Local Government Energy Audit:
Energy Audit Report

Central Utility Plant

Brookdale Community College
765 Newman Springs Road
Lincroft, NJ 07738

March 26, 2018

Final Report by:
TRC Energy Services

Disclaimer

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

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

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

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

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1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Central Utility Plant (CUP).

The goal of an LGEA report is to provide public facilities and local governments with valuable information on their facilities' energy usage. The LGEA program identifies energy conservation measures (ECMs) and energy management options that may benefit public facilities and to provides information on financial incentives from New Jersey's Clean Energy Programs (NJCEP) and other sources assistance which may be available to help with ECM implementation.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey community colleges in controlling their energy costs and help to protect our environment by promoting more efficient use of energy resources statewide.

1.1 Facility Summary

The Central Utility Plant (CUP) is a 9,756 square foot facility comprised offices on the first floor and mechanical rooms in the basement. A single building houses the equipment that provides chilled and hot water for the majority of campus. Three 740-ton water-cooled centrifugal chillers generate chilled water. Chilled water is distributed throughout the campus by three pumps driven by 50-hp motors. Two cooling towers with two cells each provide condenser water for the chillers. Eight 2,850 MBh condensing boilers generate hot water. Hot water is distributed throughout the campus by three (3) pumps driven by 25-hp motors. Most of the central utility plant's major equipment is six years old and highly efficient.

Lighting at the Central Utility Plant primarily consists of fixtures with T8 linear fluorescent bulbs which are considered inefficient according to new standards for lighting efficiency. There is very little heating or cooling used onsite by occupants of the Central Utility Plant. The offices are conditioned with a split system heat pump.

Parking lot lights throughout the campus are illuminated by fixtures with 400-Watt metal halide lamps. Non-building exterior lighting for the campus were included in this report, because power is delivered to the Plant before being distributed to lights and buildings throughout the campus. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated four energy conservation measures. These ECMs together represent an opportunity for Central Utility Plant to reduce its annual energy costs by $59,844 and its annual greenhouse gas emissions by 536,497 lbs CO_2e. We estimate that if all measures are implemented as recommended, the project would pay for itself in energy savings alone in about 2.7 years. The breakdown of existing utility costs and projected annual savings following implementation of all measures are shown in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Central Utility Plant's annual energy use by about 62% overall.

Please Note: The energy used by the central plant equipment was divided among the individual buildings that use chilled water and hot water. The energy usage and savings shown below reflect only end-use energy consumption at the Central Utility Plant, plus electric power used for non-building exterior lighting in parking areas throughout campus. All natural gas used by the CUP's main boilers was divided up among the buildings that the campus wide district heating loop serves. So, the only end-use energy consumption counted as CUP energy usage is the relatively small amount of electric power used by the CUP's occupants, any other equipment on campus supplied through the main electric account but not attributed to a particular building.

A detailed description of how the energy usage was divided up for campus main accounts and the Central Utility Plant's existing energy use can be found in Section 3.

Figure 1 – Previous 12 Month Utility Costs

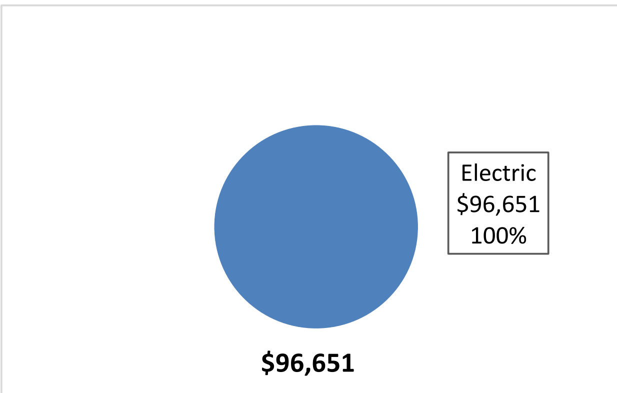
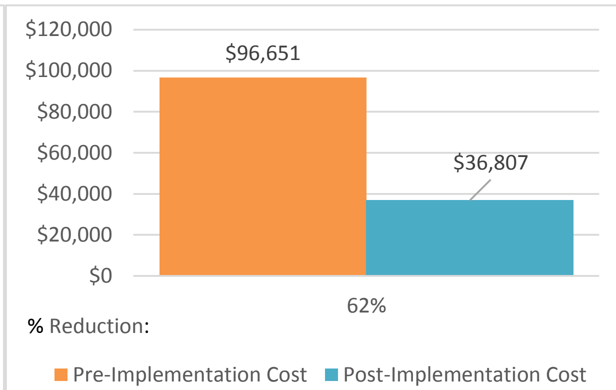


