Local Government Energy Audit:
Energy Audit Report

W. Kable Russell Building (#7)

Ocean County College

1 College Drive

Toms River, New Jersey 08754

October 18, 2018

Final Report by:

TRC Energy Services

Disclaimer

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

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

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

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

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1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for W. Kable Russell Building (#7).

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

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist local governments and public facilities in controlling their energy costs and help to protect our environment by reducing energy usage statewide.

1.1 Facility Summary

W. Kable Russell Building (#7) is a 27,070 square foot facility comprised mostly of administrative offices, classrooms. It contains several academic tutoring centers, as well as the faculty offices for the Math and English Departments. The building has three floors and is occupied year round. It is occupied by an average of 80 people per day during the spring and fall semesters and about 40 people per day during the summer term. The building was constructed in 1990. It is constructed of concrete masonry block with a white membrane roof. All windows and door are double paned glass with aluminum frames. The building is on the campus' primary electric account. It is also served by the campus-wide district heating loop. It has no separate electric account.

Lighting at W. Kable Russell Building (#7) consists of mostly of 4-foot T8 linear fluorescent fixtures, with some 2-foot T8 U-bend ceiling fixtures, a few compact fluorescents in the stairwells, and high pressure sodium and metal halide fixtures lighting the exterior of the building. Most classroom and office lighting is controlled by occupancy sensors, but there are some rooms where new occupancy sensors controls could be added to control lights. Exterior lights are controlled by timers.

Classrooms and offices are heated by fan coil unit ventilators (FCUs) in each room or by ceiling vents connected to a variable air volume (VAV) system. The VAV system is supplied by a York Air handling unit (AHU) on the third floor (20-HP supply fan, 10-HP return). Heating hot water is supplied to the fan coil and air handling unit from boilers at Central Plant, via a campus-wide district heating loop. Chilled water is supplied to the fan coil and air handling units by a Trane 100-ton air cooled screw chiller. Heating hot water and chilled water pumps (7.5-HP each) are located on the first and third floors respectively to distribute heated and chilled water to the FCUs and the AHU. Domestic hot water for the building is provided by one 65-gallon A.O. Smith hot water heater located on the third floor.

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 eight energy efficiency measures for implementation, which together represent an opportunity for W. Kable Russell Building (#7) to reduce annual energy costs by roughly $10,418 and annual greenhouse gas emissions by 64,059 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 6.7 years. The breakdown of existing utility costs and the estimated energy savings after project implementation are shown in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce W. Kable Russell Building (#7)'s total annual energy use by about 6%. Energy costs shown include the building's estimated portion of distributed electric and gas used for distributed heat from the Central Plant.

Figure 1 – Previous 12 Month Utility Costs

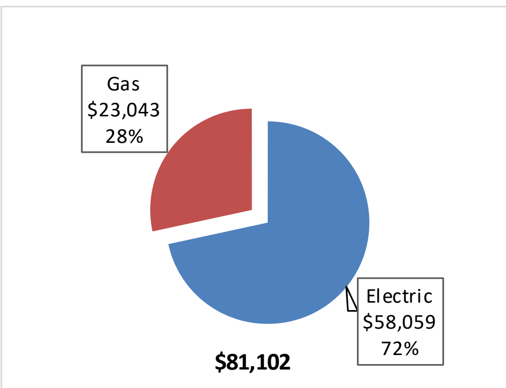
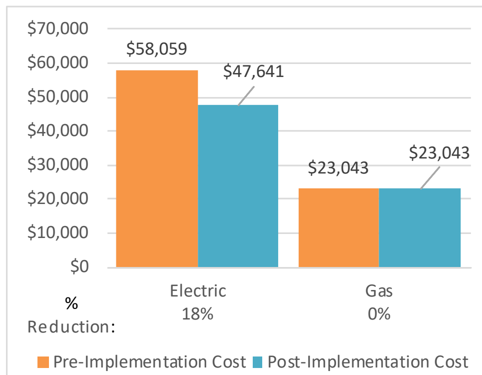


Figure 2 – Potential Post-Implementation Costs



A detailed description of W. Kable Russell Building (#7)'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			49,662	12.7	0.0	$8,133.23	$59,300.22	$4,440.00	$54,860.22	6.7	50,009
ECM 1	Install LED Fixtures	Yes	6,473	0.9	0.0	$1,060.02	$1,905.78	$900.00	$1,005.78	0.9	6,518
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	41,501	11.6	0.0	$6,796.68	$55,811.17	$3,515.00	$52,296.17	7.7	41,791
ECM 3	Retrofit Fixtures with LED Lamps	Yes	137	0.0	0.0	$22.45	$77.50	$25.00	$52.50	2.3	138
ECM 4	Install LED Exit Signs	Yes	1,551	0.1	0.0	$254.08	$1,505.77	$0.00	$1,505.77	5.9	1,562
Lighting Control Measures			2,719	0.6	0.0	$445.36	$1,312.00	$180.00	$1,132.00	2.5	2,738
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	2,719	0.6	0.0	$445.36	$1,312.00	$180.00	$1,132.00	2.5	2,738
Motor Upgrades			512	0.3	0.0	$83.81	$3,228.64	$0.00	$3,228.64	38.5	515
ECM 6	Premium Efficiency Motors	Yes	512	0.3	0.0	$83.81	$3,228.64	$0.00	$3,228.64	38.5	515
Variable Frequency Drive (VFD) Measures			10,721	2.5	0.0	$1,755.78	$10,489.45	$0.00	$10,489.45	6.0	10,796
ECM 7	Install VFDs on Chilled Water Pumps	Yes	3,185	0.9	0.0	$521.61	$3,606.80	$0.00	$3,606.80	6.9	3,207
ECM 8	Install VFDs on Hot Water Pumps	Yes	7,536	1.5	0.0	$1,234.17	$6,882.65	$0.00	$6,882.65	5.6	7,589
TOTALS			63,614	16.0	0.0	$10,418.17	$74,330.31	$4,620.00	$69,710.31	6.7	64,059

* - 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 measure 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.

