Local Government Energy Audit:
Energy Audit Report

Maintenance Building

Brookdale Community College

765 Newman Springs Road

Lincroft, NJ 07738

March 27, 2018

Final Report by:

TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate 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 Advanced Technology Center.

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

Maintenance Building is a single story 5,805 square foot facility, which is comprised primarily of storage and maintenance spaces and few small offices. The building is typically staffed by about 15 people, year round, about 40 hours per week.

Interior lighting at the Maintenance Building primarily consists of fixtures with T8 linear fluorescent tubes, plus a few compact fluorescent and incandescent bulbs. Lighting is controlled throughout the building by manual switches. Exterior lighting has all been recently upgraded to high efficiency LED fixtures. Exterior lighting is controlled by photocells.

The building's heating and cooling requirements are minimal. The maintenance office is conditioned with a small package unit and the maintenance shops are heated by a forced air furnace.

The building receives electricity from a master meter. It has no separate electric submeter. The building's usage was estimated based on building function, size, and occupancy hours.

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, which together represent an opportunity for the Maintenance Building to reduce its annual energy costs by approximately $662 and annual its greenhouse gas emissions by about 5,626 lbs CO_2e. We estimate that if all ECMs are implemented as recommended, then the project would pay for itself in about 5.8 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 Maintenance Building's annual energy use by about 28% overall.

Figure 1 – Previous 12 Month Utility Costs

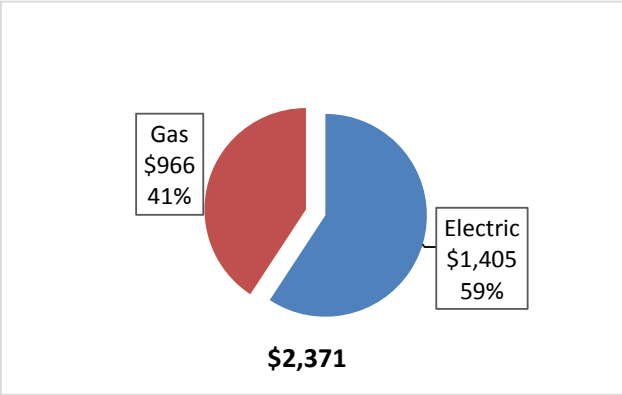
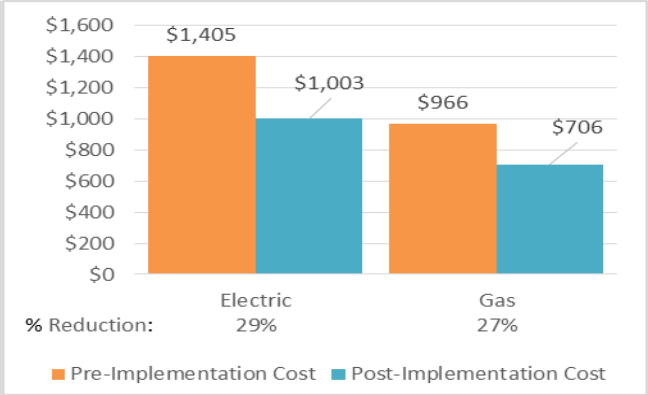


Figure 2 – Potential Post-Implementation Costs



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

Estimates of total cost, energy savings, and financial incentives which may be available for each ECM are summarized below in Figure 3. A brief description of each measure category can be found below. A detailed description of each ECM 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			**2,561**	**1.0**	**0.0**	**$287.63**	**$2,454.70**	**$390.00**	**$2,064.70**	**7.2**	**2,579**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	2,561	1.0	0.0	$287.63	$2,454.70	$390.00	$2,064.70	7.2	2,579
Lighting Control Measures			**518**	**0.2**	**0.0**	**$58.17**	**$1,274.00**	**$165.00**	**$1,109.00**	**19.1**	**522**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	518	0.2	0.0	$58.17	$1,274.00	$165.00	$1,109.00	19.1	522
HVAC System Improvements			**47**	**0.0**	**17.3**	**$265.27**	**$659.74**	**$0.00**	**$659.74**	**2.5**	**2,072**
ECM 3	Install Programmable Thermostats	Yes	47	0.0	17.3	$265.27	$659.74	$0.00	$659.74	2.5	2,072
Domestic Water Heating Upgrade			**451**	**0.0**	**0.0**	**$50.66**	**$14.34**	**$0.00**	**$14.34**	**0.3**	**454**
ECM 4	Install Low-Flow Domestic Hot Water Devices	Yes	451	0.0	0.0	$50.66	$14.34	$0.00	$14.34	0.3	454
TOTALS			**3,577**	**1.2**	**17.3**	**$661.74**	**$4,402.78**	**$555.00**	**$3,847.78**	**5.8**	**5,626**