Figure 2 – Potential Post-Implementation Costs



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

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		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			**531,111**	**87.1**	**0.0**	**$59,657.17**	**$193,043.04**	**$34,820.00**	**$158,223.04**	**2.7**	**534,825**
ECM 1	Install LED Fixtures	Yes	511,986	83.9	0.0	$57,508.98	$185,787.24	$33,600.00	$152,187.24	2.6	515,566
ECM 2	Retrofit Fixtures with LED Lamps	Yes	18,432	3.2	0.0	$2,070.36	$6,398.80	$1,220.00	$5,178.80	2.5	18,561
ECM 3	Install LED Exit Signs	Yes	693	0.1	0.0	$77.83	$857.00	$0.00	$857.00	11.0	698
Lighting Control Measures			**1,661**	**0.3**	**0.0**	**$186.54**	**$1,390.00**	**$150.00**	**$1,240.00**	**6.6**	**1,672**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	1,661	0.3	0.0	$186.54	$1,390.00	$150.00	$1,240.00	6.6	1,672
TOTALS			**532,772**	**87.4**	**0.0**	**$59,843.71**	**$194,433.04**	**$34,970.00**	**$159,463.04**	**2.7**	**536,497**

* - 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.

Energy Efficient Practices

TRC also identified nine low-cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Central Utility Plant include:

- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Reduce Motor Short Cycling
- Perform Routine Motor Maintenance
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Assess Chillers & Request Tune-Ups
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance

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 Central Utility Plant. Based on the site's configuration, there is a low potential for installing any solar PV or 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
- Energy Savings Improvement Program (ESIP)

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.2 for additional information on the ESIP Program.

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

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

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 4 – Project Contacts

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

2.2 General Site Information

On December 8, 2016, TRC performed an energy audit at Central Utility Plant located in Lincroft, New Jersey. TRC's team met Tim Drury, Director of Facilities Management & Construction to review the facility operations and help focus our investigation on specific energy-using systems.

The Central Utility Plant is a 9,756 square foot facility comprised offices on the first floor and mechanical rooms in the basement. A single building houses the equipment that provides chilled and hot water for the majority of campus.

Electric power is delivered to the CUP via the campus's main account with JCP&L and distributed from there to most campus buildings. Hot water heat is provided to most campus buildings via a district heating loop. Some buildings are also provided with chilled water from the CUP via a district cooling loop. Three 740-ton water-cooled centrifugal chillers generate chilled water. Eight 2,850 MBh condensing boilers generate hot water. Hot water is distributed throughout the campus by three pumps driven by 25-hp motors. Chilled water is distributed throughout the campus by three pumps driven by 50-hp motors. Two cooling towers with two cells each provide condenser water for the chillers. Parking lot lights throughout the campus are illuminated by fixtures with 400-Watt metal halide lamps. Non-building exterior lighting for the campus were included in this report, because power is delivered to the Plant before being distributed lights and buildings throughout the campus.

All major HVAC equipment at the CUP, at campus buildings supplied by the CUP, and even the HVAC equipment at other satellite campuses is efficiently monitored and controlled via the college's Carrier iVu Building Automation System.

Please Note: Most of the central utility plant equipment is six years old and highly efficient. The main boiler and chiller systems are only a few years old and all among the highest efficiency models on the market today. The systems all have state-of-the-art controls as well to maximize the efficiency of thermal generation on-site and efficiently monitor demand for heating and cooling from the campus buildings that it serves. We could find no cost-effective upgrades to recommend for any major HVAC equipment or controls at the Central Utility Plant. The only ECMs that we found to recommend for this site are lighting upgrades.

Image 1: Campus-Wide Hot and Chilled Water Distribution Systems

2.3 Building Occupancy

The building is occupied every day to serve the needs of the campus. The typical schedule is presented in the table below. The central plant is used year round.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Central Utility Plant (CUP)	Mon-Thurs	5:30am-10pm
Central Utility Plant (CUP)	Fri, Sat	5:30am-6pm
Central Utility Plant (CUP)	Sun	5:30am-2pm

2.4 Building Envelope

The buildings is constructed of poured concrete and concrete block with a brick façade in some locations. The west roof of the building is metal standing seam. The east section is a concrete deck mechanical pad.

