Local Government Energy Audit:
Energy Audit Report

Main Academic Central

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 Main Academic Central.

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

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

1.1 Facility Summary

The Main Academic Central building at Brookdale Community College is two stories, 44,875 square feet and was constructed in 1974. Interior lighting consists of a combination of T8 linear fluorescent, compact fluorescent (CFL), and incandescent lamps. Lighting control is provided by both occupancy sensors and manual wall switches. The cooling and heating systems consist of Carrier air handler units that are equipped with chilled and hot water coils. The chilled and hot water are supplied by the Central Utility Plant. The building receives electric power via the campus main account (with JCP&L). It has no separate utility meters or submeters.

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 measures which together represent an opportunity for the Main Academic Central to reduce annual energy costs by $10,923 and annual greenhouse gas emissions by 97,926 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 3.7 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Main Academic Central's annual energy use by 7%.

Figure 1 – Previous 12 Month Utility Costs

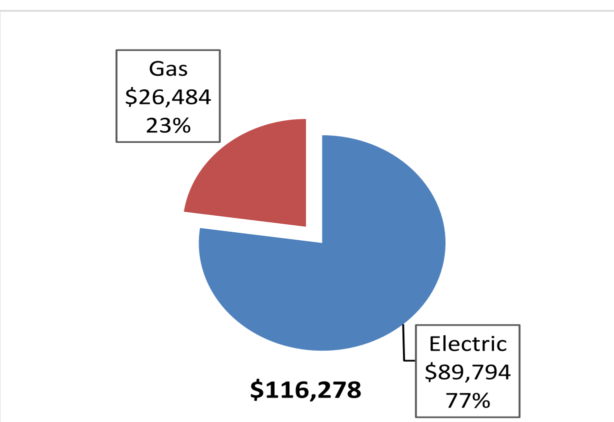
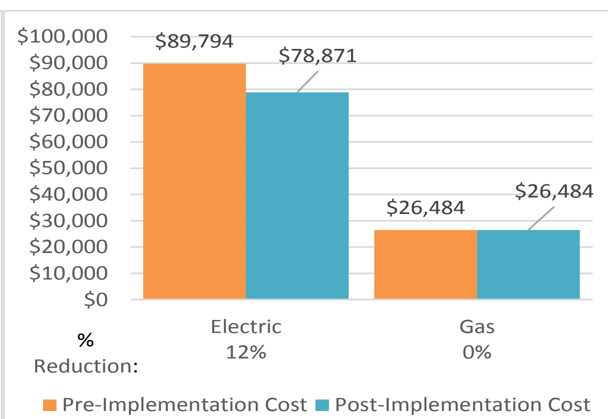


Figure 2 – Potential Post-Implementation Costs



A detailed description of Main Academic Central's existing energy use can be found in Section 3.

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

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**80,712**	**16.7**	**$9,066.04**	**$41,464.05**	**$5,865.00**	**$35,599.05**	**3.9**	**81,277**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	79,927	16.6	$8,977.78	$40,065.83	$5,865.00	$34,200.83	3.8	80,485
ECM 2	Install LED Exit Signs	Yes	786	0.1	$88.26	$1,398.22	$0.00	$1,398.22	15.8	791
Lighting Control Measures			**16,534**	**3.4**	**$1,857.14**	**$5,142.00**	**$645.00**	**$4,497.00**	**2.4**	**16,649**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	12,423	2.6	$1,395.40	$4,330.00	$645.00	$3,685.00	2.6	12,510
ECM 4	Install High/Low Lighitng Controls	Yes	4,111	0.8	$461.74	$812.00	$0.00	$812.00	1.8	4,140
TOTALS			**97,246**	**20.1**	**$10,923.18**	**$46,606.05**	**$6,510.00**	**$40,096.05**	**3.7**	**97,926**

* - 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 17 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 Main Academic Central include:

- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Reduce Motor Short Cycling
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Assess Chillers & Request Tune-Ups
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls

- Water Conservation

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Main Academic Central. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	75	kW DC STC
Electric Generation	89,353	kWh/yr
Displaced Cost	$7,770	/yr
Installed Cost	$195,000	

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 8.3 for additional information on the ESIP Program.

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

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Timothy Drury	Director of Facilities Management and Construction	tdrury@brookdalecc.edu	(732) 224-2217
Designated Representative			
Christopher Otis	Manager,Fire Safety & Environmental Compliance	cotis@brookdalecc.edu	(732) 224-2217
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On December 6, 2016, TRC performed an energy audit at the Main Academic Central building located in Lincroft, New Jersey TRC's team met with Christopher Otis, Manager of Fire Safety & Environmental Compliance to review the facility operations and help focus our investigation on specific energy-using systems.

The Main Academic Central is a 44,875 square foot building constructed in 1974. It is located between the Bankier Library and the Main Academic North buildings and is comprised of classrooms, conference rooms, storage rooms, and mechanical spaces.