* - 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.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

Domestic Hot Water Conservation Measures generally involve retrofitting or replacing older inefficient fixtures with water conserving fixtures. New "low-flow" fixtures can provide equivalent, or greater, performance at a reduced cost for water heating. These measures save energy by reducing the fuel used for domestic hot water heating by reducing hot water demand and standby losses.

Energy Efficient Practices

TRC also identified six 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 Maintenance Building include:

- Close Doors and Windows
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean and/or Replace HVAC Filters
- Perform Proper Furnace Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Maintenance Building. 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
- 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 7.

Because the building has no separate submeter, it probably would not qualify for the Direct Install program.

For larger facilities, 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.

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

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

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

2.2 General Site Information

On December 7, 2016, TRC Energy Services performed an energy audit at Maintenance Building located in Lincroft, New Jersey. TRC's team met with Tim Drury, Director of Facilities Management & Construction to review the facility operations and help focus our investigation on specific energy-using systems.

Maintenance Building is a single story 5,805 square foot facility. It was constructed in 1967. It is comprised primarily of storage and maintenance spaces and few small offices.

2.3 Building Occupancy

The building is typically occupied from 8:00 AM to 4:00 PM Monday through Friday, by about 15 maintenance staff. The typical schedule is presented in the table below. The facility is used year round.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Brookdale CC - Maintenance Building	Weekday	8:00 AM - 4:00 PM
Brookdale CC - Maintenance Building	Weekend	NONE

2.4 Building Envelope

The building is constructed of concrete with a stucco facade. The building has a pitched roofs covered with composite shingles. The building has few windows. The exterior main doors are constructed of aluminum and in good condition. The building also has a few aluminum roll-up doors that are in good condition though showing signs of wear.

Image 1: Maintenance Building - Front Exterior

2.5 On-Site Generation

Maintenance Building does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

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

Lighting System

Lighting is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). Most of the fixtures are 1-lamp or 2-lamp, 4-foot long troffers with diffusers. Lighting control in all spaces is provided by manually controlled wall switches.

The building's exterior lighting is minimal and consists primarily of efficient screw-in LED lamps that are controlled by photocells, although the lights were seen on during the day. This is a sign that photocells may need to be cleaned or replaced.

Image 2: Building Lighting

Direct Expansion Air Conditioning System (DX)

A 1.5 ton Carrier direct-expansion (DX) package unit with a gas-fired furnace (125 MBh output) and outside air economizer is used to condition the maintenance office space. The unit provides constant air volume with a single 0.75-hp supply fan. The unit utilizes a compressor and a DX coil. The gas-fired furnace provides heating as needed. The unit is controlled by a basic programmable thermostat.

Forced Air Heating

A small Gibson forced air natural gas fired furnace (101 MBh output) provides heating to the maintenance shops. This unit is controlled by a manual thermostats.

Image 3: Building Heating and Cooling Units and Controls

Domestic Hot Water Heating System

Domestic hot water is provided by a single 54-gallon electric hot water heater with an input rating of 4.5 kW.

Image 4: Domestic Hot Water Heater

Building Plug Load

There are two computer work stations in the building. The computers are desktop units with LCD monitors. There is no centralized PC power management software installed.

The facility has a break room that includes a refrigerator, microwave and toaster oven. The building also has one vending machine, but it was unplugged at the time of the site visit.

2.7 Water-Using Systems

There are two restrooms at this facility. A sampling of restrooms found that the faucets are rated at 2.5 gallons per minute (gpm) or higher.

