



Local Government Energy Audit: Energy Audit Report



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Technology Building
(Building 25)

Ocean County College

1 College Drive
Toms River, NJ 08754

June 28, 2017

Draft Report by:
TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities associated with recommended upgrades to the facility's systems at this site. Approximate savings are included in this report to make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. It should be noted that detailed design efforts are required in order to implement several of the improvements evaluated as part of this energy analysis.

The energy conservation measures and estimates of energy consumption contained in this report have been reviewed for technical accuracy. However, all estimates contained herein of energy consumption at the site are not guaranteed, because energy consumption ultimately depends on behavioral factors, the weather, and many other uncontrollable variables. The energy assessor and New Jersey Board of Public Utilities (NJBP) shall in no event be liable should the actual energy consumption vary from the estimated consumption shown herein.

Estimated installation costs are based on a variety of sources, including our own experience at similar facilities, our own pricing research using local contractors and vendors, and cost estimating handbooks such as those provided by RS Means. The cost estimates represent our best judgment for the proposed action. The Owner 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 a particular installation, and for conditions which cannot be known prior to in-depth investigation and design, the energy assessor does not guarantee installed cost estimates and shall in no event be liable should actual installed costs vary from the estimated costs herein.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates and are based on program information available at the time this report is written. The NJBP reserves the right to extend, modify, or terminate programs without prior or further notice, including incentive levels and eligibility requirements. The Owner should review available program incentives and requirements prior to selecting and/or installing any recommended measures.

Table of Contents

1	Executive Summary.....	6
1.1	Facility Summary	6
1.2	Your Cost Reduction Opportunities.....	6
	Energy Conservation Measures.....	6
	Energy Efficient Practices	8
	Self-Generation Measures	8
1.3	Implementation Planning.....	8
2	Facility Information and Existing Conditions	10
2.1	Project Contacts	10
2.2	General Site Information.....	10
2.3	Building Occupancy	10
2.4	Building Envelope	11
2.5	On-site Generation.....	11
2.6	Energy-Using Systems	11
	Lighting System	11
	Hot Water System	11
	Air Conditioning (DX).....	12
	Domestic Hot Water.....	12
	Plug load & Vending Machines	12
2.7	Water-Using Systems	12
3	Site Energy Use and Costs.....	13
3.1	Total Cost of Energy	13
3.2	Electricity Usage	14
3.3	Natural Gas Usage	15
3.4	Benchmarking.....	15
3.5	Energy End-Use Breakdown	18
4	Energy Conservation Measures	19
4.1	Recommended ECMs	19
4.1.1	Lighting Upgrades.....	20
	ECM 1: Install LED Fixtures	20
	ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers.....	21
	ECM 3: Install LED Exit Signs.....	21
4.1.2	Lighting Control Measures	22
	ECM 4: Install Occupancy Sensor Lighting Controls	22
4.1.3	Electric Unitary HVAC Measures	23
	ECM 5: Install High Efficiency Electric AC.....	23
4.1.4	Domestic Water Heating Upgrade	23
	ECM 6: Install Low-Flow DHW Devices.....	24

4.1.5	Plug Load Equipment Control - Vending Machine	24
	ECM 7: Vending Machine Control	24
5	Energy Efficient Practices	25
	Close Doors and Windows	25
	Perform Proper Lighting Maintenance.....	25
	Develop a Lighting Maintenance Schedule	25
	Ensure Lighting Controls Are Operating Properly	25
	Perform Routine Motor Maintenance	25
	Practice Proper Use of Thermostat Schedules and Temperature Resets	26
	Clean Evaporator/Condenser Coils on AC Systems	26
	Clean and/or Replace HVAC Filters	26
	Perform Proper Water Heater Maintenance	26
	Plug Load Controls.....	26
	Water Conservation	26
6	Self-Generation Measures.....	28
6.1	Photovoltaic.....	28
7	Demand Response	30
8	Project Funding / Incentives	31
8.1	SmartStart	31
8.2	Direct Install	32
8.3	SREC Registration Program.....	33
8.4	Energy Savings Improvement Program.....	33
8.5	Demand Response Energy Aggregator.....	34
9	Energy Purchasing and Procurement Strategies	35
9.1	Retail Electric Supply Options.....	35
9.2	Retail Natural Gas Supply Options	35

Appendix A: Equipment Inventory & Recommendations

Appendix B: EPA Statement of Energy Performance

Table of Figures

Figure 1 – Previous 12 Month Utility Costs.....	6
Figure 2 – Potential Post-Implementation Costs	6
Figure 3 – Summary of Energy Reduction Opportunities	7
Figure 4 – Project Contacts	10
Figure 5 - Building Schedule.....	10
Figure 6 - Utility Summary	13
Figure 7 - Energy Cost Breakdown	13
Figure 8 - Graph of 12 Months Electric Usage & Demand	14
Figure 9 - Table of 12 Months Electric Usage & Demand	14
Figure 10 - Graph of 12 Months Natural Gas Usage	15
Figure 11 - Table of 12 Months Natural Gas Usage	15
Figure 12 - Energy Use Intensity Comparison – Existing Conditions.....	16
Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures	16
Figure 14 - Energy Balance (% and kBtu/SF)	18
Figure 15 – Summary of Recommended ECMs.....	19
Figure 16 – Summary of Lighting Upgrade ECMs.....	20
Figure 17 – Summary of Lighting Control ECMs	22
Figure 18 - Summary of Unitary HVAC ECMs.....	23
Figure 19 - Summary of Domestic Water Heating ECMs	23
Figure 20 - Summary of Solar PV Array Analysis for OCC Campus.....	29
Figure 22 - ECM Incentive Program Eligibility	31

I EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPUB) has sponsored this Local Government Energy Audit (LGEA) Report for Technology Building.

The goal of a LGEA is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and put you in a position to implement the ECMs. The LGEA also sets you on the path to receive financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing the ECMs.

This study was conducted by TRC Energy Services, as part of a comprehensive effort to assist New Jersey local government in controlling energy costs and protecting our environment by offering a full spectrum of energy management options.

I.1 Facility Summary

The Technology Building at Ocean County College is a 31,250 square foot, two-story building constructed in 2003. It has a flat roof with double paned windows. Interior lighting is predominantly linear T8 lamp fixtures with electronic ballasts. Lighting control is provided by both occupancy sensors and manual wall switches. Cooling and heating are provided by two (2) rooftop packaged units, two (2) split AC units, and (5) hydroTherm modular hot water boilers. The building receives electric power via the campus main account (with JCP&L). The building has no separate utility meters onsite during the site visit.

A thorough description of the facility and our observations are located in Section 2.

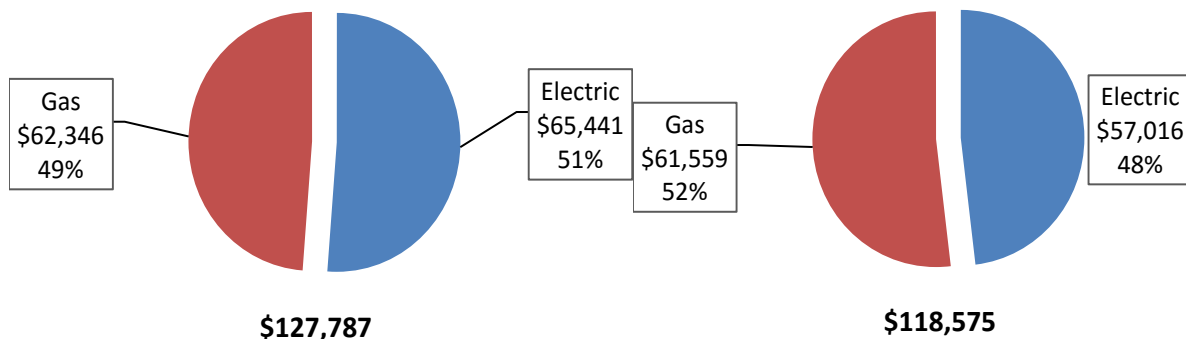
I.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC Energy Services evaluated 7 projects which represent an opportunity for Technology Building to reduce annual energy costs by roughly \$9,212 and annual greenhouse gas emissions by 61,392 lbs CO₂e. The measures would pay for themselves in roughly 5.23 years. The breakdown of existing and potential utility costs is illustrated in Figure 1 and Figure 2, respectively. These projects represent an opportunity to reduce Technology Building's annual energy use by 3.3%. We estimate that the building's electric costs would be reduced by about 7.2% overall.

