Local Government Energy Audit:
Energy Audit Report

Building #36 - TRLC

101 Vera King Farris Drive

Galloway, New Jersey 08205

Stockton University

July 15, 2019

Report by:

TRC Energy Services

Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information about financial incentives that may be available. Most energy conservation measures have received preliminary analysis of feasibility that identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to establish a basis for further discussion and to help prioritize energy measures.

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual 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. Please review all available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

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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 Building #36 – TRLC (Building #36).

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 New Jersey universities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Building #36 is a 6,150 square foot facility comprised of various space types within a single building. The building is one story and includes a computer lab, a kitchen, some offices, a multipurpose room, and a mechanical space.

Interior lighting at Building #36 consists of linear T8 fluorescent, LED, and compact fluorescent lamps. Exterior lighting consists of metal halide and CFL fixtures. Heating is provided primarily by two hot water boilers and supplemented by five split-system heat pumps on the roof. Cooling for the facility is provided by the same rooftop split-system heat pumps. 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 10 measures and recommends eight that represent an opportunity for Building #36 to reduce annual energy costs by roughly $2,155 and annual greenhouse gas emissions by 20,113 lbs. CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 5.2 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 Building annual energy use by 20%.

Figure 1 – Previous 12 Month Utility Costs

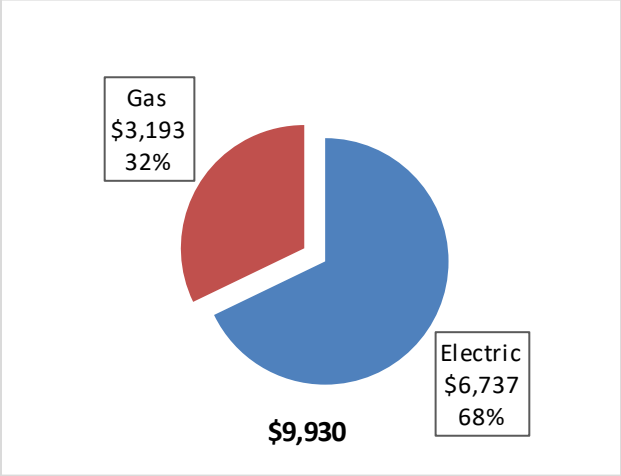
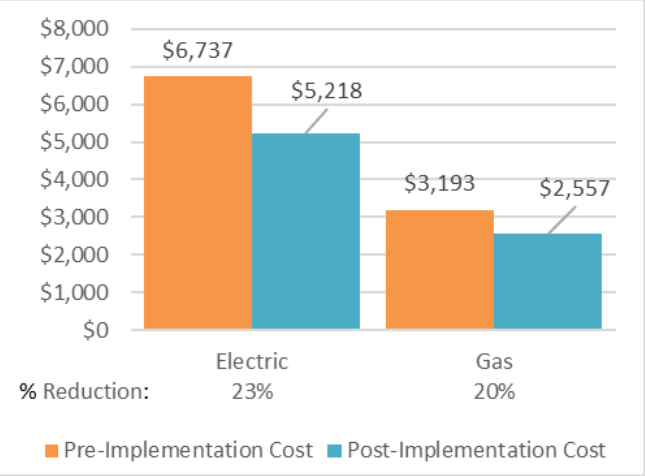


Figure 2 – Potential Post-Implementation Costs



A detailed description of Building #36's existing energy use can be found in Section 3, "Site Energy Use and Costs".

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, "Energy Conservation Measures."

Figure 3 – Summary of Energy Reduction Opportunities

	Energy Conservation Measure	Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**9,374**	**1.7**	**0.0**	**$1,125.80**	**$4,845.45**	**$970.00**	**$3,875.45**	**3.4**	**9,439**
ECM 1	Install LED Fixtures	Yes	1,809	0.3	0.0	$217.25	$1,931.93	$200.00	$1,731.93	8.0	1,822
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	215	0.0	0.0	$25.79	$68.77	$10.00	$58.77	2.3	216
ECM 3	Retrofit Fixtures with LED Lamps	Yes	7,350	1.4	0.0	$882.75	$2,844.75	$760.00	$2,084.75	2.4	7,402
Lighting Control Measures			**2,589**	**0.5**	**0.0**	**$310.92**	**$3,160.00**	**$280.00**	**$2,880.00**	**9.3**	**2,607**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	2,142	0.4	0.0	$257.22	$2,160.00	$280.00	$1,880.00	7.3	2,157
ECM 5	Install High/Low Lighitng Controls	Yes	447	0.1	0.0	$53.69	$1,000.00	$0.00	$1,000.00	18.6	450
Electric Unitary HVAC Measures			**5,354**	**3.0**	**0.0**	**$642.99**	**$24,377.00**	**$1,326.33**	**$23,050.66**	**35.8**	**5,391**
	Install High Efficiency Heat Pumps	No	5,354	3.0	0.0	$642.99	$24,377.00	$1,326.33	$23,050.66	35.8	5,391
Domestic Water Heating Upgrade			**0**	**0.0**	**9.8**	**$99.14**	**$2,138.28**	**$50.00**	**$2,088.28**	**21.1**	**1,149**
	Install High Efficiency Gas Water Heater	No	0	0.0	3.0	$30.20	$2,109.60	$50.00	$2,059.60	68.2	350
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	6.8	$68.94	$28.68	$0.00	$28.68	0.4	799
Food Service Equipment & Refrigeration Measures			**0**	**0.0**	**56.2**	**$567.72**	**$4,341.88**	**$400.00**	**$3,941.88**	**6.9**	**6,578**
ECM 7	Dishwasher Replacement	Yes	0	0.0	56.2	$567.72	$4,341.88	$400.00	$3,941.88	6.9	6,578
Plug Load Equipment Control - Vending Machine			**685**	**0.0**	**0.0**	**$82.27**	**$460.00**	**$0.00**	**$460.00**	**5.6**	**690**
ECM 8	Vending Machine Control	Yes	685	0.0	0.0	$82.27	$460.00	$0.00	$460.00	5.6	690
TOTALS FOR HIGH PRIORITY MEASURES			**12,648**	**2.1**	**63.0**	**$2,155.65**	**$12,836.01**	**$1,650.00**	**$11,186.01**	**5.2**	**20,113**
TOTALS FOR ALL EVALUATED MEASURES			**18,001**	**5.2**	**66.0**	**$2,828.83**	**$39,322.61**	**$3,026.33**	**$36,296.27**	**12.8**	**25,854**

