Local Government Energy Audit:
Energy Audit Report

Freehold Campus

Western Monmouth Higher Education Center (WMHEC)

Brookdale Community College
3680 US Highway 9 South
Freehold, NJ 07728

March 27, 2018

Final Report by:
TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Freehold Campus.

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, as part of a comprehensive effort to help colleges and universities in New Jersey reduce their control their energy costs and help protect our environment by reducing energy demand statewide.

1.1 Facility Summary

The Brookdale Community College Freehold Campus is a single 69,000 square foot building in Freehold, New Jersey. The facility is also known as the Western Monmouth Higher Education Center (WMHEC). It is a higher education facility operated as part of a combined program with Rutgers University however, the building is owned by Brookdale Community College (BCC).

It is comprised primarily of college classrooms and administrative offices. There are also science and computer labs, study areas, restrooms, and a small convenience store on the first floor. It is occupied year-round by an average of about 600 people per day. It is typically open Monday to Friday 7:45 AM to 10:00 PM.

The building was constructed in 1988. It is a 4-story brick building with a columned portico at the front entrance and gabled windows across a sloping shingled roof. The windows and doors are all double-pane glass. All door and window seals appeared tight and well maintained. The roof around the perimeter is covered with asphalt shingles. The center of the roof is flat and covered with a white thermoplastic membrane.

Lighting at Freehold Campus consists primarily of 32-Watt T8 fluorescent tubes and compact fluorescent fixtures. All interior lighting is controlled by manual wall switches. Exterior lighting is on timers and is mostly comprised of pole-mounted 250-Watt HID fixtures, though some of the parking lot lighting has been recently upgraded to LEDs.

The building is primarily heated by two 670 MBH Cleaver-Brooks boilers. Cooling is provided by a 140-ton Carrier air-cooled scroll-type chiller. Hot and cold air is distributed throughout the building via three Trane air handling units (AHUs), each with one 15-HP supply and one 7.5-HP return fans. There are also four Trane gas/electric packaged rooftop units to provide supplementary heating and cooling to each floor. The building systems are monitored and setpoints controlled from the main campus via a Honeywell IVA system.

A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC recommends 11 energy efficiency measures for the building which together represent an opportunity for Brookdale Community College to reduce the annual energy costs of the Freehold Campus by $28,863 and reduce its annual greenhouse gas emissions by about 235,902 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in energy savings in 5.8 years. The breakdown of existing utility costs and anticipated reductions following project implementation are shown in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce the Freehold Campus's annual energy use by about 18%.

Figure 1 – Previous 12 Month Utility Costs

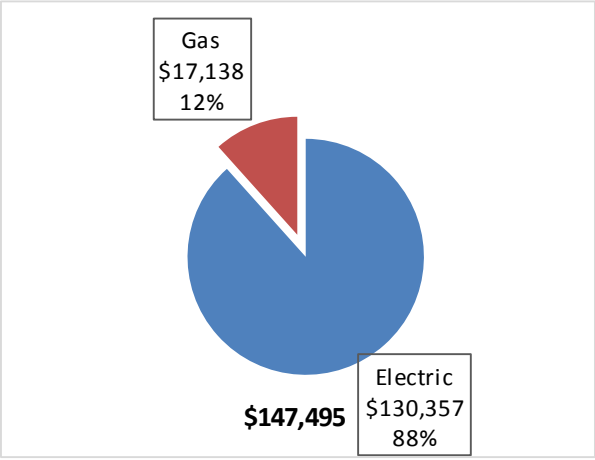
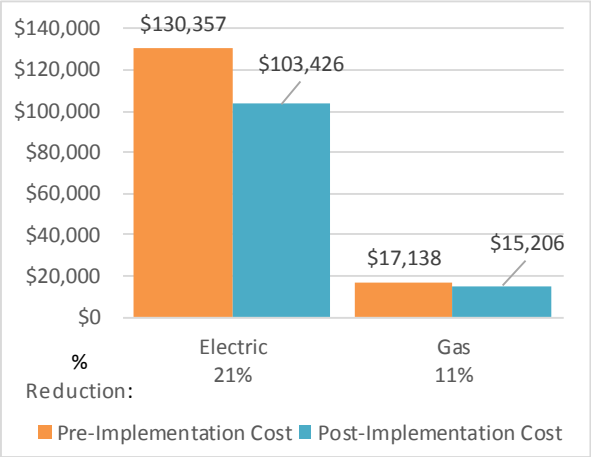


Figure 2 – Potential Post-Implementation Costs



A detailed description of Freehold Campus's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**160,926**	**32.9**	**0.0**	**$20,029.26**	**$109,036.55**	**$10,215.00**	**$98,821.55**	**4.9**	**162,051**
ECM 1	Install LED Fixtures	Yes	29,682	4.5	0.0	$3,694.25	$16,792.33	$3,010.00	$13,782.33	3.7	29,889
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	75,122	16.8	0.0	$9,349.87	$71,111.83	$7,025.00	$64,086.83	6.9	75,647
ECM 3	Retrofit Fixtures with LED Lamps	Yes	53,079	11.3	0.0	$6,606.37	$18,207.78	$180.00	$18,027.78	2.7	53,450
ECM 4	Install LED Exit Signs	Yes	3,043	0.3	0.0	$378.77	$2,924.61	$0.00	$2,924.61	7.7	3,065
Lighting Control Measures			**29,868**	**6.8**	**0.0**	**$3,717.42**	**$19,102.00**	**$2,635.00**	**$16,467.00**	**4.4**	**30,077**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	29,868	6.8	0.0	$3,717.42	$19,102.00	$2,635.00	$16,467.00	4.4	30,077
Motor Upgrades			**292**	**0.1**	**0.0**	**$36.36**	**$3,147.84**	**$0.00**	**$3,147.84**	**86.6**	**294**
ECM 6	Premium Efficiency Motors	Yes	292	0.1	0.0	$36.36	$3,147.84	$0.00	$3,147.84	86.6	294
Variable Frequency Drive (VFD) Measures			**16,204**	**2.0**	**0.0**	**$2,016.78**	**$12,567.00**	**$0.00**	**$12,567.00**	**6.2**	**16,317**
ECM 7	Install VFDs on Chilled Water Pumps	Yes	6,251	0.8	0.0	$778.03	$6,015.30	$0.00	$6,015.30	7.7	6,295
ECM 8	Install VFDs on Hot Water Pumps	Yes	9,953	1.3	0.0	$1,238.76	$6,551.70	$0.00	$6,551.70	5.3	10,022
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**97.2**	**$1,220.56**	**$32,164.59**	**$2,948.00**	**$29,216.59**	**23.9**	**11,379**
ECM 9	Install High Efficiency Hot Water Boilers	Yes	0	0.0	97.2	$1,220.56	$32,164.59	$2,948.00	$29,216.59	23.9	11,379
Domestic Water Heating Upgrade			**0**	**0.0**	**56.7**	**$711.49**	**$4,912.15**	**$170.00**	**$4,742.15**	**6.7**	**6,633**
ECM 10	Install High Efficiency Gas Water Heater	Yes	0	0.0	56.7	$711.49	$4,912.15	$170.00	$4,742.15	6.7	6,633
Plug Load Equipment Control - Vending Machine			**9,087**	**0.0**	**0.0**	**$1,130.96**	**$1,840.00**	**$0.00**	**$1,840.00**	**1.6**	**9,150**
ECM 11	Vending Machine Control	Yes	9,087	0.0	0.0	$1,130.96	$1,840.00	$0.00	$1,840.00	1.6	9,150
TOTALS			**216,377**	**41.8**	**153.8**	**$28,862.84**	**$182,770.13**	**$15,968.00**	**$166,802.13**	**5.8**	**235,902**

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

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

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

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

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

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

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

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

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

Energy Efficient Practices

TRC also identified nine 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 Freehold Campus include:

- Close Doors and Windows
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Assess Chillers & Request Tune-Ups
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls

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 Freehold Campus. The potential for cost-effective installation of a solar photovoltaic (PV) system is not great due to the size and the shape of the rooftop, but there appears to be some potential for solar PV development if the college chooses to pursue it.

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

1.3 Implementation Planning

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

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

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

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

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

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

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

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

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

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Tim Drury	Director of Facilities Management & Construction	tdrury@brookdalecc.edu	732-224-2217
Morris Collier	Maintenance Supervisor		
TRC Energy Services			
Tom Page	Auditor	tpage@TRCsolutions.com	(732) 855-0033

2.2 General Site Information

On December 13, 2016, TRC performed an energy audit at Freehold Campus located in Freehold, New Jersey. TRC's team met with Morris Collier to review the facility operations and help focus our investigation on specific energy-using systems.

The Brookdale Community College Freehold Campus is a single 69,000 square-foot building in Freehold, New Jersey. The facility is also known as the Western Monmouth Higher Center (WMHEC). It is a higher education facility operated as part of a combined program with Rutgers University however, the building is owned by BCC.