2.5 On-Site Generation

The Central Utility Plant does not have any on-site electric generating capacity.

2.6 Energy-Using Systems

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

Lighting System

Lighting is provided mostly by 32-Watt, linear fluorescent T8 lamps with electronic ballasts. The fixtures contain mostly 2-lamp or 3-lamp, or 4-foot long troffers with diffusers. The mechanical rooms also contain fixtures with high-pressure sodium lamps or some metal halide lamps. Lighting control in all spaces is provided by wall switches. All of the building's exit signs use compact fluorescent bulbs.

The campus's parking lots are illuminated with fixtures containing pole-mounted 400-Watt metal halide lamps. These fixtures are controlled by photocells.

Chilled Water or Condenser Water System

The building contains the campus's central chilled water plant. The central chilled water plant is comprised of three (3) 740-ton water-cooled centrifugal chillers. The Trane CenTraVac CVHL chillers are driven by variable speed motors and are very efficient at part load conditions (IPLV part load efficiency is <0.3 kW /ton). The peak campus cooling load is currently around 1,300 tons, so no more than two (2) of the three (3) chillers are ever required to operate. The chillers are five (5) years old and in excellent condition.

Chilled water is distributed throughout the campus through a district cooling loop by three (3) pumps driven by 50-hp motors. The pump motors are all controlled by variable frequency drives (VFDs). The chilled water temperature setpoint is reset based on outdoor air temperature. When the outside air is 80°F or greater, the plant distributes 44°F chilled water; when the outside air is 65°F or less, the plant distributes 52°F chilled water.

Image 2: Central Chiller System

Two cooling towers each with two cells provide condenser water for the chillers. Each cell of the cooling tower has its own variable speed fan. The condenser water system is connected to a sand filter. The condenser water is distributed by three (3) pumps driven by 60-hp motors. The pump motors are all controlled by VFDs.

Hot Water Heating System

The building contains the campus's central hot water plant. The central hot water plant is comprised of eight Harsco P-K Mach C-3000 condensing hot water boilers with a rated output of about 2,850 MBh each. With water entering the boilers at around 120°F, the boilers are capable of efficiencies around 95%. These modular boilers are staged to efficiently match boiler operations to campus thermal load. The boiler system is six years old and in excellent condition.

Hot water is distributed throughout the campus via a district heating loop by three pumps driven by 25-hp motors. The pump motors are controlled by VFDs to minimize power demand for pumping.

Image 3: Campus main boiler system & heating hot water pump

Image 4: All large motors in the Central Utility Plant are controlled by VFDs

Building Heating and Cooling

One 2-ton Sanyo air-source split system heat pump is used to heat and cool the CUP's office area. The evaporator unit is located on the wall in the office area and the condenser/compressor unit is located outside. The evaporator unit uses 100% return air to condition the space. The unit is controlled by a thermostat located in the space.

Image 5: Ductless mini-split heat pump in office area

A few small Dayton hot water unit heaters provide supplemental space heating in the boiler room area.

Building Plug Load

Aside from the power used onsite to provide heating and cooling to campus buildings. The CUP's end-use electric consumption is minimal. There are about nine computer work stations throughout the building. All of the computers are desktop units with LCD monitors, plus a few printers and other standard office equipment used by staff. There is no centralized PC power management software installed.

2.7 Water-Using Systems

There are two restrooms at this facility. A sampling of restrooms found that the lavatory fixtures are rated as low-flow that meet current federal guidelines for water conservation in public buildings.

3 SITE ENERGY USE AND COSTS

Nearly the entire campus receives electricity through a master electric meter. Some campus buildings receive heat from the central utility plant a well. The billed usage through main electric and gas accounts were divided among individual campus buildings, based on building size, function, and occupancy. As part of this energy proration, the energy used by the central utility plant to generate and distribute chilled water and hot water is assigned to the buildings that use these utilities (not the central utility plant). The energy use shown in this report reflects the energy used to illuminate, condition, and occupy the central utility plant only, plus electric power used by non-building campus exterior lighting (e.g. parking lots).