The building receives electric power via the campus main account (with JCP&L). The building has no separate utility meters. The breakdown of energy usage is based on both our estimates of the Main Academic Central's shares of the total electric and gas loads as well as the number and sizes of energy-using equipment on site.

TRC recommends installing electric submeters for all buildings and also metering the hot and chilled water flow to each building to better sharpen the view of relative energy demand between one campus building and another.

2.3 Building Occupancy

The Main Academic Central building is open year round and the typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately 725 staff and students.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Main Academic Central	Weekday	8:00 AM - 9:00 PM
Main Academic Central	Weekend	8:30 AM - 6:30 PM

2.4 Building Envelope

The building has a reinforced concrete foundation. The building has a hip roof covered with metal standing seam that is in good condition. The windows throughout the building are glass double pane with metal frames and are in good condition as well. Exterior doors are glass and also metal framed. All door and window seals appeared to be tight and no excessive air infiltration was noted.

2.5 On-Site Generation

Main Academic Central 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

Interior lighting is provided by a combination of 32-Watt linear fluorescent T8 lamps with electronic ballasts, 26-Watt compact fluorescent lamps (CFL), and incandescent lamps. Most of the T8 fixtures are 2-lamp or 3-lamp, 4-foot long troffers with diffusers. Exit signs throughout the building are fluorescent fixtures. Lighting control is provided by both occupancy sensors and manual wall switches. The building has minimal exterior lighting which consists of metal halide walkway pole mounted fixtures. These fixtures along with others campus wide buildings pole mounted fixtures have been added to the Central Utility Plant electricity consuming equipment.

Hot Water Heating System

The hot water system consists of three multi zone Carrier air handler units (AHUs) located in the mechanical spaces. They are equipped with hot water coils for heating and chilled water coils for cooling. The building receives hot water via the campus-wise central heating loop. Hot water is generated at the Central Utility Plant by eight HARSCO P-K MACH condensing boilers with an output capacity of 2,850 MBh each. The boilers have a nominal combustion efficiency of 95%. Hot water is supplied to the AHUs by pumps in the building. There is one 3 hp and one 10 hp pump that are on variable frequency drive (VFD) controls to reduce the electric demand. The AHUs are a variable air volume (VAV) system with terminal reheat coils. They are 45 VAV reheat coils located above the ceiling in individual rooms. The operation and scheduling of all boilers is controlled from the Central Utility Plant.

Chilled Water Air Conditioning System (CHW)

The building also receives chilled water via the campus-wide central cooling loop. Chilled water is generated at the Central Utility Plant by three 740 ton water-cooled centrifugal chillers. Chilled water is distributed to the AHUs by one 7.5 hp and one 40 hp pump in the building. The pumps are on variable frequency drives (VFD) controls. The operation and scheduling of all chillers is controlled from the Central Utility Plant.

Domestic Hot Water Heating System

The domestic water heating system for the building consists of one electric Bradford White hot water heater with an input rating of 9 kW and a 50 gallon storage tank. It is in good condition.

Building Plug Load

The building has approximately 75 computers with LCD monitors that are used daily, plus servers, nine photocopiers, and some small printers. The computers, monitors, and printers seemed to be all recent models designed with power management software to reduce the power when they sit idle for more than a few minutes. The building has four vending machines all located in the main hallway area.

2.7 Water-Using Systems

There are two restrooms at the facility. A sampling of restrooms found that the faucets, toilets and urinals are rated as low flow.

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. Sub-meter data was not available for a full 12-month period. Therefore, we had to use our best estimate of consumption for each building to divide up the master metered energy purchases. Annual electric usage for each building on the main account was estimated. Thermal load for each building on the central heating and cooling loops was apportioned according to building square footage. The resulting usage estimates may vary from current actual energy usage for some buildings that are supplied by the master metered electric and gas accounts.

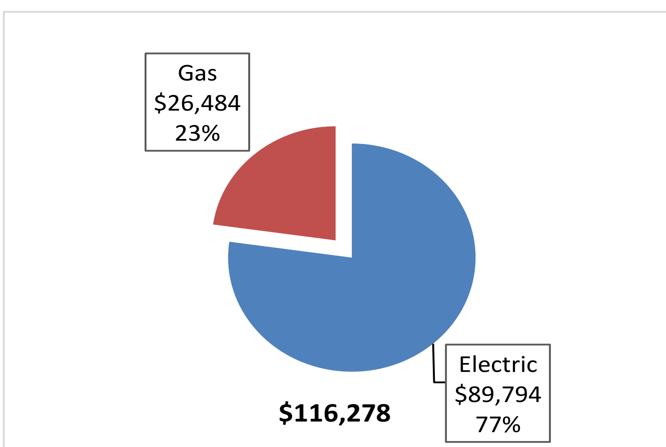
The Main Academic Central building receives all electric and thermal energy from the campus's master electric and gas accounts. Below is our estimate of the portion of energy consumptions and costs that can be attributed to the Main Academic Central building.