Energy Efficient Practices

TRC also identified eight 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 W. Kable Russell Building (#7) include:

- Close Doors and Windows
- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Reduce Motor Short Cycling
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Assess Chillers & Request Tune-Ups
- Clean and/or Replace HVAC Filters
- 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 W. Kable Russell Building (#7). Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

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

1.3 Implementation Planning

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

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

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

- SmartStart
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- 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.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

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			
James Calamia	Director of Facilities	jcalamia@ocean.edu	732-255-0400 x-2066
Lenny Mannino	Assoc Dir of Bldg Maint	lmannino@ocean.edu	732-255-0410
TRC Energy Services			
Tom Page	Auditor	tpage@TRCsolutions.com	(732) 855-0033

2.2 General Site Information

On June 14, 2016, TRC performed an energy audit at W. Kable Russell Building (#7) located in Toms River, NJ. TRC's auditor met with Leonard Mannino to review the facility operations and help focus our investigation on specific energy-using systems.

W. Kable Russell Building (#7) is a 27,070 square foot facility comprised mostly of administrative offices, classrooms. It contains several academic tutoring centers, as well as the faculty offices for the Math and English Departments. The building was constructed in 1990.

The building is on the campus' primary electric account. It is also served by the campus-wide district heating loop. It has no separate electric account. The building's total annual electric consumption was estimated based on partial year data from building submeters. The building consumes a small amount of gas on site for domestic hot water, but most of its estimated end-usage of natural gas is from the building's consumption of hot water for heating supplied by the Central Plant (which is generated by four 6000 MBH Aerco gas-fired boilers). The building's portion of the heat provided to the campus-wide district heating loop was estimated based on building square footage.

2.3 Building Occupancy

The Russell Building is occupied by an average of 80 people per day during the spring and fall semesters and about 40 people per day during the summer term. The building's typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
W. Kable Russel Building	Weekday	7AM - 10PM
W. Kable Russel Building	Sat	9AM - 6PM
W. Kable Russel Building	Sun	CLOSED
W. Kable Russel Building	Summer Weekdays	7AM - 5PM
W. Kable Russel Building	Summer Weekend	CLOSED

2.4 Building Envelope

It is constructed of concrete masonry block with a white membrane roof. All windows and door are double paned glass with aluminum frames. Window and door frames all appeared to be in good condition. No evidence of excessive air infiltration was noted.

Image 1: Russell Building Exterior – Front Door

2.5 On-Site Generation

Russell Building has a Kohler 125-kW diesel emergency back-up generator. It is only run for emergencies, plus a few hours per year for required testing. So, fuel use at the site is negligible.

The Russell Building is on the campus' main electric account. Power is distributed to the Russell Building, and other campus buildings, from the Central Plant. The Central Plant's combined heat and power (CHP) system also generates a portion of the campus's total electric load on site. So, some of the building's electric demand is provided by a CHP system.

2.6 Energy-Using Systems

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

Lighting System

Lighting at W. Kable Russell Building (#7) consists of mostly of 4-foot T8 linear fluorescent fixtures, with some 2-foot T8 U-bend ceiling fixtures. There are also a few compact fluorescents in the stairwells and outside near the main entrance. High pressure sodium and metal halide fixtures light the exterior of the building.

Most classroom and office lighting is controlled by occupancy sensors, but there are some rooms where new occupancy sensors controls could be added to control lights. Exterior lights are controlled by timers.

Image 2: Russell Building - Hallway Lighting

Heating Ventilation and Air Conditioning (HVAC) Systems

Classrooms and offices are heated by fan coil unit ventilators (FCUs) in each room or by ceiling vents connected to a variable air volume (VAV) system. There are 14 rooms with FCUs with 1-HP fan motors. Building temperature setpoints and scheduling is controlled from the Central Plant.

Image 3: Air Cooled Chiller Condensing Unit

The VAV system is supplied by a York Air handling unit (AHU) on the third floor with a 20-HP supply fan, 10-HP return fan. The supply and return fans are controlled by variable frequency drives (VFDs).

Heating hot water is supplied to the fan coil and air handling unit from boilers at Central Plant, via a campus-wide district heating loop. Chilled water is supplied to the fan coil and air handling units by a Trane 100-ton air cooled screw chiller. The condenser unit is located on the ground outside the rear entrance (Door 6). The chiller is about eight years old and in fair condition. There was some discussion while on site, about complaints that the current chiller is too noisy and the possibility that it might be replaced by a new chilled water loop and supplied by the new chiller system at the Central Plant. We looked at options for direct chiller replacement with a new higher efficiency unit. The current model is a relatively high efficiency, so early replacement would likely not be cost effective (i.e. simple payback was estimated to be >25 years). Extension of the current district cooling loop to supply the building from the new chiller system at the Central Plant would likely be more costly than direct replacement, but might be the most energy efficient option overall. More study of options to extend the campus' district chilled water system is recommended.

The heating hot water and chilled water pumps (7.5 HP each) distribute heated and chilled water to the FCUs and the AHU. There is also one 5-HP dual service pump. All hot and chilled water distribution pumps are run at a constant speed.

Image 4: Hot Water and Chilled Water Pumps

Significant HVAC control issues were observed at the Russell Building. FCU fans were observed to be running continuously even when the rooms were unoccupied. Significant energy could be saved by adding additional controls to shut off fans when rooms are unoccupied or better scheduling of classroom occupancy and availability. For example, we estimate that each additional hour per day that FCU fans are running when not needed, probably cost the Ocean County College $568 in electric costs on an annual basis. Occupancy-controlled thermostats are available which might help to keep units turned off when unneeded. We considered options for adding sensors and controls for each FCU, but were unable to come up with a clear solution. Part of the solution might be to close portions of the building during the summer term and rather than keep all classrooms ready for immediate usage. This would entail some operational changes for the building, but would clearly reduce energy usage.

Another control issue found was the uneven distribution of heating and cooling throughout the building. For example, during our visit we observed that office rooms 223 and 225 on the second floor seemed much too hot, while at the same time classroom 244 (across the hall) was much too cold. We heard several complaints from building occupants that their room was frequently too hot or too cold. So, the temperature differences observed were more than minor variations due to individual occupant preferences. More likely, there is a problem there with temperature sensors and/or the VAV boxes that supply those spaces.

