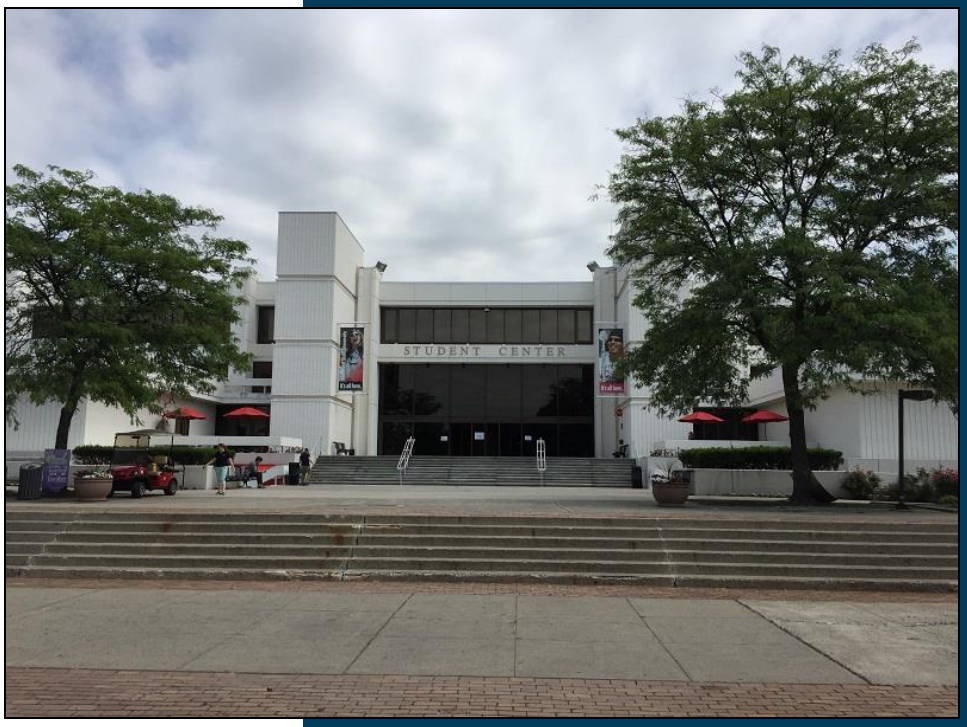
Local Government Energy Audit:
Energy Audit Report



Student Center

1 Normal Ave.

Montclair, New Jersey 07043

Montclair State University

July 30, 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 saving 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 the Student Center.

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

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

1.1 Facility Summary

The Student Center is a 131,061 square foot facility constructed in 1998. The building is a four-story educational support facility having several spaces including offices, innovation rooms, conference areas, common areas, a cafeteria, computer labs, mechanical, electrical, and elevator rooms.

Lighting at Student Center consists of a combination of 32-Watt T8 fluorescent fixtures, 14-Watt T5 fluorescent fixtures, and 40-Watt T12 fluorescent fixtures; all of which are inefficient in performance when compared to the latest lighting technology available in the market. Exterior lighting is provided by a combination of 400-Watt Metal Halide fixtures and LED fixtures. Lighting control is provided by a combination of switches and occupancy sensors for interior fixtures and photocells for exterior fixtures.

Cooling is provided by chilled water (CHW) from the District Energy Plant to the Student Center's mechanical room, where it is distributed by pumps to the building's air handling equipment. Steam is provided from the District Energy Plant to the Student Center's mechanical room, where it is converted to heating and domestic hot water by steam to water heat exchangers. Heating hot water is distributed to the building's AHUs.

Cooling and ventilation are provided to the zones by a combination of air handling units, package units, and split systems.

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 and recommended 12 measures that together represent an opportunity for the Student Center to reduce annual energy costs by roughly $103,672 and annual greenhouse gas emissions by 621,413 lbs CO_2e. We estimate that if all high priority measures are implemented as recommended, the project will pay for itself in roughly 2.8 years. TRC has defined high priority measures as the evaluated measures that have a simple payback less than the typical equipment life of the proposed equipment. 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 Student Center's annual energy use by 8%.

Figure 1 – Previous 12 Month Utility Costs

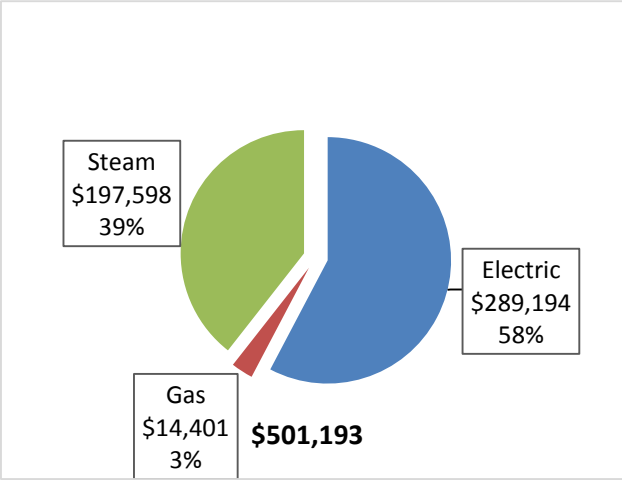
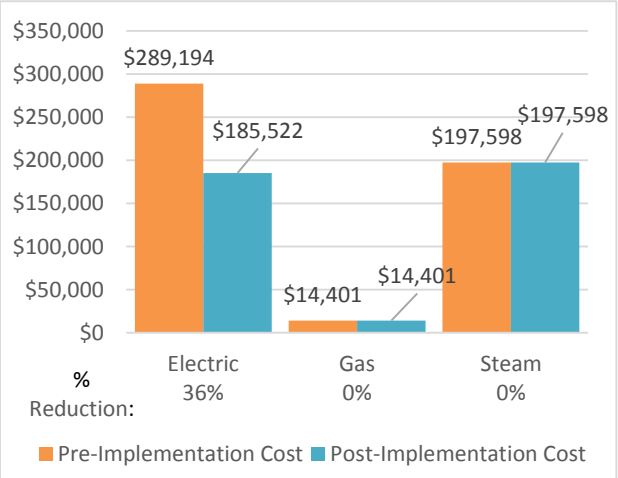


Figure 2 – Potential Post-Implementation Costs



A detailed description of the Student Center's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the evaluated 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		High Priority?	Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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			**346,558**	**0**	**48.4**	**0.0**	**$58,221.69**	**$169,499.64**	**$12,100.00**	**$157,399.64**	**2.7**	**348,981**
ECM 1	Install LED Fixtures	Yes	7,887		1.2	0.0	$1,324.98	$2,344.06	$600.00	$1,744.06	1.3	7,942
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	214,983		30.1	0.0	$36,117.18	$99,264.17	$5,625.00	$93,639.17	2.6	216,486
ECM 3	Retrofit Fixtures with LED Lamps	Yes	118,721		16.7	0.0	$19,945.09	$61,115.45	$5,875.00	$55,240.45	2.8	119,551
ECM 4	Install LED Exit Signs	Yes	4,967		0.4	0.0	$834.44	$6,775.97	$0.00	$6,775.97	8.1	5,002
Lighting Control Measures			**69,439**	**0**	**9.5**	**0.0**	**$11,665.83**	**$45,800.00**	**$5,425.00**	**$40,375.00**	**3.5**	**69,925**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	63,353		8.7	0.0	$10,643.26	$43,200.00	$5,425.00	$37,775.00	3.5	63,796
ECM 6	Install High/Low Lighitng Controls	Yes	6,087		0.8	0.0	$1,022.57	$2,600.00	$0.00	$2,600.00	2.5	6,129
Motor Upgrades			**1,625**	**0**	**0.3**	**0.0**	**$273.07**	**$22,382.29**	**$0.00**	**$22,382.29**	**82.0**	**1,637**
ECM 7	Premium Efficiency Motors	Yes	1,625		0.3	0.0	$273.07	$22,382.29	$0.00	$22,382.29	82.0	1,637
Variable Frequency Drive (VFD) Measures			**174,440**	**0**	**25.0**	**0.0**	**$29,305.90**	**$54,733.61**	**$14,200.00**	**$40,533.61**	**1.4**	**175,660**
ECM 8	Install VFDs on Constant Volume (CV) HVAC	Yes	48,212		14.3	0.0	$8,099.63	$36,783.20	$8,800.00	$27,983.20	3.5	48,549
ECM 9	Install VFDs on Chilled Water Pumps	Yes	126,228		10.8	0.0	$21,206.28	$17,950.41	$5,400.00	$12,550.41	0.6	127,110
Electric Unitary HVAC Measures			**5,645**	**0**	**3.3**	**0.0**	**$948.44**	**$13,465.98**	**$828.00**	**$12,637.98**	**13.3**	**5,685**
ECM 10	Install High Efficiency Electric AC	Yes	5,645		3.3	0.0	$948.44	$13,465.98	$828.00	$12,637.98	13.3	5,685
Food Service Equipment & Refrigeration Measures			**9,780**	**0**	**1.1**	**0.0**	**$1,642.98**	**$18,016.00**	**$950.00**	**$17,066.00**	**10.4**	**9,848**
ECM 11	Replace Refrigeration Equipment	Yes	9,780		1.1	0.0	$1,642.98	$18,016.00	$950.00	$17,066.00	10.4	9,848
Plug Load Equipment Control - Vending Machine			**9,611**	**0**	**0.0**	**0.0**	**$1,614.58**	**$1,840.00**	**$0.00**	**$1,840.00**	**1.1**	**9,678**
ECM 12	Vending Machine Control	Yes	9,611		0.0	0.0	$1,614.58	$1,840.00	$0.00	$1,840.00	1.1	9,678
TOTALS FOR HIGH PRIORITY MEASURES			**617,098**	**0**	**87.7**	**0.0**	**$103,672.49**	**$325,737.52**	**$33,503.00**	**$292,234.52**	**2.8**	**621,413**
TOTALS FOR ALL EVALUATED MEASURES			**617,098**	**0**	**87.7**	**0.0**	**$103,672.49**	**$325,737.52**	**$33,503.00**	**$292,234.52**	**2.8**	**621,413**

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

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

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

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

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

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

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

Energy Efficient Practices

TRC also identified 14 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 the Student Center include:

- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Repair/Replace Steam Traps
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Student Center. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

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

1.3 Implementation Planning

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

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

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

- SmartStart
- Pay for Performance - Existing Building (P4P)
- Energy Savings Improvement Program (ESIP)

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

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 8.3 for additional information on the ESIP Program.