Figure 7 - Utility Summary

Utility Summary for Main Academic Central		
Fuel	Usage	Cost
Electricity	799,409 kWh	$89,794
Natural Gas	23,062 Therms	$26,484
Total		**$116,278**

The current annual energy cost for this facility is $116,278 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. It is supplied via the main electric account for the campus and distributed from the Central Utility Plant to the Main Academic Central building. The average electric cost over the past 12 months on the main account was $0.112/kWh. This is a blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly estimated electricity consumption and peak demand are shown in the chart below.

Figure 9 - Electric Usage & Demand

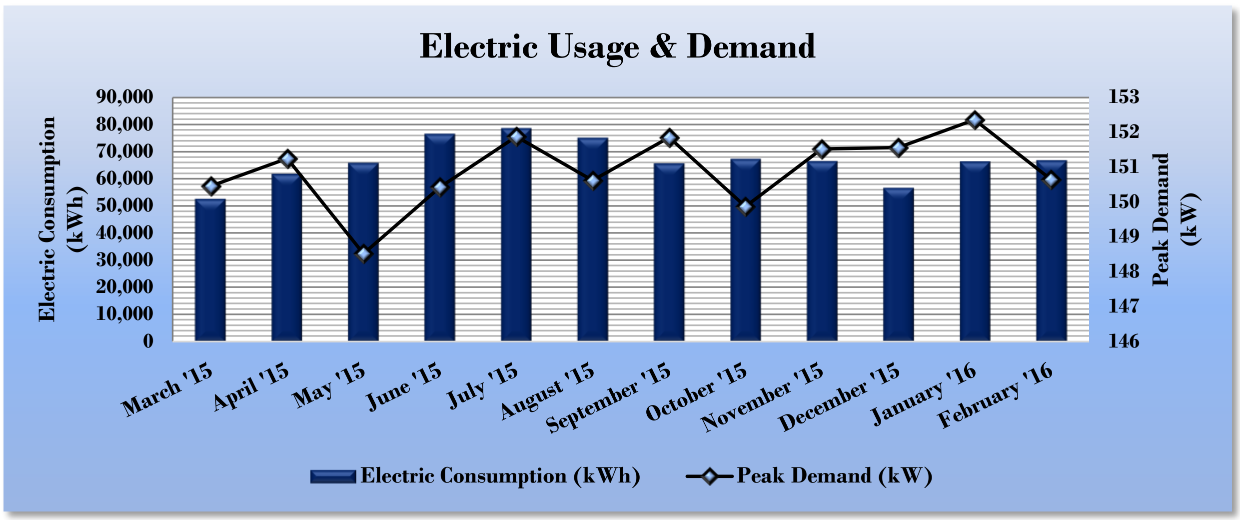


Figure 10 - Electric Usage & Demand

Electric Billing Data for Main Academic Central					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost	TRC Estimated Usage?
4/13/15	30	52,602	150	$5,909	Yes
5/12/15	31	61,759	151	$6,937	Yes
6/11/15	30	65,850	149	$7,397	Yes
7/13/15	31	76,496	150	$8,592	Yes
8/12/15	30	78,584	152	$8,827	Yes
9/11/15	31	75,011	151	$8,426	Yes
10/13/15	30	65,594	152	$7,368	Yes
11/12/15	30	67,288	150	$7,558	Yes
12/14/15	31	66,424	152	$7,461	Yes
1/13/16	30	56,639	152	$6,362	Yes
2/11/16	31	66,388	152	$7,457	Yes
3/11/16	30	66,774	151	$7,500	Yes
Totals	**365**	**799,409**	**152.36**	**$89,794**	12
Annual	**365**	**799,409**	**152.36**	**$89,794**	

3.3 Natural Gas Usage

Natural Gas is provided by New Jersey Natural Gas. It is supplied to the boilers at the Central Utility Plant. The gas fired boilers distributes hot water to many campus buildings, including the Main Academic Central building. From the main gas account, we determined the average gas cost for the most recent 12-month billing period to be $1.148/therm. This is the blended rate used throughout the analyses in this report. Estimated monthly gas consumption for the building is shown in the chart below.