Figure 1 – Previous 12 Month Utility Costs

Figure 2 – Potential Post-Implementation Costs



A detailed description of Technology Building’s existing energy use can be found in Section 3 “Site Energy Use and Costs”.

The evaluated measures have been listed and grouped into major categories as shown in Figure 3. Brief descriptions of the categories can be found below and descriptions of the individual 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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades		46,280	9.3	0.0	\$7,579.33	\$43,793.46	\$2,995.00	\$40,798.46	5.38	46,603
ECM 1	Install LED Fixtures	6,256	1.3	0.0	\$1,024.57	\$8,882.57	\$400.00	\$8,482.57	8.28	6,300
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	37,273	7.8	0.0	\$6,104.35	\$34,158.00	\$2,595.00	\$31,563.00	5.17	37,534
ECM 3	Install LED Exit Signs	2,750	0.2	0.0	\$450.41	\$752.89	\$0.00	\$752.89	1.67	2,769
Lighting Control Measures		1,498	0.3	0.0	\$245.38	\$1,972.00	\$340.00	\$1,632.00	6.65	1,509
ECM 4	Install Occupancy Sensor Lighting Controls	1,498	0.3	0.0	\$245.38	\$1,972.00	\$340.00	\$1,632.00	6.65	1,509
Electric Unitary HVAC Measures		848	0.5	0.0	\$138.92	\$4,488.66	\$276.00	\$4,212.66	30.32	854
ECM 5	Install High Efficiency Electric AC	848	0.5	0.0	\$138.92	\$4,488.66	\$276.00	\$4,212.66	30.32	854
Domestic Water Heating Upgrade		0	0.0	81.9	\$786.62	\$86.04	\$0.00	\$86.04	0.11	9,586
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	81.9	\$786.62	\$86.04	\$0.00	\$86.04	0.11	9,586
Plug Load Equipment Control - Vending Machine		2,821	0.0	0.0	\$461.96	\$1,437.60	\$0.00	\$1,437.60	3.11	2,840
ECM 7	Vending Machine Control	2,821	0.0	0.0	\$461.96	\$1,437.60	\$0.00	\$1,437.60	3.11	2,840
TOTALS		51,447	10.1	81.9	\$9,212.20	\$51,777.76	\$3,611.00	\$48,166.76	5.23	61,392

* - 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 conditions allow. 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 old inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide cooling equivalent to older air condition systems, but use less energy. These measures save energy by reducing the power used by the air condition system due to improved electrical efficiency.

Domestic Water Heating upgrade measures generally involve replacing old inefficient domestic water heating systems with modern energy efficient systems. New domestic water heating systems can provide equivalent or greater capacity as older systems, but use less energy. These measures save energy by reducing the fuel used by the domestic water heating systems due to improved efficiency or the removal of standby losses.

Plug Load Equipment control measures generally involve installing automation that limits the power use or operation of equipment plugged into an electrical receptacle based on occupancy.

Energy Efficient Practices

TRC Energy Services also identified 11 no/low cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems. Through these practices equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. Opportunities identified at Technology Building include:

- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these Energy Efficient Practices, please refer to Section 5.

Self-Generation Measures

TRC Energy Services evaluated the potential for installing self-generation sources for Technology Building. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

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

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, the equipment changes outlined for each ECM need to be selected and installed through project implementation. One of the first considerations is if there is capital available for project implementation. Another consideration is whether to pursue individual ECMs, a group of ECMs, or a comprehensive approach wherein all ECMs are pursued, potentially in conjunction with other facility projects or improvements.

Rebates, incentives, and financing are available from the NJBPU, NJCEP, as well as some of the state's investor-owned utilities, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any project, please review the appropriate incentive program guidelines before proceeding. This is important because in most cases you will need to submit an application for the incentives before purchasing materials and beginning installation.

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

- SmartStart (SS)
- Direct Install (DI)
- Energy Savings Improvement Program (ESIP)

For facilities with capital available for implementation of selected individual measures or phasing 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 design the ECM(s), select the equipment and apply for the incentive(s). Program pre-approval is required for some SS incentives, so only after receiving approval may the ECM(s) be installed. The incentive values listed above in Figure 3 represent the SS program and will be explained further in Section 8, as well as the other programs as mentioned below.

This facility also qualifies for the Direct Install program which, through an authorized network of participating contractors, can assist with the implementation of a group of measures versus installing individual measures or phasing implementation. This program is designed to be turnkey and will provide an incentive up to 70% of the cost of the project identified by the designated contractor.

For facilities without capital available 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 external project development, design, and implementation services as well as financing for implementing ECMs. This LGEA report is the first step for participating in ESIP and should help you determine next steps. Refer to Section 8.7 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a program (non-NJCEP) designed to reduce consumer electric load when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability locally. By enabling grid operators to call upon Curtailment Service Providers and energy consumers 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 will receive payments whether or not their facility is called upon to curtail their load. Refer to Section 7 for additional information on this program.

Additional descriptions of all relevant incentive programs are located in Section 8. You may also check the following website for further information on available rebates and incentives:

www.njcleanenergy.com/ci

To ensure projects are implemented such that maximum savings and incentives are achieved, bids and specifications should be reviewed by your procurement personnel and/or consultant(s) to ensure that selected equipment coincides with LGEA recommendations, as well as applicable incentive program guidelines and requirements.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
James CALAMIA	Director of Facility	jcalamia@ocean.edu	732-255-0400 Ex. t2066
Designated Representative			
John Jack	Maintenance Technician		732-255-0400
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	732-855-2883

2.2 General Site Information

On June 13, 2016, TRC Energy Services performed an energy audit at Technology Building located in Toms River, NJ. TRC Energy Services' team met with John Jack to review the facility operations and focus the investigation on specific energy-using systems.

The two-story building is a 31,250 square feet facility constructed in 2003 and houses five teaching computer labs, two computer graphics labs, an ITV classroom, a video post-production studio, a 72-seat stepped lecture hall, an executive conference room, as well as, faculty and support offices.

The foundation consists of conventional, reinforced concrete foundation and exterior walls are finished with brick masonry and concrete block. It has a flat roof covered with a black and white membrane and is in good condition. The windows throughout the facility are double paned glass. Exterior doors are glass as well housed in a metal frame. All door and window seals appeared to be tight. No signs of outside air infiltration was noted.

The building receives electric power via the campus main account (with JCP&L). The building has no separate utility meters onsite during the site visit, but the site contact mentioned that all campus buildings will be metered very soon.

Interior lighting is predominantly linear T8 fixtures and lamps with electronic ballasts. Lighting control is provided by both occupancy sensors and manual wall switches.

In contrast to many campus buildings, the Technology Building is one the few that is not supplied hot water from the Central Plant. It produces its own hot water for heating through five modular hot water boilers. Cooling is provided by two (2) rooftop packaged and two (2) split AC units.