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

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

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Ana Pinto	Director of Energy Management	pintoa@mail.montclair.edu	973-655-3244
TRC Energy Services			
Moussa Traore	Auditor	MTraore@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On June 15, 2017, TRC performed an energy audit at the Student Center located in Montclair, New Jersey. TRC met with Ana Pinto to review the facility operations and help focus our investigation on specific energy-using systems.

The Student Center is a 131,061 square foot facility constructed in 1998. The building is a four-story educational support facility including offices, innovation rooms, conference areas, common areas, cafeteria, computer labs, mechanical, electrical, and elevator rooms.

Lighting at the Student Center consists of a combination of 32-Watt, T8 fluorescent fixtures, 14-Watt, T5 fluorescent fixtures, and 40-Watt, T12 fluorescent fixtures, which are all inefficient in performance when compared to the latest lighting technology available in the market. Exterior lighting is provided by a combination of 400-Watt metal halide fixtures and LED fixtures. Lighting control is provided by a combination of switches and occupancy sensors for interior fixtures and photocells for exterior fixtures.

Cooling is provided by chilled water (CHW) from the District Energy Plant to the Student Center's mechanical room, where it is distributed by pumps to the building's air handling equipment. Steam is provided from the District Energy Plant to the Student Center's mechanical room, where it is converted to heating and domestic hot water by steam to water heat exchangers. Heating hot water is distributed to the building's AHUs.

Cooling and ventilation are provided to the zones by a combination of air handling units, package units, and split systems.

2.3 Building Occupancy

The typical building operating schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Student Center	Weekday	6:00 AM - 10:00 PM
Student Center	Weekend	6:00 AM - 10:00 PM

2.4 Building Envelope

The Student Center is a four-story building. The construction is of concrete masonry block with finished painted exterior and double-pane, tinted windows with fixed frames. The flat roof is constructed of built-up roofing material.

Figure 6 – Building Façade

2.5 On-Site Generation

The campus has a central cogeneration plant. The cogeneration plant uses natural gas fired turbines to produce electricity. Waste heat from the turbines is used to produce steam. The steam is delivered to some of the buildings on campus and used to produce chilled water which is delivered to some of the buildings on campus. See the campus summary report for additional information regarding the campus cogeneration plant.

Student Center does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

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

Lighting System

Lighting at the Student Center consists of a combination of 32-Watt, T8 fluorescent fixtures; 14-Watt, T5 fluorescent fixtures; and 40-Watt, T12 fluorescent fixtures, which are inefficient in performance when compared to the latest lighting technology available in the market. Most of the fixtures are 2-foot or 4-foot long troffers with diffusers having 1, 2, 3, and 4-lamp configurations. In addition to the fluorescent fixtures, the facility is also served by 13-Watt and 26-Watt compact fluorescent lamps and 40-Watt incandescent lamps. Some areas in the building also have LED based fixtures.

Interior lighting control in the building is provided by a combination of manual switches and occupancy sensors. The occupancy sensors are either wall or ceiling mounted depending on the space layout.

Figure 7 - Building Lighting Systems

Typical LED Fixture

Typical T12 Fluorescent Fixture

The building's exterior lighting consists primarily of LED fixtures and 400-Watt metal halide fixtures. The exterior lamps that are controlled by photocells.

Chilled Water System

Chilled water (CHW) is provided from the District Energy Plant to the Student Center's mechanical room, where it is distributed by chilled water pumps to the building's air handling equipment. The water is distributed by three constant speed 30 hp pumps.

Figure 8 – Chilled Water Pumping System

Chilled Water Pumps

Chilled Water Pump Nameplate

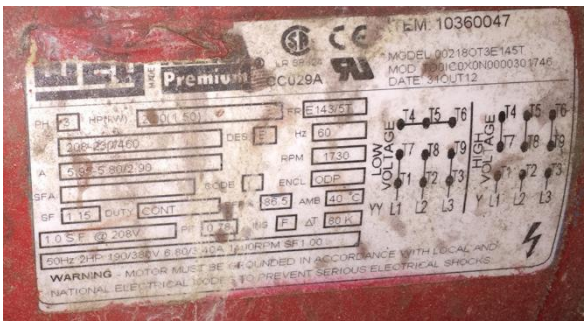
Steam to Hot Water System

The heating hot water (HHW) system consists of steam-to-water heat exchangers in the mechanical room that receives steam from the District Energy Plant. From there, the HHW is distributed to the building's AHUs. The HHW is distributed by three (3) 2 hp hot water pumps operating at constant speed.

Figure 9 – Hot Water Pumping System

Hot Water Pumps

Hot Water Pump Nameplate



Air Distribution System

Conditioned air at the Student Center is provided by six (6) constant volume air handling units. Out of the six (6) units, four (4) units have 15 hp supply fans, and two (2) units have 25 hp supply fans. All the units are equipped with chilled water coils for cooling and hot water coils for heating. There is no fan control on all the units; therefore, fans operate at a constant speed of 100% regardless of the zone load condition.

Figure 10 – Air Distribution System

Air Handling Unit

AHU Supply Fan Nameplate

Direct Expansion Air Conditioning System (DX)

In addition to the chilled water based air handlers, the facility also has split systems with capacities ranging between 0.74 ton and 4 tons. The facility is also served by a 12 ton rooftop packaged AC system with natural gas based heating.

The units are constant air volume systems. The units each utilize a scroll compressor and a direct-expansion (DX) coil.

Building Energy Management System (BEMS)

The facility is controlled by Automated Logic Corporation's WebCTRL building energy management system (BEMS). The BEMS provides controls the air handling unit, and pumps.

Figure 11 – Building Energy Management System (BEMS)

Domestic Hot Water Heating System

Steam from the District Energy Plant produces domestic hot water through a dedicated steam to water heat exchanger located in the mechanical room. The facility is also served by an electric 3kW water heater.

Figure 12 – Domestic Hot Water Heaters

Steam to DHW Heat Exchanger

Electric DHW Heater

Food Service Equipment

The facility has a full commercial kitchen that is used to prepare breakfast and lunch for the students. The ovens, fryers, and griddle are all electric. There are five (5) full sized electric conventional ovens, five (5) electric fryers, three (3) electric griddles, and four (4) insulated food holding cabinets.

Figure 13 – Cooking Equipment

Refrigeration

Facility has refrigeration equipment including but not limited to coolers, medium temperature freezers, low temperature freezers, stand-up refrigerators sizes between 30-50 cu. ft., and ice machines which can produce ice at a rate more than 450 lbs. /day.

Figure 14 – Refrigeration Equipment

Building Plug Load

There are roughly 171 computer work stations throughout the facility. All the computers are desktop units with LCD monitors. There is no centralized PC power management software installed.

The facility contains other systems which contribute to plug load including printers, microwaves, televisions, etc. at the facility. In addition to the typical plug load equipment, the facility also has refrigerated and a non-refrigerated vending machines.

3 SITE ENERGY USE AND COSTS

This building receives electricity and natural gas through master meters. It also receives electricity, steam and chilled water from the campus central cogeneration plant. These utilities were prorated for individual buildings based on building size and function.

Prorated and direct purchase utility data were 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 3.6 for additional information.

3.1 Total Cost of Energy

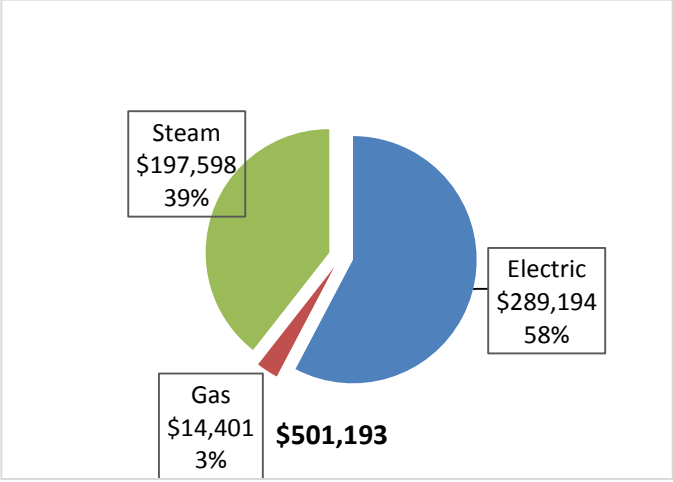
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 15 - Utility Summary

Utility Summary for Student Center		
Fuel	**Usage**	**Cost**
Electricity	3,466,690 kWh	$289,194
Natural Gas	19,594 Therms	$14,401
Steam	10,841 kLbs	$197,598
Total		**$501,193**

The current annual energy cost for this facility is $501,193 as shown in the chart below.