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

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

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

Lighting Control 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.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

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

Food Service Equipment & Refrigeration measures generally involve improvements in the efficiency of cooking, food service, dishwashing, and food storage equipment. These measures may include more efficient convection ovens, steamers, ice machines, or refrigeration, and save energy by using more energy efficient equipment.

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

Energy Efficient Practices

TRC also identified six, low-cost or no-cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and operation and maintenance costs. Potential opportunities identified at Building 36 - TRLC include:

- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Clean Evaporator/Condenser Coils on AC Systems
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- 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 Building #36. Based on the configuration of the site and its loads, there is a low potential for installing any PV and combined heat and power, self-generation measures.

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

1.3 Implementation Planning

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

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines. 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 the installation. Program pre-approval is required for some SmartStart incentives, so pre-approval is required before you proceed with ECM installation. The incentive estimates listed in Figure 3, on page 2, are based on the SmartStart program. More details on this program and others are available in Section 8.1.

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

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

Additional information on relevant incentive programs is located in Section 8.1 and 8.2. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Customer			
Charles (Skip) West , AIA	Director, Office of Facilities Planning & Construction	Charles.West@stockton.edu	(609) 626-5522
Designated Representative			
Michael J. Ferraro II	Energy Systems Specialist	Michael.Ferraro@stockton.edu	(609) 652-4884
TRC Energy Services			
Vish Nimbalkar, P.E.	Auditor	VNaikNimbalkar@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On June 21, 2018, TRC performed an energy audit at Building #36 located in Galloway, New Jersey. TRC's team met with Michael J. Ferraro II to review the facility operations and help focus our investigation on specific energy-using systems.

Building #36 is a 6,150 square foot facility comprised of various space types within a single building. The building is one story and includes a computer lab, kitchen, some offices, a multipurpose room, and a mechanical space.

Interior lighting at Building 36 consists of linear T8 fluorescent, LED, and compact fluorescent lamps (CFLs). Exterior lighting consists of metal halide and CFLs. Heating is provided primarily by two hot water boilers and supplemented by five split-system heat pumps on the roof. Cooling for the facility is provided by the same rooftop split-system heat pumps.

The building was constructed in 1986.

2.3 Building Occupancy

The building is open every day, year-round to faculty and students. The typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately 20 staff and students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Building 36 - TRLC	Weekday	8:00AM to 10:00PM
Building 36 - TRLC	Weekend	8:00AM to 6:00PM

2.4 Building Envelope

The building is constructed of concrete block and structural steel with a stone facade. It has flat roofs covered with a black membrane that is in poor condition. The building has double-pane windows that are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum with large glass panes and are in good condition.

Figure 6 - Building Envelope

2.5 On-Site Generation

Stockton University installed a 1,200 kW, direct current (DC), solar energy project in March 2015. The project included photovoltaic (PV) arrays on parking lot canopies, one of which is interconnected near Building 36. The systems provide 6% of the electricity required for the campus.

Marina Energy is the power purchase agreement provider and financier of the solar energy system.

2.6 Energy-Using Systems

Lighting System

Interior lighting at the facility is provided mostly by linear, 32-Watt, fluorescent T8 lamps with electronic ballasts, as well as LED fixtures and some compact fluorescent lamps (CFL). Most of the linear fluorescent fixtures are 1-lamp or 4-lamp, 4-foot long troffers with diffusers. Lighting control in most spaces is provided by wall switches. The building's exterior lighting consists primarily of metal halide and CFL fixtures that are controlled by photocells.

Figure 7 – Lighting Technologies

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

Hot Water Heating System

The hot water system consists of one Slant/Fin 112 kBtu/hr output condensing boiler and one Weil-McLain 122 kBtu/hr output, non-condensing boiler. The condensing boiler has a nominal combustion efficiency of 93% and the non-condensing boiler has a nominal combustion efficiency of 83%. The boilers are configured in a constant flow primary distribution, with two hot water pumps. Each boiler is supplied by a dedicated 0.25 horse power (HP) pump. The boilers provide hot water to air handlers and unit heaters. The boilers are relatively new and are in good condition and well maintained.