2.3 Building Occupancy

The building is used year round and the occupancy varies with classes. The typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Technology Building #25	Weekday	7:00 AM - 6:00 PM
Technology Building #25	Weekend	10:00 AM - 6:00 PM

2.4 Building Envelope



The two-story building has, reinforced concrete foundation. It has a flat roof covered with a black and white membrane. The building is constructed of concrete block and brick masonry. The windows are double paned. Exterior doors and windows are all glass with metal framed. They are in good condition with no signs of outside air infiltration.

2.5 On-site Generation

The campus has a 1.1 MW Waukesha reciprocating engines combined heat and power (CHP) power plant at the Central Plant. The CHP plant generates a significant portion of the power used by the Technology Building and other central campus buildings.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided predominately by linear 32 Watt fluorescent T8 lamps with electronic ballasts as well as compact fluorescent lamps (CFL). Most of the building tenant spaces use 2-lamp or 3-lamp, 4-foot long troffers with diffusers. The first floor lobby, room 107 (conference room), hallway, and the video production room are lit with 13 Watt CFL recessed cans with electronic ballasts. The remaining building's spaces are lit with 32 Watt linear fluorescent lamps and fixtures. Lighting control is provided by both occupancy sensors and manual wall switches. The building has a minimal exterior light which consists of four (4) 250 Watt metal halide lamps. They are controlled with photocells.

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Hot Water System



The hot water system consists of five (5) HydroTherm modular gas-fired non-condensing water boilers with an output capacity of 1,525 MBh each and an estimated nominal efficiency of 80%. They are configured in variable flow primary distribution with two (2) 5 hp hot water supply pumps and two (2) 3 hp return pumps. The pumps are equipped with variable frequency drives. They provide hot water to Trane packaged rooftop units equipped with hot water coil for heating and direct-expansion coil for cooling. The boilers are in good condition and well maintained. The operation and scheduling of all the boilers is controlled from the

Central Plant.

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Air Conditioning (DX)



Two 1.5 ton Mitsubishi split AC units are used to condition room 211 (Telecommunication room). The units are located on the roof. One 40 ton and one 55 ton Trane direct-expansion (DX) packaged units with a hot water coil are used to cool and heat the rest of the building. They provide constant air volume with a single 5 hp and 15 hp supply fan and a 1.5 hp and 7.5 hp return fan respectively. Air is exhausted from toilet rooms, corridors, and meeting areas through the roof exhausters. The operation and scheduling of all chillers is controlled from the Central Plant.

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Domestic Hot Water

The building has a minimal demand for domestic hot water. Domestic hot water is provided by one (1) 40-gallon gas fired A.O. Smith hot water heater located in Room 119. It is 9 years old and appeared to be in good condition.

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Plug load & Vending Machines

The building has approximately 213 computers that are mostly computers with LCD monitors. There is one server closet with cooling provided by the Mitsubishi split AC. The facility has two (2) refrigerated beverage vending machines.

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

2.7 Water-Using Systems

There are several restrooms at this facility. A sampling of restrooms found that all of the faucets are rated for 2.2 gpm or higher, the toilets are rated at 2.5 gallons per flush and the urinals are rated at 2 gallons per flush.

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/ft² and energy use/ft². These energy use indices are indicative of the relative energy effectiveness of this building. There are a number of factors that could cause the energy use of this building to vary from the “typical” energy use for other facilities identified as: Higher Education - Public. Specific local climate conditions, daily occupancy hours of the facility, seasonal fluctuations in occupancy, daily operating hours of energy use systems, and the behavior of the occupants with regard to operating systems that impact energy use such as turning off appliances and leaving windows open. 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. So, we had to use our best estimate of consumption for each building to divide up the energy purchases through the mater electric and gas accounts. Annual electric usage for each building on the main account was estimated from the partial year submeter data that was available. Thermal load for each building on the central heating and cooling loops was apportioned according to building square footage. These estimates were complicated by the fact that the amount of electricity produced by the Central Plant’s CHP system could not be determined precisely for the billing period for which we had utility bills. So, our usage estimates may vary from current actual energy usage for some buildings that are supplied by master metered electric and gas accounts.

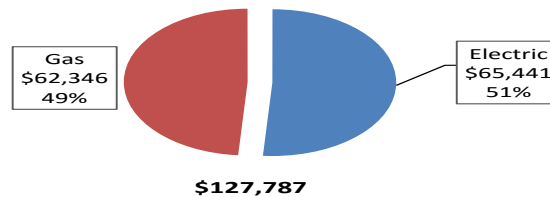
The Instructional Computer Center receives all electric and thermal energy from the campus’ mater electric and gas accounts. Below is our estimate of the portion of energy consumptions and costs that can be attributed to the Library building.

Figure 6 - Utility Summary

Utility Summary for Technology Building		
Fuel	Usage	Cost
Electricity	399,586 kWh	\$65,441
Natural Gas	64,886 Therms	\$62,346
Total		\$127,787

The current utility cost for this site is \$127,787 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost (combined for commodity, transmission and distribution) for the past 12 months is \$0.164/kWh, which is the blended rate used throughout the analyses in this report. The monthly electricity consumption and peak demand is represented graphically in the chart below.

Figure 8 - Graph of 12 Months Electric Usage & Demand

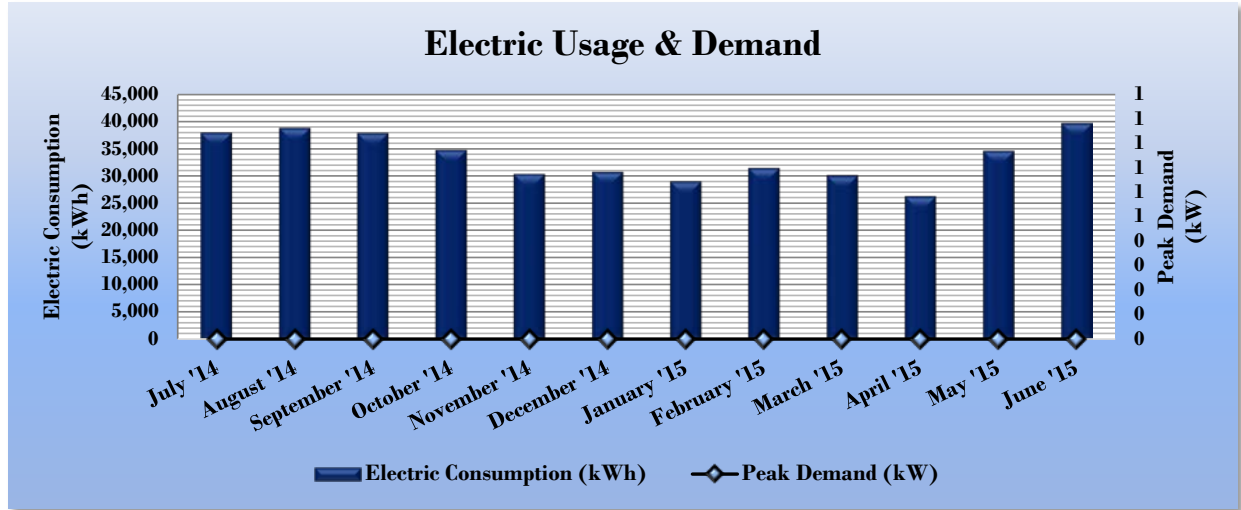


Figure 9 - Table of 12 Months Electric Usage & Demand

Electric Billing Data for Technology Building						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
8/1/14	31	37,942			\$4,386	Yes
9/1/14	29	38,810			\$5,990	Yes
10/1/14	29	37,907			\$6,144	Yes
11/1/14	32	34,788			\$5,942	Yes
12/1/14	31	30,365			\$5,333	Yes
1/1/15	32	30,799			\$5,101	Yes
2/1/15	30	29,023			\$5,326	Yes
3/1/15	29	31,447			\$7,340	Yes
4/1/15	32	30,108			\$4,760	Yes
5/1/15	30	26,271			\$4,374	Yes
6/1/15	32	34,630			\$5,572	Yes
7/1/15	30	39,685			\$5,531	Yes
Totals	367	401,776	0	\$0	\$65,800	12
Annual	365	399,586	0	\$0	\$65,441	

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is \$0.961/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is represented graphically in the chart below.