Estimates of end-use electric and natural gas usage for each building were developed and evaluated to determine the annual energy performance metrics for each building in terms of 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

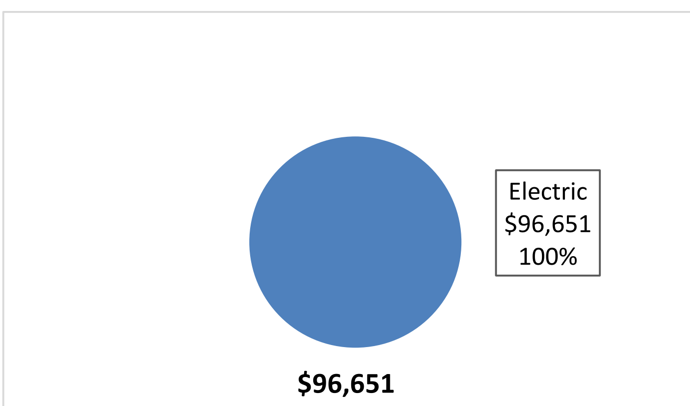
The following energy consumption and cost data is prorated from a recent 12-month period of master metered electric billing data. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Central Utility Plant		
Fuel	**Usage**	**Cost**
Electricity	860,456 kWh	$96,651
Total		**$96,651**

The current annual energy cost for this facility is $96,651 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric rate over a recent 12-month period was found to be $0.112/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The prorated monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

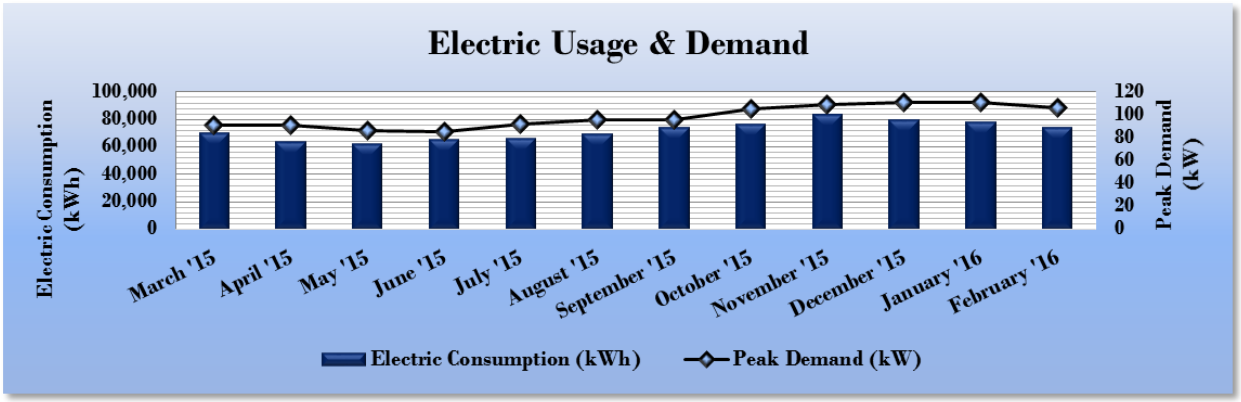


Figure 9 - Electric Usage & Demand

Electric Billing Data for Central Utility Plant					
Period Ending	Days in Period	Electric Usage (kWh)	Average Demand (kW)	Total Electric Cost	TRC Estimated Usage?
4/13/15	32	70,142	91	$7,879	Yes
5/12/15	29	63,344	91	$7,115	Yes
6/11/15	30	62,227	86	$6,990	Yes
7/13/15	32	64,958	85	$7,296	Yes
8/12/15	30	66,116	92	$7,426	Yes
9/11/15	30	68,925	96	$7,742	Yes
10/13/15	32	74,109	96	$8,324	Yes
11/12/15	30	75,926	105	$8,528	Yes
12/14/15	32	83,515	109	$9,381	Yes
1/13/16	30	79,695	111	$8,952	Yes
2/11/16	29	77,576	111	$8,714	Yes
3/11/16	29	73,924	106	$8,303	Yes
Totals	**365**	**860,456**	**111**	**$96,651**	12
Annual	**365**	**860,456**	**111**	**$96,651**	

3.3 Natural Gas Usage

The CUP building has no end-use natural gas consumption. All gas usage on site is used by the main boilers to generate hot water which is distributed throughout the campus. This energy usage has already been attributed to each building based on square footage and occupancy.

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 10 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Central Utility Plant	National Median Building Type: Other - Special
Source Energy Use Intensity (kBtu/ft^2)	944.9	123.1
Site Energy Use Intensity (kBtu/ft^2)	300.9	78.8

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

Figure 11 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Central Utility Plant	National Median Building Type: Other - Special
Source Energy Use Intensity (kBtu/ft^2)	359.9	123.1
Site Energy Use Intensity (kBtu/ft^2)	114.6	78.8

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.