Figure 16 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was $0.168/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 17 - Electric Usage & Demand

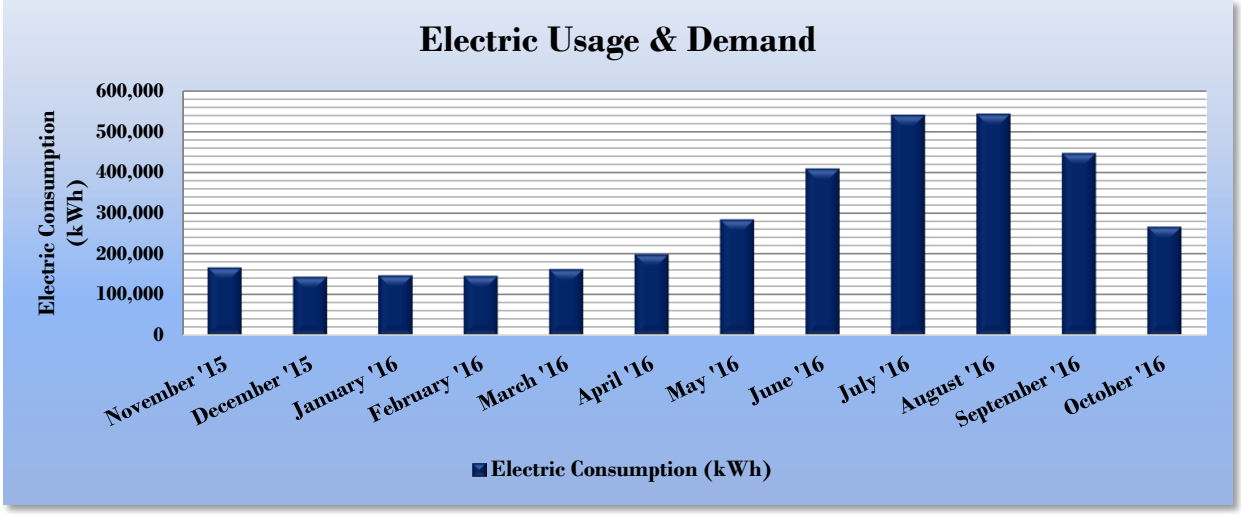


Figure 18 - Electric Usage & Demand

Electric Billing Data for Student Center				
Period Ending	Days in Period	Electric Usage (kWh)	Total Electric Cost	TRC Estimated Usage?
11/30/15	30	167,451	$11,748	Yes
12/31/15	31	144,483	$11,458	Yes
1/31/16	31	147,928	$9,927	Yes
2/28/16	28	146,098	$20,049	Yes
3/31/16	31	162,692	$10,907	Yes
4/30/16	30	199,608	$14,375	Yes
5/31/16	31	285,121	$22,844	Yes
6/30/16	30	410,287	$35,205	Yes
7/31/16	31	542,210	$46,828	Yes
8/31/16	31	545,070	$47,301	Yes
9/30/16	30	448,156	$37,607	Yes
10/31/16	31	267,587	$20,943	Yes
Totals	**365**	**3,466,690**	**$289,194**	12
Annual	**365**	**3,466,690**	**$289,194**	

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.735/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 19 - Natural Gas Usage

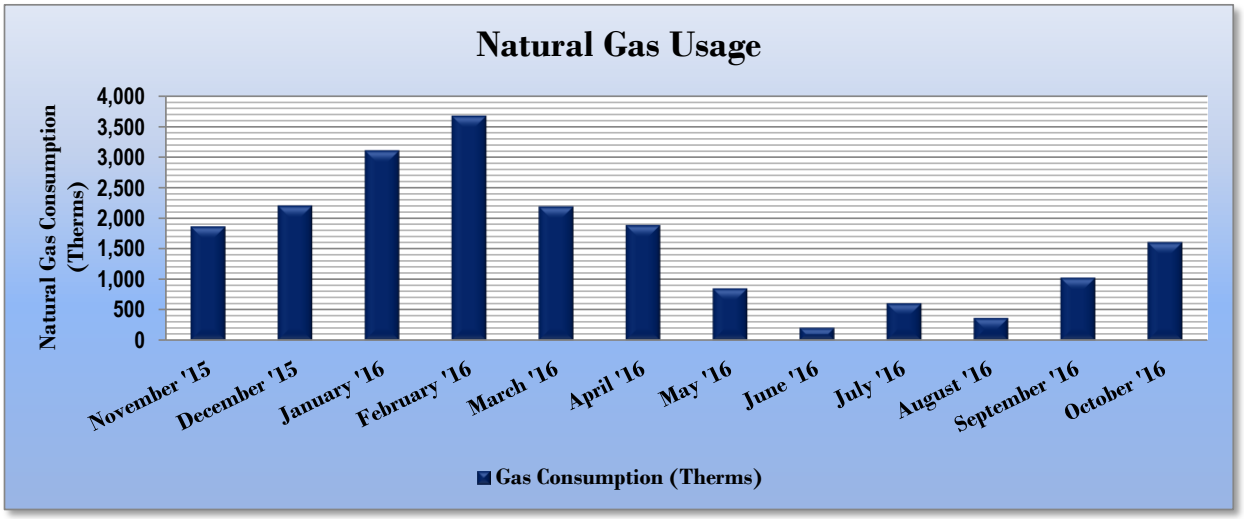


Figure 20 - Natural Gas Usage

Gas Billing Data for Student Center				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
11/30/15	30	1,864	$2,203	Yes
12/31/15	31	2,203	$1,864	Yes
1/31/16	31	3,106	$2,403	Yes
2/28/16	28	3,675	$2,523	Yes
3/31/16	31	2,189	$1,071	Yes
4/30/16	30	1,889	$959	Yes
5/31/16	31	854	$443	Yes
6/30/16	30	208	$117	Yes
7/31/16	31	609	$376	Yes
8/31/16	31	366	$222	Yes
9/30/16	30	1,026	$629	Yes
10/31/16	31	1,605	$1,591	Yes
Totals	**365**	**19,594**	**$14,401**	12
Annual	**365**	**19,594**	**$14,401**	

3.4 Steam Usage

Steam is provided by Campus CHP. The average steam cost for the past 12 months is $18.227/kLb, which is the blended rate used throughout the analyses in this report. The steam consumption is shown in the table below.

Figure 21 - Steam Usage

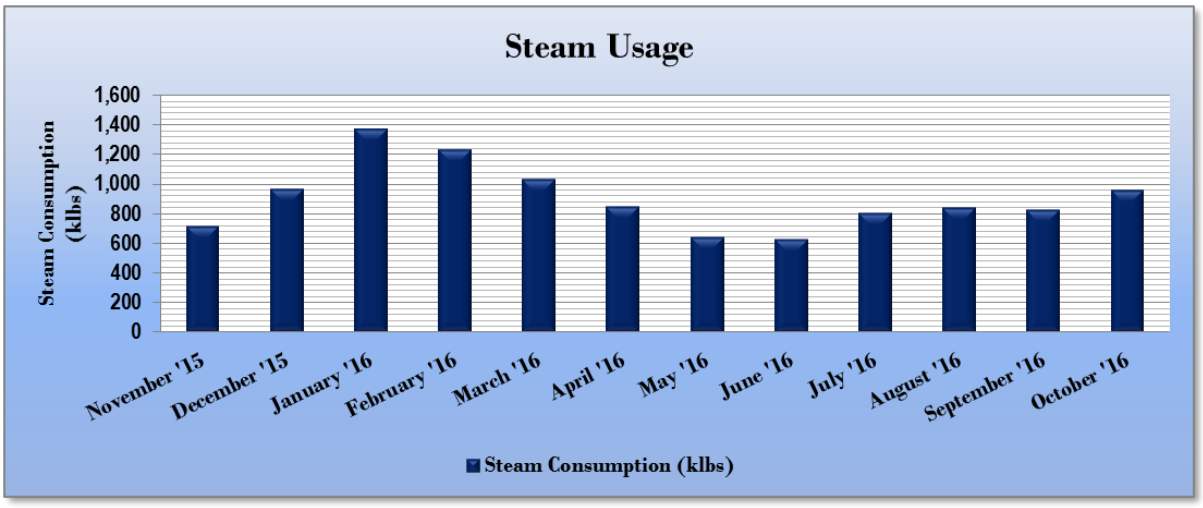


Figure 22 – Steam Usage

Steam Billing Data for Student Center				
Period Ending	Days in Period	Steam Usage (kLbs)	Fuel Cost	TRC Estimated Usage?
11/30/15	30	717	$10,930	Yes
12/31/15	31	962	$14,771	Yes
1/31/16	31	1,366	$21,335	Yes
2/28/16	28	1,233	$51,107	Yes
3/31/16	31	1,030	$15,648	Yes
4/30/16	30	843	$12,666	Yes
5/31/16	31	640	$9,987	Yes
6/30/16	30	624	$9,479	Yes
7/31/16	31	804	$12,110	Yes
8/31/16	31	839	$12,657	Yes
9/30/16	30	825	$12,382	Yes
10/31/16	31	957	$14,527	Yes
Totals	**365**	**10,841**	**$197,598**	12
Annual	**365**	**10,841**	**$197,598**	

3.5 Chilled Water Usage

Chilled water is provided by the campus cogeneration plant. The average chilled water cost is $0.327/ton-hr, which is the blended rate used throughout the analyses in this report. The chilled water consumption is shown in the table below. Chilled water is produced by steam engine chillers at the cogeneration plant, however, for ease of analysis and reporting chilled water use and cost has been combined with electricity use and cost in this report in the summary graphics.

Figure 23 - Chilled Water Usage

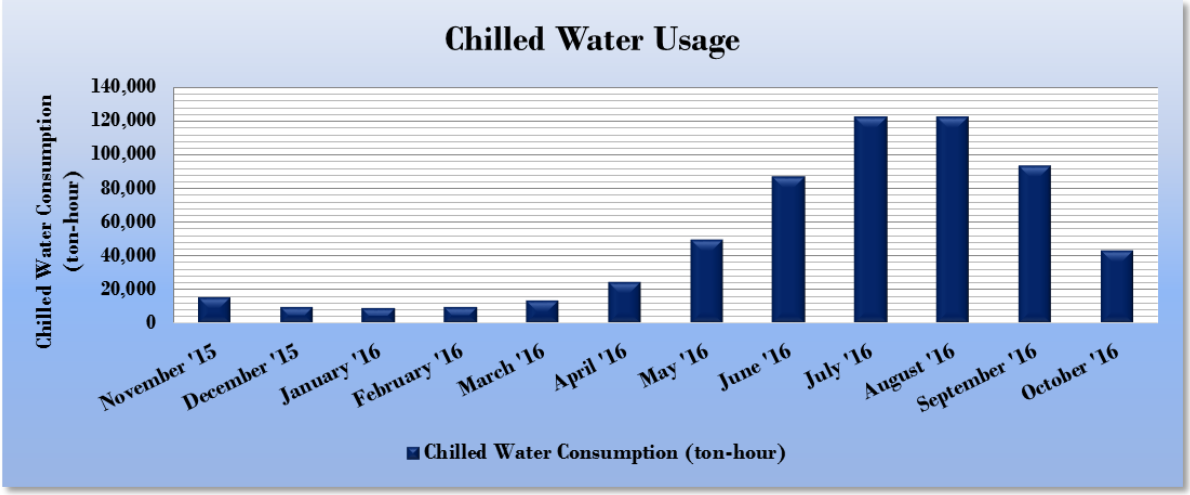


Figure 24 – Chilled Water Usage

Chilled Water Billing Data for Student Center				
Period Ending	Days in Period	Chilled Water Usage (ton-hour)	Total Chilled Water Cost	TRC Estimated Usage?
11/30/15	30	15,620	$5,115	Yes
12/31/15	31	9,288	$3,057	Yes
1/31/16	31	9,052	$3,013	Yes
2/28/16	28	9,780	$4,006	Yes
3/31/16	31	13,718	$4,480	Yes
4/30/16	30	24,561	$7,962	Yes
5/31/16	31	49,805	$16,567	Yes
6/30/16	30	87,136	$28,450	Yes
7/31/16	31	122,213	$39,684	Yes
8/31/16	31	122,213	$39,722	Yes
9/30/16	30	93,303	$30,212	Yes
10/31/16	31	42,829	$13,981	Yes
Totals	**365**	**599,520**	**$196,248**	12
Annual	**365**	**599,520**	**$196,248**	

3.6 Benchmarking

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

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy." Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 25 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Student Center	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	417.6	262.6
Site Energy Use Intensity (kBtu/ft^2)	204.0	130.7

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

Figure 26 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Student Center	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	367.2	262.6
Site Energy Use Intensity (kBtu/ft^2)	187.9	130.7

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.