Figure 10 - Graph of 12 Months Natural Gas Usage

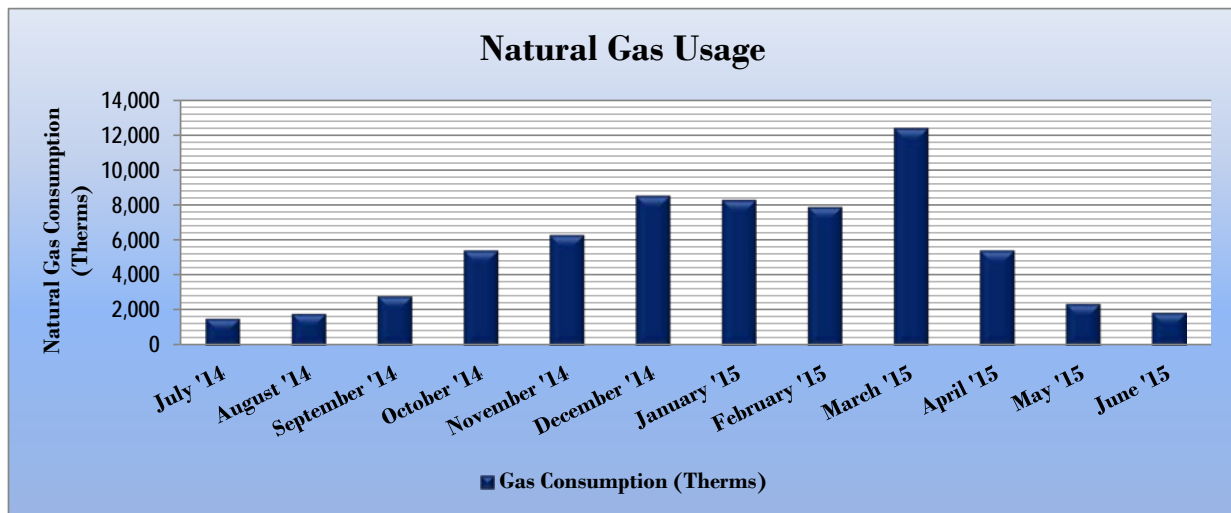


Figure 11 - Table of 12 Months Natural Gas Usage

Gas Billing Data for Technology Building				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
8/1/14	31	1,536	\$1,018	Yes
9/1/14	31	1,806	\$2,183	Yes
10/1/14	30	2,812	\$2,721	Yes
11/1/14	31	5,419	\$5,021	Yes
12/1/14	31	6,309	\$5,656	Yes
1/1/15	30	8,544	\$8,349	Yes
2/1/15	31	8,310	\$8,051	Yes
3/1/15	28	7,901	\$7,672	Yes
4/1/15	30	12,395	\$11,491	Yes
5/1/15	29	5,418	\$5,320	Yes
6/1/15	33	2,383	\$2,618	Yes
7/1/15	29	1,875	\$2,075	Yes
Totals	364	64,708	\$62,175	12
Annual	365	64,886	\$62,346	

3.4 Benchmarking

This facility was benchmarked through Portfolio Manager, an online tool created and managed by the United State Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager analyzes your building’s consumption data, cost information, and operational use details and

compares its performance against a yearly baseline, national medians, or similar buildings in your portfolio. Metrics used in this comparison are the energy use intensity (EUI) and ENERGY STAR® Score.

Energy use intensity 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 energy than similar buildings on a square foot basis or if that building performs better than the median. EUI is presented in both 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 is the raw fuel consumed to generate the energy consumed at the site, factoring in energy production and distribution losses.

Due to the many uncertainties regarding electric and gas end-usage for buildings on master metered accounts (as discussed in Sections 3.2 and 3.3 above), we have provided a combined benchmarking (in kBtu/sq-ft) for all campus buildings that are served by master electric and gas accounts.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Technology Building	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft ²)	355.0	262.6
Site Energy Use Intensity (kBtu/ft ²)	251.3	130.7

By implementing all recommended measures covered in this reporting, the Project’s estimated post-implementation EUI improves as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Technology Building	National Median Building Type: Higher Education - Public
Source Energy Use Intensity (kBtu/ft ²)	334.6	262.6
Site Energy Use Intensity (kBtu/ft ²)	243.0	130.7

Many buildings can also receive a 1 – 100 ENERGY STAR® score. This score 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 does not currently qualify to receive an ENERGY STAR™ 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. While this does not qualify is not eligible for an ENERGY STAR™ score, 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 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>

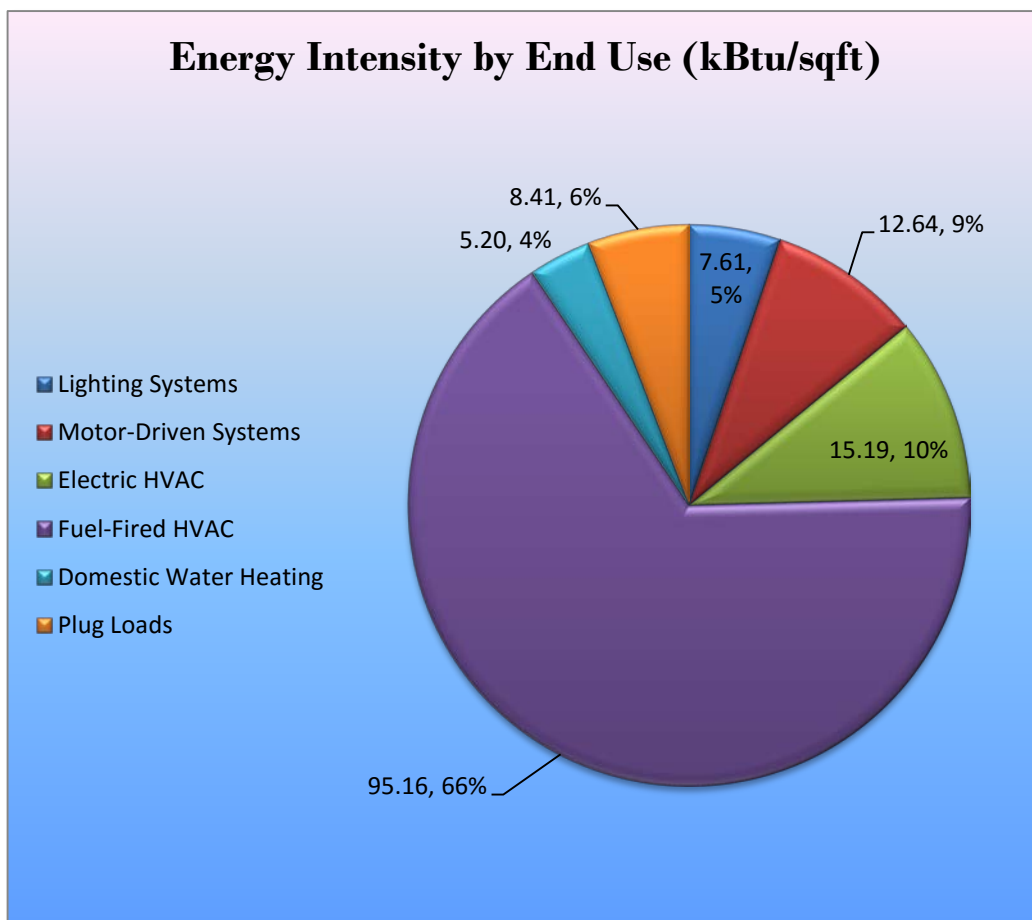
3.5 Energy End-Use Breakdown

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 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.