This building is not is not eligible to receive an ENERGY STAR® score, because it shares electric and gas end usage with the other central campus buildings – which are all served by the Central Utility Plant's main electric and gas accounts. Without individual submeters to measure each building's actual electric and thermal energy usage, we cannot be certain that the assumptions on which we based our estimates of building performance are accurate for this building and other central campus buildings. Because of this limitation, a Portfolio Manager Statement of Energy Performance (SEP) was generated for all of the BCC - Lincroft central campus buildings combined, based on the utility data provided for the master electric and gas accounts, 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.

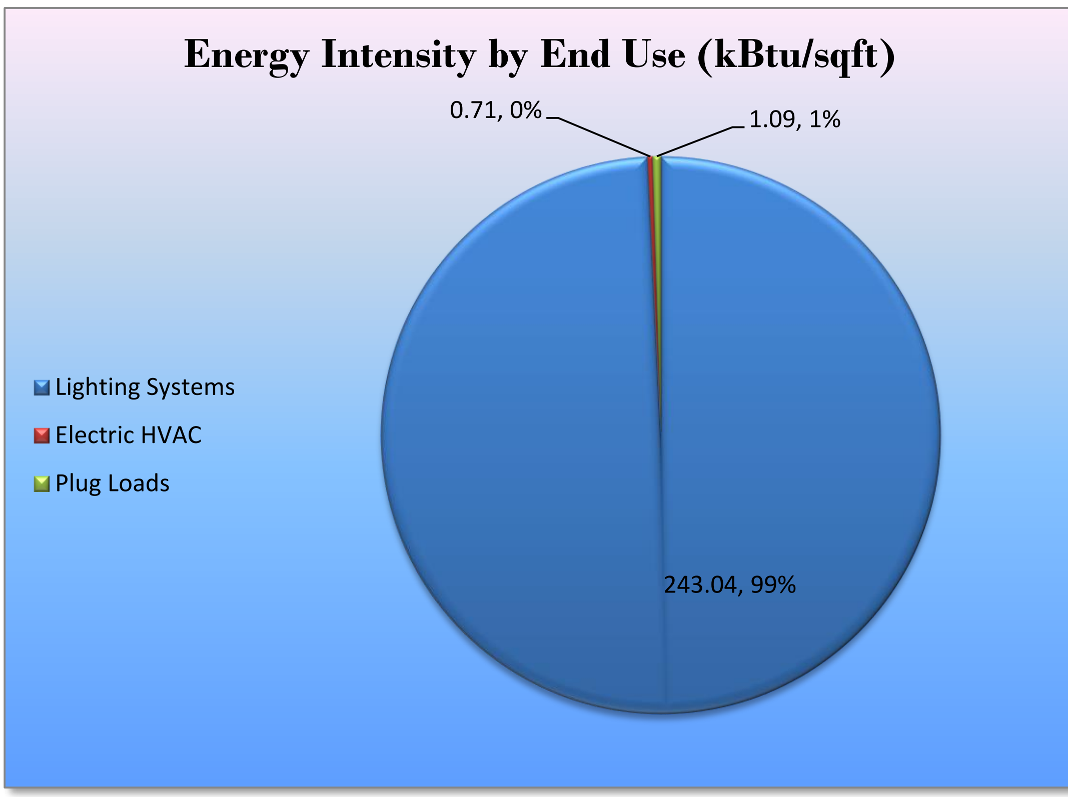
3.5 Energy End-Use Breakdown

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. The central utility plant equipment is NOT included in the analysis to be consistent with the prorated historical energy use applied to the rest of the campus.

This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage in the building. This can help determine where the greatest benefits might be found from energy efficiency measures.

In this case, the end-use electric usage by the occupants of the CUP building is relatively small. Most of the energy usage included in this portion of main electric account usage is actually campus parking lot lighting, not energy consumed by building occupants.

Figure 12 - Energy Balance (% and kBtu/SF)



4 Energy Conservation Measures

Level of Analysis

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

The following sections describe the evaluated measures.

4.1 High Priority ECMs

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

Figure 13 – Summary of High Priority 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		**531,111**	**87.1**	**0.0**	**$59,657.17**	**$193,043.04**	**$34,820.00**	**$158,223.04**	**2.7**	**534,825**
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* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

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

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 14 below.