For both of these HVAC control issues, we recommend that Ocean CountyCollege work with their current building control system vendor to study these matters more closely to determine whether current sensors and controls need to be replaced and/or what additional equipment might be added to better control building energy usage.

Domestic Hot Water Heating System

Domestic hot water for the building is provided by one 65-gallon A.O Smith gas-fired hot water heater located on the third floor.

Building Plug Load

Building plug load equipment consists mostly of standard office and classroom equipment– such as computers, monitors, printers, large screen televisions, video projectors, and microwaves. We also found a clothes washer and dryer in one custodial closet. Most of the equipment was fairly new and ENERGY STAR® rated. No plug load equipment upgrades are recommended. However, use of smart power strips for office equipment can often save energy.

Please see Section 5 for more information on plug load control devices and other O&M measures.

2.7 Water-Using Systems

The building has six restrooms. We checked the water fixture flow rates. We found that toilets, urinals, and sinks to be water-conserving low-flow fixtures.

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

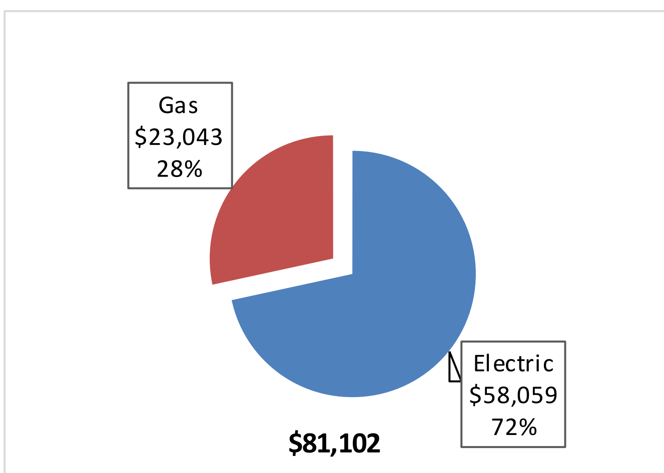
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for W. Kable Russell Building		
Fuel	Usage	Cost
Electricity	354,511 kWh	$58,059
Natural Gas	25,757 Therms	$23,043
Total		$81,102

The current annual energy cost for this facility is $81,102 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

The building is on the campus' primary electric account. It is also served by the campus-wide district heating loop. It has no separate electric account. The building's total annual electric consumption was estimated based on partial year data from building submeters. Electric power is provided to the Central Plant by JCP&L. The average electric cost over the past 12 months was $0.164/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

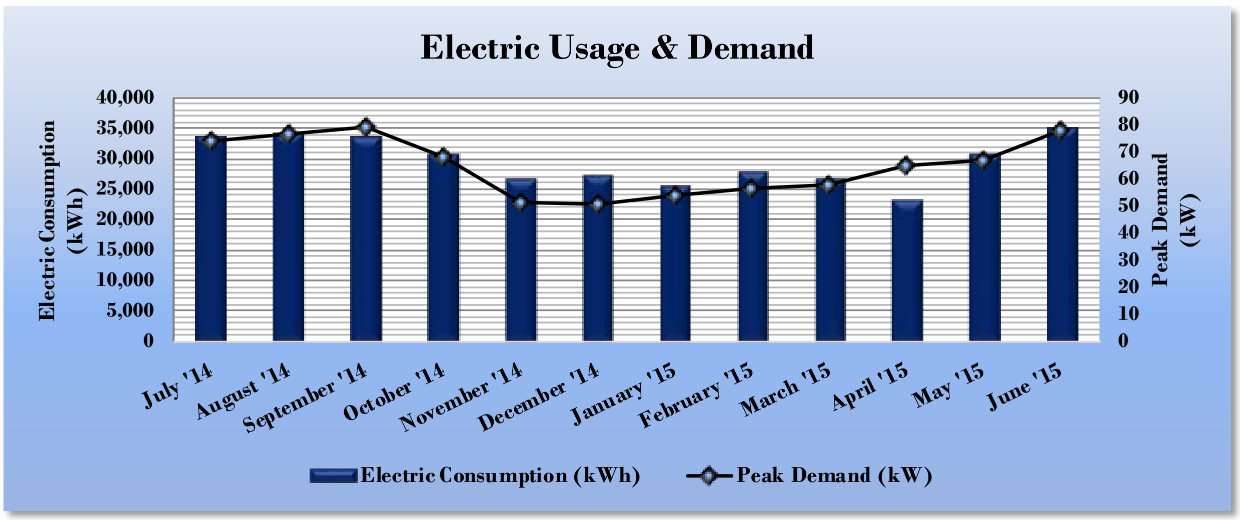


Figure 9 - Electric Usage & Demand

Electric Billing Data for W. Kable Russell Building					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost	TRC Estimated Usage?
8/6/14	31	33,662	74	$3,892	Yes
9/5/14	29	34,432	76	$5,315	Yes
10/3/14	29	33,631	79	$5,451	Yes
11/4/14	32	30,864	68	$5,271	Yes
12/5/14	31	26,940	51	$4,731	Yes
1/6/15	32	27,325	51	$4,526	Yes
2/5/15	30	25,749	54	$4,725	Yes
3/6/15	29	27,899	57	$6,512	Yes
4/7/15	32	26,712	58	$4,223	Yes
5/7/15	30	23,307	65	$3,881	Yes
6/8/15	32	30,724	67	$4,943	Yes
7/8/15	30	35,208	78	$4,907	Yes
Totals	367	356,453	79	$58,377	12
Annual	365	354,511	79	$58,059	

3.3 Natural Gas Usage

The building is heated by a campus-wide district heating loop. The building consumes a small amount of gas on site for domestic hot water, but most of its estimated end-usage of natural gas is due to the building's consumption of hot water for heating (which is provided by four 6000 MBH Aerco gas-fired boilers at the Central Plant). The building's portion of the heat provided to the campus-wide district heating loop was estimated based on building square footage. A portion of the Central Plant's natural gas consumption is used to generate electric power via the Plant's CHP system. Power generated at the plants is then consumed by central campus buildings, including the Russell Building.