The building was constructed in 1988. It is comprised primarily of college classrooms and administrative offices. There are also science and computer labs, study areas, restrooms, and a small convenience store on the first floor.

2.3 Building Occupancy

The building is occupied year-round on weekdays by an average of about 600 students and staff per day. It is typically open Monday to Friday 7:45 AM to 10:00 PM.

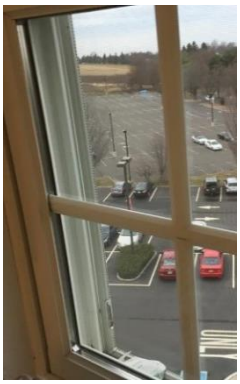
Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Brookdale CC - Freehold Campus	Weekday	7:45 AM - 10:00 PM
Brookdale CC - Freehold Campus	Weekend	NONE

2.4 Building Envelope

BCC's Freehold Campus building is a 4-story brick building with a columned portico at the front entrance and gabled windows across a sloping shingled roof. The windows and doors are all double-pane glass. All door and window seals appeared tight and well maintained. The roof around the perimeter is covered with asphalt shingles. The center of the roof is flat and covered with a white thermoplastic membrane. The building envelope appears to be in very good condition. No excessive air infiltration was noted near any building openings.

Image 1: Building Front Facade, Window and Door Frames



2.5 On-Site Generation

Freehold Campus does not have any on-site electric generating capacity.

2.6 Energy-Using Systems

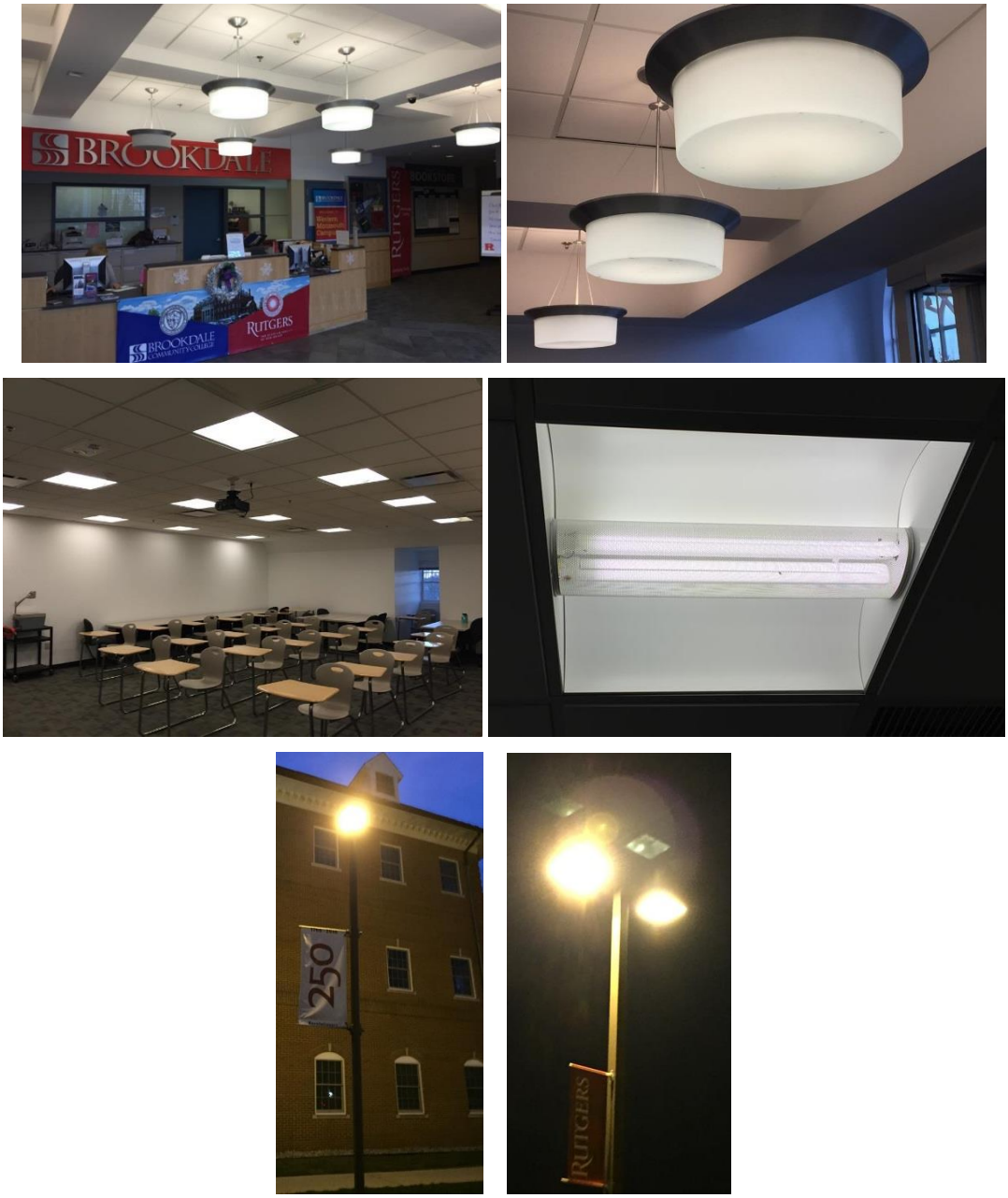
Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

Lighting at Freehold Campus consists primarily of 32-Watt T8 linear fluorescent tubes. The fixtures are mostly 2 or 4 tube 4-ft linear fluorescents. There are also some: T8 U-bend fixtures (32-Watt), recessed can ceiling fixtures (2 x 13Watt) compact fluorescent lamps (CFLs), as well as (2 x 40-Watt) linear CFLs. None of the rooms have occupancy sensors to turn off lights in unoccupied spaces. All interior lighting is controlled by manual switches.

Exterior lighting is controlled by timers and consists primarily of pole-mounted 250-Watt metal halide (MH) and high-pressure sodium (HPS) fixtures. Some of the parking lot lighting has been recently upgraded with high efficiency LED fixtures.

Image 2: Interior and Exterior Lighting at BCC - Freehold Campus



Heating, Ventilation, and Air Conditioning (HVAC)

The building is primarily heated by two 670 MBH Cleaver-Brooks boilers. The boilers are original to the building. They are in fair condition and appear to be well maintained, but they are beyond their rated useful lifetime.

Cooling is provided by one 140-ton Carrier air-cooled scroll-type chiller. The chiller is a high efficiency model that is only a few years old and in good condition.

Two 5-HP hot water pumps and two 3-HP chilled water pumps distribute heated and chilled water to the air handling units (AHUs). The HWP and CWP pumps are all about 20 years old.

Hot and cold air is distributed throughout the building via three Trane AHUs. Each AHU has one 15-HP supply and one 7.5-HP return fan. Supply and return fans are all controlled by variable frequency drives (VFDs). The AHUs have economizers and duct reheats. It is a variable air volume (VAV) system with 45 zone controller VAV boxes located above the ceiling of classrooms and offices throughout the building.

There are also four Trane gas/electric packaged rooftop units, one per floor, which provide supplementary heating and cooling. Each unit provides an additional 25 tons of cooling capacity and 324 MBH of heating capacity for each floor.

The system is monitored remotely from the main campus via a Honeywell IVA building energy management system (BEMS). With the IVA system facility staff can monitor all the of the building's major equipment and HVAC systems including boilers, chillers, RTUs, AHUs, and VAV boxes. Building scheduling and setpoints are controlled from the main campus. However, Telaire thermostats provide building occupants with some degree of local control as well.

Image 3: HVAC Equipment - Boilers, Pumps, AHUs, VFDs, and Thermostats

Domestic Hot Water Heating System

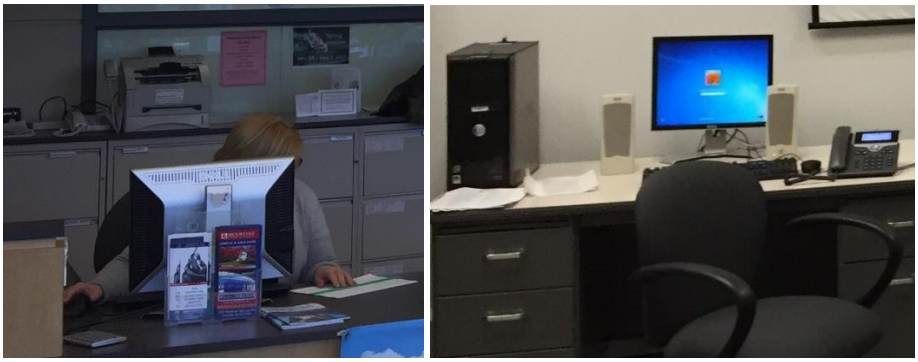
The domestic hot water heating system for the facility consists of a single gas-fired Bradford White 100-gallon hot water heater. It is a 10 year-old, standard efficiency unit.