Figure 14 – 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		**531,111**	**87.1**	**0.0**	**$59,657.17**	**$193,043.04**	**$34,820.00**	**$158,223.04**	**2.7**	**534,825**
ECM 1	Install LED Fixtures	511,986	83.9	0.0	$57,508.98	$185,787.24	$33,600.00	$152,187.24	2.6	515,566
ECM 2	Retrofit Fixtures with LED Lamps	18,432	3.2	0.0	$2,070.36	$6,398.80	$1,220.00	$5,178.80	2.5	18,561
ECM 3	Install LED Exit Signs	693	0.1	0.0	$77.83	$857.00	$0.00	$857.00	11.0	698

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	10,117	1.4	0.0	$1,136.41	$4,381.99	$1,100.00	$3,281.99	2.9	10,188
Exterior	501,869	82.5	0.0	$56,372.57	$181,405.25	$32,500.00	$148,905.25	2.6	505,378

Measure Description

We recommend replacing existing parking lot pole lighting fixtures containing HID lamps with new high performance LED light fixtures or LED retrofit kits. The total count was 325 parking lot fixtures. Upgrading to LEDs in all parking lot areas would cut parking lot energy usage by more than half.

We also recommend replacing the HID lighting in the boiler room area with LED fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

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

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	18,432	3.2	0.0	$2,070.36	$6,398.80	$1,220.00	$5,178.80	2.5	18,561
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T8 fluorescent, incandescent, halogen, and compact fluorescent lamps at the CUP with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

ECM 3: 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	693	0.1	0.0	$77.83	$1,075.55	$0.00	$1,075.55	13.8	698
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend replacing all compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. Though existing exit signs use only a few watts per fixture, they are on continuously, so savings from lower wattage LED exit signs adds up over time. Existing exit signs at the CUP could be retrofitted with LEDs instead, but installing new LED exit signs is often the lowest cost option.

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

4.1.2 Lighting Control Measures

Figure 15 – 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		**1,661**	**0.3**	**0.0**	**$186.54**	**$1,390.00**	**$150.00**	**$1,240.00**	**6.6**	**1,672**
ECM 4	Install Occupancy Sensor Lighting Controls	1,661	0.3	0.0	$186.54	$1,390.00	$150.00	$1,240.00	6.6	1,672

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 4: 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)
1,661	0.3	0.0	$186.54	$1,390.00	$150.00	$1,240.00	6.6	1,672

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, and offices areas. 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.

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.

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.

Perform Routine Motor Maintenance

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

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Assess Chillers & Request Tune-Ups

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

Check for and Seal Duct Leakage

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

Perform Proper Boiler Maintenance

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

Perform Proper Water Heater Maintenance

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

6 ON-SITE GENERATION MEASURES

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

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

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

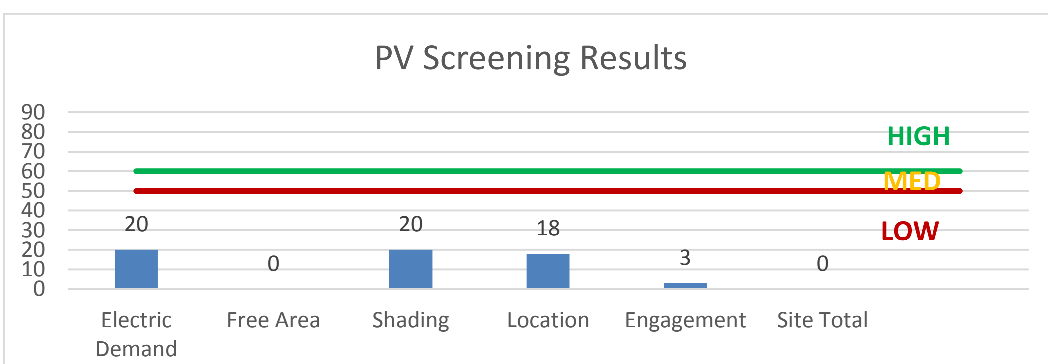
6.1 Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a Low potential for installing a PV array.

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 this case the rooftop area is small and not properly oriented to make installation of solar PV at this site feasible. In our opinion, the facility does appear not meet these minimum criteria for cost-effective PV installation.