Figure 8 – Heating Hot Water Equipment

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

Direct Expansion Air Conditioning System (DX)

There are five Trane split-system heat pumps that provide cooling and supplementary heating to the facility. Three of the units have a cooling capacity of 2 tons and a heating capacity of 23 kBtu/hr. One of the units has a cooling capacity of 4 tons and a heating capacity of 47 kBtu/hr. The last heat pump has a nominal capacity of 4.5 tons and a heating capacity of 52 kBtu/hr.

There are four air-handlers associated with the split-system heat pumps, one with a 3 HP supply fan and three with 1/3 HP supply fans each. The units are controlled by individual thermostats located in zones.

Figure 9 – Air-Conditioning Equipment

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

Domestic Hot Water Heating System

The DHW heating system for the facility consists of one Slate, gas-fired, hot water heater with an input rating of 30 kBtu/hr and an efficiency factor of 56%. The water heater has a 30-gallon storage tank. A 0.5 HP recirculation pump distributes water to the entire site.

Figure 10 – DHW Equipment


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

Food Service Equipment

The facility has a low-temperature, natural gas, under-counter dishwater in the break area.

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

Building Plug Load

There are roughly 15 computer work stations throughout the facility. There are also a variety of other appliances including printers, TVs, a projector, microwaves and refrigerators.

The facility also has two non-refrigerated vending machines.

Figure 11 – Plug Load Appliances


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

2.7 Water-Using Systems

There are two restrooms in the facility, with four faucets that are rated for 2 gallons per minute (gpm) or higher.

3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. Also, 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 in 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

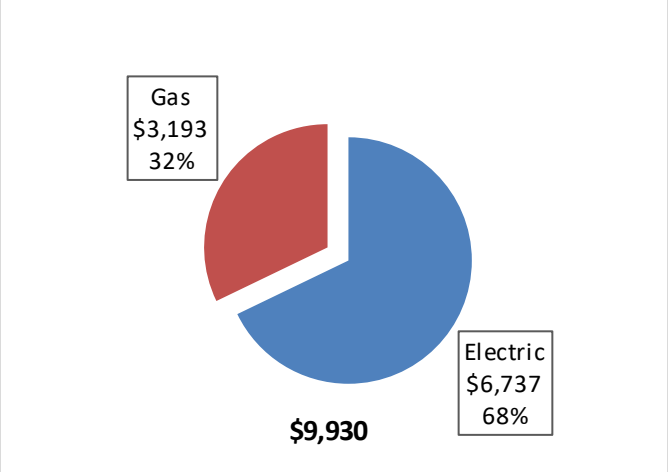
The following energy consumption and cost data is based on the last 12-month period of billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 12 - Utility Summary

Utility Summary for Building 36 - TRLC		
Fuel	Usage	Cost
Electricity	56,094 kWh	$6,737
Natural Gas	3,160 Therms	$3,193
Total		$9,930

The current annual energy cost for this facility is $9,930, as shown in the chart below.

Figure 13 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by Atlantic City Electric. The average electric cost over the past 12 months was $0.120/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. Electricity demand and consumption are greater in the summer months due to the increased cooling load used by electric air-conditioning equipment. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 14 - Graph of 12 Months of Electric Usage & Demand

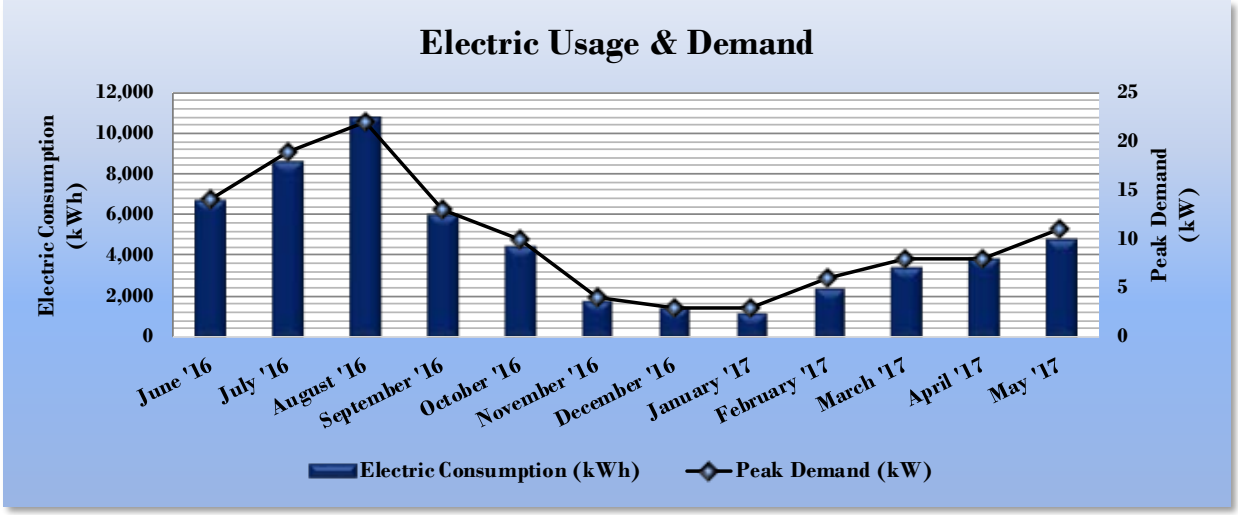


Figure 15 - Table of 12 Months of Electric Usage & Demand

Electric Billing Data for Building 36 - TRLC						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
6/30/16	30	6,782	14		$815	Yes
7/31/16	31	8,619	19		$1,035	Yes
8/31/16	31	10,856	22		$1,304	Yes
9/30/16	30	6,090	13		$731	Yes
10/31/16	31	4,518	10		$543	Yes
11/30/16	30	1,814	4		$218	Yes
12/31/16	31	1,528	3		$184	Yes
1/31/17	31	1,220	3		$147	Yes
2/28/17	28	2,474	6		$297	Yes
3/31/17	31	3,442	8		$413	Yes
4/30/17	30	3,911	8		$470	Yes
5/31/17	31	4,839	11		$581	Yes
Totals	365	56,094	22	$0	$6,737	12
Annual	365	56,094	22	$0	$6,737	