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 Maintenance Building has its own separate gas account for heating. Electric usage was estimated for individual buildings on the main account, based on building size, function, and occupancy.

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

3.1 Total Cost of Energy

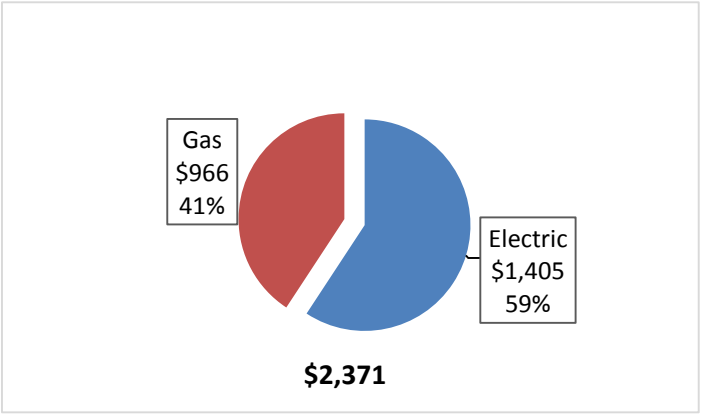
The following energy consumption and cost data is prorated from a recent 12-month period of master metered electric billing data. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Maintenance Building		
Fuel	**Usage**	**Cost**
Electricity	12,507 kWh	$1,405
Natural Gas	643 Therms	$966
Total		**$2,371**

The current annual energy cost for this facility is $2,371 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

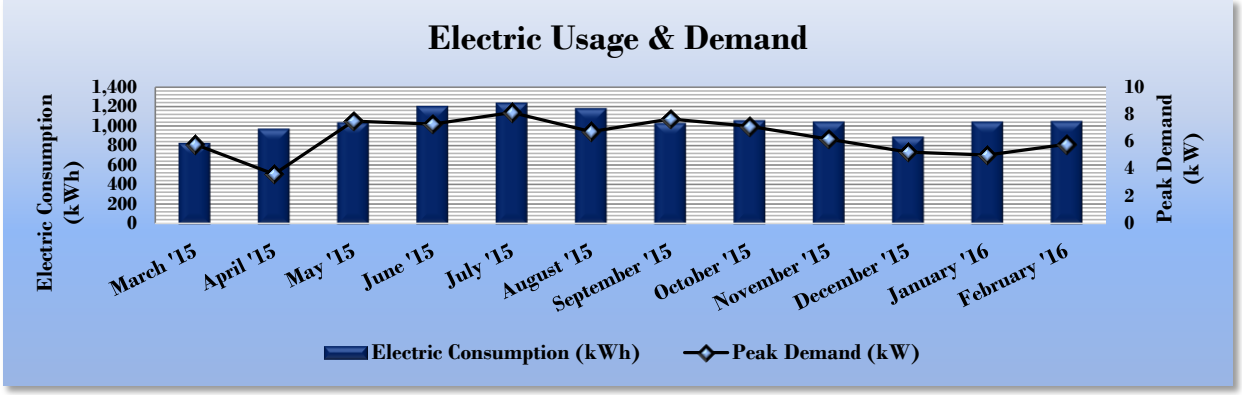


Figure 9 - Electric Usage & Demand

Electric Billing Data for Maintenance Building					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost	TRC Estimated Usage?
4/13/15	32	823	5.8	$92	Yes
5/12/15	29	966	3.6	$109	Yes
6/11/15	30	1,030	7.5	$116	Yes
7/13/15	32	1,197	7.3	$134	Yes
8/12/15	30	1,230	8.1	$138	Yes
9/11/15	30	1,174	6.7	$132	Yes
10/13/15	32	1,026	7.7	$115	Yes
11/12/15	30	1,053	7.1	$118	Yes
12/14/15	32	1,039	6.2	$117	Yes
1/13/16	30	886	5.2	$100	Yes
2/11/16	29	1,039	5.0	$117	Yes
3/11/16	29	1,045	5.8	$117	Yes
Totals	**365**	**12,507**	**8.1**	**$1,405**	12
Annual	**365**	**12,507**	**8.1**	**$1,405**	

3.3 Natural Gas Usage

Natural gas is provided by New Jersey Natural Gas. The average rate for natural gas service over a recent 12-month period was found to be $1.148/therm, which is the blended rate used throughout the analyses in this report. The monthly prorated gas consumption is shown in the chart below.