Figure 16 - Photovoltaic Screening



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

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

6.2 Combined Heat and Power

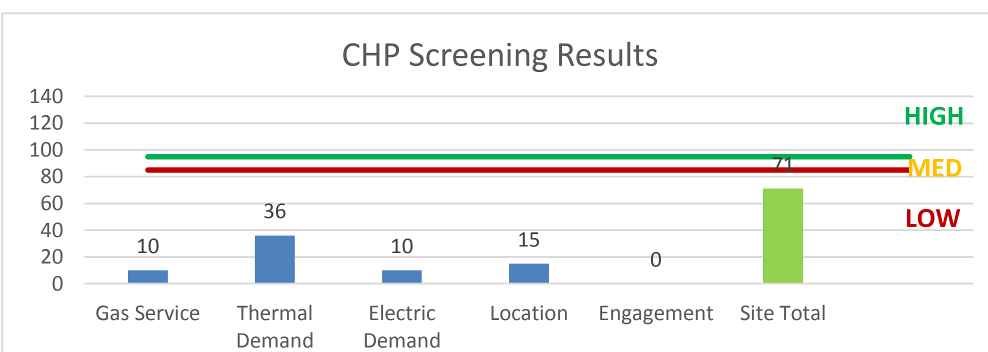
Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric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

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

The frequent low thermal load is the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. Though the Central Utility Plant's does produce waste heat from its boilers and chillers almost year round and CHP is a cost effective option for other college campuses, the heating and cooling equipment there is all relatively new. In the future, when the CUP's boiler and chiller systems are nearing the end of their useful life (i.e. in ~20 yrs), the college may want to consider generating some of its power onsite via a CHP system at the Central Utility Plant.

Figure 17 - Combined Heat and Power Screening



7 Demand Response

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

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

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

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

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

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

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

In our opinion this building is not a good candidate for DR, though possibly the college could participate in a DR program that through DR measures to temporarily reduce electric demand, when called upon, at all building supplied by the main electric account.

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

Figure 18 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x					
ECM 2	Retrofit Fixtures with LED Lamps	x					
ECM 3	Install LED Exit Signs	x					
ECM 4	Install Occupancy Sensor Lighting Controls	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. This facility does not meet all of the criteria for participating in the P4P program based on the measures identified in this study. 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.](www.njcleanenergy.com/SSB)

8.2 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. Detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

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

9 Energy Purchasing and Procurement Strategies

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Facilities Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,368	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,058	0.41	2,470	0.0	$277.43	$871.60	$155.00	2.58
Facilities Office	5	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	4,368	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,058	0.05	313	0.0	$35.21	$562.50	$85.00	13.56
Facilities Office	2	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	139	0.0	$15.57	$171.40	$0.00	11.01
Facilities Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	5,122	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	5,122	0.01	101	0.0	$11.38	$35.90	$5.00	2.72
Stairwell	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	5,122	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,122	0.05	382	0.0	$42.91	$117.00	$20.00	2.26
Boiler Rm	37	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	5,122	Relamp	No	37	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	5,122	1.49	10,600	0.0	$1,190.70	$2,782.40	$555.00	1.87
Boiler Rm	6	High-Pressure Sodium: (1) 100W Lamp	Wall Switch	138	5,122	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	20	5,122	0.58	4,098	0.0	$460.29	$2,045.46	$600.00	3.14
Boiler Rm	5	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	5	LED Exit Signs: 2 W Lamp	None	2	8,760	0.03	346	0.0	$38.92	$428.50	$0.00	11.01
Boiler Rm	5	High-Pressure Sodium: (1) 150W Lamp	Wall Switch	188	5,122	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	40	5,122	0.60	4,283	0.0	$481.09	$1,668.95	$500.00	2.43
Boiler Rm	2	Metal Halide: (1) 150W Lamp	Wall Switch	190	5,122	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	40	5,122	0.24	1,736	0.0	$195.04	$667.58	$0.00	3.42
Tunnel 1	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.32	447	0.0	$50.26	$702.00	$120.00	11.58
Tunnel 1	1	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	69	0.0	$7.78	$85.70	$0.00	11.01
Tunnel 2	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.19	261	0.0	$29.32	$409.50	$70.00	11.58
Print Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	5,122	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,585	0.20	1,448	0.0	$162.66	$416.80	$80.00	2.07
Outside Boiler Rm	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	5,122	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	5,122	0.12	859	0.0	$96.54	$225.60	$45.00	1.87
Outside Boiler Rm	1	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	69	0.0	$7.78	$85.70	$0.00	11.01
Women's Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	5,122	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,585	0.05	362	0.0	$40.67	$191.20	$15.00	4.33
Men's Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	5,122	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,585	0.05	362	0.0	$40.67	$345.20	$15.00	8.12
Men's Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	5,122	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,585	0.04	253	0.0	$28.41	$71.80	$10.00	2.18
Office 1	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.15	662	0.0	$74.31	$341.60	$65.00	3.72
Office 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,120	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,120	0.01	62	0.0	$6.93	$35.90	$5.00	4.46
Office 2	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.15	662	0.0	$74.31	$341.60	$65.00	3.72
Office 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,120	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,120	0.03	123	0.0	$13.86	$71.80	$10.00	4.46
Coat Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	5,122	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,585	0.10	724	0.0	$81.33	$266.40	$50.00	2.66
Coat Rm	1	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	69	0.0	$7.78	$85.70	$0.00	11.01