As the electric and gas accounts were shared between various buildings, it was not possible to benchmark these buildings and provide a score individually. A campus wide Portfolio Manager® Statement of Energy Performance (SEP) was generated.

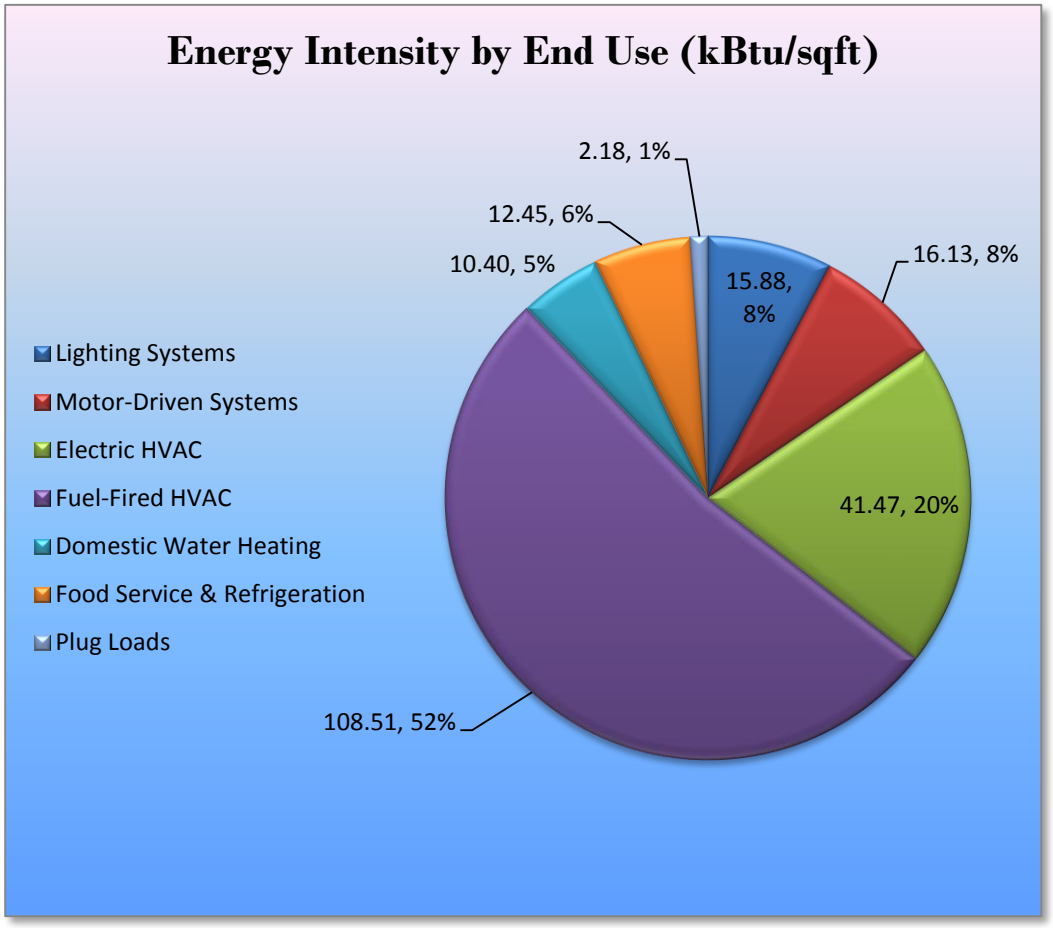
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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.

3.7 Energy End-Use Breakdown

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

Figure 27 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Student Center 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 High Priority ECMs

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

Figure 28 – Summary of High Priority ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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		**346,558**	**0**	**48.4**	**0.0**	**$58,221.69**	**$169,499.64**	**$12,100.00**	**$157,399.64**	**2.7**	**348,981**
ECM 1	Install LED Fixtures	7,887	0	1.2	0.0	$1,324.98	$2,344.06	$600.00	$1,744.06	1.3	7,942
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	214,983	0	30.1	0.0	$36,117.18	$99,264.17	$5,625.00	$93,639.17	2.6	216,486
ECM 3	Retrofit Fixtures with LED Lamps	118,721	0	16.7	0.0	$19,945.09	$61,115.45	$5,875.00	$55,240.45	2.8	119,551
ECM 4	Install LED Exit Signs	4,967	0	0.4	0.0	$834.44	$6,775.97	$0.00	$6,775.97	8.1	5,002
Lighting Control Measures		**69,439**	**0**	**9.5**	**0.0**	**$11,665.83**	**$45,800.00**	**$5,425.00**	**$40,375.00**	**3.5**	**69,925**
ECM 5	Install Occupancy Sensor Lighting Controls	63,353	0	8.7	0.0	$10,643.26	$43,200.00	$5,425.00	$37,775.00	3.5	63,796
ECM 6	Install High/Low Lighitng Controls	6,087	0	0.8	0.0	$1,022.57	$2,600.00	$0.00	$2,600.00	2.5	6,129
Motor Upgrades		**1,625**	**0**	**0.3**	**0.0**	**$273.07**	**$22,382.29**	**$0.00**	**$22,382.29**	**82.0**	**1,637**
ECM 7	Premium Efficiency Motors	1,625	0	0.3	0.0	$273.07	$22,382.29	$0.00	$22,382.29	82.0	1,637
Variable Frequency Drive (VFD) Measures		**174,440**	**0**	**25.0**	**0.0**	**$29,305.90**	**$54,733.61**	**$14,200.00**	**$40,533.61**	**1.4**	**175,660**
ECM 8	Install VFDs on Constant Volume (CV) HVAC	48,212	0	14.3	0.0	$8,099.63	$36,783.20	$8,800.00	$27,983.20	3.5	48,549
ECM 9	Install VFDs on Chilled Water Pumps	126,228	0	10.8	0.0	$21,206.28	$17,950.41	$5,400.00	$12,550.41	0.6	127,110
Electric Unitary HVAC Measures		**5,645**	**0**	**3.3**	**0.0**	**$948.44**	**$13,465.98**	**$828.00**	**$12,637.98**	**13.3**	**5,685**
ECM 10	Install High Efficiency Electric AC	5,645	0	3.3	0.0	$948.44	$13,465.98	$828.00	$12,637.98	13.3	5,685
Food Service Equipment & Refrigeration Measures		**9,780**	**0**	**1.1**	**0.0**	**$1,642.98**	**$18,016.00**	**$950.00**	**$17,066.00**	**10.4**	**9,848**
ECM 11	Replace Refrigeration Equipment	9,780	0	1.1	0.0	$1,642.98	$18,016.00	$950.00	$17,066.00	10.4	9,848
Plug Load Equipment Control - Vending Machine		**9,611**	**0**	**0.0**	**0.0**	**$1,614.58**	**$1,840.00**	**$0.00**	**$1,840.00**	**1.1**	**9,678**
ECM 12	Vending Machine Control	9,611	0	0.0	0.0	$1,614.58	$1,840.00	$0.00	$1,840.00	1.1	9,678
TOTALS		**617,098**	**0**	**87.7**	**0.0**	**$103,672.49**	**$325,737.52**	**$33,503.00**	**$292,234.52**	**2.8**	**621,413**

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

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

4.2 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 29 below.

Figure 29 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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		**346,558**	**0**	**48.4**	**0.0**	**$58,221.69**	**$169,499.64**	**$12,100.00**	**$157,399.64**	**2.7**	**348,981**
ECM 1	Install LED Fixtures	7,887	0	1.2	0.0	$1,324.98	$2,344.06	$600.00	$1,744.06	1.3	7,942
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	214,983	0	30.1	0.0	$36,117.18	$99,264.17	$5,625.00	$93,639.17	2.6	216,486
ECM 3	Retrofit Fixtures with LED Lamps	118,721	0	16.7	0.0	$19,945.09	$61,115.45	$5,875.00	$55,240.45	2.8	119,551
ECM 4	Install LED Exit Signs	4,967	0	0.4	0.0	$834.44	$6,775.97	$0.00	$6,775.97	8.1	5,002

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)	Chilled Water Savings (Ton-Hr)	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	0	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	7,887	0	1.2	0.0	$1,324.98	$2,344.06	$600.00	$1,744.06	1.3	7,942

Measure Description

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

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

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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	214,467	0	30.0	0.0	$36,030.39	$98,872.17	$5,605.00	$93,267.17	2.6	215,966
Exterior	517	0	0.1	0.0	$86.79	$392.00	$20.00	$372.00	4.3	520

Measure Description

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

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

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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	118,721	0	16.7	0.0	$19,945.09	$61,115.45	$5,875.00	$55,240.45	2.8	119,551
Exterior	0	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing incandescent, compact fluorescent, and linear fluorescent or other 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 that use less power than other lighting technologies, yet provide equivalent lighting output for the space.

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

ECM 4: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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	4,967	0	0.4	0.0	$834.44	$6,775.97	$0.00	$6,775.97	8.1	5,002
Exterior	0	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

4.3 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 30 below.