All natural gas service (for heat, hot water, and electric power) consumed at the Russell Building is provided by NJ Natural Gas. The average gas cost for the past 12 months is $0.895/therm, which is the blended rate used throughout the analyses in this report. The building's estimated monthly gas consumption is shown in the chart below. The building has no separate gas account. The main boilers at the CHP building burn natural gas.

Figure 10 - Natural Gas Usage

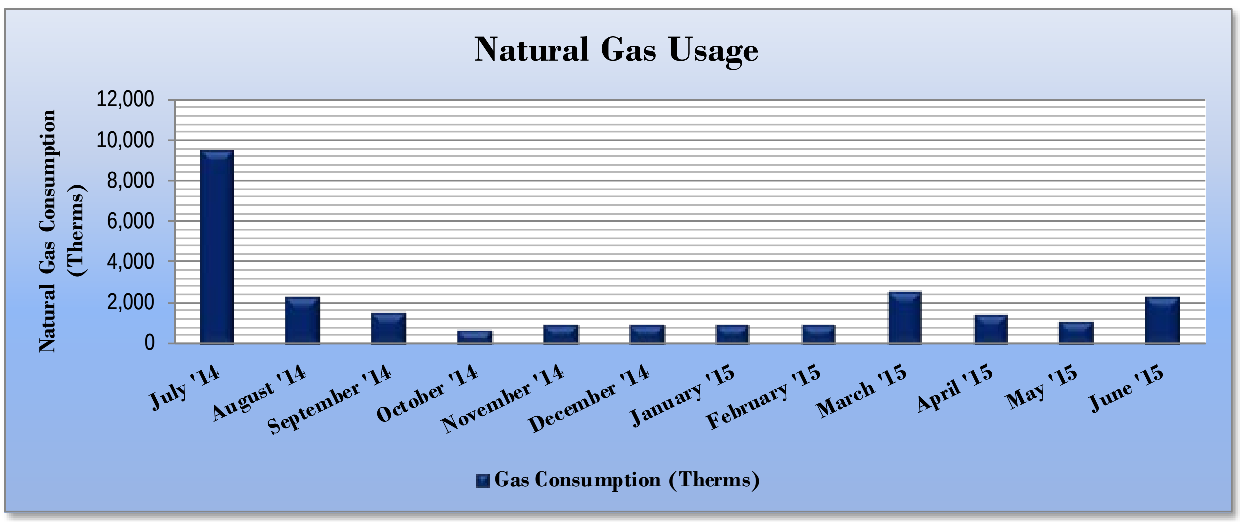


Figure 11 - Natural Gas Usage

Gas Billing Data for W. Kable Russell Building				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
8/1/14	31	9,532	$8,433	Yes
9/1/14	31	2,372	$2,119	Yes
10/1/14	30	1,580	$1,422	Yes
11/1/14	31	721	$661	Yes
12/1/14	31	1,004	$906	Yes
1/1/15	30	1,009	$923	Yes
2/1/15	31	1,005	$915	Yes
3/1/15	28	962	$877	Yes
4/1/15	31	2,591	$2,314	Yes
5/1/15	30	1,491	$1,342	Yes
6/1/15	31	1,146	$1,037	Yes
7/1/15	30	2,344	$2,094	Yes
Totals	365	25,757	$23,043	12
Annual	365	25,757	$23,043	

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		
	W. Kable Russell Building	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	240.2	262.6
Site Energy Use Intensity (kBtu/ft^2)	139.8	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		
	W. Kable Russell Building	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	215.0	262.6
Site Energy Use Intensity (kBtu/ft^2)	131.8	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. Your building is not is one of the building categories that are eligible to receive a score. This building does not belong to one of the categories that are currently eligible to receive an ENERGY STAR® score. However, based on its estimated EUI, it appears to be near the average for most college academic buildings.

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

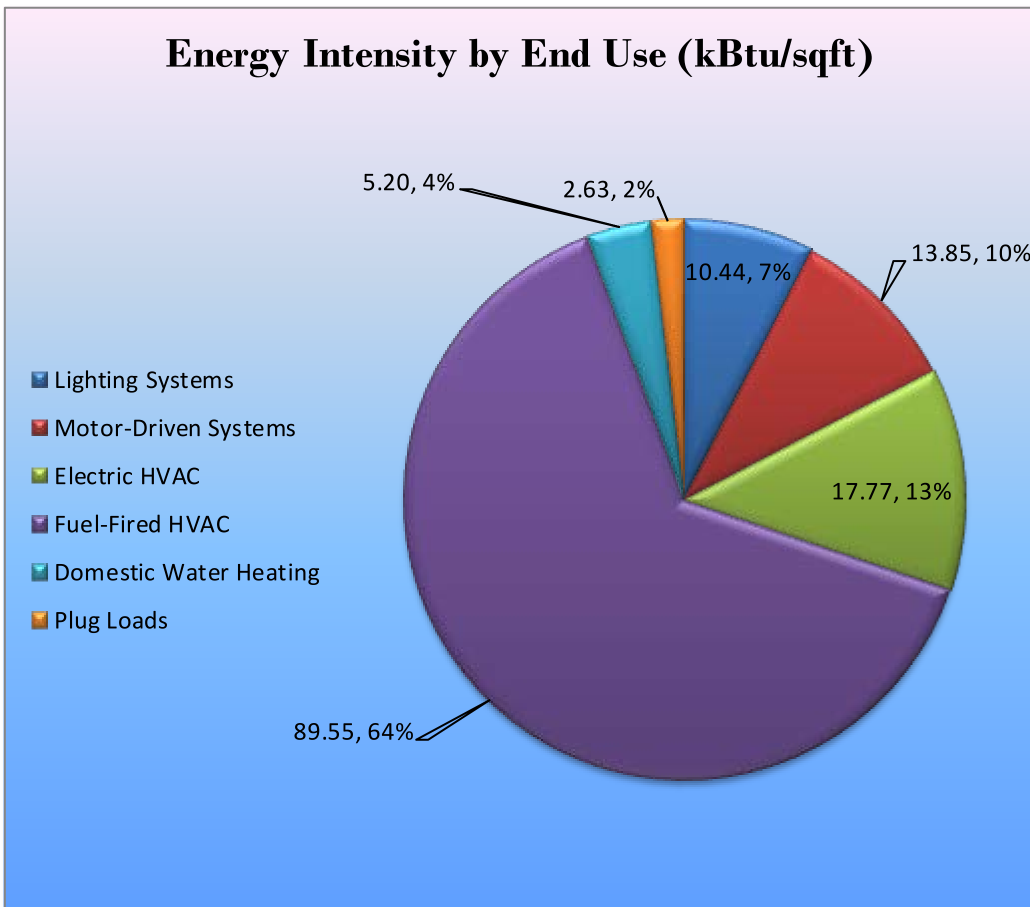
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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/ft^2 and %)