Building Plug Load and Refrigeration

Building plug load consist primarily of computers, printers, and other typical office equipment. There are also many video monitors and projectors in classrooms. There are 164 computer work stations throughout the facility. Approximately 90% of the computers are desktop units with LCD monitors. There are about eight server racks as well.

The facility has five refrigerated vending machines and three non-refrigerated snack vending machines in total. The building also has several ENERGY STAR® rated refrigerators throughout the building and some refrigerated display cases in the campus store.

Image 4: Building Plug Load - Office Equipment, Video Monitors, Refrigerators, and Vending Machines



2.7 Water-Using Systems

All of the building's restrooms were found to have sinks, toilets, and urinals with flow restrictors and/or sensors to reduce water usage that were in compliance with current low-flow water conservation standards. Toilets were found to be 1.6 gallons per flush (gpf), urinals were 1.0 gpf, and most sinks were about 2.0 gallons per minute (gpm).

3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

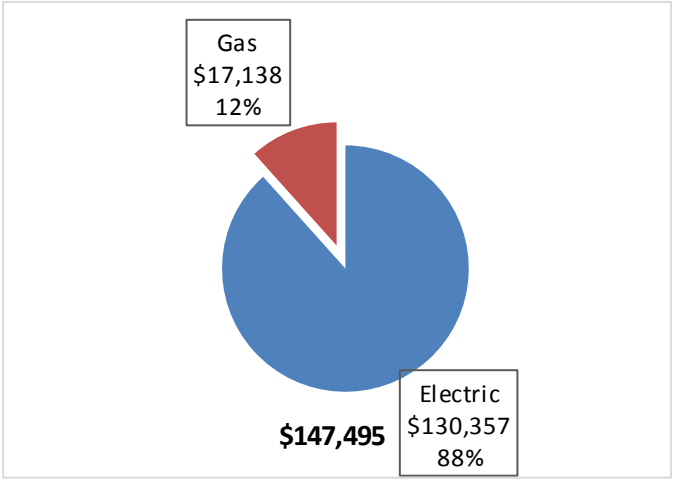
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Freehold Campus		
Fuel	**Usage**	**Cost**
Electricity	1,047,360 kWh	$130,357
Natural Gas	13,646 Therms	$17,138
Total		**$147,495**

The current annual energy cost for this facility is $147,495 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.124/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 8 -Electric Usage & Demand

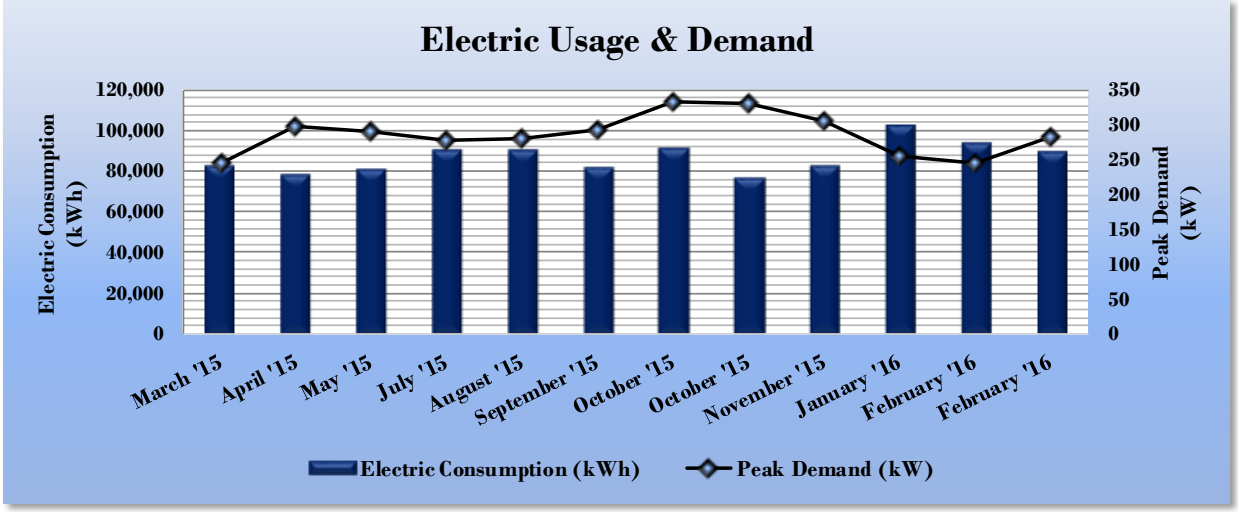


Figure 9 Electric Usage & Demand

Electric Billing Data for Freehold Campus					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost	TRC Estimated Usage?
4/15/15	28	83,520	246	$10,447	No
5/14/15	31	78,400	298	$10,148	No
6/15/15	30	81,600	290	$10,566	No
7/16/15	31	91,200	277	$11,523	No
8/17/15	30	90,880	280	$11,508	No
9/16/15	31	82,560	293	$10,319	No
10/16/15	31	91,520	333	$11,369	No
11/13/15	30	77,440	330	$9,897	No
12/15/15	31	82,880	305	$10,324	No
1/18/16	30	102,720	255	$12,104	No
2/16/16	31	94,720	245	$11,219	No
3/15/16	31	89,920	283	$10,934	No
Totals	**365**	**1,047,360**	**332.8**	**$130,357**	0
Annual	**365**	**1,047,360**	**332.8**	**$130,357**	

3.3 Natural Gas Usage

Natural Gas is provided by New Jersey Natural Gas. The average gas cost for the past 12 months is $1.256/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 -Natural Gas Usage

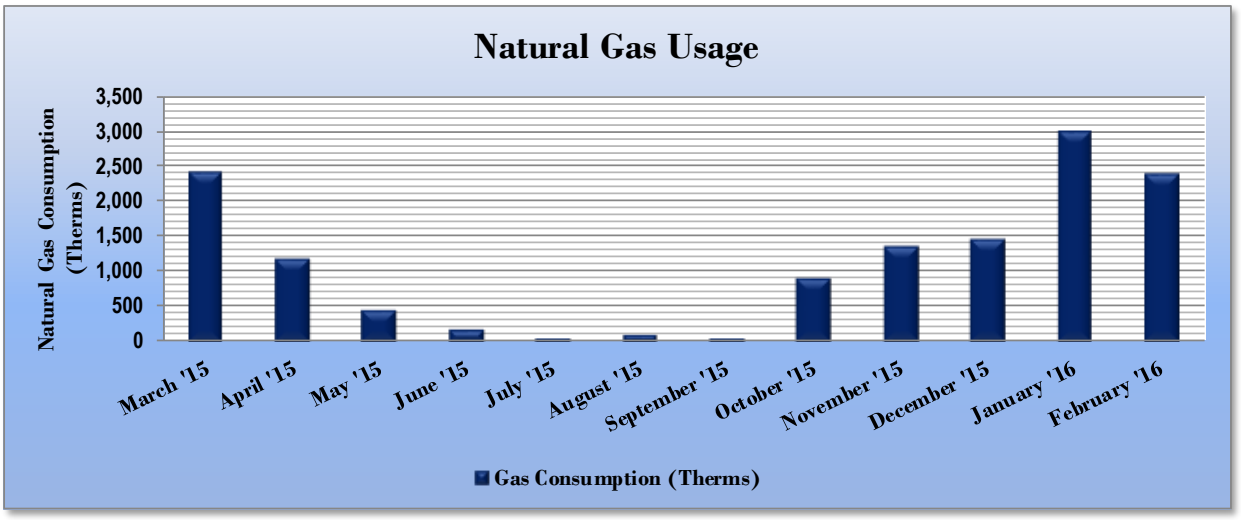


Figure 11 -Natural Gas Usage

Gas Billing Data for Freehold Campus			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
4/1/15	31	2,416	$2,769
5/1/15	30	1,202	$1,526
5/30/15	29	459	$766
6/29/15	30	191	$486
8/1/15	33	61	$357
9/1/15	31	96	$392
10/1/15	30	66	$362
11/1/15	31	905	$1,186
12/1/15	30	1,374	$1,647
1/1/16	31	1,475	$1,746
2/1/16	31	3,001	$3,246
2/29/16	28	2,401	$2,656
Totals	**365**	**13,646**	**$17,138**
Annual	**365**	**13,646**	**$17,138**

3.4 Benchmarking

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

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

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Freehold Campus	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	183.4	262.6
Site Energy Use Intensity (kBtu/ft^2)	71.6	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 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Freehold Campus	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	147.5	262.6
Site Energy Use Intensity (kBtu/ft^2)	58.6	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. Currently your building type is not one of the categories that are eligible to receive a score.

