Local Government Energy Audit:
Energy Audit Report

Health & Human Performance Building (#29)

Ocean County College

1 College Drive
Toms River, New Jersey
08754

October 18, 2018

Final Report by:
TRC Energy Services

Disclaimer

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

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

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

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

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the Health & Human Performance Building (#29).

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

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist colleges and universities in controlling their energy costs and help to protect our environment by reducing energy demand statewide.

1.1 Facility Summary

The Health & Human Performance Building (#29) is a 59,923 square foot gymnasium. It contains a main gym with basketball courts, showers, locker rooms, classrooms, offices, a fitness center and training rooms. Also, adjacent to the building are eight lighted tennis courts. The building is typically occupied by about 30 faculty members and staff, plus students, when classes are in session and about 12 staff people during the summer months. It is open every day, year round, Monday-Friday from 7:00 AM to 10:00 PM and from 10:00 AM to 6:00 PM on Saturday and Sunday.

The building was built in 1967 and expanded in 1974. It is constructed of brick and concrete masonry block and has a flat, light-colored gravel roof over the main gym and a white thermoplastic that covers the rest of the building. Doors and windows are mostly double-paned glass with aluminum frames.

The Health & Human Performance Building (#29) is on the main campus electric account and has power distributed from the Central Plant. Most of the power is supplied by Jersey Central Power & Light (JCP&L), though buildings on the main campus electric account also receive some power from a 1.1-MW combined heat and power (CHP) plant located at the CHP Building (#21). The building has its own gas service supplied by New Jersey Natural Gas (NJNG).

Building cooling is provided by six packaged rooftop air conditioning units, three Carrier 10-ton units and two Carrier 8.5-ton units, and one Aaon 8.5-ton unit. There are also two York gas/electric split systems, 20 tons each, and two Carrier gas/electric split systems, 20 tons each. There is also one Sanyo mini-split (2-tons), which provide cooling to the equipment room.

Heating is provided by three (3) Sterling roof top units (300 MBH each) and (2) Carrier RTUs, with input capacities of 224 and 507 MBH respectively. The building also two (2) Weil McLain hot water boilers, both of which are 2000 MBH each.

Lighting at the Health & Human Performance Building (#29) consists mostly of T8 linear or U-Bend fluorescent tubes. Metal halide and compact fluorescent fixtures light the exterior of the building. Bollard fixtures near the front entrance were recently retrofitted with LEDs. A few office areas have occupancy sensor controls but in most areas, lighting is controlled by manual switches.

Detailed descriptions and assessments of the building's major equipment are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC recommends eight measures which together represent an opportunity for the Health & Human Performance Building (#29) to reduce annual energy costs by roughly $15,571 and annual greenhouse gas emissions by 95,743 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself though energy savings alone in about 4.9 years. The breakdown of existing utility costs and potential for reduction in energy costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce the Health & Human Performance Building (#29)'s electric costs by about 13% and its total annual energy usage by about 4% overall.

Figure 1 – Previous 12 Month Utility Costs

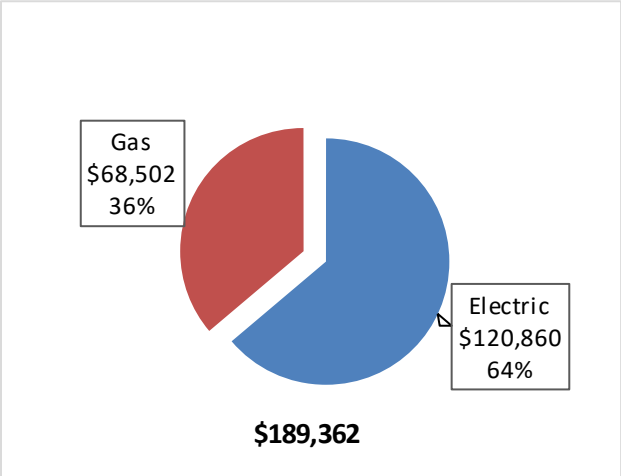
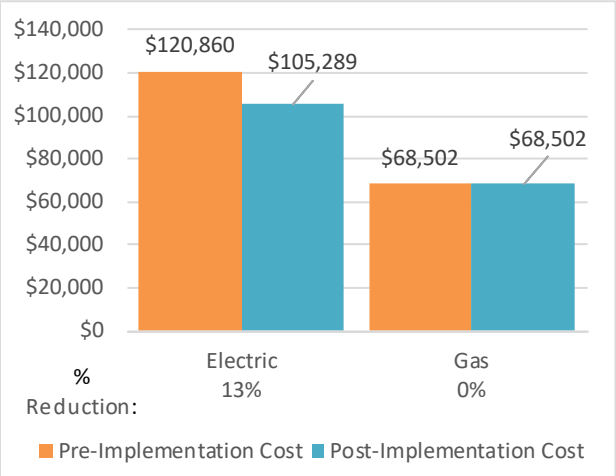


Figure 2 – Potential Post-Implementation Costs



A detailed description of Health & Human Performance Building (#29)'s existing energy use can be found in Section 3.