This breakdown of energy usage is based on both our estimates of the Technology 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 14 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy projects, help prioritize specific measures for implementation, and set Technology Building on the path to receive financial incentives. 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 considered sufficient to make “Go/No-Go” decisions and to prioritize energy projects. Savings are based on the New Jersey Board of Public Utilities New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016. Further analysis or investigation may be required to calculate more accurate savings to support any custom SmartStart, Pay for Performance, or Large Energy Users incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJ prescriptive SmartStart program. Depending on your implementation strategy, the project may be eligible for more lucrative incentives through other programs as identified in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Lighting Upgrades		46,280	9.3	0.0	\$7,579.33	\$43,793.46	\$2,995.00	\$40,798.46	5.38	46,603
ECM 1	Install LED Fixtures	6,256	1.3	0.0	\$1,024.57	\$8,882.57	\$400.00	\$8,482.57	8.28	6,300
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	37,273	7.8	0.0	\$6,104.35	\$34,158.00	\$2,595.00	\$31,563.00	5.17	37,534
ECM 3	Install LED Exit Signs	2,750	0.2	0.0	\$450.41	\$752.89	\$0.00	\$752.89	1.67	2,769
Lighting Control Measures		1,498	0.3	0.0	\$245.38	\$1,972.00	\$340.00	\$1,632.00	6.65	1,509
ECM 4	Install Occupancy Sensor Lighting Controls	1,498	0.3	0.0	\$245.38	\$1,972.00	\$340.00	\$1,632.00	6.65	1,509
Electric Unitary HVAC Measures		848	0.5	0.0	\$138.92	\$4,488.66	\$276.00	\$4,212.66	30.32	854
ECM 5	Install High Efficiency Electric AC	848	0.5	0.0	\$138.92	\$4,488.66	\$276.00	\$4,212.66	30.32	854
Domestic Water Heating Upgrade		0	0.0	81.9	\$786.62	\$86.04	\$0.00	\$86.04	0.11	9,586
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	81.9	\$786.62	\$86.04	\$0.00	\$86.04	0.11	9,586
Plug Load Equipment Control - Vending Machine		2,821	0.0	0.0	\$461.96	\$1,437.60	\$0.00	\$1,437.60	3.11	2,840
ECM 7	Vending Machine Control	2,821	0.0	0.0	\$461.96	\$1,437.60	\$0.00	\$1,437.60	3.11	2,840
TOTALS		51,447	10.1	81.9	\$9,212.20	\$51,777.76	\$3,611.00	\$48,166.76	5.23	61,392

* - 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

Lighting Upgrades include several “submeasures” as outlined in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
Lighting Upgrades		46,280	9.3	0.0	\$7,579.33	\$43,793.46	\$2,995.00	\$40,798.46	5.38	46,603
ECM 1	Install LED Fixtures	6,256	1.3	0.0	\$1,024.57	\$8,882.57	\$400.00	\$8,482.57	8.28	6,300
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	37,273	7.8	0.0	\$6,104.35	\$34,158.00	\$2,595.00	\$31,563.00	5.17	37,534
ECM 3	Install LED Exit Signs	2,750	0.2	0.0	\$450.41	\$752.89	\$0.00	\$752.89	1.67	2,769

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 ₂ e Emissions Reduction (lbs)
Interior	1,735	0.4	0.0	\$284.17	\$5,410.34	\$0.00	\$5,410.34	19.04	1,747
Exterior	4,026	0.8	0.0	\$659.30	\$2,008.27	\$400.00	\$1,608.27	2.44	4,054

Measure Description

This measure evaluates replacing existing fixtures containing fluorescent and HID lamps with new high performance LED light fixtures. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Maintenance savings are anticipated since LED sources have burn hours which are generally more than twice that of a fluorescent source and more than 10 times incandescent sources. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

During planning and design for the installation of new fixtures, we recommend a holistic approach that considers both the technology of the lighting sources and how they are controlled.

Please refer to Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and light fixtures affected by this measure.

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 ₂ e Emissions Reduction (lbs)
Interior	37,273	7.8	0.0	\$6,104.35	\$34,158.00	\$2,595.00	\$31,563.00	5.17	37,534
Exterior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.00	0

Measure Description

This measure evaluates replacing linear fluorescent lamps, ballasts, and reflectors with LED tube lamps, reflectors, and drivers specifically designed for existing linear fluorescent fixtures. The retrofit uses the existing fixture housing but replaces the rest of the components with an efficient source and reflectors designed for LEDs. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output and efficiently projects the light into the space.

Maintenance savings are anticipated since LED sources have burn hours which are more than twice that of a fluorescent source. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

During retrofit planning and design, we recommend a holistic approach that considers both the technology of the lighting sources and how they are controlled.

Please refer to Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and light fixtures affected by this measure.

ECM 3: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
Interior	2,750	0.2	0.0	\$450.41	\$752.89	\$0.00	\$752.89	1.67	2,769
Exterior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.00	0

Measure Description

This measure evaluates replacing incandescent lighting in exit signs with LEDs. LED sources require virtually no maintenance and LED exit signs have a life expectancy of at least 20 years. Many manufacturers can provide retrofit kits that meet fire and safety code requirements. Retrofit kits are less expensive and simpler to install than replacement signs, however, new fixtures would have a longer useful life and are therefore recommended.

A reduction in maintenance costs will be realized with the proposed retrofit because lamps will not have to be replaced as frequently.

Please refer to Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and light fixtures affected by this measure.

4.1.2 Lighting Control Measures

Lighting control measures include one “submeasure” as outlined in Figure 17 below.

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
Lighting Control Measures	1,498	0.3	0.0	\$245.38	\$1,972.00	\$340.00	\$1,632.00	6.65	1,509
ECM 4 Install Occupancy Sensor Lighting Controls	1,498	0.3	0.0	\$245.38	\$1,972.00	\$340.00	\$1,632.00	6.65	1,509

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 ₂ e Emissions Reduction (lbs)
1,498	0.3	0.0	\$245.38	\$1,972.00	\$340.00	\$1,632.00	6.65	1,509

Measure Description

This measure evaluates installing occupancy sensors to control light fixtures that are currently manually controlled in classrooms and private offices. Sensors detect occupancy using ultrasonic and/or infrared wave technologies. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Occupants will also be able to manually turn off fixtures. Energy savings result 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. Ceiling-mounted or remote-mounted sensors require the use of low voltage switching relays or a wireless signal to the switch. In general, use wall switch replacement sensors for single occupant offices and other small rooms. Install ceiling-mounted or remote mounted sensors in locations without local switching, in situations where the existing wall switches are not in the line-of-sight of the main work area, and in large spaces. We recommend a holistic design approach that considers both the technology of the lighting sources and how they are controlled.

Maintenance savings are anticipated due to reduced lamp operation, however, additional maintenance costs may be incurred because the occupancy sensors may require periodic adjustment; it is anticipated that the net effect on maintenance costs will be negligible.

Please refer to Appendix A: Equipment Inventory & Recommendations for a detailed list of the locations and light fixtures affected by this measure.

4.1.3 Electric Unitary HVAC Measures

Unitary HVAC measures include one “submeasure” as outlined in Figure 18 below.