Figure 10 - Natural Gas Usage

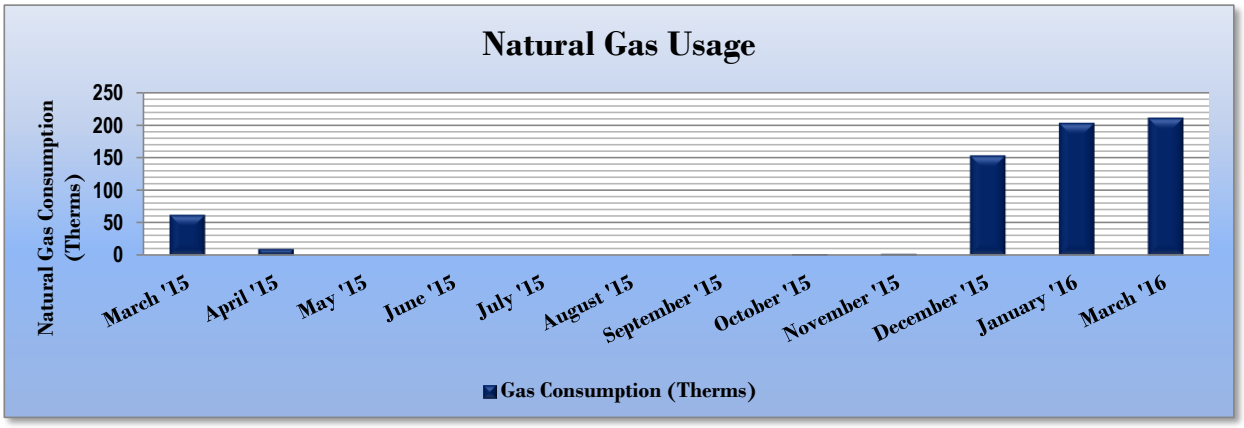


Figure 11 - Natural Gas Usage

Gas Billing Data for Maintenance Building			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
4/15/15	29	62	$92
5/14/15	29	10	$35
6/11/15	28	0	$25
7/16/15	30	0	$30
8/12/15	32	0	$25
9/10/15	29	0	$25
10/8/15	28	0	$25
11/9/15	32	2	$27
12/11/15	32	2	$27
1/11/16	31	153	$176
2/11/16	31	203	$233
3/16/16	34	211	$246
Totals	**365**	**643**	**$966**
Annual	**365**	**643**	**$966**

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		
	Maintenance Building	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	34.7	262.6
Site Energy Use Intensity (kBtu/ft^2)	18.4	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		
	Maintenance Building	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	24.2	262.6
Site Energy Use Intensity (kBtu/ft^2)	13.1	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.

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.