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

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			83,321	25.7	0.0	$13,645.60	$64,400.91	$3,995.00	$60,405.91	4.4	83,903
ECM 1	Install LED Fixtures	Yes	39,524	15.0	0.0	$6,472.99	$18,711.79	$775.00	$17,936.79	2.8	39,801
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	40,322	10.2	0.0	$6,603.56	$42,221.77	$3,030.00	$39,191.77	5.9	40,604
ECM 3	Retrofit Fixtures with LED Lamps	Yes	2,990	0.6	0.0	$489.61	$2,714.47	$190.00	$2,524.47	5.2	3,010
ECM 4	Install LED Exit Signs	Yes	485	0.0	0.0	$79.44	$752.89	$0.00	$752.89	9.5	488
Lighting Control Measures			5,211	1.6	0.0	$853.35	$9,148.00	$1,300.00	$7,848.00	9.2	5,247
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	5,211	1.6	0.0	$853.35	$9,148.00	$1,300.00	$7,848.00	9.2	5,247
Motor Upgrades			371	0.2	0.0	$60.68	$1,752.72	$0.00	$1,752.72	28.9	373
ECM 6	Premium Efficiency Motors	Yes	371	0.2	0.0	$60.68	$1,752.72	$0.00	$1,752.72	28.9	373
Variable Frequency Drive (VFD) Measures			2,611	0.8	0.0	$427.54	$6,015.30	$0.00	$6,015.30	14.1	2,629
ECM 7	Install VFDs on Hot Water Pumps	Yes	2,611	0.8	0.0	$427.54	$6,015.30	$0.00	$6,015.30	14.1	2,629
Plug Load Equipment Control - Vending Machine			3,566	0.0	0.0	$584.04	$690.00	$0.00	$690.00	1.2	3,591
ECM 8	Vending Machine Control	Yes	3,566	0.0	0.0	$584.04	$690.00	$0.00	$690.00	1.2	3,591
TOTALS			95,078	28.3	0.0	$15,571.22	$82,006.93	$5,295.00	$76,711.93	4.9	95,743

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

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

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

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium®). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

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

Energy Efficient Practices

TRC Energy Services also identified 10 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at the Health & Human Performance Building (#29) include:

- Close Doors and Windows
- Turn Off Unneeded Motors
- Perform Routine Motor Maintenance
- Install Destratification Fans
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Ensure Economizers are Functioning Properly
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for the Health & Human Performance Building (#29). Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

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

1.3 Implementation Planning

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

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

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

- SmartStart
- Pay for Performance
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Energy Savings Improvement Program (ESIP)
- Demand Response Aggregator

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

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

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
James Calamia	Director of Facilities	jcalamia@ocean.edu	732-255-0400 x-2066
Lenny Mannino	Assoc Dir of Bldg Maint	lmannino@ocean.edu	732-255-0410
TRC Energy Services			
Tom Page	Auditor	tpage@TRCsolutions.com	(732) 855-0033

2.2 General Site Information

On June 15, 2016, TRC performed an energy audit at the Health & Human Performance Building (#29) located in Toms River, New Jersey. TRC's team met with Jim Calamia and Leonard Mannino to review the facility operations and help focus our investigation on specific energy-using systems.

The Health & Human Performance Building (#29) is a 59,923 square foot gymnasium and was built in 1967 and expanded in 1974. It contains a main gym with basketball courts, showers, locker rooms, classrooms, offices, a fitness center, and training rooms. Also, adjacent to the building are eight lighted tennis courts.

The Health & Human Performance Building (#29) is on the main campus electric account and has power distributed from the Central Plant. Most of the power is supplied by Jersey Central Power & Light (JCP&L), though buildings on the main campus electric account also receive some power from a 1.1-MW combined heat and power (CHP) plant at the CHP Building (#21). The building has its own gas service supplied by New Jersey Natural Gas (NJNG).

2.3 Building Occupancy

It is typically occupied by about 30 faculty members and staff, plus students, when classes are in session and about 12 staff people during the summer months. It is open every day, Monday-Friday from 7:00 AM to 10:00 PM and 10:00 AM to 6:00 PM on Saturdays and Sundays.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Health & Human Performance Building	Weekday	7AM - 10PM
Health & Human Performance Building	Weekend	10AM - 6PM
Health & Human Performance Building	Summer Weekdays	7AM - 6PM
Health & Human Performance Building	Summer Weekend	CLOSED

2.4 Building Envelope

The Health & Human Performance Building (#29) is constructed of brick and concrete masonry block. The building has a flat light-colored gravel roof over the main gym and a white thermoplastic covering the rest of the building. The roof appeared to be in fairly good condition.

Doors and windows are mostly double-paned glass with aluminum frames. No excessive air infiltration was noted or reported to us by facility staff. All window and door seals appeared tight.