3.3 Natural Gas Usage

Natural gas is provided by South Jersey Gas. The average gas cost for the past 12 months is $1.011/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption reflects a gas heating profile and is shown in the chart below.

Figure 16 - Graph of 12 Months Natural Gas Usage

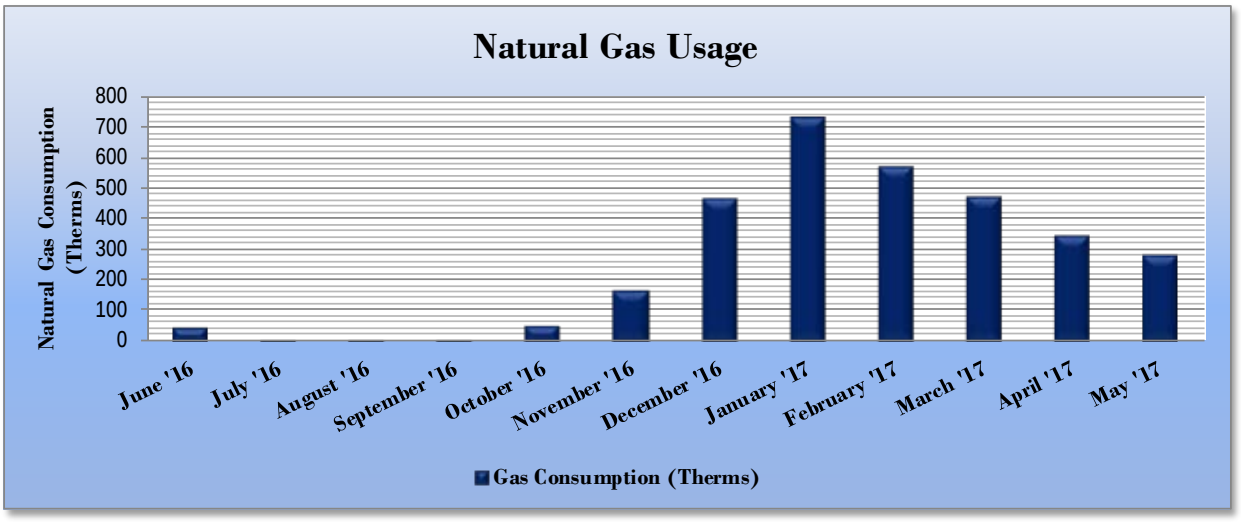


Figure 17 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Building 36 - TRLC				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
6/30/16	30	48	$48	Yes
7/31/16	31	3	$3	Yes
8/31/16	31	3	$3	Yes
9/30/16	30	5	$5	Yes
10/31/16	31	56	$57	Yes
11/30/16	30	167	$169	Yes
12/31/16	31	470	$475	Yes
1/31/17	31	734	$742	Yes
2/28/17	28	572	$578	Yes
3/31/17	31	472	$477	Yes
4/30/17	30	346	$350	Yes
5/31/17	31	283	$286	Yes
Totals	365	3,160	$3,193	12
Annual	365	3,160	$3,193	

3.4 Benchmarking

This facility was benchmarked using *Portfolio Manager®*, an online tool created and managed by the U.S. 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.

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 the specific building type will show if a building uses more or less energy than similar buildings 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 18 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Building 36 - TRLC	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft^2)	151.7	262.6
Site Energy Use Intensity (kBtu/ft^2)	82.5	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 19 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Building 36 - TRLC	**National Median Building Type: Higher Education - Public**
Source Energy Use Intensity (kBtu/ft^2)	118.9	262.6
Site Energy Use Intensity (kBtu/ft^2)	65.2	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 an ENERGY STAR® certification. This facility is currently not eligible to receive a score.