Figure 11 - Natural Gas Usage

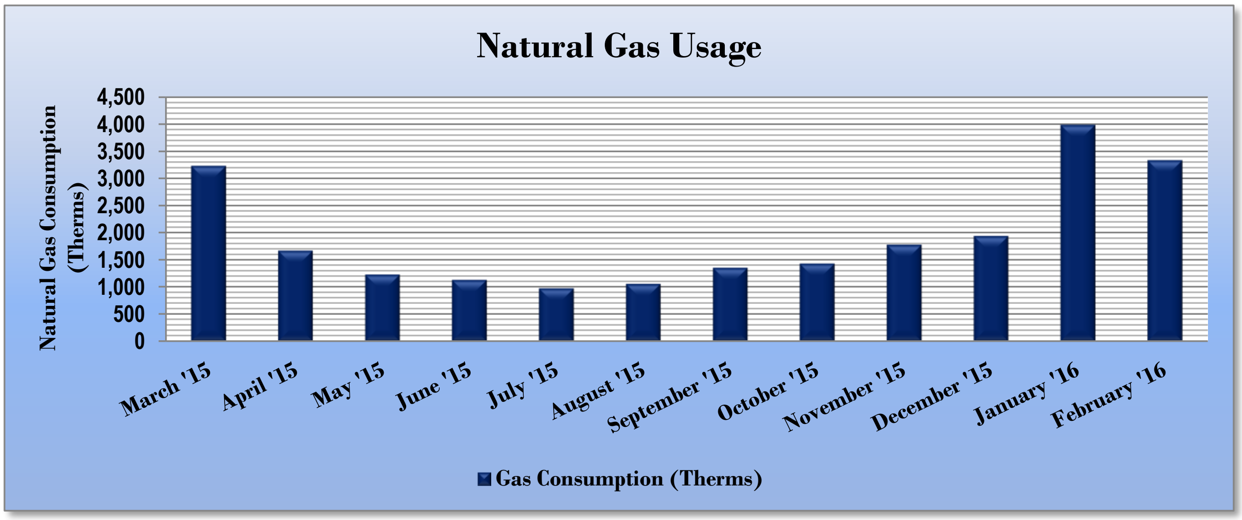


Figure 12 - Natural Gas Usage

Gas Billing Data for Main Academic Central				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
4/1/15	31	3,223	$3,701	Yes
5/1/15	30	1,666	$1,913	Yes
6/1/15	31	1,225	$1,407	Yes
7/1/15	30	1,125	$1,292	Yes
8/1/15	31	969	$1,113	Yes
9/1/15	31	1,054	$1,210	Yes
10/1/15	30	1,351	$1,552	Yes
11/1/15	31	1,429	$1,641	Yes
12/1/15	30	1,775	$2,039	Yes
1/1/16	31	1,933	$2,220	Yes
2/1/16	31	3,981	$4,572	Yes
3/1/16	28	3,330	$3,824	Yes
Totals	**365**	**23,062**	**$26,484**	12
Annual	**365**	**23,062**	**$26,484**	

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 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Main Academic Central	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	244.8	262.6
Site Energy Use Intensity (kBtu/ft^2)	112.2	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 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Main Academic Central	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	221.6	262.6
Site Energy Use Intensity (kBtu/ft^2)	104.8	130.7

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This building is not eligible to receive a score because final end-usage of energy could not be precisely apportioned for each building. We have provided a combined benchmarking score for the whole campus and it may be useful to compare this average campus score to EUI scores available for similar college campuses.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for the campus, 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.