Figure 30 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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		**69,439**	**0**	**9.5**	**0.0**	**$11,665.83**	**$45,800.00**	**$5,425.00**	**$40,375.00**	**3.5**	**69,925**
ECM 5	Install Occupancy Sensor Lighting Controls	63,353	0	8.7	0.0	$10,643.26	$43,200.00	$5,425.00	$37,775.00	3.5	63,796
ECM 6	Install High/Low Lighitng Controls	6,087	0	0.8	0.0	$1,022.57	$2,600.00	$0.00	$2,600.00	2.5	6,129

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

ECM 5: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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)
63,353	0	8.7	0.0	$10,643.26	$43,200.00	$5,425.00	$37,775.00	3.5	63,796

Measure Description

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

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

ECM 6: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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)
6,087	0	0.8	0.0	$1,022.57	$2,600.00	$0.00	$2,600.00	2.5	6,129

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are stairwells and interior corridors.

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

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

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

4.4 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 31 below.

Figure 31 – Summary of Motor Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**1,625**	**0**	**0.3**	**0.0**	**$273.07**	**$22,382.29**	**$0.00**	**$22,382.29**	**82.0**	**1,637**
ECM 7	Premium Efficiency Motors	1,625		0.3	0.0	$273.07	$22,382.29	$0.00	$22,382.29	82.0	1,637

ECM 7: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,625	0	0.3	0.0	$273.07	$22,382.29	$0.00	$22,382.29	82.0	1,637

Measure Description

We recommend replacing standard efficiency motors with IHP 2014 efficiency motors on all system to be retrofit with VFDs, since standard efficiency motors are not generally compatible with VFDs. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

4.5 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 32 below.

Figure 32 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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		**174,440**	**0**	**25.0**	**0.0**	**$29,305.90**	**$54,733.61**	**$14,200.00**	**$40,533.61**	**1.4**	**175,660**
ECM 8	Install VFDs on Constant Volume (CV) HVAC	48,212	0	14.3	0.0	$8,099.63	$36,783.20	$8,800.00	$27,983.20	3.5	48,549
ECM 9	Install VFDs on Chilled Water Pumps	126,228	0	10.8	0.0	$21,206.28	$17,950.41	$5,400.00	$12,550.41	0.6	127,110

ECM 8: Install VFDs on Constant Volume (CV) HVAC

Summary of Measure Economics

Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
48,212	0	14.3	0.0	$8,099.63	$36,783.20	$8,800.00	$27,983.20	3.5	48,549

Measure Description

We recommend installing variable frequency drives (VFDs) to control supply fan motor speeds to convert a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one (1). 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 9: Install VFDs on Chilled Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	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)
126,228	0	10.8	0.0	$21,206.28	$17,950.41	$5,400.00	$12,550.41	0.6	127,110

Measure Description

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

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

4.6 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 33 below.

Figure 33 - Summary of Unitary HVAC ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**5,645**	**0**	**3.3**	**0.0**	**$948.44**	**$13,465.98**	**$828.00**	**$12,637.98**	**13.3**	**5,685**
ECM 10	Install High Efficiency Electric AC	5,645	0	3.3	0.0	$948.44	$13,465.98	$828.00	$12,637.98	13.3	5,685

ECM 10: Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,645	0	3.3	0.0	$948.44	$13,465.98	$828.00	$12,637.98	13.3	5,685

Measure Description

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

4.7 Food Service Equipment & Refrigeration Measures

Our recommendations for food service and refrigeration measures are summarized in Figure 34 below.

Figure 34 - Summary of Food Service Equipment & Refrigeration ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Food Service Equipment & Refrigeration Measures		**9,780**	**0**	**1.1**	**0.0**	**$1,642.98**	**$18,016.00**	**$950.00**	**$17,066.00**	**10.4**	**9,848**
ECM 11	Replace Refrigeration Equipment	9,780	0	1.1	0.0	$1,642.98	$18,016.00	$950.00	$17,066.00	10.4	9,848

ECM 11: Replace Refrigeration Equipment

Summary of Measure Economics

Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
9,780	0	1.1	0.0	$1,642.98	$18,016.00	$950.00	$17,066.00	10.4	9,848

Measure Description

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

4.8 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 35 below.

Figure 35 - Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure	Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine	**9,611**	**0**	**0.0**	**0.0**	**$1,614.58**	**$1,840.00**	**$0.00**	**$1,840.00**	**1.1**	**9,678**
ECM 12 Vending Machine Control	9,611		0.0	0.0	$1,614.58	$1,840.00	$0.00	$1,840.00	1.1	9,678

ECM 12: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Chilled Water Savings (Ton-Hr)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
9,611	0	0.0	0.0	$1,614.58	$1,840.00	$0.00	$1,840.00	1.1	9,678

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.

5 ENERGY EFFICIENT PRACTICES

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

Close Doors and Windows

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

Perform Proper Lighting Maintenance

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

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

Perform Routine Motor Maintenance

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

Use Fans to Reduce Cooling Load

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

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Clean Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

Check for and Seal Duct Leakage

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

Repair/Replace Steam Traps

Properly functioning steam traps ensure that all latent heat in the steam is delivered to the end use by preventing pressurized steam from leaking. Steam traps should be inspected as part of the regular steam system maintenance. Traps that are blocked, venting, or allowing steam to leak through should be repaired or replaced. Repairing or replacing existing steam traps will reduce steam losses.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Water Conservation

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

6 On-Site Generation Measures

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

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

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

6.1 Photovoltaic

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

A preliminary screening based on the campus' electric demand and the size and location of free areas on campus was performed and is addressed in the campus level summary report.

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.

The campus has a CHP plant that uses natural gas fired turbines to generate electricity. Waste heat from the turbines is used to produce steam which is either delivered to buildings on campus or used to produce chilled water which is delivered to buildings on campus. Since the campus has a CHP that serves a significant portion of the campus further evaluation of individual building CHP applications were not done.

7 DEMAND RESPONSE

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

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

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

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

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

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

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

In our opinion this building is not is a good candidate for DR.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 36 for a list of the eligible programs identified for each recommended ECM.

Figure 36 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	X			X		
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X			X		
ECM 3	Retrofit Fixtures with LED Lamps	X			X		
ECM 4	Install LED Exit Signs						
ECM 5	Install Occupancy Sensor Lighting Controls	X			X		
ECM 6	Install High/Low Lighitng Controls						
ECM 7	Premium Efficiency Motors	X			X		
ECM 8	Install VFDs on Constant Volume (CV) HVAC	X			X		
ECM 9	Install VFDs on Chilled Water Pumps	X			X		
ECM 10	Install High Efficiency Electric AC	X			X		
ECM 11	Replace Refrigeration Equipment						
ECM 12	Vending Machine Control						

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. This facility does not meet all of the criteria for participating in the P4P program based on the measures identified in this study. However, since additional measures may be identified during the P4P evaluation and the facility is close to meeting the P4P program criteria it is worth considering the P4P program for this site. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

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

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

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

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

Incentives

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

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

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

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

8.2 Pay for Performance - Existing Buildings

Overview

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

Incentives

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

How to Participate

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

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

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

8.3 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
Basement Corridor	5	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	5	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	394	0.0	$66.23	$537.78	$0.00	8.12
Basement Corridor	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,322	0.37	2,731	0.0	$458.73	$902.00	$120.00	1.70
Basement Corridor	3	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,322	0.15	1,108	0.0	$186.19	$551.00	$30.00	2.80
Basement Corridor	6	Compact Fluorescent: CFL - Screw-in - 23W - 1L	Wall Switch	23	4,745	Relamp	No	6	LED Screw-In Lamps: LED - 16W	Wall Switch	16	4,745	0.03	226	0.0	$37.95	$322.52	$0.00	8.50
Basement Corridor	6	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	4,745	None	Yes	6	LED - Linear Tubes: (4) 2' Lamps	High/Low Control	34	3,322	0.05	334	0.0	$56.10	$200.00	$0.00	3.56
Basement Corridor	13	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	13	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	3,322	0.37	2,759	0.0	$463.59	$1,021.60	$0.00	2.20
Basement Corridor	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,745	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	3,322	0.49	3,605	0.0	$605.59	$1,056.20	$180.00	1.45
Basement Corridor	8	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	3,322	0.80	5,911	0.0	$993.01	$1,494.67	$160.00	1.34
Basement Corridor	7	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	4,745	Relamp & Reballast	Yes	7	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	3,322	0.18	1,369	0.0	$230.05	$886.00	$35.00	3.70
Basement Corridor	2	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	181	0.0	$30.46	$215.11	$0.00	7.06
Break Rm	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.10	739	0.0	$124.13	$504.00	$55.00	3.62
ID Office	13	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	13	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.37	2,759	0.0	$463.59	$1,091.60	$35.00	2.28
Auxillary	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.29	2,123	0.0	$356.61	$902.00	$35.00	2.43
Storage	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	500	0.04	33	0.0	$5.60	$126.40	$0.00	22.56
Director Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,745	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,322	0.09	683	0.0	$114.68	$420.40	$65.00	3.10
Computer Lab	24	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	24	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.69	5,094	0.0	$855.86	$2,056.80	$70.00	2.32
Rathskeller	61	Incandescent: INC-40W	Occupancy Sensor	40	4,077	Relamp	No	61	LED Screw-In Lamps: LED - 6W	Occupancy Sensor	6	4,077	1.53	9,724	0.0	$1,633.56	$3,278.93	$305.00	1.82
Rathskeller	7	Compact Fluorescent: CFL - Screw-in - 26W - 2L	Occupancy Sensor	52	4,077	Relamp	No	7	LED Screw-In Lamps: LED - 36W	Occupancy Sensor	36	4,077	0.08	512	0.0	$86.01	$752.54	$0.00	8.75
Rathskeller	2	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	181	0.0	$30.46	$215.11	$0.00	7.06
Kitchen	12	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	12	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.34	2,547	0.0	$427.93	$1,028.40	$35.00	2.32
Kitchen	4	LED Screw-In Lamps: LED A-Lamp 13W	Wall Switch	13	4,745	None	No	4	LED Screw-In Lamps: LED A-Lamp 13W	Wall Switch	13	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Men's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.09	683	0.0	$114.68	$445.50	$65.00	3.32
Men's Restroom	1	Compact Fluorescent: CFL - Screw-in - 26W - 1L	Wall Switch	26	4,745	Relamp	No	1	LED Screw-In Lamps: LED - 18W	Wall Switch	18	4,745	0.01	43	0.0	$7.15	$53.75	$0.00	7.52
Women's Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.09	683	0.0	$114.68	$445.50	$65.00	3.32
Women's Restroom	3	Compact Fluorescent: CFL - Screw-in - 26W - 1L	Wall Switch	26	4,745	Relamp	No	3	LED Screw-In Lamps: LED - 18W	Wall Switch	18	4,745	0.02	128	0.0	$21.45	$161.26	$0.00	7.52