Image 1: Building Front Entrance

2.5 On-Site Generation

The Health & Human Performance Building (#29) does not have any on-site electric generation capacity. However, the campus has a 1.1-MW Waukesha reciprocating engine CHP system at the Central Plant. The CHP plant generates a significant portion of the power used by the Health & Human Performance Building (#29) and other central campus buildings that are on the campus' main electric account.

2.6 Energy-Using Systems

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

Lighting System

Lighting at the Health & Human Performance Building (#29) consists mostly of 32-Watt T8 linear or U-Bend fluorescent fixtures. There are also a significant number of recessed can ceiling fixtures and wall sconces with compact fluorescent bulbs.

The exterior of the building is lit primarily by metal halide, high pressure sodium, and compact fluorescent light fixtures. These are believed to all be controlled by photosensors. Bollard fixtures near the front entrance were recently retrofitted with LEDs. Adjacent to the building are lighted tennis courts, which appear to be lit by (24) 1000-Watt pole-mounted metal halide fixtures.

In a few office areas (mostly on the lower level) and in the main gym lights are controlled by occupancy sensor controls, but in most areas of the building the only lighting controls are manual switches.

Image 2: Interior Lighting Fixtures

Image 3: Exterior Lighting Fixtures

Heating Ventilation and Air Conditioning (HVAC)

Building cooling is provided by six packaged rooftop air conditioning units, three Carrier 10-ton units and two Carrier 8.5-ton units, and one Aaon 8.5-ton unit. There are also two York gas/electric split systems, 20 tons each, and two Carrier gas/electric split systems, 20 tons each. There is also one Sanyo mini-split (2-tons), which provide cooling to the equipment room.

Heating is provided by three Sterling roof top units (300 MBH each), which together have a combined heating capacity of about 1,000 MBH. The building also two Weil McLain hot water boilers too, which are 2000 MBH each.

The building is cooled by six packaged rooftop air conditioning units – two Carrier RTUs with a cooling capacity of 8.5 tons, three Carrier 10-ton units, and one 8.5-ton AAON unit. There are also four large gas/electric split systems – two Trane units and two York units, each with a cooling capacity of 20 tons. There is also one Sanyo mini-split system (~2 tons) in the equipment room.

Heating is provided by three Sterling roof top units (300 MBH each) and two Carrier RTUs, with input capacities of 224 and 507 MBH respectively. The building also has two Weil McLain hot water non-condensing boilers, 2000 MBH each. They are estimated to be about 81% efficient. Heating hot water is distributed from the boilers throughout the building by six HHW pumps – between ¾ HP and 3.0 HP each – which are run at constant speed.

The building has (16) Greenheck™ rooftop exhaust fans, mostly to ventilate the main gym area. All of the exhaust fan motors are small – ¼ HP to 1.5 HP each.

All RTUs and exhaust fans appeared to be in good condition. Precise dates of installation were not known for all units, but none appeared to be more than 10 years old. The main boilers also appeared to be well-maintained and probably less than 10 years old. When it's time, consider upgrading to more efficient condensing boilers, but presently the energy savings would most likely not be enough to justify early replacement.

Image 4: Main Boilers and How Water Pumps

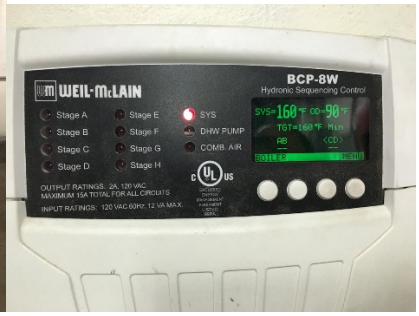


Image 5: Rooftop Units and Exhaust Fans

Domestic Hot Water Heating System

The domestic hot water heating for the building is provided by two 119-gallon A.O. Smith hot water heaters, which are located in the boiler room. They are high efficiency units and appear to be only about four years old and in good condition. No domestic hot water measures are recommended at this time.

Imaae 6: Domestic Hot Water Heaters

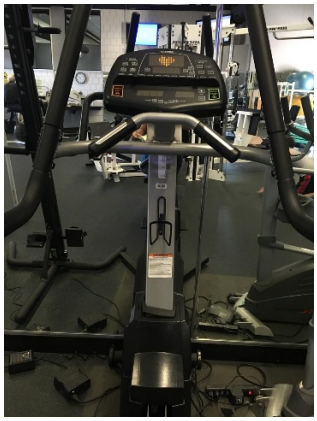
Refrigeration

Building usage of refrigeration equipment is not large. We counted only three medium-sized standard refrigerators (12-16 ft^3 each) that are used by building staff. There are also two medium Manitowoc ice making machines that are used for ice packs by fitness trainers.

Image 7: Ice Makers

Building Plug Load

Building plug load consists mostly of standard office equipment (e.g. computers, monitors, copiers, and microwaves). Plus, there are many treadmills and other fitness machines used by students. There are also many other types electric equipment used for trainers to treat injuries, such as heating pads, small whirlpool tubs, etc. The building also has three vending machines. Purchasing high efficency and energy saving devices, installing plug load controllers and/or encouraging staff to turn off equipment when not in use, are generally best options toward reducing energy demand for most types of plud load equipment.