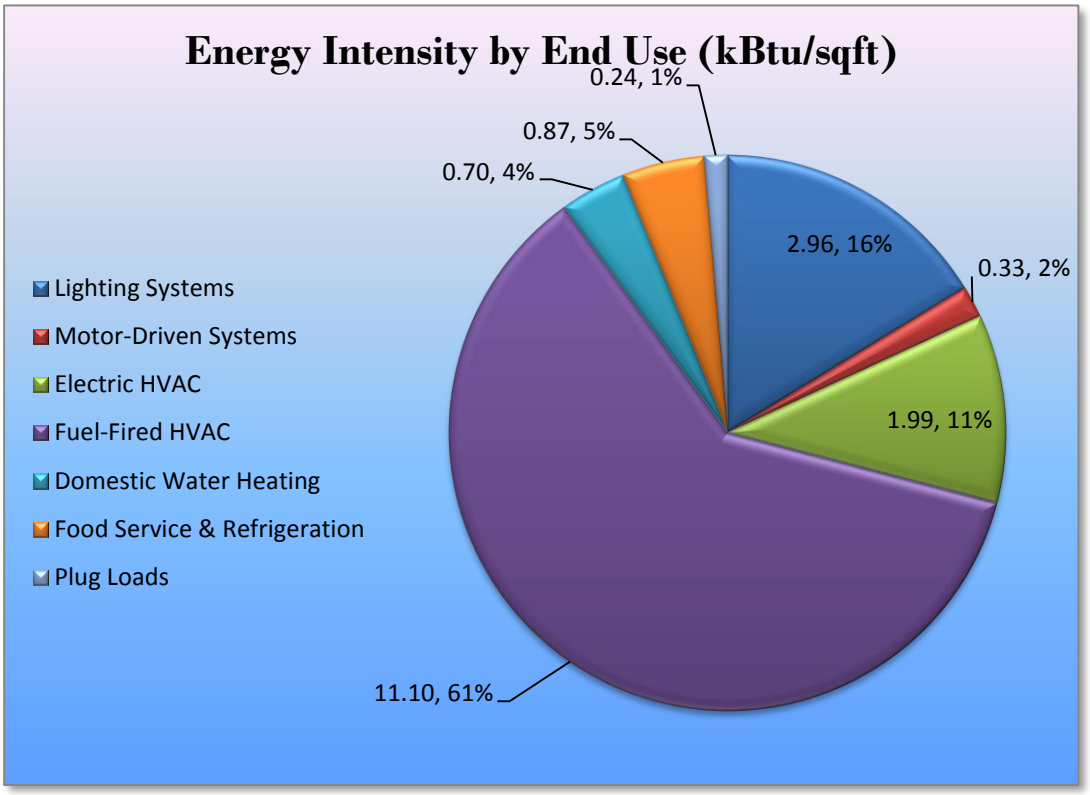
A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training 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.

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

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



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Maintenance Building 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 7.

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 15 – Summary of High Priority ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Installed Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**2,561**	**1.0**	**0.0**	**$287.63**	**$2,454.70**	**$390.00**	**$2,064.70**	**7.2**	**2,579**
ECM 1	Retrofit Fixtures with LED Lamps	2,561	1.0	0.0	$287.63	$2,454.70	$390.00	$2,064.70	7.2	2,579
Lighting Control Measures		**518**	**0.2**	**0.0**	**$58.17**	**$1,274.00**	**$165.00**	**$1,109.00**	**19.1**	**522**
ECM 2	Install Occupancy Sensor Lighting Controls	518	0.2	0.0	$58.17	$1,274.00	$165.00	$1,109.00	19.1	522
HVAC System Improvements		**47**	**0.0**	**17.3**	**$265.27**	**$659.74**	**$0.00**	**$659.74**	**2.5**	**2,072**
ECM 3	Install Programmable Thermostats	47	0.0	17.3	$265.27	$659.74	$0.00	$659.74	2.5	2,072
Domestic Water Heating Upgrade		**451**	**0.0**	**0.0**	**$50.66**	**$14.34**	**$0.00**	**$14.34**	**0.3**	**454**
ECM 4	Install Low-Flow Domestic Hot Water Devices	451	0.0	0.0	$50.66	$14.34	$0.00	$14.34	0.3	454
TOTALS		**3,577**	**1.2**	**17.3**	**$661.74**	**$4,402.78**	**$555.00**	**$3,847.78**	**5.8**	**5,626**

* - 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

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: 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	2,543	1.0	0.0	$285.63	$2,454.70	$390.00	$2,064.70	7.2	2,561
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

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

4.1.2 Lighting Control Measures

ECM 2: 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)
513	0.2	0.0	$57.68	$1,274.00	$105.00	$1,169.00	20.3	517

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in the breakroom, 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.