Higher education buildings are not eligible to receive an ENERGY STAR® score (i.e. 1-100). However, comparing the building's estimated EUI to the national median value for its building type, size, and age may be informative. Overall the building appears to be significantly more energy efficient than the national average for its type. This is likely due to the HVAC equipment consisting mostly of higher efficiency units. The building has a good control system, the equipment and building envelope appear to be generally well maintained.

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

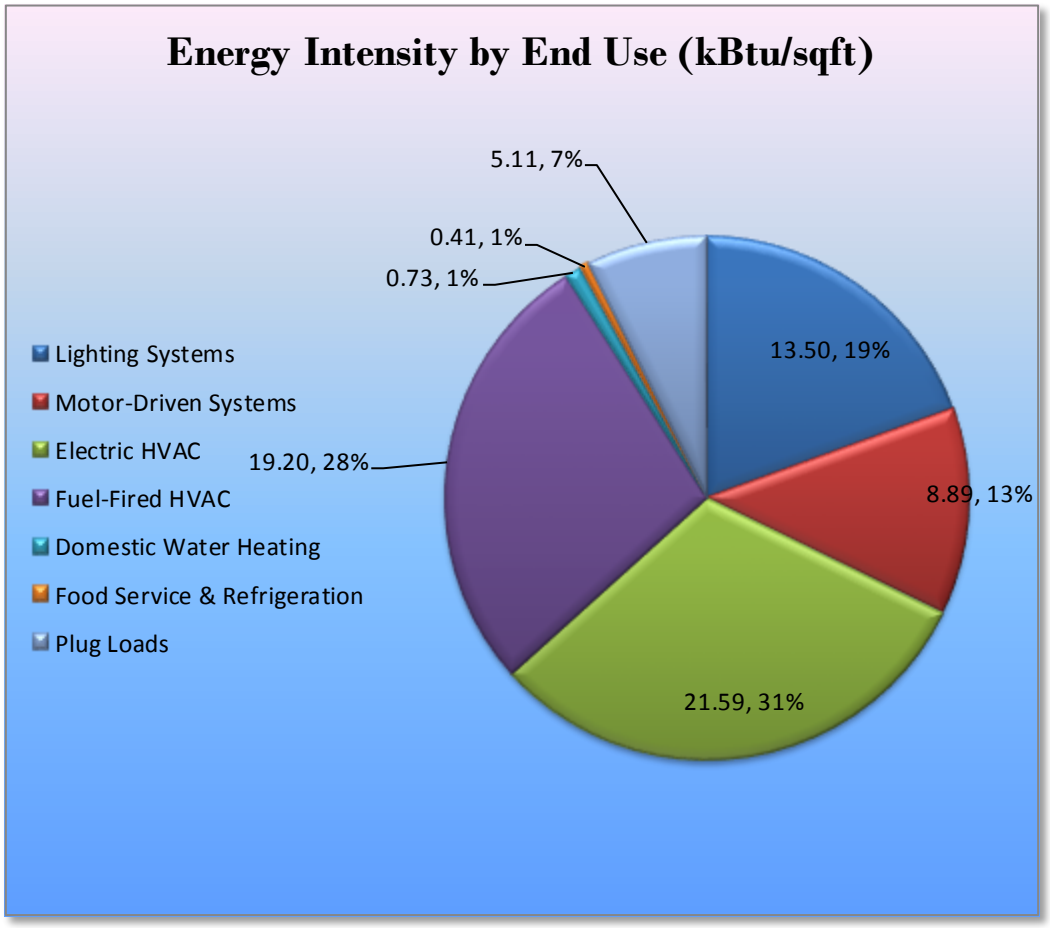
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training.

3.5 Energy End-Use Breakdown

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

Figure 14 - Energy Balance (kBtu/SF,%)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**160,926**	**32.9**	**0.0**	**$20,029.26**	**$109,036.55**	**$10,215.00**	**$98,821.55**	**4.9**	**162,051**
ECM 1	Install LED Fixtures	29,682	4.5	0.0	$3,694.25	$16,792.33	$3,010.00	$13,782.33	3.7	29,889
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	75,122	16.8	0.0	$9,349.87	$71,111.83	$7,025.00	$64,086.83	6.9	75,647
ECM 3	Retrofit Fixtures with LED Lamps	53,079	11.3	0.0	$6,606.37	$18,207.78	$180.00	$18,027.78	2.7	53,450
ECM 4	Install LED Exit Signs	3,043	0.3	0.0	$378.77	$2,924.61	$0.00	$2,924.61	7.7	3,065
Lighting Control Measures		**29,868**	**6.8**	**0.0**	**$3,717.42**	**$19,102.00**	**$2,635.00**	**$16,467.00**	**4.4**	**30,077**
ECM 5	Install Occupancy Sensor Lighting Controls	29,868	6.8	0.0	$3,717.42	$19,102.00	$2,635.00	$16,467.00	4.4	30,077
Motor Upgrades		**292**	**0.1**	**0.0**	**$36.36**	**$3,147.84**	**$0.00**	**$3,147.84**	**86.6**	**294**
ECM 6	Premium Efficiency Motors	292	0.1	0.0	$36.36	$3,147.84	$0.00	$3,147.84	86.6	294
Variable Frequency Drive (VFD) Measures		**16,204**	**2.0**	**0.0**	**$2,016.78**	**$12,567.00**	**$0.00**	**$12,567.00**	**6.2**	**16,317**
ECM 7	Install VFDs on Chilled Water Pumps	6,251	0.8	0.0	$778.03	$6,015.30	$0.00	$6,015.30	7.7	6,295
ECM 8	Install VFDs on Hot Water Pumps	9,953	1.3	0.0	$1,238.76	$6,551.70	$0.00	$6,551.70	5.3	10,022
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**97.2**	**$1,220.56**	**$32,164.59**	**$2,948.00**	**$29,216.59**	**23.9**	**11,379**
ECM 9	Install High Efficiency Hot Water Boilers	0	0.0	97.2	$1,220.56	$32,164.59	$2,948.00	$29,216.59	23.9	11,379
Domestic Water Heating Upgrade		**0**	**0.0**	**56.7**	**$711.49**	**$4,912.15**	**$170.00**	**$4,742.15**	**6.7**	**6,633**
ECM 10	Install High Efficiency Gas Water Heater	0	0.0	56.7	$711.49	$4,912.15	$170.00	$4,742.15	6.7	6,633
Plug Load Equipment Control - Vending Machine		**9,087**	**0.0**	**0.0**	**$1,130.96**	**$1,840.00**	**$0.00**	**$1,840.00**	**1.6**	**9,150**
ECM 11	Vending Machine Control	9,087	0.0	0.0	$1,130.96	$1,840.00	$0.00	$1,840.00	1.6	9,150
TOTALS		**216,377**	**41.8**	**153.8**	**$28,862.84**	**$182,770.13**	**$15,968.00**	**$166,802.13**	**5.8**	**235,902**

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

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

4.1.1 Lighting Upgrades

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

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**160,926**	**32.9**	**0.0**	**$20,029.26**	**$109,036.55**	**$10,215.00**	**$98,821.55**	**4.9**	**162,051**
ECM 1	Install LED Fixtures	29,682	4.5	0.0	$3,694.25	$16,792.33	$3,010.00	$13,782.33	3.7	29,889
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	75,122	16.8	0.0	$9,349.87	$71,111.83	$7,025.00	$64,086.83	6.9	75,647
ECM 3	Retrofit Fixtures with LED Lamps	53,079	11.3	0.0	$6,606.37	$18,207.78	$180.00	$18,027.78	2.7	53,450
ECM 4	Install LED Exit Signs	3,043	0.3	0.0	$378.77	$2,924.61	$0.00	$2,924.61	7.7	3,065

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

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	6,642	1.1	0.0	$826.73	$5,290.92	$460.00	$4,830.92	5.8	6,689
Exterior	23,039	3.4	0.0	$2,867.52	$11,501.41	$2,550.00	$8,951.41	3.1	23,200

Measure Description

We recommend replacing existing fixtures containing compact fluorescent and HID lamps with new LED fixtures or installing LED retrofit kits designed for those fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

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

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	75,122	16.8	0.0	$9,349.87	$71,111.83	$7,025.00	$64,086.83	6.9	75,647
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	53,019	11.3	0.0	$6,598.84	$18,176.03	$170.00	$18,006.03	2.7	53,389
Exterior	60	0.0	0.0	$7.52	$31.75	$10.00	$21.75	2.9	61

Measure Description

We recommend replacing existing incandescent, halogen, HID 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 which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

ECM 4: Install LED EXIT Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	3,043	0.3	0.0	$378.77	$2,924.61	$0.00	$2,924.61	7.7	3,065
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend replacing all incandescent or compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. Replacing CFL exit signs with LED exit signs does not save many watts per fixture, but the savings adds up over times, because the exit signs are lit all the time.