2.7 Water-Using Systems

We inspected a representative sample of water fixtures throughout building. All of the faucets, toilets, and urinals appeared to meet current water-conservation standards for designation as “low-flow” equipment. No upgrades to any water fixtures are recommended for this building.

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

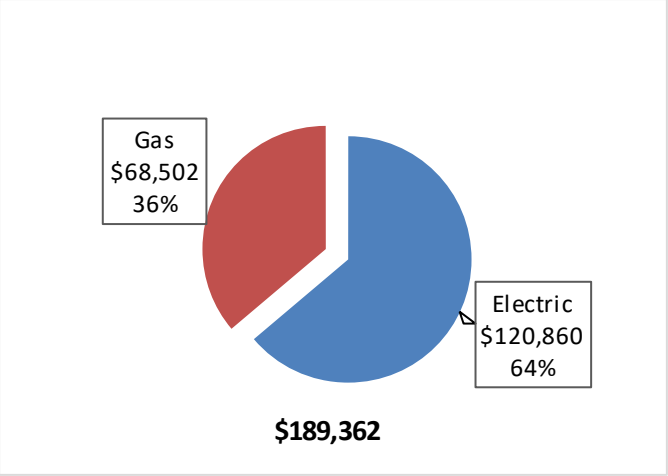
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Health & Human Performance Building		
Fuel	Usage	Cost
Electricity	737,976 kWh	$120,860
Natural Gas	57,151 Therms	$68,502
Total		$189,362

The current annual energy cost for this facility is $189,362 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. It is supplied via the main electric account for the campus and distributed from the Central Plant to the Health and Human Performance Center. The average electric cost over the past 12 months on the main account was $0.164/kWh. This is a blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

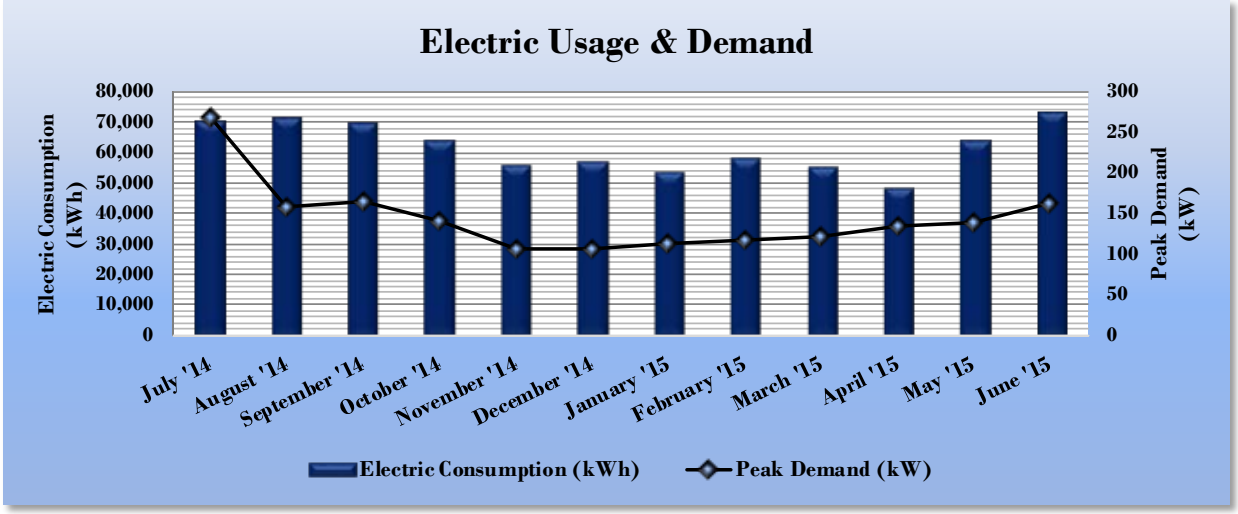


Figure 9 - Electric Usage & Demand

Electric Billing Data for Health & Human Performance Building					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost	TRC Estimated Usage?
8/6/14	31	70,074	268	$8,101	Yes
9/5/14	29	71,676	159	$11,063	Yes
10/3/14	29	70,009	164	$11,347	Yes
11/4/14	32	64,248	141	$10,973	Yes
12/5/14	31	56,080	107	$9,849	Yes
1/6/15	32	56,882	106	$9,422	Yes
2/5/15	30	53,600	112	$9,836	Yes
3/6/15	29	58,078	118	$13,556	Yes
4/7/15	32	55,605	121	$8,792	Yes
5/7/15	30	48,518	135	$8,079	Yes
6/8/15	32	63,957	139	$10,290	Yes
7/8/15	30	73,292	162	$10,215	Yes
Totals	367	742,019	268	$121,522	12
Annual	365	737,976	268	$120,860	

3.3 Natural Gas Usage

Natural Gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.199/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Natural Gas Usage

