	3.50	42.00	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
Roof	Campus	1	Air-Cooled Scroll Chiller	155.00	Yes	1	Air-Cooled Screw Chiller	Variable	155.00	1.24	0.73	35.99	59,096	0.0	$7,917.97	$150,173.74	$14,260.00	17.17
Ground	Campus	2	Air-Cooled Scroll Chiller	339.00	Yes	2	Air-Cooled Centrifugal Chiller	Variable	339.00	1.24	0.73	187.63	308,056	0.0	$41,274.90	$578,458.90	$62,376.00	12.50

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Campus	3	Non-Condensing Hot Water Boiler	4,200.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen	1	Furnace	280.00	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
Boiler Room	Campus	4	Tankless Water Heater	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	4	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	5.3	$40.76	$28.68	$0.00	0.70
Labs	32	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	42.7	$326.05	$229.44	$0.00	0.70
Kitchen	5	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	1.3	$10.19	$35.85	$0.00	3.52
Various	6	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	1.6	$12.23	$43.02	$0.00	3.52
Various	10	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	13.4	$101.89	$71.70	$0.00	0.70

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	2	Medium Temp Freezer (0F to 30F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Cooler (35F to 55F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Stand-Up Freezer, Solid Door (>50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Food Court	3	Stand-Up Refrigerator, Glass Door (16 - 30 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
Trainer Office	1	Ice Making Head (<450 lbs/day), Batch	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	6	Gas Convection Oven (Half Size)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Gas Rack Oven (Single)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Gas Steamer	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	13	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 (High Temp)	Natural Gas	N/A	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?
Various	346	Computer	270.0	No
Various	2,000	Laptop	75.0	Yes
Various	6	Printer, small	400.0	Yes
Various	59	Printer, medium	600.0	Yes
Various	17	Printer, large	800.0	Yes
Various	95	Projector	50.0	Yes
Various	21	Microwave	1,500.0	Yes
Various	8	Refrigerator, small	126.0	Yes
Various	10	Refrigerator, medium	226.0	No
Various	7	Refrigerator, large	572.0	No
Various	3	Coffee Machine	900.0	No
Various	71	TV 24 in	120.0	Yes
Various	33	TV 42 in	200.0	Yes
Various	2	Clothes Washer	1,200.0	No
Various	2	Dryer	5,000.0	No
Various	6	Dishwasher	1,000.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Various	5	Refrigerated	Yes	0.00	8,059	0.0	$1,079.81	$1,150.00	$0.00	1.06

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR® Score[1]

Williamstown High School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 338,067
Built: 1997

For Year Ending: May 31, 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 High School 700 N. Tuckahoe Road Williamstown, New Jersey 08094	_____ . (___)___-_____	___ _____ . (___)___-_____ _____

Property ID: 5016224

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
119.7 kBtu/ft²

Source EUI
235.9 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	22,627,717 (56%)
Electric - Grid (kBtu)	17,834,584 (44%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	114.5
National Median Source EUI (kBtu/ft²)	225.6
% Diff from National Median Source EUI	5%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	3,247

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)