	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
Campus Parking Lot #1	40	Metal Halide: (1) 400W Lamp	None	458	4,380	Fixture Replacement	No	40	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	146	4,380	10.15	61,769	0.0	$6,938.16	$22,326.80	$4,000.00	2.64
Campus Parking Lot #2	17	Metal Halide: (1) 400W Lamp	None	458	4,380	Fixture Replacement	No	17	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	146	4,380	4.32	26,252	0.0	$2,948.72	$9,488.89	$1,700.00	2.64
Campus Parking Lot #3	25	Metal Halide: (1) 400W Lamp	None	458	4,380	Fixture Replacement	No	25	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	146	4,380	6.35	38,605	0.0	$4,336.35	$13,954.25	$2,500.00	2.64
Campus Parking Lot #4	15	Metal Halide: (1) 400W Lamp	None	458	4,380	Fixture Replacement	No	15	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	146	4,380	3.81	23,163	0.0	$2,601.81	$8,372.55	$1,500.00	2.64
Campus Parking Lot #5	35	Metal Halide: (1) 400W Lamp	None	458	4,380	Fixture Replacement	No	35	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	146	4,380	8.88	54,047	0.0	$6,070.89	$19,535.95	$3,500.00	2.64
Campus Parking Lot #6	43	Metal Halide: (1) 400W Lamp	None	458	4,380	Fixture Replacement	No	43	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	146	4,380	10.92	66,401	0.0	$7,458.52	$24,001.31	$4,300.00	2.64
Campus Parking Lot #7	12	Metal Halide: (1) 400W Lamp	None	458	4,380	Fixture Replacement	No	12	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	146	4,380	3.05	18,531	0.0	$2,081.45	$6,698.04	$1,200.00	2.64
Street Pole Lighting	71	Metal Halide: (1) 400W Lamp	None	458	4,380	Fixture Replacement	No	71	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	146	4,380	18.02	109,639	0.0	$12,315.24	$39,630.07	$7,100.00	2.64
Site Lighting	67	Metal Halide: (1) 400W Lamp	None	458	4,380	Fixture Replacement	No	67	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	None	146	4,380	17.01	103,462	0.0	$11,621.42	$37,397.39	$6,700.00	2.64

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
Boiler Room	Central Campus	3	Chilled Water Pump	50.0	94.5%	Yes	0	No	94.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Central Campus	3	Heating Hot Water Pump	25.0	94.5%	Yes	0	No	94.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Central Campus	3	Process Pump	60.0	95.0%	Yes	0	No	95.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
CUP	Offices	1	Split-System AC	2.17		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Rm	Campus	3	Water-Cooled Centrifugal Chiller	740.00	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
Boiler Rm	Central Campus	8	Condensing Hot Water Boiler	2,850.00	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?
CUP Offices	9	Desktop Computers	120.0	Yes
CUP Offices	9	Computer Monitors	28.0	Yes
CUP Offices	2	Printers	13.0	Yes
CUP Offices	1	32" LCD TV	92.0	Yes

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Brookdale Community College - Lincroft Campus

Primary Property Type: College/University
Gross Floor Area (ft²): 900,381
Built: 1967

For Year Ending: February 29, 2016
Date Generated: June 28, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Brookdale Community College - Lincroft Campus 765 Newman Springs Road Lincroft, New Jersey 07738	Brookdale Community College 765 Newman Springs Road Lincroft, NJ 07738 (732) 224-2217	Timothy Drury 765 Newman Springs Road Lincroft, NJ 07738 (732) 224-2217 tdrury@brookdalecc.edu

Property ID: 5733170

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
95.4 kBtu/ft²

Source EUI
211.9 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	48,132,581 (56%)
Natural Gas (kBtu)	37,799,044 (44%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	118.2
National Median Source EUI (kBtu/ft²)	262.6
% Diff from National Median Source EUI	-19%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	7,528

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)