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 W. Kable Russell Building (#7) 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		49,662	12.7	0.0	$8,133.23	$59,300.22	$4,440.00	$54,860.22	6.7	50,009
ECM 1	Install LED Fixtures	6,473	0.9	0.0	$1,060.02	$1,905.78	$900.00	$1,005.78	0.9	6,518
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	41,501	11.6	0.0	$6,796.68	$55,811.17	$3,515.00	$52,296.17	7.7	41,791
ECM 3	Retrofit Fixtures with LED Lamps	137	0.0	0.0	$22.45	$77.50	$25.00	$52.50	2.3	138
ECM 4	Install LED Exit Signs	1,551	0.1	0.0	$254.08	$1,505.77	$0.00	$1,505.77	5.9	1,562
Lighting Control Measures		2,719	0.6	0.0	$445.36	$1,312.00	$180.00	$1,132.00	2.5	2,738
ECM 5	Install Occupancy Sensor Lighting Controls	2,719	0.6	0.0	$445.36	$1,312.00	$180.00	$1,132.00	2.5	2,738
Motor Upgrades		512	0.3	0.0	$83.81	$3,228.64	$0.00	$3,228.64	38.5	515
ECM 6	Premium Efficiency Motors	512	0.3	0.0	$83.81	$3,228.64	$0.00	$3,228.64	38.5	515
Variable Frequency Drive (VFD) Measures		10,721	2.5	0.0	$1,755.78	$10,489.45	$0.00	$10,489.45	6.0	10,796
ECM 7	Install VFDs on Chilled Water Pumps	3,185	0.9	0.0	$521.61	$3,606.80	$0.00	$3,606.80	6.9	3,207
ECM 8	Install VFDs on Hot Water Pumps	7,536	1.5	0.0	$1,234.17	$6,882.65	$0.00	$6,882.65	5.6	7,589
TOTALS		63,614	16.0	0.0	$10,418.17	$74,330.31	$4,620.00	$69,710.31	6.7	64,059

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

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

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 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		49,662	12.7	0.0	$8,133.23	$59,300.22	$4,440.00	$54,860.22	6.7	50,009
ECM 1	Install LED Fixtures	6,473	0.9	0.0	$1,060.02	$1,905.78	$900.00	$1,005.78	0.9	6,518
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	41,501	11.6	0.0	$6,796.68	$55,811.17	$3,515.00	$52,296.17	7.7	41,791
ECM 3	Retrofit Fixtures with LED Lamps	137	0.0	0.0	$22.45	$77.50	$25.00	$52.50	2.3	138
ECM 4	Install LED Exit Signs	1,551	0.1	0.0	$254.08	$1,505.77	$0.00	$1,505.77	5.9	1,562

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	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	6,473	0.9	0.0	$1,060.02	$1,905.78	$900.00	$1,005.78	0.9	6,518

Measure Description

We recommend replacing existing exterior fixtures containing high pressure sodium (HPS) or metal halide (MH) lamps with new high performance LED light fixtures. Exterior recessed can fixtures with compact fluorescent or incandescent bulbs can be retrofitted with retrofit kits designed to fit the cans.

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 tubes 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	41,501	11.6	0.0	$6,796.68	$55,811.17	$3,515.00	$52,296.17	7.7	41,791
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). LED retrofit kits are available that designed to be used in 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 tubes 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	137	0.0	0.0	$22.45	$77.50	$25.00	$52.50	2.3	138
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing screw-in incandescent, halogen, CFL, or HID 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 tubes and more than 10 times longer than many incandescent lamps.

ECM 4: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	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	1,551	0.1	0.0	$254.08	$1,505.77	$0.00	$1,505.77	5.9	1,562
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. Upgrading exit signs to LEDs does not provide a huge reduction in wattage per fixture, but because they are on continuously, the savings adds up over time. Also, LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years.

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

4.1.2 Lighting Control Measures

Our recommendtions for upgrades for lighting control measures are summarized in Figure 17 below.

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		2,719	0.6	0.0	$445.36	$1,312.00	$180.00	$1,132.00	2.5	2,738
ECM 5	Install Occupancy Sensor Lighting Controls	2,719	0.6	0.0	$445.36	$1,312.00	$180.00	$1,132.00	2.5	2,738

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)
2,719	0.6	0.0	$445.36	$1,312.00	$180.00	$1,132.00	2.5	2,738

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, classrooms, and offices areas. Most rooms in the building already use occupancy sensors to turn off lights when the space is unoccupied. However, we found six classrooms on the first floor where the lighting was controlled by manual switches that could be cost-effectively upgraded with occupancy sensors.

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.

4.1.3 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 18 below.

Figure 18-Summary of Motor 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)
Motor Upgrades		512	0.3	0.0	$83.81	$3,228.64	$0.00	$3,228.64	38.5	515
ECM 6	Premium Efficiency Motors	512	0.3	0.0	$83.81	$3,228.64	$0.00	$3,228.64	38.5	515

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)
512	0.3	0.0	$83.81	$3,228.64	$0.00	$3,228.64	38.5	515

Measure Description

We recommend replacing standard efficiency motors with *NEMA Premium®* efficiency motors. We recommend replacing the one hot water pump (7.5 HP), (1) chilled water pump (7.5 HP), and (1) dual service pump (5 HP). Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although often 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.