4.1.3 HVAC System Upgrades

ECM 3: Install Programmable Thermostats

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)
47	0.0	17.3	$265.27	$659.74	$0.00	$659.74	2.5	2,072

Measure Description

We recommend replacing manual thermostats with programmable thermostats. Manual thermostats are generally adjusted to a single heating and cooling setpoint and left at that setting regardless of occupancy in the area served by the HVAC equipment. As a result, the same level of heating and cooling is provided regardless of the occupancy in the space. Programmable thermostats can be set to maintain different temperature settings for different times of day and for different days of the week. By reducing heating temperature setpoints and raising cooling temperature setpoints when space are unoccupied, the operation of the HVAC equipment is reduced while still maintaining reasonable space temperatures for building usage at all times.

Programmable thermostats provide energy savings by reducing heating and cooling energy usage when a room is unoccupied.

4.1.4 Domestic Hot Water Heating System Upgrades

ECM 4: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
902	0.0	0.0	$101.29	$14.34	$0.00	$14.34	0.1	908

Measure Description

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

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

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.

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Clean and/or Replace HVAC Filters

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

Perform Proper Furnace Maintenance

Preventative furnace maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should include tasks such as checking for gas / carbon monoxide leaks; changing the air and fuel filters; checking components for cracks, corrosion, dirt, or debris build-up; ensuring the ignition system is working properly; testing and adjusting operation and safety controls; inspecting the electrical connections; and ensuring proper lubrication for motors and bearings.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion

issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

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

6 On-Site Generation Measures

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

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

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

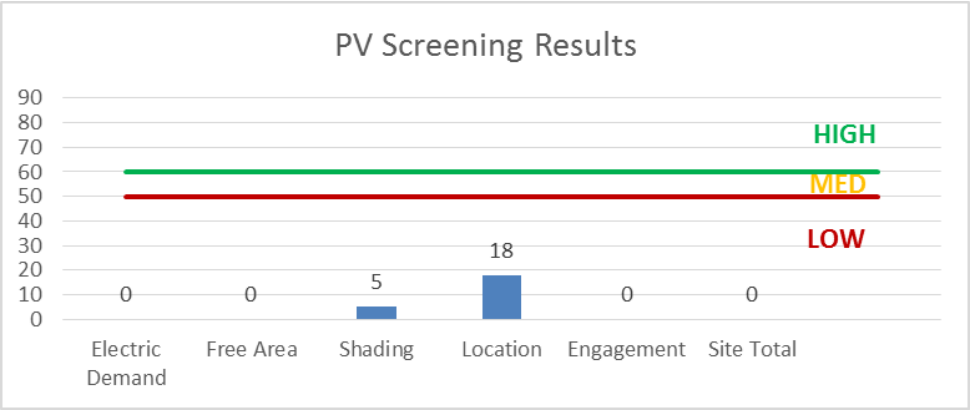
6.1 Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the building appears to have a Low potential for cost-effective installations of a solar 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 our opinion, the facility does appear not meet these minimum criteria for cost-effective PV installation.

Figure 16 - Photovoltaic Screening



A small solar array might be feasible on the back roof of the building, which faces southeast, but the site is not ideal. The roof is not very large and shading from nearby trees might be an issue. (See cover photo.) If Brookdale Community College were interested in developing solar generating capacity on campus, it would be probably be more cost-effective to develop other campus buildings with larger flat rooftops or possibly unused ground areas nearby, rather than developing solar generating capacity at this site.

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

Figure 17 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Retrofit Fixtures with LED Lamps	x			
ECM 2	Install Occupancy Sensor Lighting Controls	x			
ECM 3	Install Programmable Thermostats	x			
ECM 4	Install Low-Flow Domestic Hot Water Devices				

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.

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 Energy Savings Improvement Program