This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**29,868**	**6.8**	**0.0**	**$3,717.42**	**$19,102.00**	**$2,635.00**	**$16,467.00**	**4.4**	**30,077**
ECM 5	Install Occupancy Sensor Lighting Controls	29,868	6.8	0.0	$3,717.42	$19,102.00	$2,635.00	$16,467.00	4.4	30,077

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

ECM 5: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
29,868	6.8	0.0	$3,717.42	$19,102.00	$2,635.00	$16,467.00	4.4	30,077

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, classrooms, offices areas and other areas where occupancy varies throughout the day. Most classrooms and offices will save significantly more energy by adding occupancy sensors along with LED upgrades.

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. See Appendix A for occupancy sensor recommendations for each space.

4.1.3 Motor Upgrades

ECM 6: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
292	0.1	0.0	$36.36	$3,147.84	$0.00	$3,147.84	86.6	294

Measure Description

We recommend replacing standard efficiency motors with NEMA Premium® efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016). Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

4.1.4 Variable Frequency Drive Measures

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

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**16,204**	**2.0**	**0.0**	**$2,016.78**	**$12,567.00**	**$0.00**	**$12,567.00**	**6.2**	**16,317**
ECM 7	Install VFDs on Chilled Water Pumps	6,251	0.8	0.0	$778.03	$6,015.30	$0.00	$6,015.30	7.7	6,295
ECM 8	Install VFDs on Hot Water Pumps	9,953	1.3	0.0	$1,238.76	$6,551.70	$0.00	$6,551.70	5.3	10,022

ECM 7: Install VFDs on Chilled Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
6,251	0.8	0.0	$778.03	$6,015.30	$0.00	$6,015.30	7.7	6,295

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.

ECM 8: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
9,953	1.3	0.0	$1,238.76	$6,551.70	$0.00	$6,551.70	5.3	10,022

Measure Description

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

4.1.5 Gas-Fired Heating System Replacements

Our recommendations for gas-fired heating system replacements are summarized in Figure 19 below.

Figure 19 - Summary of Gas-Fired Heating Replacement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**97.2**	**$1,220.56**	**$32,164.59**	**$2,948.00**	**$29,216.59**	**23.9**	**11,379**
ECM 9	Install High Efficiency Hot Water Boilers	0	0.0	97.2	$1,220.56	$32,164.59	$2,948.00	$29,216.59	23.9	11,379

ECM 9: Install High Efficiency Hot Water Boilers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	97.2	$1,220.56	$32,164.59	$2,948.00	$29,216.59	23.9	11,379

Measure Description

We recommend replacing older inefficient hot water boilers with high efficiency hot water boilers. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. The two Cleaver Brooks boilers are in fair condition, but they are beyond their rated useful life. Newer models are now available with much higher efficiency.

Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers that can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F. Therefore, condensing hydronic boilers were only evaluated when the return water temperature is less than 130°F during most of the operating hours. As a result, condensing hydronic boilers are recommended for this site.

4.1.6 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 20 below.

Figure 20 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**56.7**	**$711.49**	**$4,912.15**	**$170.00**	**$4,742.15**	**6.7**	**6,633**
ECM 10	Install High Efficiency Gas Water Heater	0	0.0	56.7	$711.49	$4,912.15	$170.00	$4,742.15	6.7	6,633

ECM 10: Install High Efficiency Gas-Fired Water Heater

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	56.7	$711.49	$4,912.15	$170.00	$4,742.15	6.7	6,633

Measure Description

We recommend replacing the existing tank water heater with a high efficiency tank water heater. Improvements in combustion efficiency and reductions in heat losses have improved the overall efficiency of storage water heaters. Energy savings results from using less gas to heat water, due to higher unit efficiency, and fewer run hours to maintain the tank water temperature.

4.1.7 Plug Load Equipment Control - Vending Machines

ECM 11: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
9,087	0.0	0.0	$1,130.96	$1,840.00	$0.00	$1,840.00	1.6	9,150

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.

Ensure Lighting Controls Are Operating Properly

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

Perform Routine Motor Maintenance

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

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Assess Chillers & Request Tune-Ups

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

Clean and/or Replace HVAC Filters

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

Perform Proper Boiler Maintenance

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

Perform Proper 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.

6 On-Site Generation Measures

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

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

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

6.1 Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has some potential for cost-effective installation of a solar PV array.

Image 5: WMHEC Rooftop

The rooftop is not large, but the central area is flat and there is some space on the southern side next to RTUs. It might support a modestly sized solar array. We estimate that the roof has about 2,600 ft^2 of unshaded roof space that might be available for solar development.

According to PV-Watts® (an online solar calculator developed by the U.S. Department of Energy) a rooftop space of that size might accommodate a 36kWatt solar array. We estimate that an array of that size at that location could produce 49,317 kWh of electric power per year, which would reduce utility electric purchases at the site by about $6,114 per year, or about 5% of the facility's current annual

electric usage. Such an array could also earn an annual SREC income for the college of about $11,515 per year for the first 15 years of the project's lifetime. We estimate the installed cost of such an array to be around $16,000, which would mean the system could potentially pay for itself in about 7.2 years.

Total Installed Cost	**$126,000**	**$**
Value of Electric Generation per Year	**$6,115.31**	**$**
Annual Income from SRECS	**$11,515.00**	**$**
Total Economic Value per Year	**$17,630.31**	**$**
Simple Payback Period	**7.15**	**years**

If Freehold Campus is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

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

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

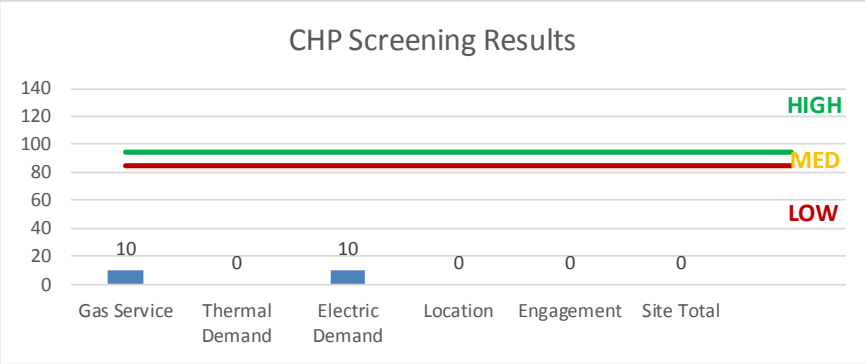
Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

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

The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP. A preliminary screening based on heating and electrical

demand, siting, and interconnection shows that the facility has a Low Potential for installing a cost-effective CHP system. The facility does not have a sufficient year-round thermal load to make CHP a cost-effective option.

Figure 21 - Combined Heat and Power Screening



7 DEMAND RESPONSE

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

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

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

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

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

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

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

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

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	X			X
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X			X
ECM 3	Retrofit Fixtures with LED Lamps	X			X
ECM 4	Install LED Exit Signs				X
ECM 5	Install Occupancy Sensor Lighting Controls	X			X
ECM 6	Premium Efficiency Motors				X
ECM 7	Install VFDs on Chilled Water Pumps	X			X
ECM 8	Install VFDs on Hot Water Pumps	X			X
ECM 9	Install High Efficiency Hot Water Boilers	X			X
ECM 10	Install High Efficiency Gas Water Heater	X			X
ECM 11	Vending Machine Control				X

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption. LEUP applicants can use in-house staff or a preferred contractor.

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 Pay for Performance - Existing Buildings

Overview

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

Incentives

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

How to Participate

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

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

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

8.3 SREC Registration Program

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

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

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

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

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

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

8.5 Demand Response Energy Aggregator

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

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract. See Section 7 for additional information.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
1st Floor Lobby	12	Compact Fluorescent: Pendant Fixtures / 2 x 23W CFL	None	46	3,965	Relamp	No	12	LED Screw-In Lamps: 2 x 12W Screw-in LEDs	None	24	3,965	0.19	1,204	0.0	$149.82	$396.00	$120.00	1.84
1st Floor Lobby	4	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	3,965	LED Retrofit	No	4	LED - Fixtures: Downlight Recessed	Wall Switch	10	3,965	0.05	301	0.0	$37.46	$230.04	$20.00	5.61
1st Floor Lobby	3	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	3	LED Exit Signs: 2 W Lamp	None	2	8,760	0.02	212	0.0	$26.33	$168.73	$0.00	6.41
Boiler Rm	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	None	93	1,500	Relamp & Reballast	No	7	LED - Linear Tubes: (3) 4' Lamps	None	44	1,500	0.26	598	0.0	$74.39	$920.50	$105.00	10.96
Classroom 001	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	13	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.70	3,073	0.0	$382.41	$2,373.83	$295.00	5.44
Classroom 001	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Classroom 002	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	13	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.70	3,073	0.0	$382.41	$2,373.83	$295.00	5.44
Classroom 002	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,800	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,800	0.05	206	0.0	$25.65	$428.00	$40.00	15.13
Classroom 002	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Classroom 003	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.54	2,363	0.0	$294.16	$1,888.33	$235.00	5.62
Classroom 003	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Classroom 004	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.49	2,127	0.0	$264.75	$1,726.50	$215.00	5.71
Classroom 004	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Classroom 005	11	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	11	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.59	2,600	0.0	$323.58	$2,050.17	$255.00	5.55
Classroom 005	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Classroom 006	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.49	2,127	0.0	$264.75	$1,726.50	$215.00	5.71
Classroom 006	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Classroom 007	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,960	0.21	940	0.0	$116.98	$935.00	$90.00	7.22
Classroom 007	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.01	56	0.0	$7.01	$98.00	$5.00	13.26
Classroom 008	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,960	0.21	940	0.0	$116.98	$935.00	$90.00	7.22
Classroom 008	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.01	56	0.0	$7.01	$98.00	$5.00	13.26
Classroom 009	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,960	0.40	1,746	0.0	$217.26	$1,791.00	$165.00	7.48
Classroom 009	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Classroom 020	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,800	Relamp & Reballast	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,960	0.55	2,417	0.0	$300.82	$1,848.00	$215.00	5.43
Classroom 020	1	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	71	0.0	$8.78	$56.24	$0.00	6.41