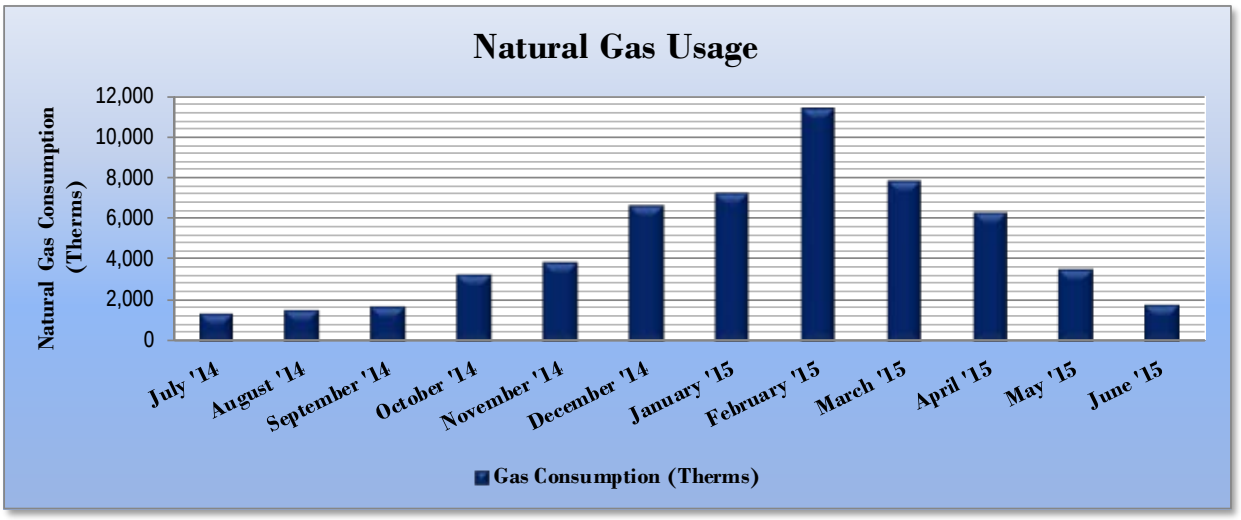


Figure 11 - Natural Gas Usage

Gas Billing Data for Health & Human Performance Building			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
7/23/14	28	1,448	$1,872
8/20/14	28	1,558	$2,820
9/19/14	30	1,746	$3,000
10/23/14	34	3,280	$4,020
11/20/14	28	3,939	$4,440
12/23/14	33	6,663	$7,683
1/26/15	34	7,263	$8,268
2/26/15	31	11,393	$12,293
3/23/15	25	7,907	$8,896
4/22/15	30	6,357	$7,385
5/26/15	34	3,573	$4,672
6/24/15	29	1,869	$2,965
Totals	364	56,995	$68,315
Annual	365	57,151	$68,502

3.4 Benchmarking

This facility was benchmarked using Portfolio Manager®, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR Score for select building types.

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 or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy." Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Health & Human Performance Building	National Median Building Type: Rec./Entertainment/Parks
Source Energy Use Intensity (kBtu/ft^2)	232.1	96.8
Site Energy Use Intensity (kBtu/ft^2)	137.4	41.2

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

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

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Health & Human Performance Building	National Median Building Type: Rec./Entertainment/Parks
Source Energy Use Intensity (kBtu/ft^2)	215.1	96.8
Site Energy Use Intensity (kBtu/ft^2)	132.0	41.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR™ certification. Gymnasiums are not is one of the building categories that are eligible to receive an ENERGY STAR® score.

TRC could only obtain a partial year of electric sub-meter date for this building. Due to lack of sub-meter data for each building and for CHP output during the billing period studied, final energy end-usage could not be precisely apportioned for each building. So, we have provided a combined benchmarking score for all campus buildings on shared electric and gas accounts combined. The EUI could only be roughly estimated for this building individually. It may be more useful to compare the average campus EUI score to EUI scores available for similar college campuses, rather than compare usage between building on the same main campus accounts.