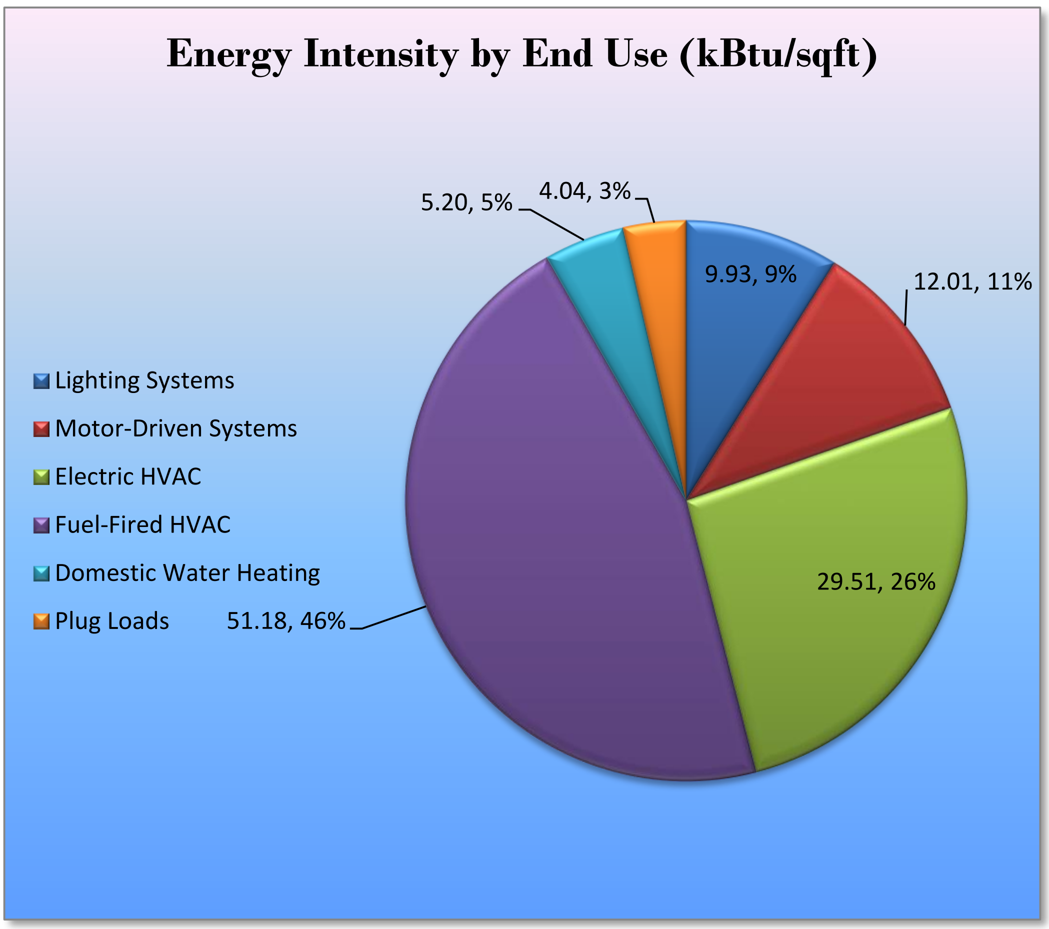
3.5 Energy End-Use Breakdown

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 and determine their proportional contribution to overall building energy usage. This visual representation of energy end uses highlights systems that may benefit most from energy efficiency projects.

The breakdown of energy usage is based on both our estimates of the Main Academic Central Building's shares of the total electric and gas loads as well as number and sizes of energy-using equipment on site.

TRC recommends to installing electric submeters for all buildings and also metering the hot and chilled water flow to each building to better sharpen the view of relative energy demand between one campus building and another.

Figure 15 - 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 Main Academic Central regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 16 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**80,712**	**16.7**	**0.0**	**$9,066.04**	**$41,464.05**	**$5,865.00**	**$35,599.05**	**3.9**	**81,277**
ECM 1	Retrofit Fixtures with LED Lamps	79,927	16.6	0.0	$8,977.78	$40,065.83	$5,865.00	$34,200.83	3.8	80,485
ECM 2	Install LED Exit Signs	786	0.1	0.0	$88.26	$1,398.22	$0.00	$1,398.22	15.8	791
Lighting Control Measures		**16,534**	**3.4**	**0.0**	**$1,857.14**	**$5,142.00**	**$645.00**	**$4,497.00**	**2.4**	**16,649**
ECM 3	Install Occupancy Sensor Lighting Controls	12,423	2.6	0.0	$1,395.40	$4,330.00	$645.00	$3,685.00	2.6	12,510
ECM 4	Install High/Low Lighitng Controls	4,111	0.8	0.0	$461.74	$812.00	$0.00	$812.00	1.8	4,140
TOTALS		**97,246**	**20.1**	**0.0**	**$10,923.18**	**$46,606.05**	**$6,510.00**	**$40,096.05**	**3.7**	**97,926**

* - 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 17 below.

Figure 17 – 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		**80,712**	**16.7**	**0.0**	**$9,066.04**	**$41,464.05**	**$5,865.00**	**$35,599.05**	**3.9**	**81,277**
ECM 1	Retrofit Fixtures with LED Lamps	79,927	16.6	0.0	$8,977.78	$40,065.83	$5,865.00	$34,200.83	3.8	80,485
ECM 2	Install LED Exit Signs	786	0.1	0.0	$88.26	$1,398.22	$0.00	$1,398.22	15.8	791

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	79,927	16.6	0.0	$8,977.78	$40,065.83	$5,865.00	$34,200.83	3.8	80,485
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T8 linear fluorescent, compact fluorescent, incandescent, and halogen incandescent lamps 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 2: 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	786	0.1	0.0	$88.26	$1,398.22	$0.00	$1,398.22	15.8	791
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. 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 18 – 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		**16,534**	**3.4**	**0.0**	**$1,857.14**	**$5,142.00**	**$645.00**	**$4,497.00**	**2.4**	**16,649**
ECM 3	Install Occupancy Sensor Lighting Controls	12,423	2.6	0.0	$1,395.40	$4,330.00	$645.00	$3,685.00	2.6	12,510
ECM 4	Install High/Low Lighitng Controls	4,111	0.8	0.0	$461.74	$812.00	$0.00	$812.00	1.8	4,140

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 3: 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)
12,423	2.6	0.0	$1,395.40	$4,330.00	$645.00	$3,685.00	2.6	12,510

Measure Description

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

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

ECM 4: Install High/Low 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)
4,111	0.8	0.0	$461.74	$812.00	$0.00	$812.00	1.8	4,140

Measure Description

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

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

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

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

5 Energy Efficient Practices

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

Close Doors and Windows

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

Perform Proper Lighting Maintenance

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

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

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.

Use Fans to Reduce Cooling Load

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

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Assess Chillers & Request Tune-Ups

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

Clean and/or Replace HVAC Filters

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

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.