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 021	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,800	Relamp & Reballast	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,960	0.51	2,216	0.0	$275.75	$1,716.50	$200.00	5.50
Classroom 021	1	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	71	0.0	$8.78	$56.24	$0.00	6.41
Storage Rm 022	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,000	Relamp & Reballast	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	700	0.37	575	0.0	$71.62	$1,168.00	$140.00	14.35
Basement Mech Rm	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,600	Relamp & Reballast	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,600	0.15	364	0.0	$45.34	$702.00	$60.00	14.16
Communications Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.02	38	0.0	$4.72	$117.00	$10.00	22.65
UPS Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.05	76	0.0	$9.45	$234.00	$20.00	22.65
Elevator Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	600	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	600	0.02	23	0.0	$2.83	$117.00	$10.00	37.76
Basement Mop Closets	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.05	76	0.0	$9.45	$234.00	$20.00	22.65
Basement Electrical Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.02	38	0.0	$4.72	$117.00	$10.00	22.65
Men's Rm	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,960	0.09	403	0.0	$50.14	$621.00	$65.00	11.09
Men's Rm	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,800	Relamp & Reballast	Yes	1	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,960	0.01	52	0.0	$6.43	$93.50	$5.00	13.76
Women's Rm	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,960	0.09	403	0.0	$50.14	$621.00	$65.00	11.09
Women's Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	Yes	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,960	0.02	70	0.0	$8.76	$98.00	$5.00	10.62
Basement Hallways	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	No	15	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,800	0.62	2,705	0.0	$336.65	$2,427.50	$300.00	6.32
Basement Hallways	4	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	2	8,760	0.02	282	0.0	$35.11	$224.97	$0.00	6.41
Basement Storage Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.02	38	0.0	$4.72	$117.00	$10.00	22.65
1st Floor Lounge	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,965	Relamp & Reballast	No	21	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,965	0.51	3,160	0.0	$393.29	$2,457.00	$210.00	5.71
1st Floor Lounge	29	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	3,965	LED Retrofit	No	29	LED - Fixtures: Downlight Recessed	Wall Switch	10	3,965	0.35	2,182	0.0	$271.56	$1,667.79	$145.00	5.61
1st Floor Lounge	3	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	3	LED Exit Signs: 2 W Lamp	None	2	8,760	0.02	212	0.0	$26.33	$168.73	$0.00	6.41
Bookstore (Rm 101)	9	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp & Reballast	No	9	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,800	0.42	1,826	0.0	$227.24	$963.00	$0.00	4.24
Rm 102	8	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp & Reballast	No	8	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,800	0.37	1,623	0.0	$201.99	$856.00	$0.00	4.24
Rm 103	16	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp & Reballast	No	16	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,800	0.74	3,246	0.0	$403.98	$1,712.00	$0.00	4.24
Rm 103	1	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	2,800	LED Retrofit	No	1	LED - Fixtures: Downlight Recessed	Wall Switch	10	2,800	0.01	53	0.0	$6.61	$57.51	$5.00	7.94
Rm 103	2	Exit Signs: Fluorescent	None	9	2,800	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	2,800	0.01	45	0.0	$5.61	$112.49	$0.00	20.05
Rm 104	17	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	17	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.62	2,693	0.0	$335.20	$1,241.25	$70.00	3.49

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Rm 104	2	Exit Signs: Fluorescent	None	9	2,800	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	2,800	0.01	45	0.0	$5.61	$112.49	$0.00	20.05
Rm 105	9	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	9	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.33	1,426	0.0	$177.46	$641.25	$35.00	3.42
Rm 106	9	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	9	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.33	1,426	0.0	$177.46	$641.25	$35.00	3.42
Restroom	1	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	3,965	Relamp	Yes	1	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	2,776	0.04	224	0.0	$27.92	$157.25	$20.00	4.92
Store	8	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	3,965	Relamp	No	8	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Wall Switch	44	3,965	0.21	1,313	0.0	$163.45	$330.00	$0.00	2.02
Faculty Lounge	7	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	3,965	Relamp	Yes	7	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	2,776	0.25	1,570	0.0	$195.45	$558.75	$35.00	2.68
Faculty Lounge	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,965	Relamp & Reballast	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,776	0.10	598	0.0	$74.40	$588.00	$30.00	7.50
Main Office	3	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	3,965	LED Retrofit	Yes	3	LED - Fixtures: Downlight Recessed	Occupancy Sensor	10	2,776	0.04	265	0.0	$32.94	$442.53	$50.00	11.91
Main Office	2	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	3,965	Relamp	Yes	2	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	2,776	0.07	449	0.0	$55.84	$82.50	$0.00	1.48
Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.01	56	0.0	$7.01	$98.00	$5.00	13.26
Rm 114A	4	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	4	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.14	634	0.0	$78.87	$281.00	$20.00	3.31
Rm 114A	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	2,800	Relamp & Reballast	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,960	0.03	141	0.0	$17.51	$196.00	$10.00	10.62
Rm 114B	4	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	4	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.14	634	0.0	$78.87	$281.00	$20.00	3.31
Rm 114C	4	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	4	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.14	634	0.0	$78.87	$281.00	$20.00	3.31
Rm 114C	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	2,800	0.01	56	0.0	$7.01	$98.00	$5.00	13.26
Rm 114D	2	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	2	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.07	317	0.0	$39.44	$198.50	$20.00	4.53
Rm 114D	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	2,800	0.01	56	0.0	$7.01	$98.00	$5.00	13.26
Rm 114E	2	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	2	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.07	317	0.0	$39.44	$198.50	$20.00	4.53
Rm 114E	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	2,800	0.01	56	0.0	$7.01	$98.00	$5.00	13.26
Office Rm 115A	3	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	2,800	LED Retrofit	Yes	3	LED - Fixtures: Downlight Recessed	Occupancy Sensor	10	1,960	0.04	187	0.0	$23.26	$288.53	$35.00	10.90
Office Rm 115A	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	2,800	0.01	56	0.0	$7.01	$98.00	$5.00	13.26
Rm 115C	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,960	0.06	269	0.0	$33.42	$504.00	$55.00	13.43
Rm 115C	2	Exit Signs: Fluorescent	None	9	2,800	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	2,800	0.01	45	0.0	$5.61	$112.49	$0.00	20.05
1st Floor Hallways	15	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	3,965	Relamp	No	15	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Wall Switch	44	3,965	0.40	2,462	0.0	$306.46	$618.75	$0.00	2.02
1st Floor Hallways	11	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	3,965	LED Retrofit	No	11	LED - Fixtures: Downlight Recessed	Wall Switch	10	3,965	0.13	828	0.0	$103.00	$632.61	$55.00	5.61