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

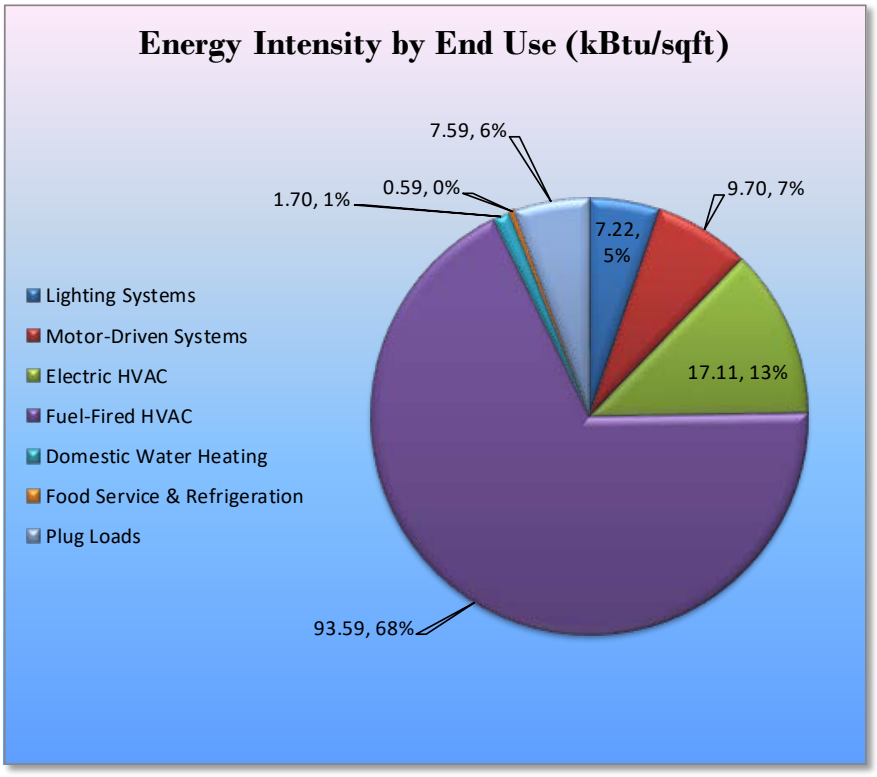
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager® account has been created online for your facility and you will be provided with the login information for the new online account. We encourage customers to update their energy usage data in Portfolio Manager® regularly, to keep track of building energy performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building's performance at: https://www.energystar.gov/buildings/training.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

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



4 ENERGY CONSERVATION MEASURES

Level of Analysis

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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 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_2e Emissions Reduction (lbs)
Lighting Upgrades		83,321	25.7	0.0	$13,645.60	$64,400.91	$3,995.00	$60,405.91	4.4	83,903
ECM 1	Install LED Fixtures	39,524	15.0	0.0	$6,472.99	$18,711.79	$775.00	$17,936.79	2.8	39,801
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	40,322	10.2	0.0	$6,603.56	$42,221.77	$3,030.00	$39,191.77	5.9	40,604
ECM 3	Retrofit Fixtures with LED Lamps	2,990	0.6	0.0	$489.61	$2,714.47	$190.00	$2,524.47	5.2	3,010
ECM 4	Install LED Exit Signs	485	0.0	0.0	$79.44	$752.89	$0.00	$752.89	9.5	488
Lighting Control Measures		5,211	1.6	0.0	$853.35	$9,148.00	$1,300.00	$7,848.00	9.2	5,247
ECM 5	Install Occupancy Sensor Lighting Controls	5,211	1.6	0.0	$853.35	$9,148.00	$1,300.00	$7,848.00	9.2	5,247
Motor Upgrades		371	0.2	0.0	$60.68	$1,752.72	$0.00	$1,752.72	28.9	373
ECM 6	Premium Efficiency Motors	371	0.2	0.0	$60.68	$1,752.72	$0.00	$1,752.72	28.9	373
Variable Frequency Drive (VFD) Measures		2,611	0.8	0.0	$427.54	$6,015.30	$0.00	$6,015.30	14.1	2,629
ECM 7	Install VFDs on Hot Water Pumps	2,611	0.8	0.0	$427.54	$6,015.30	$0.00	$6,015.30	14.1	2,629
Plug Load Equipment Control - Vending Machine		3,566	0.0	0.0	$584.04	$690.00	$0.00	$690.00	1.2	3,591
ECM 8	Vending Machine Control	3,566	0.0	0.0	$584.04	$690.00	$0.00	$690.00	1.2	3,591
TOTALS		95,078	28.3	0.0	$15,571.22	$82,006.93	$5,295.00	$76,711.93	4.9	95,743

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

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

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 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_2e Emissions Reduction (lbs)
Lighting Upgrades		83,321	25.7	0.0	$13,645.60	$64,400.91	$3,995.00	$60,405.91	4.4	83,903
ECM 1	Install LED Fixtures	39,524	15.0	0.0	$6,472.99	$18,711.79	$775.00	$17,936.79	2.8	39,801
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	40,322	10.2	0.0	$6,603.56	$42,221.77	$3,030.00	$39,191.77	5.9	40,604
ECM 3	Retrofit Fixtures with LED Lamps	2,990	0.6	0.0	$489.61	$2,714.47	$190.00	$2,524.47	5.2	3,010
ECM 4	Install LED Exit Signs	485	0.0	0.0	$79.44	$752.89	$0.00	$752.89	9.5	488

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

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	585	0.2	0.0	$95.75	$1,743.27	$135.00	$1,608.27	16.8	589
Exterior	38,940	14.8	0.0	$6,377.24	$16,968.52	$640.00	$16,328.52	2.6	39,212

Measure Description

We recommend replacing existing fixtures throughout the building that contain fluorescent, HID, or incandescent lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

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

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	40,322	10.2	0.0	$6,603.56	$42,221.77	$3,030.00	$39,191.77	5.9	40,604
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	510	0.2	0.0	$83.51	$2,242.68	$185.00	$2,057.68	24.6	513
Exterior	2,480	0.4	0.0	$406.10	$471.79	$5.00	$466.79	1.1	2,497