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Rathskeller	65	Incandescent: INC-40W	Occupancy Sensor	40	4,077	Relamp	No	65	LED Screw-In Lamps: LED - 6W	Occupancy Sensor	6	4,077	1.63	10,361	0.0	$1,740.68	$3,493.95	$325.00	1.82
Rathskeller	7	Compact Fluorescent: CFL - Screw-in - 26W - 2L	Occupancy Sensor	52	4,077	Relamp	No	7	LED Screw-In Lamps: LED - 36W	Occupancy Sensor	36	4,077	0.08	512	0.0	$86.01	$752.54	$0.00	8.75
Rathskeller	4	Linear Fluorescent - T5: 2' T5 (14W) - 2L	Occupancy Sensor	34	4,077	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,077	0.05	319	0.0	$53.56	$192.80	$40.00	2.85
Rathskeller	7	Incandescent: INC-40W	Occupancy Sensor	40	4,077	Relamp	No	7	LED Screw-In Lamps: LED - 6W	Occupancy Sensor	6	4,077	0.18	1,116	0.0	$187.46	$376.27	$35.00	1.82
Rathskeller	13	LED Screw-In Lamps: LED A-Lamp 13W	Occupancy Sensor	13	4,077	None	No	13	LED Screw-In Lamps: LED A-Lamp 13W	Occupancy Sensor	13	4,077	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rathskeller	2	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	181	0.0	$30.46	$215.11	$0.00	7.06
Rathskeller	8	Compact Fluorescent: CFL - Screw-in - 26W - 1L	Occupancy Sensor	26	4,077	Relamp	No	8	LED Screw-In Lamps: LED - 18W	Occupancy Sensor	18	4,077	0.05	293	0.0	$49.15	$430.02	$0.00	8.75
Market Room	22	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	22	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.63	4,670	0.0	$784.54	$1,930.40	$70.00	2.37
Market Room	2	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	181	0.0	$30.46	$215.11	$0.00	7.06
BookStore	109	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	None	Yes	109	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	0.35	2,587	0.0	$434.67	$1,890.00	$245.00	3.78
Office	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	None	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	1	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	91	0.0	$15.23	$107.56	$0.00	7.06
Storage	17	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	500	None	Yes	17	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	350	0.05	43	0.0	$7.14	$540.00	$0.00	75.59
Storage	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	500	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.17	136	0.0	$22.80	$468.00	$40.00	18.77
Storage	1	Linear Fluorescent - T8: 8' T8 (59W) - 1L	Wall Switch	58	500	Relamp	No	1	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	36	500	0.02	13	0.0	$2.13	$66.80	$0.00	31.43
Storage	15	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	500	Relamp	No	15	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	500	0.19	151	0.0	$25.36	$538.50	$75.00	18.28
Storage	7	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	500	Relamp	No	7	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	500	0.07	54	0.0	$9.13	$223.30	$35.00	20.63
BookStore	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	11	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.31	2,335	0.0	$392.27	$965.20	$35.00	2.37
BookStore	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,745	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.11	801	0.0	$134.58	$460.27	$75.00	2.86
BookStore	50	LED Screw-In Lamps: LED A-Lamp 13W	Wall Switch	13	4,745	None	Yes	50	LED Screw-In Lamps: LED A-Lamp 13W	Occupancy Sensor	13	3,322	0.14	1,064	0.0	$178.76	$810.00	$105.00	3.94
Hallway	3	Linear Fluorescent - T8: 8' T8 (59W) - 1L	Wall Switch	58	4,745	Relamp	No	3	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	36	4,745	0.05	360	0.0	$60.50	$200.40	$0.00	3.31
Hallway	74	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	4,745	Relamp & Reballast	Yes	74	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	1.95	14,476	0.0	$2,432.00	$8,602.00	$545.00	3.31
Hallway	6	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.22	1,601	0.0	$268.97	$972.00	$35.00	3.48
Hallway	4	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	363	0.0	$60.93	$430.22	$0.00	7.06
Medical Room	10	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	1.00	7,388	0.0	$1,241.26	$1,888.33	$235.00	1.33

	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
Medical Room	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.09	637	0.0	$106.98	$459.60	$35.00	3.97
Medical Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
Medical Room	1	Incandescent: INC-65W	Wall Switch	65	4,745	Relamp	No	1	LED Screw-In Lamps: LED - 10W	Wall Switch	10	4,745	0.04	301	0.0	$50.65	$53.75	$5.00	0.96
Innovation Center	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.71	5,234	0.0	$879.24	$1,885.50	$300.00	1.80
Innovation Center	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.15	1,138	0.0	$191.14	$562.50	$85.00	2.50
Innovation Center	6	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.60	4,433	0.0	$744.75	$1,241.00	$155.00	1.46
Innovation Center	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,745	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	0.05	382	0.0	$64.17	$143.60	$20.00	1.93
104M	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
104M	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
104K	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
104J	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
104I	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
104H	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
104G	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
104F	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
104Q	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.02	180	0.0	$30.25	$58.50	$10.00	1.60
104P	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.02	180	0.0	$30.25	$58.50	$10.00	1.60
104O	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.20	1,478	0.0	$248.25	$593.67	$75.00	2.09
Red Hawk Nest	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	None	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Red Hawk Nest	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.02	180	0.0	$30.25	$58.50	$10.00	1.60
Red Hawk Nest	47	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	47	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	1.69	12,541	0.0	$2,106.93	$6,309.00	$105.00	2.94
Red Hawk Nest	8	Incandescent: INC-40W	Wall Switch	40	4,745	Relamp	Yes	8	LED Screw-In Lamps: LED - 6W	Occupancy Sensor	6	3,322	0.21	1,563	0.0	$262.55	$700.02	$75.00	2.38
110	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
110	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,745	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	0.13	954	0.0	$160.25	$557.20	$75.00	3.01
110G	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
110B	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.20	1,478	0.0	$248.25	$593.67	$75.00	2.09
110A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
110F	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.40	2,955	0.0	$496.50	$917.33	$115.00	1.62
110C	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
110D	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.20	1,478	0.0	$248.25	$593.67	$75.00	2.09
110E	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
112	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.61	4,551	0.0	$764.56	$1,440.00	$235.00	1.58
Prayer Rm	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,745	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	0.10	715	0.0	$120.18	$485.40	$65.00	3.50
Men's Restroom	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	None	No	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Women's Restroom	7	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	None	No	7	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
113	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	28	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.86	6,371	0.0	$1,070.38	$2,178.00	$350.00	1.71
113b	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
113a	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
113c	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
113D	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
117	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,745	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	0.13	954	0.0	$160.25	$557.20	$75.00	3.01
120	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,745	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	0.13	954	0.0	$160.25	$557.20	$75.00	3.01
118	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,745	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	0.13	954	0.0	$160.25	$557.20	$75.00	3.01
119	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,745	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	0.13	954	0.0	$160.25	$557.20	$75.00	3.01
121	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.25	1,820	0.0	$305.82	$738.00	$115.00	2.04
111	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.37	2,731	0.0	$458.73	$972.00	$155.00	1.78
111	6	Compact Fluorescent: CFL - Screw-in - 13W - 1L	Wall Switch	13	4,745	Relamp	No	6	LED Screw-In Lamps: LED - 9W	Wall Switch	9	4,745	0.02	128	0.0	$21.45	$322.52	$0.00	15.03
123	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
122	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
124	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,745	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	0.05	382	0.0	$64.17	$143.60	$20.00	1.93

	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
124A	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
124B	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.20	1,478	0.0	$248.25	$593.67	$75.00	2.09
124C	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.02	180	0.0	$30.25	$58.50	$10.00	1.60
125A	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.02	180	0.0	$30.25	$58.50	$10.00	1.60
125	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
106	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,745	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.22	1,602	0.0	$269.15	$650.53	$115.00	1.99
107	14	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.70	5,172	0.0	$868.88	$1,908.00	$175.00	1.99
103	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.31	2,275	0.0	$382.28	$855.00	$135.00	1.88
103F	4	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	4,745	Relamp & Reballast	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	0.11	782	0.0	$131.46	$662.00	$55.00	4.62
103D	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.20	1,478	0.0	$248.25	$593.67	$75.00	2.09
103C	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
103B	3	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.30	2,217	0.0	$372.38	$755.50	$95.00	1.77
103A	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.25	1,820	0.0	$305.82	$738.00	$115.00	2.04
101	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.05	360	0.0	$60.50	$117.00	$20.00	1.60
100	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,745	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	0.05	382	0.0	$64.17	$143.60	$20.00	1.93
1st Floor Lobby	110	Incandescent: INC-40W	Wall Switch	40	4,745	Relamp	Yes	110	LED Screw-In Lamps: LED - 6W	Occupancy Sensor	6	3,322	2.90	21,489	0.0	$3,610.10	$7,802.83	$795.00	1.94
1st Floor Lobby	2	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	181	0.0	$30.46	$215.11	$0.00	7.06
1st Floor Lobby	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	4,745	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,745	0.02	172	0.0	$28.88	$98.00	$5.00	3.22
1st Floor Lobby	4	Compact Fluorescent: CFL - Screw-in - 13W - 1L	Wall Switch	13	4,745	Relamp	No	4	LED Screw-In Lamps: LED - 9W	Wall Switch	9	4,745	0.01	85	0.0	$14.30	$215.01	$0.00	15.03
Corridor	9	Compact Fluorescent: CFL - Screw-in - 23W - 1L	Wall Switch	23	4,745	Relamp	Yes	9	LED Screw-In Lamps: LED - 16W	High/Low Control	16	3,322	0.08	576	0.0	$96.78	$683.78	$0.00	7.07
Dinning Hall	36	Linear Fluorescent - T5: 2' T5 (14W) - 2L	Wall Switch	34	4,745	Relamp	Yes	36	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,322	0.59	4,341	0.0	$729.35	$2,275.20	$430.00	2.53
Storage	6	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	500	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	350	0.30	234	0.0	$39.24	$972.00	$60.00	23.24
Dinning Hall	90	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	90	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	8.97	66,496	0.0	$11,171.32	$16,185.00	$2,010.00	1.27
Dinning Hall	75	Linear Fluorescent - T5: 2' T5 (14W) - 2L	Wall Switch	34	4,745	Relamp	Yes	75	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,322	1.22	9,045	0.0	$1,519.49	$4,965.00	$925.00	2.66
Dinning Hall	10	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	10	LED Exit Signs: 2 W Lamp	None	6	8,760	0.07	907	0.0	$152.32	$1,075.55	$0.00	7.06