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
1st Floor Hallways	4	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	2	8,760	0.02	282	0.0	$35.11	$224.97	$0.00	6.41
1st Flr Men's & Women's Rms	20	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	Yes	20	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,960	0.32	1,407	0.0	$175.14	$2,500.00	$170.00	13.30
1st Floor Mech Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,500	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,500	0.04	97	0.0	$12.02	$161.83	$20.00	11.80
Storage Rm	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,500	Relamp & Reballast	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,500	0.11	256	0.0	$31.88	$394.50	$45.00	10.96
Loading Dock	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,800	0.02	106	0.0	$13.23	$117.00	$10.00	8.09
Stairwells	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	None	114	3,965	Relamp & Reballast	No	10	LED - Linear Tubes: (4) 4' Lamps	None	58	3,965	0.41	2,553	0.0	$317.81	$1,618.33	$200.00	4.46
Stairwells	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	3,965	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	None	15	3,965	0.03	160	0.0	$19.86	$196.00	$10.00	9.36
Stairwells	2	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	141	0.0	$17.55	$112.49	$0.00	6.41
Office Rm 119	7	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	7	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.25	1,109	0.0	$138.02	$404.75	$20.00	2.79
Office Rm 119	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	2,800	0.01	56	0.0	$7.01	$98.00	$5.00	13.26
Office Rm 119A	4	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	4	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.14	634	0.0	$78.87	$281.00	$20.00	3.31
Office Rm 119A	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	2,800	0.01	56	0.0	$7.01	$98.00	$5.00	13.26
Office Rm 119B	2	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	2	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.07	317	0.0	$39.44	$198.50	$20.00	4.53
Office Rm 119B	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	2,800	0.01	56	0.0	$7.01	$98.00	$5.00	13.26
Main Entranceway	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	3,965	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	None	15	3,965	0.03	160	0.0	$19.86	$196.00	$10.00	9.36
Rm 201	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.32	1,418	0.0	$176.50	$1,087.00	$140.00	5.37
Rm 201A	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.05	236	0.0	$29.42	$277.83	$40.00	8.09
Rm 202	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.86	3,782	0.0	$470.66	$3,129.33	$390.00	5.82
Rm 203	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.86	3,782	0.0	$470.66	$3,129.33	$390.00	5.82
Office Rm 204	2	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	2	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.07	317	0.0	$39.44	$198.50	$20.00	4.53
Rm 204A	2	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	2	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.07	317	0.0	$39.44	$198.50	$20.00	4.53
Rm 204B	2	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	2	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.07	317	0.0	$39.44	$198.50	$20.00	4.53
Rm 204C	2	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	2	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.07	317	0.0	$39.44	$198.50	$20.00	4.53
2nd Flr Janitor's Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	600	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	600	0.02	23	0.0	$2.83	$117.00	$10.00	37.76
Control Rm	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp & Reballast	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.19	304	0.0	$37.79	$936.00	$80.00	22.65

	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
Men's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,960	0.06	269	0.0	$33.42	$350.00	$40.00	9.27
Men's Rm	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,800	Relamp & Reballast	Yes	1	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,960	0.01	52	0.0	$6.43	$93.50	$5.00	13.76
Men's Rm	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,960	0.03	125	0.0	$15.59	$233.00	$20.00	13.66
Women's Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,960	0.12	537	0.0	$66.85	$584.00	$60.00	7.84
Women's Rm	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,800	Relamp & Reballast	Yes	2	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,960	0.02	103	0.0	$12.86	$187.00	$10.00	13.76
2nd Flr Hallways	25	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,965	Relamp & Reballast	No	25	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,965	1.03	6,384	0.0	$794.53	$4,045.83	$500.00	4.46
2nd Flr Hallways	8	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	8	LED Exit Signs: 2 W Lamp	None	2	8,760	0.04	564	0.0	$70.21	$449.94	$0.00	6.41
Rm 206	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.43	1,891	0.0	$235.33	$1,410.67	$180.00	5.23
Rm 206	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,800	0.02	93	0.0	$11.62	$117.00	$0.00	10.07
Rm 207	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.43	1,891	0.0	$235.33	$1,410.67	$180.00	5.23
Rm 207	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Rm 208	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.49	2,127	0.0	$264.75	$1,726.50	$215.00	5.71
Rm 208	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Rm 209	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.49	2,127	0.0	$264.75	$1,726.50	$215.00	5.71
Rm 209	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Rm 210	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.49	2,127	0.0	$264.75	$1,726.50	$215.00	5.71
Rm 210	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,800	0.03	113	0.0	$14.03	$196.00	$10.00	13.26
Rm 211	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.43	1,891	0.0	$235.33	$1,410.67	$180.00	5.23
Rm 211	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,800	0.02	87	0.0	$10.82	$187.00	$10.00	16.36
Rm 212	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.43	1,891	0.0	$235.33	$1,410.67	$180.00	5.23
Rm 212	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,800	0.02	87	0.0	$10.82	$187.00	$10.00	16.36
Rm 213	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.43	1,891	0.0	$235.33	$1,410.67	$180.00	5.23
Rm 213	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,800	0.02	87	0.0	$10.82	$187.00	$10.00	16.36
Rm 214	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.43	1,891	0.0	$235.33	$1,410.67	$180.00	5.23
Rm 214	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,800	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,800	0.02	87	0.0	$10.82	$187.00	$10.00	16.36

	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
Rm 215	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,800	Relamp & Reballast	Yes	13	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,960	0.70	3,073	0.0	$382.41	$2,373.83	$295.00	5.44
Rm 301	11	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	11	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.40	1,743	0.0	$216.90	$723.75	$35.00	3.18
Rm 302	11	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	11	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.40	1,743	0.0	$216.90	$723.75	$35.00	3.18
Rm 303	11	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	11	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.40	1,743	0.0	$216.90	$723.75	$35.00	3.18
Rm 304	10	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	10	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.36	1,584	0.0	$197.18	$682.50	$35.00	3.28
Rm 305	11	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	11	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.40	1,743	0.0	$216.90	$723.75	$35.00	3.18
Rm 306	12	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	12	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.43	1,901	0.0	$236.61	$765.00	$35.00	3.09
Rm 307	15	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	15	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.54	2,376	0.0	$295.77	$888.75	$35.00	2.89
Rm 307	2	Exit Signs: Fluorescent	None	9	2,800	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	2,800	0.01	45	0.0	$5.61	$112.49	$0.00	20.05
Rm 308	16	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	16	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.58	2,535	0.0	$315.49	$930.00	$35.00	2.84
Rm 308	2	Exit Signs: Fluorescent	None	9	2,800	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	2,800	0.01	45	0.0	$5.61	$112.49	$0.00	20.05
Rm 309	11	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	11	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.40	1,743	0.0	$216.90	$723.75	$35.00	3.18
Rm 310	16	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	16	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.58	2,535	0.0	$315.49	$1,200.00	$70.00	3.58
Rm 310	2	Exit Signs: Fluorescent	None	9	2,800	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	2,800	0.01	45	0.0	$5.61	$112.49	$0.00	20.05
Rm 311	11	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	11	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.40	1,743	0.0	$216.90	$723.75	$35.00	3.18
Rm 312	16	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	16	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.58	2,535	0.0	$315.49	$1,200.00	$70.00	3.58
Rm 313	12	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	12	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.43	1,901	0.0	$236.61	$765.00	$35.00	3.09
Server Closet	1	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	1,000	LED Retrofit	No	1	LED - Fixtures: Downlight Recessed	Wall Switch	10	1,000	0.01	19	0.0	$2.36	$57.51	$5.00	22.23
Women's Rm	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,965	Relamp & Reballast	Yes	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,776	0.19	1,196	0.0	$148.80	$1,446.00	$95.00	9.08
Men's Rm	10	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,965	Relamp & Reballast	Yes	10	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,776	0.16	996	0.0	$124.00	$1,250.00	$85.00	9.39
3rd Flr Housekeeping	1	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	1,000	LED Retrofit	No	1	LED - Fixtures: Downlight Recessed	Wall Switch	10	1,000	0.01	19	0.0	$2.36	$57.51	$5.00	22.23
3rd Flr Hallways	23	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	3,965	LED Retrofit	No	23	LED - Fixtures: Downlight Recessed	Wall Switch	10	3,965	0.28	1,730	0.0	$215.37	$1,322.73	$115.00	5.61
3rd Flr Hallways	15	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	3,965	Relamp	No	15	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Wall Switch	44	3,965	0.40	2,462	0.0	$306.46	$618.75	$0.00	2.02
3rd Flr Hallways	5	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	5	LED Exit Signs: 2 W Lamp	None	2	8,760	0.03	353	0.0	$43.88	$281.21	$0.00	6.41
Breaker Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.10	152	0.0	$18.89	$468.00	$40.00	22.65