Where possible, we recommend replacing motors whenever new controls are proposed to be added such as VFDs. The combined payback from upgrading the motor to the highest efficiency model available for that size, plus the addition of the new controls, justifies the cost of the upgrades and will maximize total savings. See Section 4.14 below for our recommended motor control measures.

4.1.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 19 below.

Figure 19 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		10,721	2.5	0.0	$1,755.78	$10,489.45	$0.00	$10,489.45	6.0	10,796
ECM 7	Install VFDs on Chilled Water Pumps	3,185	0.9	0.0	$521.61	$3,606.80	$0.00	$3,606.80	6.9	3,207
ECM 8	Install VFDs on Hot Water Pumps	7,536	1.5	0.0	$1,234.17	$6,882.65	$0.00	$6,882.65	5.6	7,589

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)
3,185	0.9	0.0	$521.61	$3,606.80	$0.00	$3,606.80	6.9	3,207

Measure Description

We recommend installing a variable frequency drives (VFD) to control the 7.5-HP chilled water pump. 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)
7,536	1.5	0.0	$1,234.17	$6,882.65	$0.00	$6,882.65	5.6	7,589

Measure Description

We recommend installing a variable frequency drives (VFD) to control the 7.5-HP hot water pump and the 5-HP dual service pump. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

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.

Turn Off Unneeded Motors

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

Reduce Motor Short Cycling

Frequent stopping and starting of motors subjects rotors and other parts to substantial stress. This can result in component wear, reducing efficiency, and increasing maintenance costs. Adjust the load on the motor to limit the amount of unnecessary stopping and starting to improve motor performance.

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.

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.

In order to be cost-effective, a solar PV array needs certain minimum criteria, such as flat or south-facing rooftop or other unshaded space on which to place the PV panels. In our opinion, the facility does appear not meet these minimum criteria for cost-effective PV installation.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the campus has a **High Potential** for cost-effective installation of rooftop PV arrays.

TRC analyzed the potentially available rooftop areas for each of the central campus buildings, in order to determine the potential cost and energy savings for installing a campus-wide solar PV array at Ocean County College. Based on our analysis, we estimate that Ocean County College has about 106,687 square feet of available unshaded roof space for all buildings combined. We estimate that the Admin Building has approximately 2,400 square feet of unshaded roof space available, which would represent about 2.2% of the total array. See rooftop image below.

We estimate that the available rooftop space combined could support up to **1,487 kW** of solar generating capacity (~4,956 PV panels @300-W_{DC} each).[1] The combined PV array could generate nearly 2 million kWh on an annual basis. This could potentially offset $326,719 of annual electric purchases from the grid. In addition, Ocean County College could receive during the first 15 years of the solar project's lifetime, up to $795,309 per year in Solar Renewable Energy Certificate (SREC) income (@ $235/MWh). We estimate that the installed cost of such an array would be about $5.2 million. Based on these numbers, we estimate that such an investment would have a simple payback period of about 6.5 years.

[1] Our estimate was based on the National Renewable Energy Lab's *PVWatts® Online Calculator* (http://pvwatts.nrel.gov/), plus TRC's analysis of current market conditions for commercial solar power development in New Jersey.

Image 5: Potentially Available Rooftop Spaces at the Library

Image 6: Summary of Solar PV Array Analysis for OCC Campus

Total Installed Cost	$5,203,450	$
Value of Electric Generation per Year	$326,719	$
Annual Income from SRECS	$468,590	$
Total Economic Value per Year	$795,309	$
Simple Payback Period	6.54	years

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

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

Figure 20 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	X			
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X			
ECM 3	Retrofit Fixtures with LED Lamps	X			
ECM 4	Install LED Exit Signs				
ECM 5	Install Occupancy Sensor Lighting Controls	X			
ECM 6	Premium Efficiency Motors		X		
ECM 7	Install VFDs on Chilled Water Pumps		X		
ECM 8	Install VFDs on Hot Water Pumps		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 SREC Registration Program

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

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

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

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

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

8.3 Energy Savings Improvement Program

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

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

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

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

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

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

8.4 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
Entrance	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	None	62	4,200	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	None	33	4,200	0.02	140	0.0	$22.94	$117.00	$0.00	5.10
Hall	16	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,200	Relamp & Reballast	No	16	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,200	0.34	2,241	0.0	$367.03	$1,872.00	$0.00	5.10
Elec Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	400	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	400	0.05	30	0.0	$4.97	$234.00	$20.00	43.04
Mech Rm	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	600	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	600	0.16	152	0.0	$24.86	$468.00	$0.00	18.82
Rm R123	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,000	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.32	1,519	0.0	$248.83	$1,087.00	$140.00	3.81
Rm R124	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,000	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.32	1,519	0.0	$248.83	$1,087.00	$140.00	3.81
Rm R125	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,000	Relamp & Reballast	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.49	2,279	0.0	$373.25	$1,726.50	$215.00	4.05
Rm R126	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,000	Relamp & Reballast	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.49	2,279	0.0	$373.25	$1,726.50	$215.00	4.05
Rm R127	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,000	Relamp & Reballast	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.49	2,279	0.0	$373.25	$1,726.50	$215.00	4.05
Ground floor	8	Exit Signs: Fluorescent	None	16	8,760	Fixture Replacement	No	8	LED Exit Signs: 2 W Lamp	None	2	8,760	0.08	1,128	0.0	$184.78	$860.44	$0.00	4.66
1st Floor Hallway	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,200	Relamp & Reballast	No	11	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,200	0.23	1,541	0.0	$252.34	$1,287.00	$0.00	5.10
1st Floor Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,940	Relamp & Reballast	No	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,940	0.37	1,704	0.0	$279.07	$1,456.50	$180.00	4.57
1st Floor Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,940	Relamp & Reballast	No	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,940	0.25	1,136	0.0	$186.05	$971.00	$120.00	4.57
1st Floor Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,940	Relamp & Reballast	No	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,940	0.05	237	0.0	$38.76	$392.00	$20.00	9.60
1st Floor Hallway	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	2,940	Relamp & Reballast	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,940	0.06	294	0.0	$48.17	$351.00	$0.00	7.29
Rm R102	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.25	811	0.0	$132.89	$971.00	$120.00	6.40
Rm R103	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,100	0.07	239	0.0	$39.16	$351.00	$30.00	8.20
Rm R103	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	800	Relamp & Reballast	No	3	LED - Linear Tubes: (1) 4' Lamp	None	15	800	0.04	48	0.0	$7.91	$294.00	$15.00	35.27
Rm R107	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.33	1,082	0.0	$177.19	$1,294.67	$160.00	6.40
Rm R108	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.33	1,082	0.0	$177.19	$1,294.67	$160.00	6.40
Rm R135	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	13	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.54	1,758	0.0	$287.93	$2,103.83	$260.00	6.40
Women's Rm	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	2,940	Relamp & Reballast	No	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,940	0.04	196	0.0	$32.12	$234.00	$0.00	7.29
Women's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,940	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,940	0.03	118	0.0	$19.38	$196.00	$10.00	9.60
Rm R109	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.09	280	0.0	$45.88	$468.00	$0.00	10.20
Rm R110	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.09	280	0.0	$45.88	$468.00	$0.00	10.20