	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
Cafeteria	25	LED - Linear Tubes: (4) 8' Lamps	Wall Switch	144	4,745	Relamp	Yes	25	LED - Linear Tubes: (4) 8' Lamps	Occupancy Sensor	144	3,322	0.79	5,893	0.0	$990.07	$5,355.00	$70.00	5.34
Cafeteria	22	Linear Fluorescent - T5: 2' T5 (14W) - 2L	Wall Switch	34	4,745	Relamp	Yes	22	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,322	0.36	2,653	0.0	$445.72	$1,330.40	$255.00	2.41
Cafeteria	4	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	363	0.0	$60.93	$430.22	$0.00	7.06
Cafeteria	4	LED - Fixtures: Decorative Pendant	Wall Switch	18	4,745	None	No	4	LED - Fixtures: Decorative Pendant	Wall Switch	18	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cafeteria	16	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	4,745	None	No	16	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	5	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	5	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.14	1,061	0.0	$178.30	$586.00	$35.00	3.09
Kitchen	6	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	4,745	None	No	6	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	25	Linear Fluorescent - T8: 8' T8 (59W) - 1L	Wall Switch	58	4,745	Relamp	Yes	25	LED - Linear Tubes: (1) 8' Lamp	Occupancy Sensor	36	3,322	0.60	4,475	0.0	$751.72	$2,210.00	$70.00	2.85
Kitchen	26	LED Screw-In Lamps: LED Screw-in 9W	Wall Switch	9	4,745	None	Yes	26	LED Screw-In Lamps: LED Screw-in 9W	Occupancy Sensor	9	3,322	0.05	383	0.0	$64.35	$540.00	$70.00	7.30
Kitchen	36	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	Yes	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	1.79	13,299	0.0	$2,234.26	$4,752.00	$430.00	1.93
Kitchen	3	Linear Fluorescent - T12: 2' T12 (20W) - 2L	Wall Switch	50	4,745	Relamp & Reballast	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	4,745	0.07	540	0.0	$90.76	$321.00	$30.00	3.21
Kitchen	3	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	3	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	272	0.0	$45.70	$322.67	$0.00	7.06
Kitchen	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.02	180	0.0	$30.25	$58.50	$10.00	1.60
Kitchen	5	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	4,745	Relamp	No	5	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	4,745	0.05	368	0.0	$61.88	$159.50	$25.00	2.17
Kitchen	2	Compact Fluorescent: CFL - Screw-in - 23W - 1L	Wall Switch	23	4,745	Relamp	No	2	LED Screw-In Lamps: LED - 16W	Wall Switch	16	4,745	0.01	75	0.0	$12.65	$107.51	$0.00	8.50
Kitchen	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	10	LED - Linear Tubes: (1) 4' Lamps	Wall Switch	18	500	None	Yes	10	LED - Linear Tubes: (1) 4' Lamps	Occupancy Sensor	18	350	0.04	31	0.0	$5.22	$270.00	$0.00	51.76
Storage	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.12	910	0.0	$152.91	$504.00	$75.00	2.81
Men's Restroom	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.20	1,478	0.0	$248.25	$738.00	$75.00	2.67
Women's Restroom	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.20	1,478	0.0	$248.25	$738.00	$75.00	2.67
Office 1	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.40	2,955	0.0	$496.50	$917.33	$115.00	1.62
Office 2	6	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.22	1,601	0.0	$268.97	$972.00	$35.00	3.48
Office 3	6	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.22	1,601	0.0	$268.97	$972.00	$35.00	3.48
Office 4	6	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.22	1,601	0.0	$268.97	$972.00	$35.00	3.48

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Office 4	2	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,745	0.06	426	0.0	$71.51	$234.00	$0.00	3.27
Office 5	6	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.22	1,601	0.0	$268.97	$972.00	$35.00	3.48
Office 5	2	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,745	0.06	426	0.0	$71.51	$234.00	$0.00	3.27
Electrical Room	1	Compact Fluorescent: CFL - Screw-in - 23W - 1L	Wall Switch	23	4,745	Relamp	No	1	LED Screw-In Lamps: LED - 16W	Wall Switch	16	4,745	0.01	38	0.0	$6.33	$53.75	$0.00	8.50
263	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.40	2,955	0.0	$496.50	$917.33	$115.00	1.62
2nd Floor Lobby	35	Compact Fluorescent: CFL - Screw-in - 26W - 2L	Wall Switch	26	4,745	Relamp	Yes	35	LED Screw-In Lamps: LED - 18W	Occupancy Sensor	18	3,322	0.34	2,532	0.0	$425.46	$4,302.71	$70.00	9.95
2nd Floor Lobby	10	Linear Fluorescent - T5: 2' T5 (14W) - 2L	Wall Switch	34	4,745	Relamp	Yes	10	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,322	0.16	1,206	0.0	$202.60	$752.00	$135.00	3.05
2nd Floor Lobby	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,745	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.15	1,138	0.0	$191.14	$562.50	$85.00	2.50
Mechanical Room	15	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	No	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.65	4,829	0.0	$811.31	$1,755.00	$150.00	1.98
Women's Restroom	5	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	4,745	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.15	1,083	0.0	$181.97	$562.50	$85.00	2.62
Men's Restroom	3	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	4,745	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.09	650	0.0	$109.18	$445.50	$65.00	3.48
Electrical Room	1	Compact Fluorescent: CFL - Screw-in - 23W - 1L	Wall Switch	23	4,745	Relamp	No	1	LED Screw-In Lamps: LED - 16W	Wall Switch	16	4,745	0.01	38	0.0	$6.33	$53.75	$0.00	8.50
Data Closet	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.10	739	0.0	$124.13	$504.00	$55.00	3.62
Women's Restroom	6	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	4,745	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.18	1,300	0.0	$218.37	$621.00	$95.00	2.41
Men's Restroom	6	Linear Fluorescent - T5: 4' T5 (28W) - 2L	Wall Switch	60	4,745	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.18	1,300	0.0	$218.37	$621.00	$95.00	2.41
Main Entrance Office	4	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.14	1,067	0.0	$179.31	$738.00	$35.00	3.92
Storage	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	500	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	350	0.10	78	0.0	$13.08	$504.00	$20.00	37.00
4th Floor Corridor	48	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	48	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	3,322	1.73	12,808	0.0	$2,151.76	$6,216.00	$0.00	2.89
423	5	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	5	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.18	1,334	0.0	$224.14	$855.00	$35.00	3.66
422	5	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	5	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.18	1,334	0.0	$224.14	$855.00	$35.00	3.66
421	5	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	5	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.18	1,334	0.0	$224.14	$855.00	$35.00	3.66
420	9	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.32	2,402	0.0	$403.45	$1,323.00	$35.00	3.19
419	43	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	43	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	1.55	11,474	0.0	$1,927.62	$5,841.00	$105.00	2.98
419	2	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	181	0.0	$30.46	$215.11	$0.00	7.06
418	10	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.36	2,668	0.0	$448.28	$1,440.00	$35.00	3.13