	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
4th Flr Server Closet	1	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	1,000	LED Retrofit	No	1	LED - Fixtures: Downlight Recessed	Wall Switch	10	1,000	0.01	19	0.0	$2.36	$57.51	$5.00	22.23
4th Flr Landing	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,965	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,965	0.04	255	0.0	$31.78	$161.83	$20.00	4.46
4th Flr Hallways	14	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	3,965	LED Retrofit	No	14	LED - Fixtures: Downlight Recessed	Wall Switch	10	3,965	0.17	1,053	0.0	$131.10	$805.14	$70.00	5.61
4th Flr Hallways	13	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	3,965	Relamp	No	13	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Wall Switch	44	3,965	0.34	2,134	0.0	$265.60	$536.25	$0.00	2.02
4th Flr Hallways	5	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	5	LED Exit Signs: 2 W Lamp	None	2	8,760	0.03	353	0.0	$43.88	$281.21	$0.00	6.41
4th Flr Lounge	3	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	3,965	Relamp	No	3	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Wall Switch	44	3,965	0.08	492	0.0	$61.29	$123.75	$0.00	2.02
4th Flr Lounge	1	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	71	0.0	$8.78	$56.24	$0.00	6.41
Men's Rm	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,965	Relamp & Reballast	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,776	0.10	598	0.0	$74.40	$858.00	$65.00	10.66
Women's Rm	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,965	Relamp & Reballast	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,776	0.08	498	0.0	$62.00	$760.00	$60.00	11.29
Mop Closet	1	Compact Fluorescent: Recessed Cans / 2 x 13W CFL	Wall Switch	26	2,800	LED Retrofit	No	1	LED - Fixtures: Downlight Recessed	Wall Switch	10	2,800	0.01	53	0.0	$6.61	$57.51	$5.00	7.94
Rm 401	6	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	6	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.22	951	0.0	$118.31	$363.50	$20.00	2.90
Rm 402	19	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	19	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.69	3,010	0.0	$374.64	$1,323.75	$70.00	3.35
Rm 402A	2	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	2	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.07	317	0.0	$39.44	$198.50	$20.00	4.53
Rm 402B	3	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	3	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.11	475	0.0	$59.15	$239.75	$20.00	3.71
Rm 402B	1	Exit Signs: Fluorescent	None	9	2,800	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	2	2,800	0.01	23	0.0	$2.81	$56.24	$0.00	20.05
Rm 403	14	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	14	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.51	2,218	0.0	$276.05	$847.50	$35.00	2.94
Rm 404	16	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	16	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.58	2,535	0.0	$315.49	$1,200.00	$70.00	3.58
Rm 405	20	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	20	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.72	3,168	0.0	$394.36	$1,365.00	$70.00	3.28
Rm 405	2	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	141	0.0	$17.55	$112.49	$0.00	6.41
Rm 406	8	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	8	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.29	1,267	0.0	$157.74	$446.00	$20.00	2.70
Rm 407	16	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	16	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.58	2,535	0.0	$315.49	$1,200.00	$70.00	3.58
Rm 408	15	Compact Fluorescent: 2 x 2-ft Linear CFL	Wall Switch	80	2,800	Relamp	Yes	15	LED Screw-In Lamps: 2x 2' Linear LED PL-L Lamps	Occupancy Sensor	44	1,960	0.54	2,376	0.0	$295.77	$888.75	$35.00	2.89
1st Flr Hallway Right	5	Compact Fluorescent: Pendant Fixtures / 2 x 23W CFL	Wall Switch	46	3,965	Relamp	No	5	LED Screw-In Lamps: 2x17W Screw-In LEDs	Wall Switch	34	3,965	0.04	274	0.0	$34.05	$537.53	$50.00	14.32
Elevators	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	3,965	Relamp & Reballast	No	8	LED - Linear Tubes: (1) 4' Lamp	None	15	3,965	0.10	638	0.0	$79.45	$784.00	$40.00	9.36
Exterior Circle	10	High-Pressure Sodium: (1) 100W Lamp	None	138	4,380	Fixture Replacement	No	10	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	20	4,380	0.87	5,944	0.0	$739.76	$3,409.10	$1,000.00	3.26

	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
Exterior Circle	1	Compact Fluorescent: 2 x 23W CFL	None	46	4,380	Relamp	No	1	LED Screw-In Lamps: 2x17W Screw-In LEDs	None	34	4,380	0.01	60	0.0	$7.52	$31.75	$10.00	2.89
Exterior Flagpole	1	Metal Halide: (1) 250W Lamp	None	295	4,380	Fixture Replacement	No	1	LED - Fixtures: Architectural Flood/Spot Luminaire	None	36	4,380	0.19	1,305	0.0	$162.37	$200.21	$50.00	0.93
Parking Lots	14	High-Pressure Sodium: (1) 250W Lamp	None	295	4,380	Fixture Replacement	No	14	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	86	4,380	2.15	14,738	0.0	$1,834.36	$7,365.96	$1,400.00	3.25
Parking Lots	1	Metal Halide: (1) 250W Lamp	None	295	4,380	Fixture Replacement	No	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	86	4,380	0.15	1,053	0.0	$131.03	$526.14	$100.00	3.25
Parking Lots	16	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	None	80	4,380	None	No	16	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	None	80	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
WMHEC	Whole Building	2	Heating Hot Water Pump	5.0	89.5%	No	2,745	Yes	89.5%	Yes	2	1.26	9,953	0.0	$1,238.76	$8,152.44	$0.00	6.58
WMHEC	Whole Building	2	Chilled Water Pump	3.0	83.0%	No	2,745	Yes	85.5%	Yes	2	0.87	6,543	0.0	$814.39	$7,562.40	$0.00	9.29
WMHEC	Whole Building	1	Other	60.0	88.5%	No	18	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC	Boiler	1	Process Blower	1.0	82.5%	No	600	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-1	1	Supply Fan	15.0	89.5%	Yes	3,391	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-1	1	Return Fan	7.5	88.5%	Yes	3,391	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-1	1	Ventilation Fan	0.5	80.0%	No	2,745	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-2	1	Supply Fan	15.0	89.5%	Yes	3,391	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-2	1	Return Fan	7.5	88.5%	Yes	3,391	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-2	1	Ventilation Fan	0.5	80.0%	No	2,745	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-3	1	Supply Fan	15.0	89.5%	Yes	3,391	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-3	1	Return Fan	7.5	88.5%	Yes	3,391	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-3	1	Ventilation Fan	0.5	80.0%	No	2,745	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	HVAC System Pneumatic Controls	1	Air Compressor	5.0	87.5%	No	1,200	No	87.5%	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
WMHEC	Front Entrance	1	Electric Forced Air Furnace		32.41	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Roof	RTU-1	1	Packaged AC	25.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - 4th Floor	RTU-2 / 4th Floor	1	Packaged AC	25.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - 3rd Floor	RTU-3 / 3rd Floor	1	Packaged AC	25.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Roof	RTU-4	1	Packaged AC	25.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-1	1	Split-System AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-2	1	Split-System AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Basement	AHU-3	1	Split-System AC	4.00		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
WMHEC	Whole Building	1	Air-Cooled Scroll Chiller	140.00	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
WMHEC - Boiler Room	Whole Building	2	Non-Condensing Hot Water Boiler	670.00	Yes	2	Condensing Hot Water Boiler	670.00	91.00%	Et	0.00	0	97.2	$1,220.56	$32,164.59	$2,948.00	23.94
WMHEC - Roof	RTU-1	1	Furnace	324.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - 4th Floor	RTU-2 / 4th Floor	1	Furnace	324.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - 3rd Floor	RTU-3 / 3rd Floor	1	Furnace	324.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC - Roof	RTU-4	1	Furnace	324.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
WMHEC	Whole Building	1	Storage Tank Water Heater (> 50 Gal)	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	95.00%	Et	0.00	0	56.7	$711.49	$4,912.15	$170.00	6.67

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
WMHEC	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC	1	Freezer Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC	1	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
WMHEC	1	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	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?
WMHEC	3	Large Flat Screen TV	50.0	No
WMHEC	18	Video Projector	300.0	No
WMHEC	8	Server Racks	183.0	No
WMHEC	4	Large Copier	494.0	Yes
WMHEC	12	Sm. Printer	192.0	No
WMHEC	164	Desktop Computers	109.0	Yes
WMHEC	195	Computer Monitors	28.0	Yes
WMHEC	8	Med. Printer	190.0	Yes
WMHEC	4	Med. Microwave	1,100.0	Yes
WMHEC	2	Large CRT TVs	245.0	Yes
WMHEC	14	Sm./Med. CRT TVs	150.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
WMHEC	3	Non-Refrigerated	Yes	0.00	1,028	0.0	$127.89	$690.00	$0.00	5.40
WMHEC	5	Refrigerated	Yes	0.00	8,059	0.0	$1,003.07	$1,150.00	$0.00	1.15

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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N/A

ENERGY STAR® Score[1]

Brookdale Community College - Freehold

Primary Property Type: College/University
Gross Floor Area (ft²): 69,000
Built: 1988

For Year Ending: February 29, 2016
Date Generated: May 16, 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
Brookdale Community College - Freehold 3680 US Highway 9 South Freehold, New Jersey 07728	Brookdale Community College 765 Newman Springs Road Lincroft, NJ 07738 (732) 224-2217	Timothy Drury 765 Newman Springs Road Lincroft, NJ 07738 (732) 224-2217 tdrury@brookdalecc.edu

Property ID: 5811156

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
72.9 kBtu/ft²

Source EUI
187.4 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	1,375,177 (27%)
Electric - Grid (kBtu)	3,658,068 (73%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	102.2
National Median Source EUI (kBtu/ft²)	262.6
% Diff from National Median Source EUI	-29%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	492

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)