Plug Load Controls

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

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gallons per minute (gpm) for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

6 On-Site Generation Measures

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

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

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

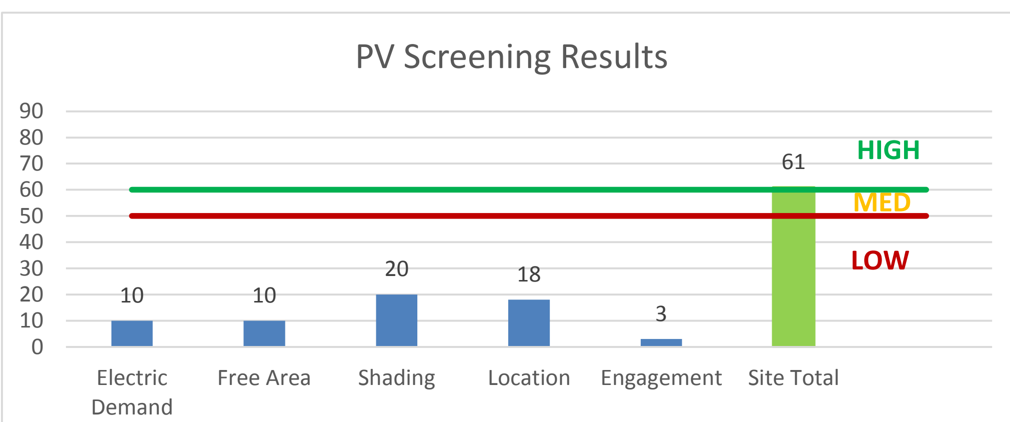
6.1 Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a High 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 our opinion, the facility does appear meet these minimum criteria for cost-effective PV installation.

Figure 19 - Photovoltaic Screening



Potential	High	
System Potential	75	kW DC STC
Electric Generation	89,353	kWh/yr
Displaced Cost	$7,770	/yr
Installed Cost	$195,000	

Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.2 for additional information.

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

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

6.2 Combined Heat and Power

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

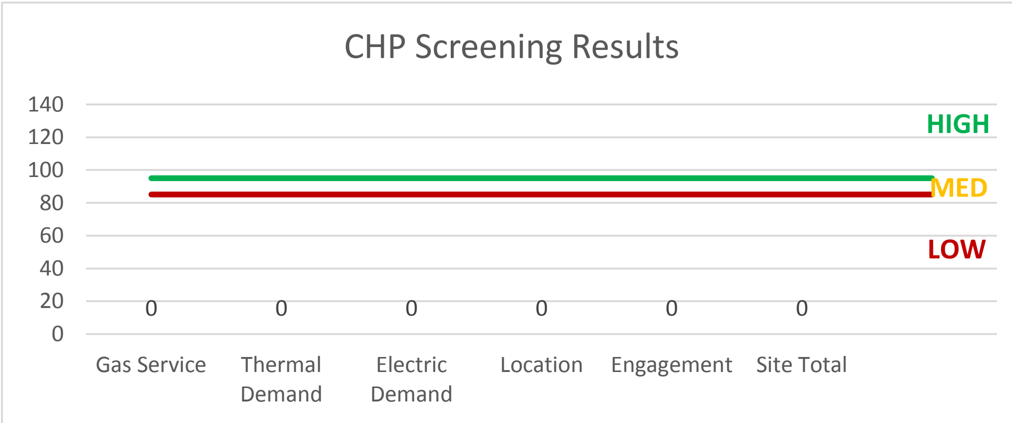
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are 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.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

Figure 20 - 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.

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

Figure 21 - 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 LED Exit Signs				
ECM 3	Install Occupancy Sensor Lighting Controls	x			
ECM 4	Install High/Low Lighitng Controls				