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
417	12	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.60	4,433	0.0	$744.75	$1,674.00	$155.00	2.04
416	10	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.36	2,668	0.0	$448.28	$1,440.00	$35.00	3.13
415	10	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.36	2,668	0.0	$448.28	$1,440.00	$35.00	3.13
413	24	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	24	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.86	6,404	0.0	$1,075.88	$3,348.00	$70.00	3.05
413	5	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	5	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	453	0.0	$76.16	$537.78	$0.00	7.06
Corridor	7	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	7	LED Exit Signs: 2 W Lamp	None	6	8,760	0.05	635	0.0	$106.62	$752.89	$0.00	7.06
Men's Restroom	3	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.11	801	0.0	$134.48	$621.00	$35.00	4.36
Men's Restroom	1	Compact Fluorescent: CFL - Screw-in - 23W - 1L	Wall Switch	23	4,745	Relamp	No	1	LED Screw-In Lamps: LED - 16W	Wall Switch	16	4,745	0.01	38	0.0	$6.33	$53.75	$0.00	8.50
406	8	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.29	2,135	0.0	$358.63	$1,206.00	$35.00	3.27
403	22	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	22	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.79	5,870	0.0	$986.22	$2,844.00	$35.00	2.85
Women's Restroom	3	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	0.11	801	0.0	$134.48	$621.00	$35.00	4.36
Women's Restroom	1	Compact Fluorescent: CFL - Screw-in - 23W - 1L	Wall Switch	23	4,745	Relamp	No	1	LED Screw-In Lamps: LED - 16W	Wall Switch	16	4,745	0.01	38	0.0	$6.33	$53.75	$0.00	8.50
400	60	U-Bend Fluorescent - T12: U T12 (34W) - 2L	Wall Switch	72	4,745	Relamp & Reballast	Yes	60	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,322	2.16	16,010	0.0	$2,689.70	$8,100.00	$140.00	2.96
Rooftop	6	Metal Halide: (1) 400W Lamp	Daylight Dimming	458	4,100	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	137	4,100	1.42	9,070	0.0	$1,523.72	$2,344.06	$600.00	1.14
Stairwell	6	Compact Fluorescent: CFL - Screw-in - 23W - 1L	Wall Switch	23	4,745	Relamp	No	6	LED Screw-In Lamps: LED - 16W	Wall Switch	16	4,745	0.03	226	0.0	$37.95	$322.52	$0.00	8.50
Annex Corridor	27	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	4,745	Relamp & Reballast	Yes	27	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	3,322	0.71	5,282	0.0	$887.35	$3,046.00	$135.00	3.28
Annex Corridor	6	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	6	LED Exit Signs: 2 W Lamp	None	6	8,760	0.04	544	0.0	$91.39	$645.33	$0.00	7.06
Annex Room	4	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	4,745	Relamp & Reballast	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	0.11	782	0.0	$131.46	$662.00	$55.00	4.62
210	3	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.30	2,217	0.0	$372.38	$755.50	$95.00	1.77
209	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.40	2,955	0.0	$496.50	$917.33	$115.00	1.62
208	6	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.60	4,433	0.0	$744.75	$1,241.00	$155.00	1.46
207	6	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.60	4,433	0.0	$744.75	$1,241.00	$155.00	1.46
206	7	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.70	5,172	0.0	$868.88	$1,402.83	$175.00	1.41
205	8	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	4,745	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,322	0.80	5,911	0.0	$993.01	$1,564.67	$195.00	1.38
Men's Restroom	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	None	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Women's Restroom	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	None	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,745	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Closet	1	LED Screw-In Lamps: LED Screw-in 9W	Wall Switch	9	500	None	No	1	LED Screw-In Lamps: LED Screw-in 9W	Wall Switch	9	500	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
elevator	6	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	4,745	Relamp & Reballast	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,322	0.16	1,174	0.0	$197.19	$858.00	$65.00	4.02
Exterior Perimeter	18	LED Screw-In Lamps: LED Screw-in 9W	Daylight Dimming	9	4,100	None	No	18	LED Screw-In Lamps: LED Screw-in 9W	Daylight Dimming	9	4,100	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Perimeter	3	LED Screw-In Lamps: LED Screw-in 15W	Daylight Dimming	15	4,100	None	No	3	LED Screw-In Lamps: LED Screw-in 15W	Daylight Dimming	15	4,100	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Perimeter	12	LED Screw-In Lamps: LED Screw-in 15W	Daylight Dimming	15	4,100	None	No	12	LED Screw-In Lamps: LED Screw-in 15W	Daylight Dimming	15	4,100	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Perimeter	4	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Daylight Dimming	46	4,100	Relamp & Reballast	No	4	LED - Linear Tubes: (1) 4' Lamp	Daylight Dimming	15	4,100	0.09	594	0.0	$99.81	$392.00	$20.00	3.73
Mechanical Room	20	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	500	Relamp & Reballast	No	20	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.87	679	0.0	$113.99	$2,340.00	$200.00	18.77
Mechanical Room	2	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	181	0.0	$30.46	$215.11	$0.00	7.06
Firesprinkler room	23	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	1.15	8,497	0.0	$1,427.45	$3,231.00	$300.00	2.05
Hallway	2	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	181	0.0	$30.46	$215.11	$0.00	7.06
Hallway	3	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	4,745	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,322	0.15	1,108	0.0	$186.19	$621.00	$65.00	2.99
Hallway	2	Exit Signs: Incandescent	None	15	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	181	0.0	$30.46	$215.11	$0.00	7.06

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
Rooftop	Student Center	1	Exhaust Fan	1.0	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Student Center	1	Exhaust Fan	7.5	91.7%	No	3,391	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Student Center	1	Exhaust Fan	2.0	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	1	Supply Fan	15.0	92.4%	No	2,745	Yes	93.0%	Yes	1	1.99	6,090	0.0	$1,023.10	$7,041.17	$1,200.00	5.71
Mechanical Room	Student Center	2	Condenser Water Pump	2.0	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	2	Other	1.5	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	2	Other	0.5	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	1	Supply Fan	25.0	93.6%	No	4,067	Yes	93.6%	Yes	1	3.23	14,586	0.0	$2,450.52	$10,845.23	$2,000.00	3.61
Mechanical Room	Student Center	1	Exhaust Fan	10.0	91.7%	No	2,745	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	1	Exhaust Fan	5.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	3	Chilled Water Pump	30.0	93.6%	No	4,067	Yes	94.1%	Yes	1	10.95	127,274	0.0	$21,382.06	$27,260.76	$5,400.00	1.02
Mechanical Room	Student Center	1	Supply Fan	15.0	92.4%	No	2,745	Yes	93.0%	Yes	1	1.99	6,090	0.0	$1,023.10	$7,041.17	$1,200.00	5.71
Mechanical Room	Student Center	1	Exhaust Fan	5.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	1	Exhaust Fan	0.3	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	1	Supply Fan	15.0	92.4%	No	2,745	Yes	93.0%	Yes	1	1.99	6,090	0.0	$1,023.10	$7,041.17	$1,200.00	5.71
Mechanical Room	Student Center	1	Exhaust Fan	5.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	1	Exhaust Fan	1.5	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	1	Exhaust Fan	11.5	91.7%	No	2,745	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	1	Supply Fan	15.0	92.4%	No	2,745	Yes	93.0%	Yes	1	1.99	6,090	0.0	$1,023.10	$7,041.17	$1,200.00	5.71
Mechanical Room	Student Center	1	Exhaust Fan	5.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	Student Center	1	Exhaust Fan	10.0	91.7%	No	2,745	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	1	Exhaust Fan	5.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Student Center	1	Exhaust Fan	2.0	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Student Center	1	Exhaust Fan	1.0	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Student Center	1	Exhaust Fan	1.0	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	3	Heating Hot Water Pump	2.0	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Annex	1	Supply Fan	25.0	93.6%	No	2,745	Yes	93.6%	Yes	1	3.23	9,845	0.0	$1,653.97	$10,845.23	$2,000.00	5.35
Mechanical Room	Annex	1	Return Fan	5.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Annex	2	Heating Hot Water Pump	2.0	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Annex	1	Condenser Water Pump	0.3	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Annex	2	Ventilation Fan	7.5	91.7%	No	3,391	No	91.7%	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
Rooftop	Kitchen	1	Packaged AC	12.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Mechanical Room	2	Split-System AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ground Floor	Student Center	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	1.30	2,195	0.0	$368.84	$5,236.77	$322.00	13.32
Ground Floor	Student Center	1	Split-System AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ground Floor	Student Center	1	Split-System AC	3.50		Yes	1	Split-System AC	3.50		14.00		No	1.30	2,195	0.0	$368.84	$5,236.77	$322.00	13.32
Ground Floor	Student Center	1	Split-System AC	2.00		Yes	1	Split-System AC	2.00		14.00		No	0.74	1,255	0.0	$210.77	$2,992.44	$184.00	13.32
Ground Floor	Student Center	4	Split-System AC	0.75		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ground Floor	Student Center	3	Split-System AC	2.00		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
Central Plant	Student Center	1	Water-Cooled Centrifugal Chiller	275.00	No							0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Student Center	Student Center	1	Forced Draft Steam Boiler	9,363.04	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Student Center	Student Center	1	Furnace	1,496.12	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
Closet	Student Center	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Student Center	1	Indirect System	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen Basement	1	Cooler (35F to 55F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen Basement	2	Medium Temp Freezer (0F to 30F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Low Temp Freezer (-35F to -5F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	3	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 Basement	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	4	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	No	Yes	0.60	5,250	0.0	$882.03	$12,070.40	$800.00	12.78
Kitchen 1st Floor	2	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	No	Yes	0.16	1,438	0.0	$241.60	$2,568.00	$150.00	10.01
Kitchen 1st Floor	1	Refrigerator Chest	No	Yes	0.12	1,027	0.0	$172.52	$1,272.80	$0.00	7.38
Kitchen 1st Floor	1	Stand-Up Refrigerator, Glass Door (>50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Stand-Up Refrigerator, Glass Door (31 - 50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	2	Refrigerator Chest	No	Yes	0.24	2,064	0.0	$346.83	$2,104.80	$0.00	6.07
Kitchen 1st Floor	2	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	2	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	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 1st Floor	1	Ice Making Head (≥450 lbs/day), Batch	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Ice Making Head (≥450 lbs/day), Batch	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	2	Ice Making Head (<450 lbs/day), Batch	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Novelty Cooler Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Cooler Description	Install Automatic Shutoff Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
School	17	Small Refrigerator	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Refrigerator self service	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Refrigerator self service	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 Basement	2	Electric Convection Oven (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen Basement	1	Electric Fryer	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen Basement	1	Electric Convection Oven (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Electric Convection Oven (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	2	Electric Fryer	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	2	Electric Griddle (4 Feet Width)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Electric Griddle (≤2 Feet Width)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Electric Fryer	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	2	Insulated Food Holding Cabinet (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Insulated Food Holding Cabinet (1/2 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Insulated Food Holding Cabinet (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Electric Fryer	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen 1st Floor	1	Electric Convection Oven (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen 1st Floor	1	Single Tank Conveyor (High Temp)	Electric	Electric	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
School	171	Desktop and LCD Monitor	191.0	Yes
School	35	Copier	515.0	Yes
School	23	Microwave	300.0	No
School	14	Toaster	850.0	No
School	76	Printer	20.0	Yes
School	39	Television	120.0	Yes
School	16	Coffee Machine	400.0	No
School	4	Water Fountain	500.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Student Center	5	Glass Fronted Refrigerated	Yes	0.00	6,044	0.0	$1,015.46	$1,150.00	$0.00	1.13
Student Center	2	Refrigerated	Yes	0.00	3,224	0.0	$541.58	$460.00	$0.00	0.85
Student Center	1	Non-Refrigerated	Yes	0.00	343	0.0	$57.54	$230.00	$0.00	4.00

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Montclair State University Campus (Buildings 1-41)

Primary Property Type: College/University
Gross Floor Area (ft²): 2,925,896
Built: 1908

For Year Ending: October 31, 2016
Date Generated: October 10, 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
Montclair State University Campus (Buildings 1-41) 1 Normal Avenue Montclair, New Jersey 07043	Montclair Statet University 1 Normal Avenue Montclair, NJ 07043 973-655-3244	Ana Pinto 1 Normal Avenue Montclair, NJ 07043 973-655-3244 pintoa@montclair.edu

Property ID: 6069294

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
172.3 kBtu/ft²

Source EUI
306.4 kBtu/ft²

Annual Energy by Fuel	
District Chilled Water -	81,507,530 (16%)
Other (kBtu)	
District Steam (kBtu)	223,798,259 (44%)
Electric - Grid (kBtu)	161,334,839 (32%)
Natural Gas (kBtu)	37,406,141 (7%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	147.6
National Median Source EUI (kBtu/ft²)	262.6
% Diff from National Median Source EUI	17%

Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	N/A

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)