Figure 18 - Summary of Unitary HVAC 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 ₂ e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		848	0.5	0.0	\$138.92	\$4,488.66	\$276.00	\$4,212.66	30.32	854
ECM 5	Install High Efficiency Electric AC	848	0.5	0.0	\$138.92	\$4,488.66	\$276.00	\$4,212.66	30.32	854

ECM 5: Install High Efficiency Electric AC

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 ₂ e Emissions Reduction (lbs)
848	0.5	0.0	\$138.92	\$4,488.66	\$276.00	\$4,212.66	30.32	854

Measure Description

This measure evaluates replacing the two Mitsubishi split air conditioners with high efficiency split air conditioners. There have been significant improvements in both compressor and fan motor efficiencies in the past several years. Therefore, electricity savings can be achieved by replacing old units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the old and new unit, the cooling load, and the annual operating hours.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

4.1.4 Domestic Water Heating Upgrade

Domestic water heating measures include one “submeasures” as outlined in Figure 19 below.

Figure 19 - Summary of Domestic Water 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 ₂ e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		0	0.0	81.9	\$786.62	\$86.04	\$0.00	\$86.04	0.11	9,586
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	81.9	\$786.62	\$86.04	\$0.00	\$86.04	0.11	9,586

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 ₂ e Emissions Reduction (lbs)
0	0.0	81.9	\$786.62	\$86.04	\$0.00	\$86.04	0.11	9,586

Measure Description

This measure evaluates the savings from installing low flow domestic water devices in the restrooms to reduce overall water flow in general and hot water flow in particular. Low flow faucet aerators reduce the water flow, relative to standard aerators, from the fixture.

All of the low flow devices reduce the overall water flow from the fixture which generally reduces the amount of hot water used resulting in energy and water savings.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

4.1.5 Plug Load Equipment Control - Vending Machine

ECM 7: 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 ₂ e Emissions Reduction (lbs)
2,821	0.0	0.0	\$461.96	\$1,437.60	\$0.00	\$1,437.60	3.11	2,840

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor based controls to reduce the energy use. These controls power down the machine when the surrounding area is vacant, then monitor the surrounding temperature and power up the cooling system at regular intervals to keep the product cool. Savings are a function of the activity level around the vending machine.

Please refer to Appendix A: Equipment Inventory & Recommendations for more information about the equipment affected by this measure.

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 low or no-cost efficiency strategies. By employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, 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.

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.

Perform Routine Motor Maintenance

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

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict 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.

Clean and/or Replace HVAC Filters

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

Perform Proper 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 "Assessing and Reducing Plug and Process Loads in Office Buildings" <http://www.nrel.gov/docs/fy13osti/54175.pdf>, or "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 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).

Refer to Section 4.1.4 for any low-flow ECM recommendations.

6 SELF-GENERATION MEASURES

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

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

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

6.1 Photovoltaic

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

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

TRC analyzed the potentially available rooftop areas for each of the central campus buildings, in order to determine the potential cost and energy savings for installing a campus-wide solar PV array at Ocean County College. Based on our analysis, we estimate that Ocean County College has about 106,687 square feet of available unshaded roof space for all buildings combined. We estimate that the Technology Building has approximately 3,300 square feet of unshaded roof space available, representing about 3% of the total array. See rooftop image below.

We estimate that the available rooftop space could support up to 1,487 kW of solar generating capacity (~4,956 PV panels @300-WDC each). The combined PV array could generate nearly 2 million kWh on an annual basis. This could potentially offset \$326,719 of annual electric purchases from the grid. In addition, our estimate was based on the National Renewable Energy Lab's PVWatts® Online Calculator (<http://pvwatts.nrel.gov/>), plus TRC's analysis of current market conditions for commercial solar power development in New Jersey.

Ocean County College could receive during the first 15 years of the solar project's lifetime, up \$795,309 per year in Solar Renewable Energy Credit (SREC) income (@ \$235/MWh). We estimate that installed cost

of such an array would be about \$5.2 million. Based on these numbers, we estimate that such an investment would have a simple payback period of about 6.5 years.

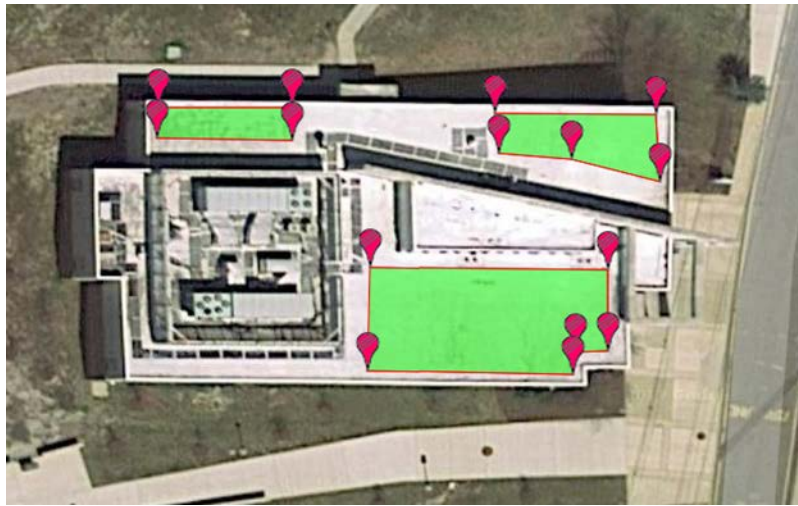


Figure 20 - Summary of Solar PV Array Analysis for OCC Campus

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

Rebates are not available for solar projects, but owners of 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 the pipeline of anticipated new solar capacity and insight into future SREC pricing. Refer to Section 8.3 for additional information.

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

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

7 DEMAND RESPONSE

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

By enabling grid operators to call upon Curtailment Service Providers and energy consumers 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 will receive payments whether or not their facility is called upon to curtail their load.

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 program often find it to be a valuable source of revenue for their facility(ies) because the payments can significantly offset annual utility 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 event cycle. DR program participants often have to install smart meters and 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 (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 program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and others, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey’s 1999 Electricity Restructuring Law which requires all customers of investor-owned electric and gas utilities to pay this charge on their monthly energy bills. As a contributor to the fund you were able to participate in the LGEA program and are also eligible to utilize the equipment incentive programs. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 22 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
ECM 1	Install LED Fixtures	x		x
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x		x
ECM 3	Install LED Exit Signs			x
ECM 4	Install Occupancy Sensor Lighting Controls	x		x
ECM 5	Install High Efficiency Electric AC			x
ECM 6	Install Low-Flow Domestic Hot Water Devices			x
ECM 7	Vending Machine Control			

SmartStart (SS) is generally well suited for implementation of individual or small sets of measures, with the flexibility to install projects at your own pace using in-house staff or a preferred contractor. Direct Install (DI) caters to small to mid-size facilities to bundle measures and simplify participation, 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 and 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; applicants can use in-house staff or preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent comparison of available incentives.

Brief descriptions of all relevant alternative financing and incentive programs are located in the sections below. You may also check the following website for further information, including most current program availability, requirements, and incentive levels: www.njcleanenergy.com/ci

8.1 SmartStart

Overview

The SmartStart (SS) program is comprised of New Construction and Retrofit components that offer incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives for various energy efficiency equipment based on national/market trends, new technologies or changes in efficiency baselines.

Prescriptive Equipment Incentives 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

All customer sizes and types may be served by this program. This program provides an effective mechanism for securing incentives for individual projects that may be completed at once or over several years.

Incentives

The prescriptive path provides fixed incentives for specific energy efficiency measures whereas the custom measure path provides incentives for unique or specialized technologies that are not addressed through prescriptive offerings.

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 the lesser of 50% of the total installed incremental project cost, or a buy down to a one year payback. 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 Direct Install

Overview

Direct Install (DI) is a turnkey program available to existing small to mid-sized facilities with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and install those measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to \$125,000 per project. Direct Install participants will also be held to a fiscal year cap of \$250,000 per entity.

How to Participate

To participate in the DI program you will need to contact the participating contractor assigned to the county where your facility is located; a complete list is provided on the DI website identified below. The contractor will be paid the program incentive directly which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps mentioned above, and the remaining 30% of the cost is your responsibility to the contractor.