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

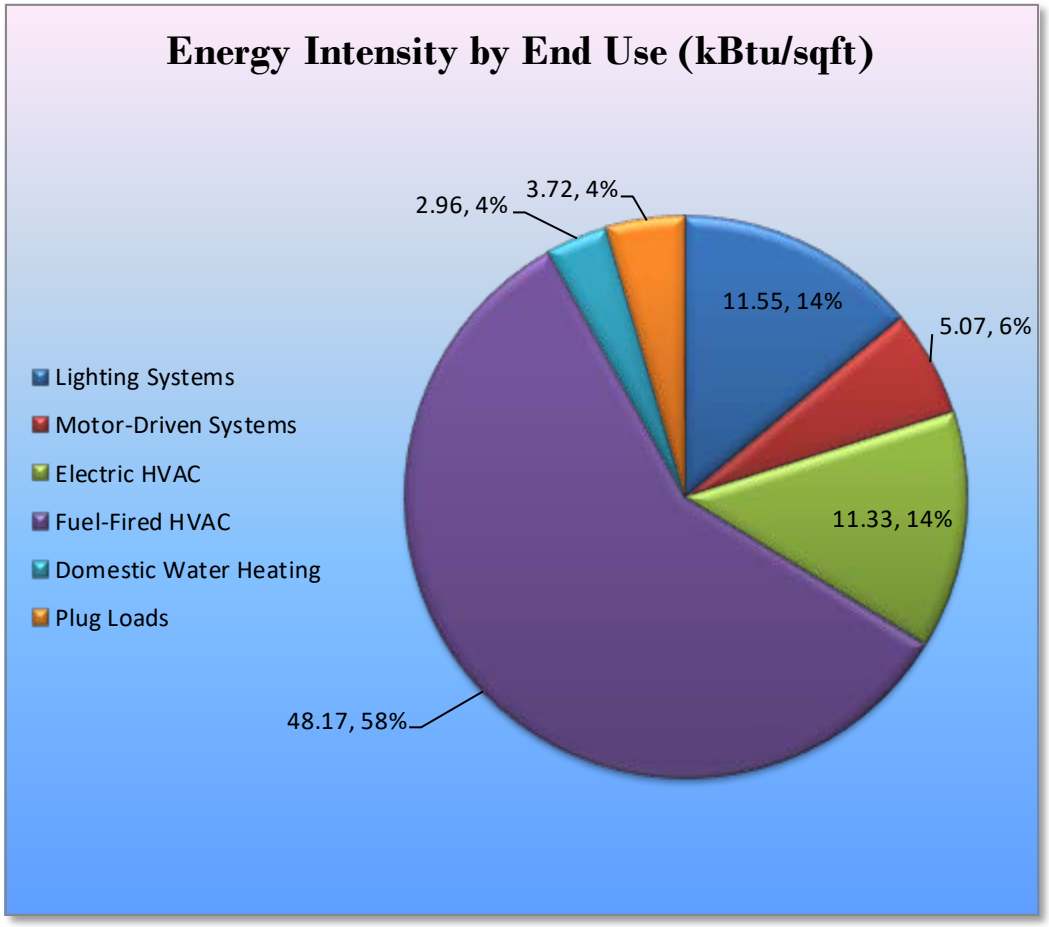
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

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

Figure 20 - 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 Building 36 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's Clean Energy Program Protocols to Measure Resource Savings* report dated June 29, 2016 and 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 21 – 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		**9,374**	**1.7**	**0.0**	**$1,125.80**	**$4,845.45**	**$970.00**	**$3,875.45**	**3.4**	**9,439**
ECM 1	Install LED Fixtures	1,809	0.3	0.0	$217.25	$1,931.93	$200.00	$1,731.93	8.0	1,822
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	215	0.0	0.0	$25.79	$68.77	$10.00	$58.77	2.3	216
ECM 3	Retrofit Fixtures with LED Lamps	7,350	1.4	0.0	$882.75	$2,844.75	$760.00	$2,084.75	2.4	7,402
Lighting Control Measures		**2,589**	**0.5**	**0.0**	**$310.92**	**$3,160.00**	**$280.00**	**$2,880.00**	**9.3**	**2,607**
ECM 4	Install Occupancy Sensor Lighting Controls	2,142	0.4	0.0	$257.22	$2,160.00	$280.00	$1,880.00	7.3	2,157
ECM 5	Install High/Low Lighitng Controls	447	0.1	0.0	$53.69	$1,000.00	$0.00	$1,000.00	18.6	450
Domestic Water Heating Upgrade		**0**	**0.0**	**6.8**	**$68.94**	**$28.68**	**$0.00**	**$28.68**	**0.4**	**799**
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	6.8	$68.94	$28.68	$0.00	$28.68	0.4	799
Food Service Equipment & Refrigeration Measures		**0**	**0.0**	**56.2**	**$567.72**	**$4,341.88**	**$400.00**	**$3,941.88**	**6.9**	**6,578**
ECM 7	Dishwasher Replacement	0	0.0	56.2	$567.72	$4,341.88	$400.00	$3,941.88	6.9	6,578
Plug Load Equipment Control - Vending Machine		**685**	**0.0**	**0.0**	**$82.27**	**$460.00**	**$0.00**	**$460.00**	**5.6**	**690**
ECM 8	Vending Machine Control	685	0.0	0.0	$82.27	$460.00	$0.00	$460.00	5.6	690
TOTALS		**12,648**	**2.1**	**63.0**	**$2,155.65**	**$12,836.01**	**$1,650.00**	**$11,186.01**	**5.2**	**20,113**

* - 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 22 below.

Figure 22 – 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		9,374	1.7	0.0	$1,125.80	$4,845.45	$970.00	$3,875.45	3.4	9,439
ECM 1	Install LED Fixtures	1,809	0.3	0.0	$217.25	$1,931.93	$200.00	$1,731.93	8.0	1,822
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	215	0.0	0.0	$25.79	$68.77	$10.00	$58.77	2.3	216
ECM 3	Retrofit Fixtures with LED Lamps	7,350	1.4	0.0	$882.75	$2,844.75	$760.00	$2,084.75	2.4	7,402

During lighting upgrade planning and design, we recommend a comprehensive approach that considers the efficiency of the lighting fixtures as well as their method of control.

Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended upgrades for each lighting measure.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	1,809	0.3	0.0	$217.25	$1,931.93	$200.00	$1,731.93	8.0	1,822

Measure Description

We recommend replacing exterior fixtures containing metal halide lamps with new, high-performance LED light fixtures. This measure saves energy by installing LEDs that use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes that are more than twice that of other sources.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	215	0.0	0.0	$25.79	$68.77	$10.00	$58.77	2.3	216
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting interior T12, linear, fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing, but would replace the other components with more efficient lighting technology. This measure saves energy by using 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 last more than twice as long as fluorescent tubes.

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	7,282	1.3	0.0	$874.55	$2,775.85	$740.00	$2,035.85	2.3	7,333
Exterior	68	0.0	0.0	$8.21	$68.90	$20.00	$48.90	6.0	69

Measure Description

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

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of fluorescent sources.

4.1.2 Lighting Control Measures

Figure 23 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**2,589**	**0.5**	**0.0**	**$310.92**	**$3,160.00**	**$280.00**	**$2,880.00**	**9.3**	**2,607**
ECM 4	Install Occupancy Sensor Lighting Controls	2,142	0.4	0.0	$257.22	$2,160.00	$280.00	$1,880.00	7.3	2,157
ECM 5	Install High/Low Lighitng Controls	447	0.1	0.0	$53.69	$1,000.00	$0.00	$1,000.00	18.6	450

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

Please see **Appendix A: Equipment Inventory & Recommendations** for a detailed list of the locations and recommended lighting control upgrades for each lighting measure.

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,142	0.4	0.0	$257.22	$2,160.00	$280.00	$1,880.00	7.3	2,157

Measure Description

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

ECM 5: 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)
447	0.1	0.0	$53.69	$1,000.00	$0.00	$1,000.00	18.6	450

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 stairwells, interior corridors, parking lots, and parking garages.

Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting and 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 levels after an area has been vacant for a preset period of time. Energy savings results from providing full lighting levels only when 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 are activated on the approach of an occupant.

4.1.3 DHW Heating System Upgrades

Our recommendations for DHW heating system improvements are summarized in Figure 24 below.

Figure 24 - Summary of DHW Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		0	0.0	6.8	$68.94	$28.68	$0.00	$28.68	0.4	799
ECM 4	Install Low-Flow Domestic Hot Water Devices	0	0.0	6.8	$68.94	$28.68	$0.00	$28.68	0.4	799

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on the facility's existing DHW equipment and recommended system upgrades.

ECM 6: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	6.8	$68.94	$28.68	$0.00	$28.68	0.4	799

Measure Description

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

Low-flow devices reduce the overall water flow from the fixture, but still provide adequate pressure for washing. These devices reduce the amount of water used per day, resulting in energy and water savings.

4.1.4 Food Service Equipment & Refrigeration Measures

Food service and refrigeration measures recommendations are summarized in Figure 25 below.

Figure 25 - Summary of Food Service Equipment & Refrigeration 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)
Food Service Equipment & Refrigeration Measures		0	0.0	56.2	$567.72	$4,341.88	$400.00	$3,941.88	6.9	6,578
ECM 5	Dishwasher Replacement	0	0.0	56.2	$567.72	$4,341.88	$400.00	$3,941.88	6.9	6,578

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing food service and refrigeration and our recommended measures for this category.

ECM 7: Dishwasher Replacement

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	56.2	$567.72	$4,341.88	$400.00	$3,941.88	6.9	6,578

Measure Description

We recommend the replacement of the dishwasher with a new energy-efficient, under-counter dishwasher. New high efficiency models often use an average of 40% less energy and water, compared to current standard efficiency equipment.

4.1.5 Plug Load Equipment Control - Vending Machines

ECM 8: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
685	0.0	0.0	$82.27	$460.00	$0.00	$460.00	5.6	690

Measure Description

Vending machines operate continuously, even during non-business hours. We recommend installing occupancy sensor controls to reduce the energy use. These controls power down vending machines when the area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the products cool. Energy savings are dependent on the vending machine and the activity level in that area.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor, but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 26 – Summary of Measures Evaluated, But Not Recommended

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)
Electric Unitary HVAC Measures	**5,354**	**3.0**	**0.0**	**$642.99**	**$24,377.00**	**$1,326.33**	**$23,050.66**	**35.8**	**5,391**
Install High Efficiency Heat Pumps	5,354	3.0	0.0	$642.99	$24,377.00	$1,326.33	$23,050.66	35.8	5,391
Domestic Water Heating Upgrade	**0**	**0.0**	**3.0**	**$30.20**	**$2,109.60**	**$50.00**	**$2,059.60**	**68.2**	**350**
Install High Efficiency Gas Water Heater	0	0.0	3.0	$30.20	$2,109.60	$50.00	$2,059.60	68.2	350
TOTALS	**5,354**	**3.0**	**3.0**	**$673.19**	**$26,486.60**	**$1,376.33**	**$25,110.26**	**37.3**	**5,741**

* - 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).

Install High-Efficiency Heat Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,354	3.0	0.0	$642.99	$24,377.00	$1,326.33	$23,050.66	35.8	5,391

Measure Description

We evaluated replacing standard-efficiency heat pumps with high-efficiency heat pumps. There have been significant improvements in both compressor and fan motor efficiencies during the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher energy efficiency ratio or seasonal energy efficiency ratio rating indicates a more efficient cooling system, and a higher heating seasonal performance factor rating indicates a more efficient heating mode. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new, high-efficiency unit, the average heating and cooling loads, and the estimated annual operating hours.