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Rm R111	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.09	280	0.0	$45.88	$468.00	$0.00	10.20
Rm R112	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.09	280	0.0	$45.88	$468.00	$0.00	10.20
Rm R113	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.06	210	0.0	$34.41	$351.00	$0.00	10.20
Copy Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.04	140	0.0	$22.94	$234.00	$0.00	10.20
Break Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.04	140	0.0	$22.94	$234.00	$0.00	10.20
Rm R116	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.16	541	0.0	$88.59	$647.33	$80.00	6.40
Rm R117	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.16	541	0.0	$88.59	$647.33	$80.00	6.40
Rm R118	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.16	541	0.0	$88.59	$647.33	$80.00	6.40
Men's Rm	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.02	70	0.0	$11.47	$117.00	$0.00	10.20
Men's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,100	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,100	0.03	85	0.0	$13.84	$196.00	$10.00	13.44
Women's Rm	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.02	70	0.0	$11.47	$117.00	$0.00	10.20
Women's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,100	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,100	0.03	85	0.0	$13.84	$196.00	$10.00	13.44
Custodial Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	None	88	600	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	None	33	600	0.04	38	0.0	$6.22	$117.00	$0.00	18.82
Rm R142	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,100	Relamp & Reballast	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,470	0.49	1,595	0.0	$261.27	$1,726.50	$215.00	5.79
Custodial Closet	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	600	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	None	33	600	0.09	80	0.0	$13.11	$468.00	$0.00	35.70
2nd Flr Hallway	40	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,100	Relamp & Reballast	No	40	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,100	0.47	1,546	0.0	$253.13	$4,280.00	$400.00	15.33
2nd Flr Hallway	6	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	6	LED Exit Signs: 2 W Lamp	None	2	8,760	0.03	423	0.0	$69.29	$645.33	$0.00	9.31
Rm R220	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.09	280	0.0	$45.88	$468.00	$0.00	10.20
Rm R221	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,100	0.10	319	0.0	$52.21	$468.00	$40.00	8.20
Rm R222	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.16	541	0.0	$88.59	$647.33	$80.00	6.40
Rm R223	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.16	541	0.0	$88.59	$647.33	$80.00	6.40
Rm R225	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.16	541	0.0	$88.59	$647.33	$80.00	6.40
Rm R226	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.16	541	0.0	$88.59	$647.33	$80.00	6.40
Rm R227	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.16	541	0.0	$88.59	$647.33	$80.00	6.40
Rm R228	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.16	541	0.0	$88.59	$647.33	$80.00	6.40

	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 R243	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.13	420	0.0	$68.82	$702.00	$0.00	10.20
Rm R244	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.13	420	0.0	$68.82	$702.00	$0.00	10.20
Rm R245	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,100	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,100	0.16	541	0.0	$88.59	$647.33	$80.00	6.40
Rm R246	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.06	210	0.0	$34.41	$351.00	$0.00	10.20
Rm R230	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.19	630	0.0	$103.23	$1,053.00	$0.00	10.20
Rm R231	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.19	630	0.0	$103.23	$1,053.00	$0.00	10.20
Rm R232	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.13	420	0.0	$68.82	$702.00	$0.00	10.20
Rm R233	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.13	420	0.0	$68.82	$702.00	$0.00	10.20
Rm R248	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,100	Relamp & Reballast	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,100	0.13	420	0.0	$68.82	$702.00	$0.00	10.20
2nd Flr Stairwell	3	CFL Screw-In Lamps: Wall Sconces	None	17	4,200	Relamp	No	3	LED Screw-In Lamps: 9W Screw-in LED Bulbs	None	9	4,200	0.02	116	0.0	$18.98	$46.50	$15.00	1.66
Men's Rm	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	2,940	Relamp & Reballast	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,940	0.06	294	0.0	$48.17	$351.00	$0.00	7.29
Men's Rm	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	2,940	Relamp & Reballast	No	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,940	0.06	296	0.0	$48.45	$490.00	$25.00	9.60
Custodial Closet	1	CFL Screw-In Lamps: 13-Watt CFL bulb	None	13	400	Relamp	No	1	LED Screw-In Lamps: 9W Screw-in LED Bulbs	None	9	400	0.00	2	0.0	$0.30	$15.50	$5.00	34.84
Sm Kitchen	1	CFL Screw-In Lamps: 13-Watt CFL bulb	None	13	4,200	Relamp	No	1	LED Screw-In Lamps: 9W Screw-in LED Bulbs	None	9	4,200	0.00	19	0.0	$3.16	$15.50	$5.00	3.32
Stairs	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	4,200	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	None	15	4,200	0.03	169	0.0	$27.69	$196.00	$10.00	6.72
Stairs	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	4,200	Relamp & Reballast	No	3	LED - Linear Tubes: (2) U-Lamp	None	33	4,200	0.06	420	0.0	$68.82	$351.00	$0.00	5.10
Rm R202	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.13	280	0.0	$45.88	$702.00	$0.00	15.30
Rm R208	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.19	420	0.0	$68.82	$1,053.00	$0.00	15.30
Rm R209	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.19	420	0.0	$68.82	$1,053.00	$0.00	15.30
Women's Rm	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.06	140	0.0	$22.94	$351.00	$0.00	15.30
Women's Rm	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	1,400	Relamp & Reballast	No	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,400	0.06	141	0.0	$23.07	$490.00	$25.00	20.15
Rm R238	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.19	420	0.0	$68.82	$1,053.00	$0.00	15.30
Rm R211	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.09	187	0.0	$30.59	$468.00	$0.00	15.30
Rm R212	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.09	187	0.0	$30.59	$468.00	$0.00	15.30
Rm R213	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.09	187	0.0	$30.59	$468.00	$0.00	15.30