Since DI offers a free assessment, LGEA applicants that do not meet the audit program eligibility requirements, but do meet the DI requirements, may be moved directly into this program.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI

8.3 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

8.4 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 the incentive programs to help further reduce costs when compiling the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

8.5 Demand Response Energy Aggregator

The first step toward participation in a Demand Response (DR) program is to contact a Curtailment Service Provider. A list of these providers is available on PJM’s website and it includes contact information for each company, as well as the states where they have active business (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 program information.

Curtailment Service Providers typically offer free assessments to determine a facility’s eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility’s ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

See Section 7 for additional information.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	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 Lobby	23	CFL Screw-In Lamps: Can Light 1x13W	Wall Switch	13	3,120	Fixture Replacement	Yes	23	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	2,184	0.14	668	0.0	\$109.47	\$1,579.97	\$20.00	14.25
1st Floor Lobby	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,120	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,184	0.06	279	0.0	\$45.72	\$350.00	\$20.00	7.22
1st Floor Lobby	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 103 Comp Lab	2	CFL Screw-In Lamps: Can Light 1x13W	Occupancy Sensor	13	3,120	Fixture Replacement	No	2	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	3,120	0.01	43	0.0	\$7.05	\$127.30	\$0.00	18.05
Room 103 Comp Lab	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.44	2,131	0.0	\$349.04	\$2,106.00	\$180.00	5.52
Room 104 Comp Lab	2	CFL Screw-In Lamps: Can Light 1x13W	Occupancy Sensor	13	3,120	Fixture Replacement	No	2	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	3,120	0.01	43	0.0	\$7.05	\$127.30	\$0.00	18.05
Room 104 Comp Lab	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,120	0.63	3,068	0.0	\$502.41	\$1,764.00	\$90.00	3.33
Room 105 Video Conf	2	CFL Screw-In Lamps: Can Light 1x13W	Occupancy Sensor	13	3,120	Fixture Replacement	No	2	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	3,120	0.01	43	0.0	\$7.05	\$127.30	\$0.00	18.05
Room 105 Video Conf	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	18	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,120	0.63	3,068	0.0	\$502.41	\$1,764.00	\$90.00	3.33
Room 107 Conf Room	20	CFL Screw-In Lamps: Can Light 1x13W	Wall Switch	13	3,120	Fixture Replacement	Yes	20	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	2,184	0.12	581	0.0	\$95.19	\$1,505.02	\$40.00	15.39
Room 107 Conf Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.03	150	0.0	\$24.50	\$233.00	\$30.00	8.28
Room 107 Conf Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,184	Relamp & Reballast	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,529	0.05	157	0.0	\$25.73	\$247.50	\$35.00	8.26
Room 108 Custodial	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp & Reballast	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,184	0.05	224	0.0	\$36.76	\$247.50	\$35.00	5.78
Room 115 Lecture Hall	7	CFL Screw-In Lamps: Can Light 1x13W	Occupancy Sensor	13	3,120	Fixture Replacement	No	7	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	3,120	0.03	151	0.0	\$24.68	\$445.56	\$0.00	18.05
Room 115 Lecture Hall	32	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	32	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.78	3,789	0.0	\$620.52	\$3,744.00	\$320.00	5.52
Room 116 Storage data	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.02	118	0.0	\$19.39	\$117.00	\$10.00	5.52
Room 117 Telec Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.07	355	0.0	\$58.17	\$263.00	\$30.00	4.01
Mechanical Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,560	Relamp & Reballast	No	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,560	0.12	296	0.0	\$48.48	\$585.00	\$50.00	11.04
Wmen's Bathroom	3	CFL Screw-In Lamps: Can Light 1x13W	Occupancy Sensor	13	1,872	Fixture Replacement	No	3	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	1,872	0.01	39	0.0	\$6.35	\$190.95	\$0.00	30.09
Wmen's Bathroom	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	56	1,872	Relamp & Reballast	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,872	0.05	149	0.0	\$24.33	\$351.00	\$0.00	14.43
Men's bathroom	3	CFL Screw-In Lamps: Can Light 1x13W	Occupancy Sensor	13	1,872	Fixture Replacement	No	3	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	1,872	0.01	39	0.0	\$6.35	\$190.95	\$0.00	30.09
Men's bathroom	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	56	1,872	Relamp & Reballast	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,872	0.05	149	0.0	\$24.33	\$351.00	\$0.00	14.43
Room 125 ad computing	10	U-Bend Fluorescent - T9: U T8 (32W) - 2L	Wall Switch	56	3,120	Relamp & Reballast	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,184	0.24	1,180	0.0	\$193.33	\$1,402.00	\$40.00	7.05
Room 126 Exec Director	3	U-Bend Fluorescent - T10: U T8 (32W) - 2L	Wall Switch	56	3,120	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,184	0.07	354	0.0	\$58.00	\$467.00	\$20.00	7.71
Room 127 Prog Analysis	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.12	598	0.0	\$98.01	\$584.00	\$60.00	5.35

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	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 128 Prog Analysis	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.12	598	0.0	\$98.01	\$584.00	\$60.00	5.35
Room 124 Senior Syst	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,184	0.06	299	0.0	\$49.01	\$350.00	\$40.00	6.33
Room 123	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp & Reballast	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.04	178	0.0	\$29.09	\$131.50	\$15.00	4.01
Room 122	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.07	355	0.0	\$58.17	\$263.00	\$30.00	4.01
Room 129 Elect Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.09	459	0.0	\$75.21	\$234.00	\$20.00	2.85
Stairway	2	CFL Screw-In Lamps: Can Light 1x13W	Wall Switch	13	3,120	Fixture Replacement	Yes	2	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	2,184	0.01	58	0.0	\$9.52	\$243.30	\$20.00	23.46
2nd Floor Exit Sign	4	Exit Signs: Incandescent	None	45	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.11	1,572	0.0	\$257.38	\$430.22	\$0.00	1.67
Hallway	25	CFL Screw-In Lamps: Can Light 1x13W	Wall Switch	13	3,120	Fixture Replacement	Yes	25	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	2,184	0.15	727	0.0	\$118.99	\$1,823.28	\$40.00	14.99
Hallway	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,120	Relamp & Reballast	No	8	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,120	0.17	832	0.0	\$136.33	\$936.00	\$0.00	6.87
Room 201 Comp Studio	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp & Reballast	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,120	0.22	1,066	0.0	\$174.52	\$789.00	\$90.00	4.01
Room 224 Receptionist	2	CFL Screw-In Lamps: Can Light 1x13W	Wall Switch	13	3,120	Fixture Replacement	Yes	2	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	2,184	0.01	58	0.0	\$9.52	\$243.30	\$20.00	23.46
Room 224 Receptionist	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,120	Relamp & Reballast	No	7	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,120	0.26	1,243	0.0	\$203.61	\$920.50	\$105.00	4.01
Room 224 Receptionist	1	Exit Signs: Incandescent	None	45	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	393	0.0	\$64.34	\$107.56	\$0.00	1.67
Room 223 Facility Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp & Reballast	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.11	533	0.0	\$87.26	\$394.50	\$45.00	4.01
Room 225	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp & Reballast	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.15	710	0.0	\$116.35	\$526.00	\$60.00	4.01
Room 222 faculty office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.07	355	0.0	\$58.17	\$263.00	\$30.00	4.01
Room 221 Faculty Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.07	355	0.0	\$58.17	\$263.00	\$30.00	4.01
Room 220 Faculty Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.07	355	0.0	\$58.17	\$263.00	\$30.00	4.01
Room 203 teaching Lab	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.49	2,368	0.0	\$387.83	\$2,340.00	\$200.00	5.52
Room 204 teaching Lab	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.49	2,368	0.0	\$387.83	\$2,340.00	\$200.00	5.52
Room 205 teaching Lab	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.49	2,368	0.0	\$387.83	\$2,340.00	\$200.00	5.52
Room 208 comp Graphic	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	22	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.53	2,605	0.0	\$426.61	\$2,574.00	\$220.00	5.52
Room 206 comp Graphic	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	22	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.53	2,605	0.0	\$426.61	\$2,574.00	\$220.00	5.52
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	3,120	Relamp & Reballast	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,120	0.04	178	0.0	\$29.09	\$131.50	\$15.00	4.01
Room 209 Video Prod	6	CFL Screw-In Lamps: Can Light 1x13W	Occupancy Sensor	13	3,120	Fixture Replacement	No	6	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	3,120	0.03	129	0.0	\$21.15	\$381.91	\$0.00	18.05