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

Reasons for not Recommending

The payback for replacing these units is longer than the effective useful life of the replacement equipment.

Install High-Efficiency Gas Water Heater

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	3.0	$30.20	$2,109.60	$50.00	$2,059.60	68.2	350

Measure Description

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

Please see **Appendix A: Equipment Inventory & Recommendations** for more details on existing equipment and proposed measures.

Reasons for not Recommending

The payback for replacing these units is longer than the effective useful life of the replacement equipment.

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 life can be extended, occupant comfort, health and safety can be improved, and energy and operations and maintenance 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.

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.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporator and condenser coils cause a restriction in air flow and heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

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 the boilers 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 it 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. Boilers should be cleaned regularly, according to the manufacturer's instructions, to remove this buildup in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons of the water heater using the drain valve. If there is a considerable amount of sediment or debris, then a full flush is recommended. This is done by turning the temperature down and then completely draining 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 or on the piping. If you notice any black residue, soot or charred metal, this is a sign you may be having combustion issues and 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 more than three to four years old, have a technician inspect the sacrificial anode annually.

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 site's 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).

Refer to Section 4.1.3 for any low-flow ECM recommendations.

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 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 whether 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 photovoltaic (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, location of free area, and shading elements show that the facility has a **low** potential for installing a PV array.

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

6.2 Combined Heat and Power

CHP are the on-site generation of electricity coupled with the recovery of heat energy, which are 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 electrical power needs supplied by grid purchases. The heat is used to supplement – or supplant – existing boilers for the purpose of space heating and/or DHW 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 that could continuously use 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.

Low and infrequent thermal load, and lack of space near the existing boilers, are the most significant factors contributing to the 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.

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, also known as curtailment service providers (CSPs), are registered with PJM, the independent system operator for mid-Atlantic state region that is responsible for maintaining electric grid reliability.

By enabling grid operators to call upon CSPs 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. CSPs make 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 DR activity in most situations.

The first step toward participation in a DR program is to contact a CSP. A list of these providers is available on PJM's website which includes contact information for each company, as well as the states where they do business (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 (www.pjm.com/training/trainingmaterial.aspx), along with a variety of other DR program information.

CSPs 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.

All Stockton University buildings participate in electricity demand response since 2012. CSPs are awarded by bid. The program meets or exceeds goal every year.

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 is also eligible to receive incentive payments for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 27 for a list of the eligible programs identified for each recommended ECM.

Figure 27 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	X					
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X					
ECM 3	Retrofit Fixtures with LED Lamps	X					
ECM 4	Install Occupancy Sensor Lighting Controls	X					
ECM 5	Install High/Low Lighitng Controls						
ECM 6	Install Low-Flow Domestic Hot Water Devices						
ECM 7	Dishwasher Replacement	X					
ECM 8	Vending Machine Control	X					

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

Most equipment sizes and types are served by the SmartStart program. The 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 their choice of contractor and can also utilize internal personnel, which would provide added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

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

8.2 Energy Savings Improvement Program

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

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

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

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project cost 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, the 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 services 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 the 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 your region's traditional utility company.

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 several 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 of 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
Multipurpose Room	34	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	23	3,640	None	Yes	34	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	23	2,548	0.15	854	0.0	$102.56	$810.00	$105.00	6.87
Multipurpose Room	13	Compact Fluorescent: one lamp CFL fixture	Wall Switch	13	3,640	Relamp	Yes	13	LED Screw-In Lamps: 1 lamp screw-in LED fixture	Occupancy Sensor	9	2,548	0.06	361	0.0	$43.33	$493.93	$100.00	9.09
Multipurpose Room	1	LED Screw-In Lamps: one lamp LED fixture	Wall Switch	17	3,640	None	Yes	1	LED Screw-In Lamps: one lamp LED fixture	Occupancy Sensor	17	2,548	0.00	21	0.0	$2.56	$0.00	$35.00	-13.65
Multipurpose Room	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 112B	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,640	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,640	0.04	247	0.0	$29.66	$68.77	$10.00	1.98
Room 110	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,640	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,548	0.11	615	0.0	$73.80	$416.06	$75.00	4.62
Hallway	25	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,640	Relamp	Yes	25	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	2,548	0.40	2,287	0.0	$274.62	$1,456.44	$125.00	4.85
Hallway	1	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	27	3,640	Relamp	Yes	1	LED - Linear Tubes: (1) 3' Lamp	High/Low Control	11	2,548	0.01	82	0.0	$9.88	$18.26	$0.00	1.85
Hallway	4	Compact Fluorescent: one lamp CFL fixture	Wall Switch	13	3,640	Relamp	Yes	4	LED Screw-In Lamps: 1 lamp screw-in LED fixture	High/Low Control	9	2,548	0.02	111	0.0	$13.33	$68.90	$20.00	3.67
Hallway	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room107	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,640	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,640	0.05	276	0.0	$33.18	$73.03	$20.00	1.60
Office 105	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,640	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,548	0.22	1,229	0.0	$147.60	$562.12	$115.00	3.03
Office 104	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,640	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,548	0.32	1,844	0.0	$221.41	$708.18	$155.00	2.50
Office 102	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,640	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,548	0.32	1,844	0.0	$221.41	$708.18	$155.00	2.50
Comupter Lab	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,548	Relamp	No	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,548	0.25	985	0.0	$118.24	$438.18	$120.00	2.69
Women's Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,640	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,640	0.03	147	0.0	$17.60	$36.52	$10.00	1.51
Women's Restroom	2	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	27	3,640	Relamp	No	2	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	3,640	0.02	138	0.0	$16.59	$36.52	$0.00	2.20
Men's Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,640	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,640	0.03	147	0.0	$17.60	$36.52	$10.00	1.51
Men's Restroom	2	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	27	3,640	Relamp	No	2	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	3,640	0.02	138	0.0	$16.59	$36.52	$0.00	2.20
Mechanical Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,640	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,640	0.03	147	0.0	$17.60	$36.52	$10.00	1.51
Exterior	4	Compact Fluorescent: one lamp CFL fixture	None	13	4,380	Relamp	No	4	LED Screw-In Lamps: 1 lamp screw-in LED fixture	None	9	4,380	0.01	79	0.0	$9.44	$68.90	$20.00	5.18
Exterior	2	Metal Halide: (1) 250W Lamp	None	295	4,380	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	89	4,380	0.30	2,080	0.0	$249.84	$1,931.93	$200.00	6.93