Measure Description

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

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

ECM 4: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	485	0.0	0.0	$79.44	$752.89	$0.00	$752.89	9.5	488
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend replacing all incandescent or compact fluorescent exit signs with LED exit signs. Most exit signs in the building are already lit by LEDs, but a few older technology units remain. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized 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_2e Emissions Reduction (lbs)
Lighting Control Measures		5,211	1.6	0.0	$853.35	$9,148.00	$1,300.00	$7,848.00	9.2	5,247
ECM 5	Install Occupancy Sensor Lighting Controls	5,211	1.6	0.0	$853.35	$9,148.00	$1,300.00	$7,848.00	9.2	5,247

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

ECM 5: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,211	1.6	0.0	$853.35	$9,148.00	$1,300.00	$7,848.00	9.2	5,247

Measure Description

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

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

4.1.3 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 18 below.

Figure 18- Summary of Motor Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		371	0.2	0.0	$60.68	$1,752.72	$0.00	$1,752.72	28.9	373
ECM 6	Premium Efficiency Motors	371	0.2	0.0	$60.68	$1,752.72	$0.00	$1,752.72	28.9	373

ECM 6: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
371	0.2	0.0	$60.68	$1,752.72	$0.00	$1,752.72	28.9	373

Measure Description

We recommend replacing standard efficiency motors with NEMA Premium® efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

4.1.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 19 below.

Figure 19- Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
ECM 7	Install VFDs on Hot Water Pumps	2,611	0.8	0.0	$427.54	$6,015.30	$0.00	$6,015.30	14.1	2,629

ECM 7: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,611	0.8	0.0	$427.54	$6,015.30	$0.00	$6,015.30	14.1	2,629

Measure Description

We recommend installing a variable frequency drives (VFD) to control a hot water pumps. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.5 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment control measures are summarized in Figure 20 below.

Figure 20- Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		3,566	0.0	0.0	$584.04	$690.00	$0.00	$690.00	1.2	3,591
ECM 8	Vending Machine Control	3,566	0.0	0.0	$584.04	$690.00	$0.00	$690.00	1.2	3,591

ECM 8: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
3,566	0.0	0.0	$584.04	$690.00	$0.00	$690.00	1.2	3,591

Measure Description

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

5 ENERGY EFFICIENT PRACTICES

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

Close Doors and Windows

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

Turn Off Unneeded Motors

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Reducing run hours for these motors can result in significant energy savings. Whenever possible, use automatic devices such as twist timers or occupancy sensors to ensure that motors are turned off when not needed.

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.

Install Destratification Fans

Allowing air to thermally stratify in spaces with high ceilings results in additional energy consumption by requiring the heating system to heat a volume of space much larger than the actual occupied space. Additional inefficiencies also occur because there are higher temperatures at the ceiling level than at the floor level. Higher temperatures at the ceiling accelerate heat loss through the roof, requiring additional energy consumption by the heating equipment in order to compensate for the accelerated heat transfer.

Destratification fans are specially designed to deliver a columnar, laminar flow of air balancing the air temperature from floor to ceiling. In addition to fuel savings, the use of destratification fans will reduce the recovery time necessary to warm the space after nightly temperature setbacks and will increase the comfort level of the occupants.

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.

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

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 "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

6 ON-SITE GENERATION MEASURES

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

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

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

6.1 Photovoltaic

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

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the campus has a **High Potential** for cost-effective installation of rooftop PV arrays.

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 Gym has approximately 20,000 square feet of unshaded roof space available, which would represent about 18.7% of the total array. See rooftop image below.

We estimate that the available rooftop space combined could support up to **1,487 kW** of solar generating capacity (~4,956 PV panels @300-W_{DC} each).[1] 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

[1] 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.

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

Image 8: Potentially Available Rooftop Spaces

Image 9: 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

Solar projects must register their projects in the SREC Registration Program (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 developed new solar projects and insight into future SREC pricing. See Section 8.3 below 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 the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

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

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

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

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

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

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

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 21 for a list of the eligible programs identified for each recommended ECM.

Figure 21 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	X			X
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X			X
ECM 3	Retrofit Fixtures with LED Lamps	X			X
ECM 4	Install LED Exit Signs				X
ECM 5	Install Occupancy Sensor Lighting Controls	X			X
ECM 6	Premium Efficiency Motors		X		X
ECM 7	Install VFDs on Hot Water Pumps		X		X
ECM 8	Vending Machine Control				X

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the SmartStart custom program provides incentives for new and innovative technologies, or process improvements not defined through one of the prescriptive incentives listed above.

Although your facility is an existing building, and only the prescriptive incentives have been applied in the calculations, the SmartStart custom measure path is recommended for ECM 6 (Premium Efficiency Motors) and ECM 7 (Install VFDs on Hot Water Pumps). These incentives are calculated utilizing a number of factors, including project cost, energy savings and comparison to existing conditions or a defined standard. To qualify, the proposed measure(s) must be at least 2% more efficient than current energy code or recognized industry standard, and save at least 75,000 kWh or 1,500 therms annually.