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	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 210 tech lab	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,120	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,120	0.05	237	0.0	\$38.78	\$234.00	\$20.00	5.52
Room 212 Elec Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,120	0.05	237	0.0	\$38.78	\$234.00	\$20.00	5.52
Room 213 Elev Machine	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,120	0.02	118	0.0	\$19.39	\$117.00	\$10.00	5.52
Women's Bathroom	3	CFL Screw-In Lamps: Can Light 1x13W	Occupancy Sensor	13	1,872	Fixture Replacement	No	3	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	1,872	0.01	39	0.0	\$6.35	\$190.95	\$0.00	30.09
Women's Bathroom	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	1,872	Relamp & Reballast	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,872	0.06	187	0.0	\$30.67	\$351.00	\$0.00	11.44
Men's bathroom	2	CFL Screw-In Lamps: Can Light 1x13W	Occupancy Sensor	13	1,872	Fixture Replacement	No	2	LED - Fixtures: Downlight Solid State Retrofit	Occupancy Sensor	7	1,872	0.01	26	0.0	\$4.23	\$127.30	\$0.00	30.09
Men's bathroom	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	1,872	Relamp & Reballast	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,872	0.06	187	0.0	\$30.67	\$351.00	\$0.00	11.44
Room 217	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,808	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,808	0.07	320	0.0	\$52.36	\$263.00	\$30.00	4.45
Room 211 Telec Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,808	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,808	0.07	320	0.0	\$52.36	\$263.00	\$30.00	4.45
Stairway	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,120	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,120	0.01	63	0.0	\$10.28	\$98.00	\$5.00	9.04
Stairway	6	CFL Screw-In Lamps: Can Light 1x13W	Wall Switch	13	3,120	Fixture Replacement	No	6	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	7	3,120	0.03	129	0.0	\$21.15	\$381.91	\$0.00	18.05
Stairway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,120	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,120	0.05	237	0.0	\$38.78	\$234.00	\$20.00	5.52
Stairway	2	Exit Signs: Incandescent	None	45	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.06	786	0.0	\$128.69	\$215.11	\$0.00	1.67
Room 114 storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,808	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,808	0.02	107	0.0	\$17.45	\$117.00	\$10.00	6.13
Room 114 storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,808	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,808	0.07	320	0.0	\$52.36	\$263.00	\$30.00	4.45
Exterior Lighting	4	Metal Halide: (1) 250W Lamp	Daylight Dimming	295	3,120	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	25	3,120	0.79	3,875	0.0	\$634.62	\$1,562.71	\$400.00	1.83
Exterior Lighting	7	CFL Screw-In Lamps: Can Light 1x13W	Daylight Dimming	13	3,120	Fixture Replacement	No	7	LED - Fixtures: Downlight Solid State Retrofit	Daylight Dimming	7	3,120	0.03	151	0.0	\$24.68	\$445.56	\$0.00	18.05

Motor Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
		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
Roof Top	Building #25	1	Exhaust Fan	0.3	65.0%	No	1,872	No	65.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof Top	Building #25	1	Exhaust Fan	0.3	65.0%	No	1,872	No	65.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof Top	Building #25	1	Exhaust Fan	0.3	65.0%	No	1,872	No	65.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof Top	Building #25 (RTU1, RTU2)	2	Other	25.0	92.0%	No	1,872	No	92.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof Top	Building #25 (RTU1, RTU2)	8	Other	1.0	82.0%	No	1,872	No	82.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof Top	Building #25 (RTU1, RTU2)	2	Other	5.0	92.0%	No	1,872	No	92.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Elevator Rom	Elevator	1	Other	25.0	94.0%	No	1,872	No	94.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Mechanical Room	Mechanical Room	1	Heating Hot Water Pump	3.0	86.0%	Yes	780	No	86.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Mechanical Room	Mechanical Room	1	Heating Hot Water Pump	3.0	86.0%	Yes	780	No	86.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Mechanical Room	Mechanical Room	1	Heating Hot Water Pump	5.0	88.0%	Yes	780	No	88.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Mechanical Room	Mechanical Room	1	Heating Hot Water Pump	5.0	88.0%	Yes	780	No	88.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Electric HVAC Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis							
		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 Top	Room 211 Telecommunication Room	2	Split-System AC	1.50		Yes	2	Split-System AC	1.50		16.00		No	0.50	848	0.0	\$138.92	\$4,488.66	\$276.00	30.32
Roof Top	Technology Building	1	Packaged AC	40.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Roof Top	Technology Building	1	Packaged AC	55.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Fuel Heating Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions		Proposed Conditions							Energy Impact & Financial Analysis						
		System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Technology Building	5	Non-Condensing Hot Water Boiler	1,525.00	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

DHW Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
		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
Room 119	Building #25	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Low-Flow Device Recommendations

Location	Recommendation Inputs				Energy Impact & Financial Analysis						
	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
2	6	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	40.9	\$393.31	\$43.02	\$0.00	0.11
2	6	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	40.9	\$393.31	\$43.02	\$0.00	0.11

Plug Load Inventory

Existing Conditions				
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
School	95	Desktop with LCD Monitor	191.0	Yes
School	118	Desktop with LCD Monitor	205.0	Yes
School	8	Multifunction office printer	850.0	Yes
School	4	Small Printer	450.0	Yes
School	5	Hand Dryer	450.0	Yes
School	10	Projector	200.0	Yes
School	1	Wall Mounted TV	128.0	Yes

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
Lobby Vending Machine	1	Glass Fronted Refrigerated	Yes	0.00	1,209	0.0	\$197.98	\$718.80	\$0.00	3.63
Lobby Vending Machine	1	Refrigerated	Yes	0.00	1,612	0.0	\$263.97	\$718.80	\$0.00	2.72

Appendix B: EPA Statement of Energy Performance



ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A **Ocean County College**

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

For Year Ending: June 30, 2015
 Date Generated: June 21, 2017

ENERGY STAR®
 Score¹

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 Ocean County College 1 College Drive Toms River, New Jersey 08754	Property Owner Ocean County College 1 College Drive Toms River, NJ 08754 732-255-0533	Primary Contact James Calamia 1 College Drive Toms River, NJ 08754 732-255-0533 jcalamia@ocean.edu
Property ID: 5093895		

Energy Consumption and Energy Use Intensity (EUI)				
Site EUI 173.3 kBtu/ft ²	Annual Energy by Fuel		National Median Comparison	
	Other: (kBtu)	4,536,380 (5%)	National Median Site EUI (kBtu/ft ²)	140.5
	Natural Gas (kBtu)	50,787,318 (56%)	National Median Source EUI (kBtu/ft ²)	262.6
	Electric - Grid (kBtu)	35,847,151 (39%)	% Diff from National Median Source EUI	23%
Source EUI 324 kBtu/ft ²			Annual Emissions	
			Greenhouse Gas Emissions (Metric Tons CO ₂ e/year)	N/A

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)