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 SREC Registration Program

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

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

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

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

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

8.3 Energy Savings Improvement Program

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

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

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

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

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

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

9 Energy Purchasing and Procurement Strategies

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
1st Floor Main Hallway	34	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	34	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,184	0.97	4,745	0.0	$533.04	$2,380.80	$0.00	4.47
1st Floor Main Hallway	5	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	5	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	302	0.0	$33.95	$537.78	$0.00	15.84
Men Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,496	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,747	0.09	359	0.0	$40.33	$266.40	$65.00	4.99
Women Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,496	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,747	0.09	359	0.0	$40.33	$266.40	$30.00	5.86
Mechanical Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,496	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,747	0.31	1,197	0.0	$134.45	$701.00	$100.00	4.47
Room 114	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.41	2,020	0.0	$226.88	$792.80	$155.00	2.81
Room 114	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,120	0.04	208	0.0	$23.38	$126.40	$0.00	5.41
Room 109	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.64	3,142	0.0	$352.93	$1,168.80	$230.00	2.66
Room 109	3	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	3	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.04	183	0.0	$20.55	$190.95	$0.00	9.29
Room 109A	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.05	224	0.0	$25.21	$191.20	$15.00	6.99
Room 107	1	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.01	61	0.0	$6.85	$63.65	$0.00	9.29
Room 107	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.41	2,020	0.0	$226.88	$792.80	$155.00	2.81
Room 109B	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.09	449	0.0	$50.42	$266.40	$50.00	4.29
Room 105	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp	No	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.58	2,842	0.0	$319.19	$1,203.20	$240.00	3.02
Room 103	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.07	355	0.0	$39.90	$150.40	$30.00	3.02
Room 101	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.28	1,347	0.0	$151.25	$567.20	$110.00	3.02
Room 101	2	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	2	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.03	122	0.0	$13.70	$127.30	$0.00	9.29
Room 101A	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.07	355	0.0	$39.90	$150.40	$30.00	3.02
Room 101B	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.10	474	0.0	$53.20	$234.00	$40.00	3.65
Room 101C	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.12	598	0.0	$67.22	$350.00	$60.00	4.31
Room 101C	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,184	0.06	279	0.0	$31.36	$242.40	$0.00	7.73
Room 104	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.33	1,598	0.0	$179.55	$676.80	$135.00	3.02
Room 104	1	Compact Fluorescent: Recessed 2x13W 2-pin	Occupancy Sensor	26	3,120	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	9	3,120	0.01	61	0.0	$6.85	$63.65	$0.00	9.29
Room 106	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp	No	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.51	2,486	0.0	$279.29	$1,052.80	$210.00	3.02
Room 108	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.46	2,244	0.0	$252.09	$868.00	$170.00	2.77

	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
Room 110	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.28	1,347	0.0	$151.25	$567.20	$110.00	3.02
Room 111	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.51	2,469	0.0	$277.30	$943.20	$185.00	2.73
Room 111	4	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	4	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.05	244	0.0	$27.41	$254.60	$0.00	9.29
Room 111A	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.28	1,347	0.0	$151.25	$567.20	$110.00	3.02
Server Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,496	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,496	0.07	284	0.0	$31.92	$150.40	$30.00	3.77
Mechanical Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,496	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,747	0.31	1,197	0.0	$134.45	$701.00	$100.00	4.47
Copy Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,496	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,747	0.09	359	0.0	$40.33	$266.40	$50.00	5.37
Room 112	4	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	Yes	4	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	9	2,184	0.06	283	0.0	$31.76	$370.60	$0.00	11.67
Room 112	1	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.00	60	0.0	$6.79	$107.56	$0.00	15.84
Room 112	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.60	2,918	0.0	$327.72	$1,093.60	$215.00	2.68
Restroom	2	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	2,496	Relamp	No	2	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	2,496	0.03	98	0.0	$10.96	$127.30	$0.00	11.61
Back Entrance	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	No	10	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,120	0.21	1,041	0.0	$116.88	$632.00	$0.00	5.41
Room 114	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.46	2,244	0.0	$252.09	$868.00	$170.00	2.77
Room 114	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,120	0.04	208	0.0	$23.38	$126.40	$0.00	5.41
2nd Floor Main Halllway	6	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	6	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	363	0.0	$40.74	$645.33	$0.00	15.84
2nd Floor Main Halllway	67	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	67	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,184	2.06	10,025	0.0	$1,126.01	$4,151.50	$670.00	3.09
Room 214	4	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	4	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.05	244	0.0	$27.41	$254.60	$0.00	9.29
Room 214	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,120	0.39	1,894	0.0	$212.80	$936.00	$160.00	3.65
Room 212	4	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	4	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.05	244	0.0	$27.41	$254.60	$0.00	9.29
Room 212	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.61	2,992	0.0	$336.12	$1,286.00	$220.00	3.17
Room 210	3	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	3	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.04	183	0.0	$20.55	$190.95	$0.00	9.29
Room 210	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.49	2,394	0.0	$268.90	$1,052.00	$180.00	3.24
Room 208	4	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	4	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.05	244	0.0	$27.41	$254.60	$0.00	9.29
Room 208	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.49	2,394	0.0	$268.90	$1,052.00	$180.00	3.24
Room 206	4	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	4	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.05	244	0.0	$27.41	$254.60	$0.00	9.29