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
Ceiling	Multiple areas	3	Supply Fan	0.3	68.5%	No	2,745	No	68.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ceiling	Multiple areas	1	Supply Fan	3.0	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Heating Hot Water System	2	Heating Hot Water Pump	0.3	68.5%	No	2,745	No	68.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Heating Hot Water System	1	Heating Hot Water Pump	0.5	76.2%	No	2,745	No	76.2%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Multiple Areas	1	Split-System Air-Source HP	4.42	52.00	Yes	1	Split-System Air-Source HP	4.42	52.00	14.00	3.80	No	1.01	1,723	0.0	$206.91	$7,468.10	$406.33	34.13
Roof	Multiple Areas	2	Split-System Air-Source HP	2.00	23.00	Yes	2	Split-System Air-Source HP	2.00	23.00	14.00	3.80	No	0.92	1,536	0.0	$184.50	$6,763.56	$368.00	34.67
Roof	Multiple Areas	1	Split-System Air-Source HP	2.00	23.00	Yes	1	Split-System Air-Source HP	2.00	23.00	14.00	3.80	No	0.19	537	0.0	$64.44	$3,381.78	$184.00	49.63
Roof	Multiple Areas	1	Split-System Air-Source HP	4.00	47.00	Yes	1	Split-System Air-Source HP	4.00	47.00	14.00	3.80	No	0.92	1,558	0.0	$187.14	$6,763.56	$368.00	34.17

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
Mechancial Closet	Entire Facility	1	Condensing Hot Water Boiler	112.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechancial Closet	Entire Facility	1	Non-Condensing Hot Water Boiler	122.00	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
Electrical Closet	Entire Facility	1	Storage Tank Water Heater (≤ 50 Gal)	Yes	1	Storage Tank Water Heater (≤ 50 Gal)	Natural Gas	67.00%	EF	0.00	0	3.0	$30.20	$2,109.60	$50.00	68.21

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	4	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	6.8	$68.94	$28.68	$0.00	0.42

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Break Area	1	Under Counter (Low Temp)	Natural Gas	N/A	No	Yes	0.00	0	56.2	$567.72	$4,341.88	$400.00	6.94

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Meeting Room	1	Overhead Projector	200.0	
Break Area	2	Microwave	1,000.0	
Break Area	1	Refrigerator	600.0	
Multiple Areas	1	TV (S)	120.0	
Multiple Areas	2	TV (L)	150.0	
Office Area	1	Printer (S)	20.0	
Office Area	1	Printer (M)	250.0	
Office Area	1	Printer (L)	515.0	
Break Area	1	Minifridge	30.0	
Multiple Areas	15	Desktop Computers	75.0	

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
Multiple Areas	2	Non-Refrigerated	Yes	0.00	685	0.0	$82.27	$460.00	$0.00	5.59

Appendix B: EPA Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Stockton University - Bldg 36 : TRLC

Primary Property Type: Mixed Use Property
Gross Floor Area (ft²): 6,150
Built: 1986

For Year Ending: April 30, 2017
Date Generated: December 13, 2018

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
Stockton University - Bldg 36 : TRLC 101 Vera King Farris Drive Galloway, New Jersey 08205	Stockton University 101 Vera King Farris Drive Galloway, NJ 08205 (____)____-_____	Dan Cordle 101 Vera King Farris Drive Galloway, NJ 08205 609-652-4221 Dan.Cordle@stockton.edu

Property ID: 6626733

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
100 kBtu/ft²

Source EUI
158.3 kBtu/ft²

Annual Energy by Fuel		National Median Comparison	
Electric - Solar (kBtu)	112,956 (18%)	National Median Site EUI (kBtu/ft²)	56.4
Natural Gas (kBtu)	310,995 (51%)	National Median Source EUI (kBtu/ft²)	89.3
Electric - Grid (kBtu)	190,834 (31%)	% Diff from National Median Source EUI	77%
		Annual Emissions	
		Greenhouse Gas Emissions (Metric Tons CO2e/year)	36

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)