	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 R214	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.09	187	0.0	$30.59	$468.00	$0.00	15.30
Rm R215	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,400	Relamp & Reballast	No	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.12	270	0.0	$44.30	$485.50	$60.00	9.61
Copy Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.04	93	0.0	$15.29	$234.00	$0.00	15.30
Rm R217	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,400	Relamp & Reballast	No	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.08	180	0.0	$29.53	$323.67	$40.00	9.61
Staff Men's Rm	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.02	47	0.0	$7.65	$117.00	$0.00	15.30
Staff Men's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	1,400	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,400	0.03	56	0.0	$9.23	$196.00	$10.00	20.15
Staff Women's Rm	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.02	47	0.0	$7.65	$117.00	$0.00	15.30
Staff Women's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	1,400	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,400	0.03	56	0.0	$9.23	$196.00	$10.00	20.15
Rm R218	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.09	187	0.0	$30.59	$468.00	$0.00	15.30
Rm R219	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.09	187	0.0	$30.59	$468.00	$0.00	15.30
Rm R242	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,400	Relamp & Reballast	No	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.19	420	0.0	$68.82	$1,053.00	$0.00	15.30
3rd Flr Mech Rm	4	Linear Fluorescent - T12: 4' T12 (40W) - 2L	None	88	4,200	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	None	33	4,200	0.16	1,063	0.0	$174.02	$468.00	$0.00	2.69
3rd Flr Mech Rm	1	Linear Fluorescent - T12: 2' T12 (20W) - 2L	None	50	4,200	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	None	33	4,200	0.01	82	0.0	$13.45	$117.00	$0.00	8.70
Stairwell	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	4,200	Relamp & Reballast	No	4	LED - Linear Tubes: (1) 4' Lamp	None	15	4,200	0.05	338	0.0	$55.37	$392.00	$20.00	6.72
Over Door A	4	Compact Fluorescent: Recessed Cans	None	32	4,380	LED Retrofit	No	4	LED - Fixtures: Downlight Recessed	None	17	4,380	0.04	302	0.0	$49.50	$230.04	$0.00	4.65
Back Doors D, E, & F	4	High-Pressure Sodium: (1) 50W Lamp	None	66	4,380	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	12	4,380	0.16	1,088	0.0	$178.18	$451.44	$400.00	0.29
Side Door C	1	High-Pressure Sodium: (1) 50W Lamp	None	66	4,380	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	12	4,380	0.04	272	0.0	$44.55	$112.86	$100.00	0.29
Side Door B	1	High-Pressure Sodium: (1) 70W Lamp	None	95	4,380	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	12	4,380	0.06	418	0.0	$68.47	$112.86	$100.00	0.19
Front Entrance Door A	2	Metal Halide: (1) 250W Lamp	None	295	4,380	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	57	4,380	0.35	2,398	0.0	$392.66	$628.58	$200.00	1.09
Front Entrance Door A	1	Metal Halide: (1) 400W Lamp	None	458	4,380	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	62	4,380	0.29	1,995	0.0	$326.67	$370.00	$100.00	0.83

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
1st Flr Mech Room	Whole Building	1	Heating Hot Water Pump	5.0	87.5%	No	2,400	Yes	89.5%	Yes	1	0.68	4,505	0.0	$737.84	$4,196.91	$0.00	5.69
1st Flr Mech Room	Whole Building	1	Chilled Water Pump	7.5	88.5%	No	1,200	Yes	91.7%	Yes	1	1.03	3,364	0.0	$550.87	$4,760.59	$0.00	8.64
1st Flr Mech Room	Whole Building	1	Heating Hot Water Pump	7.5	88.5%	No	1,200	Yes	91.7%	Yes	1	1.03	3,364	0.0	$550.87	$4,760.59	$0.00	8.64
3rd Flr Mech Rm	RAF-1	1	Return Fan	10.0	89.5%	Yes	3,391	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Flr Mech Rm	AHU-1	1	Supply Fan	20.0	91.0%	Yes	3,391	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
3rd Flr Mech Rm	AHU-1	1	Other	1.0	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Unit Ventilators	14	Supply Fan	1.0	82.5%	No	2,745	No	82.5%	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
Outside Near Door 6	Whole Building	1	Air-Cooled Screw Chiller	100.00	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
Central Heating Plant	Admin Building	4	Condensing Hot Water Boiler	5,580.00	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
3rd Floor Mech Rm	Whole Building	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Various	30	Computer	109.0	Yes
Various	30	Monitors	28.0	Yes
Various	3	Copiers	408.0	No
Various	5	Printers	109.0	No
Various	3	Microwave	800.0	No
Custodial Closet	1	Washing Machine	1,200.0	Yes
Custodial Closet	1	Clothes Dryer	5,600.0	No

Appendix B: ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

Ocean County College

Primary Property Type: College/University
Gross Floor Area (ft²): 526,034
Built: 1966

For Year Ending: June 30, 2015
Date Generated: April 21, 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
Ocean County College 1 College Drive Toms River, New Jersey 08754	_________________ , (____)____-______	____ ________ , (____)____-______ _________________

Property ID: 5093695

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
164.7 kBtu/ft²

Source EUI
315.4 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	50,787,318 (59%)
Electric - Grid (kBtu)	35,847,151 (41%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	137.1
National Median Source EUI (kBtu/ft²)	262.6
% Diff from National Median Source EUI	20%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	6,808

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)