	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
Room 206	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.49	2,394	0.0	$268.90	$1,052.00	$180.00	3.24
Room 204	4	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	4	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.05	244	0.0	$27.41	$254.60	$0.00	9.29
Room 204	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.49	2,394	0.0	$268.90	$1,052.00	$180.00	3.24
Room 202	8	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	8	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.10	488	0.0	$54.81	$509.20	$0.00	9.29
Room 202	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.37	1,795	0.0	$201.67	$818.00	$140.00	3.36
Room 200	6	Compact Fluorescent: Recessed 2x13W 2-pin	Wall Switch	26	3,120	Relamp	No	6	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.08	366	0.0	$41.11	$381.90	$0.00	9.29
Room 200	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.55	2,693	0.0	$302.51	$1,169.00	$200.00	3.20
Room 200	2	Halogen Incandescent: PAR38 70W	Wall Switch	70	3,120	Relamp	No	2	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.09	438	0.0	$49.17	$127.30	$0.00	2.59
Room 201	2	Halogen Incandescent: PAR38 70W	Wall Switch	70	3,120	Relamp	No	2	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.09	438	0.0	$49.17	$127.30	$0.00	2.59
Room 201	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.49	2,394	0.0	$268.90	$1,052.00	$180.00	3.24
Room 203	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.49	2,394	0.0	$268.90	$1,052.00	$180.00	3.24
Room 203	1	Halogen Incandescent: PAR38 70W	Wall Switch	70	3,120	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.04	219	0.0	$24.58	$63.65	$0.00	2.59
Room 205	1	Halogen Incandescent: PAR38 70W	Wall Switch	70	3,120	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.04	219	0.0	$24.58	$63.65	$0.00	2.59
Room 205	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.49	2,394	0.0	$268.90	$1,052.00	$180.00	3.24
Room 207	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.37	1,795	0.0	$201.67	$818.00	$140.00	3.36
Room 207	2	Halogen Incandescent: PAR38 70W	Wall Switch	70	3,120	Relamp	No	2	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.09	438	0.0	$49.17	$127.30	$0.00	2.59
Room 209	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.55	2,693	0.0	$302.51	$1,169.00	$200.00	3.20
Room 211	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.55	2,693	0.0	$302.51	$1,169.00	$200.00	3.20
Room 211	2	Halogen Incandescent: PAR38 70W	Wall Switch	70	3,120	Relamp	No	2	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	3,120	0.09	438	0.0	$49.17	$127.30	$0.00	2.59
Room 213	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,184	0.11	558	0.0	$62.71	$368.80	$20.00	5.56
Room 213	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,120	0.10	474	0.0	$53.20	$234.00	$40.00	3.65
Server Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,184	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,184	0.02	73	0.0	$8.18	$63.20	$0.00	7.72
Storage	1	Incandescent: 100W A Lamp	Wall Switch	100	2,496	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	2,496	0.07	261	0.0	$29.34	$63.65	$0.00	2.17
Storage	1	Compact Fluorescent: 52W CFL Screw-in	Wall Switch	52	2,496	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	2,496	0.03	123	0.0	$13.86	$63.65	$0.00	4.59
Men Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,496	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,496	0.03	100	0.0	$11.28	$71.80	$10.00	5.48

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Men Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,496	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,747	0.14	539	0.0	$60.50	$495.60	$80.00	6.87
Women Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,496	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,496	0.03	100	0.0	$11.28	$71.80	$10.00	5.48
Women Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,496	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,747	0.14	539	0.0	$60.50	$341.60	$80.00	4.32
Basement	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,184	0.80	3,890	0.0	$436.96	$1,869.00	$260.00	3.68
Basement	1	Exit Signs: Fluorescent	None	12	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.00	60	0.0	$6.79	$107.56	$0.00	15.84
Basement	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,120	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,120	0.04	201	0.0	$22.57	$95.13	$20.00	3.33
Elevator Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,496	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,496	0.01	50	0.0	$5.64	$35.90	$5.00	5.48

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
Mechanical Room	MAC Building	1	Return Fan	5.0	88.5%	No	2,496	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	MAC Building	1	Supply Fan	7.5	91.0%	No	2,496	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	MAC Building	1	Return Fan	3.0	81.0%	No	2,496	No	81.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	MAC Building	1	Other	0.3	65.0%	No	1,560	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	ATEC Building	1	Heating Hot Water Pump	10.0	91.7%	Yes	1,248	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	ATEC Building	1	Chilled Water Pump	20.0	91.0%	Yes	1,152	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	CAR Building	1	Heating Hot Water Pump	3.0	82.0%	Yes	1,560	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	CAR Building	1	Chilled Water Pump	7.5	87.0%	Yes	1,152	No	87.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	MAC Building	1	Other	5.0	81.0%	No	1,248	No	81.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	MAC Building	1	Return Fan	3.0	84.0%	No	2,652	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	MAC Building	1	Heating Hot Water Pump	0.8	65.0%	No	1,560	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	MAC Building	2	Heating Hot Water Pump	0.3	65.0%	No	1,560	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Rooms	Air Handling Units	3	Supply Fan	7.5	91.0%	Yes	2,652	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Rooms	Air Handling Units	1	Supply Fan	30.0	91.0%	Yes	2,652	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	MAC Building	1	Chilled Water Pump	10.0	91.7%	Yes	1,152	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Central Utility Plant	Campus Buildings	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
Central Plant	Campus Buildings	8	Condensing Hot Water Boiler	2,850.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

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

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Mechanical Room	2	Electric Humidifier	32,000.0	No
Facilty	75	Desktop with LCD Monitors	191.0	Yes
Facilty	12	Printer	460.0	Yes
Facilty	9	Copy Machine	1,000.0	No
Facilty	7	Microwave	1,000.0	No
Facilty	1	Refrigrator	350.0	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
Facility	3	Glass Fronted Refrigerated	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Facility	1	Non-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

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)