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

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

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

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

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

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

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Entrance	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,080	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,080	0.01	39	0.0	$4.33	$35.90	$5.00	7.13
Office 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.06	184	0.0	$20.65	$233.00	$20.00	10.31
Locksmith Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.03	92	0.0	$10.33	$174.50	$10.00	15.93
Office 2	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.06	184	0.0	$20.65	$233.00	$20.00	10.31
Men's Rm	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	1,000	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,000	0.01	14	0.0	$1.61	$31.90	$5.00	16.74
Men's Rm	1	Incandescent: 60W Bulb	Wall Switch	60	1,000	LED Retrofit	No	1	LED Screw-In Lamps: 9W LED Bulb	Wall Switch	9	1,000	0.04	54	0.0	$6.07	$15.50	$5.00	1.73
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,080	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,080	0.01	39	0.0	$4.33	$35.90	$5.00	7.13
Mop Closet	1	Incandescent: 60W Bulb	Wall Switch	60	600	LED Retrofit	No	1	LED Screw-In Lamps: 9W LED Bulb	Wall Switch	9	600	0.04	32	0.0	$3.64	$15.50	$5.00	2.88
Server Rm	2	Compact Fluorescent: 23W CFL Spotlight	Wall Switch	23	600	LED Retrofit	No	2	LED Screw-In Lamps: 12W LED Spotlight	Wall Switch	12	600	0.02	14	0.0	$1.57	$46.00	$10.00	22.91
Main Storage Area	36	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,080	Relamp	Yes	36	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,456	0.58	1,734	0.0	$194.81	$2,102.40	$285.00	9.33
Main Storage Area	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,456	0.09	276	0.0	$30.98	$175.50	$30.00	4.70
Cage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,080	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,080	0.02	73	0.0	$8.17	$58.50	$10.00	5.93
Break Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,600	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,120	0.03	74	0.0	$8.33	$187.80	$10.00	21.36
Furnace Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	800	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	800	0.01	15	0.0	$1.67	$35.90	$5.00	18.54
Storage Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.02	35	0.0	$3.93	$58.50	$10.00	12.34
Parts Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.05	70	0.0	$7.86	$117.00	$20.00	12.34
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,000	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,000	0.01	19	0.0	$2.08	$35.90	$5.00	14.83
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.02	35	0.0	$3.93	$58.50	$10.00	12.34
Restroom	1	Incandescent: 60W Bulb	Wall Switch	60	1,000	LED Retrofit	No	1	LED Screw-In Lamps: 9W LED Bulb	Wall Switch	9	1,000	0.04	54	0.0	$6.07	$15.50	$5.00	1.73
Paint Rm	2	Compact Fluorescent: 13W CFL Bulb	Wall Switch	13	1,200	LED Retrofit	No	2	LED Screw-In Lamps: 9W LED Bulb	Wall Switch	9	1,200	0.01	10	0.0	$1.14	$31.00	$10.00	18.37
Salt Rm	2	Compact Fluorescent: 13W CFL Bulb	Wall Switch	13	1,200	LED Retrofit	No	2	LED Screw-In Lamps: 9W LED Bulb	Wall Switch	9	1,200	0.01	10	0.0	$1.14	$31.00	$10.00	18.37
Fuel Pump	3	LED Screw-In Lamps: 18W LED	None	18	4,680	None	No	3	LED Screw-In Lamps: 18W LED	None	18	4,680	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Building Exterior	5	LED Screw-In Lamps: 18W LED	None	18	4,680	None	No	5	LED Screw-In Lamps: 18W LED	None	18	4,680	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Closet	Carrier Furnace	1	Supply Fan	0.8	82.5%	No	460	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Closet	Gibson Furnace	1	Supply Fan	0.8	82.5%	No	460	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	Fuel Pump	2	Process Pump	1.5	84.0%	No	50	No	84.0%	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
Mezzanine	Maintenace Shop Office	1	Packaged AC	1.50		No							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
Closet	Maintenace Shop	1	Furnace	125.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Closet	Maintenace Shop	1	Furnace	101.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Programmable Thermostat Recommendations

		Recommendation Inputs				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	Thermostat Quantity	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	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
Maintenance Building	Whole Building	2	1.50	-	226.00	0.00	47	17.3	$265.27	$659.74	$0.00	2.49

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Closet	Maintenace Shop	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Men's Rm	2	Faucet Aerator (Lavatory)	2.50	1.00	0.00	902	0.0	$101.29	$14.34	$0.00	0.14

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Break Room	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Offices	2	Desktop Computer	109.0	Yes
Offices	2	Computer Monitors	28.0	Yes
Offices	1	Small Printer	80.0	Yes
Break Rm	1	Small Microwave	900.0	No
Break Rm	1	Toaster Oven	1,000.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Break Rm	0	Refrigerated	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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)