SmartStart custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives in the SmartStart program (inclusive of prescriptive and custom) 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 prescriptive program you will need to submit an application for the specific equipment installed or 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. Please note that SmartStart custom application requirements are different from the prescriptive applications and will most likely require additional effort to complete.

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

8.2 Pay for Performance

Overview

The Pay for Performance (P4P) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

Incentives

Incentives are calculated based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.15/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

How to Participate

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors) or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at: www.njcleanenergy.com/P4P.

8.3 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) 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 NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

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 (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other 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

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main Gym	42	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Occupancy Sensor	120	3,312	Relamp & Reballast	No	42	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,312	2.12	9,747	0.0	$1,596.26	$8,836.10	$840.00	5.01
Main Gym	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	4,732	Relamp & Reballast	No	6	LED - Linear Tubes: (2) 4' Lamps	None	29	4,732	0.16	1,059	0.0	$173.39	$702.00	$60.00	3.70
Main Gym	2	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	139	0.0	$22.70	$215.11	$0.00	9.48
Main Gym	1	Exit Signs: LED - 2 W Lamp	None	2	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	2	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Equip Rm	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,800	Relamp & Reballast	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,960	0.25	985	0.0	$161.26	$1,052.00	$20.00	6.40
Tennis Courts	24	Metal Halide: (1) 1000W Lamp	Wall Switch	1,080	1,700	LED Retrofit	No	24	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	380	1,700	13.67	32,273	0.0	$5,285.39	$14,046.00	$0.00	2.66
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,400	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	980	0.03	66	0.0	$10.80	$233.00	$30.00	18.79
Women's Locker Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,400	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,680	0.03	113	0.0	$18.52	$233.00	$30.00	10.96
Equip Storage	4	Compact Fluorescent: Wall Sconces (2 bulbs ea.)	Wall Switch	26	1,600	Relamp	Yes	4	LED Screw-In Lamps: 2 x 9W LED Bulbs	Occupancy Sensor	18	1,120	0.04	97	0.0	$15.87	$546.02	$60.00	30.62
Shower Area	11	Compact Fluorescent: Wall Sconces (2 bulbs ea.)	Wall Switch	26	2,400	Relamp	Yes	11	LED Screw-In Lamps: 2 x 9W LED Bulbs	Occupancy Sensor	18	1,680	0.12	400	0.0	$65.47	$1,452.57	$145.00	19.97
Shower Area	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,400	Relamp & Reballast	Yes	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,680	0.02	59	0.0	$9.70	$214.00	$25.00	19.48
Storage	1	Compact Fluorescent: Wall Sconces (2 bulbs ea.)	Wall Switch	26	1,400	Relamp	Yes	1	LED Screw-In Lamps: 2 x 9W LED Bulbs	Occupancy Sensor	18	980	0.01	21	0.0	$3.47	$223.51	$30.00	55.74
Women's Locker Room	14	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,400	Relamp & Reballast	Yes	14	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,680	0.25	830	0.0	$135.87	$1,912.00	$140.00	13.04
Women's Locker Room	13	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,400	Relamp & Reballast	Yes	13	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,680	0.23	770	0.0	$126.16	$1,814.00	$135.00	13.31
Women's Locker Room	1	Compact Fluorescent: Round Wrap	Wall Switch	17	2,400	Relamp	Yes	1	LED Screw-In Lamps: 9W LED Bulb	Occupancy Sensor	9	1,680	0.01	29	0.0	$4.75	$169.75	$25.00	30.46
Women's Locker Room	3	Compact Fluorescent: Recessed Cans	Wall Switch	17	2,400	LED Retrofit	Yes	3	LED - Fixtures: Downlight Recessed	Occupancy Sensor	10	1,680	0.03	84	0.0	$13.79	$325.28	$35.00	21.05
Staff Locker Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,400	Relamp & Reballast	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,680	0.04	119	0.0	$19.41	$312.00	$30.00	14.53
Staff Locker Room	2	Compact Fluorescent: Round Wrap	Wall Switch	17	2,400	Relamp	Yes	2	LED Screw-In Lamps: 9W LED Bulb	Occupancy Sensor	9	1,680	0.02	58	0.0	$9.50	$377.51	$45.00	34.98
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,600	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,120	0.03	75	0.0	$12.35	$233.00	$30.00	16.44
Hall	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,732	Relamp & Reballast	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,732	0.02	155	0.0	$25.40	$117.00	$0.00	4.61
Hall	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,732	Relamp & Reballast	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,732	0.83	5,454	0.0	$893.23	$1,404.00	$120.00	1.44
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	4,732	Relamp & Reballast	No	3	LED - Linear Tubes: (2) 4' Lamps	None	29	4,732	0.08	529	0.0	$86.70	$351.00	$30.00	3.70
Stairwell	3	Compact Fluorescent: Wall Sconces (2 bulbs ea.)	None	26	4,732	Relamp	No	3	LED Screw-In Lamps: 2 x 9W LED Bulbs	None	18	4,732	0.02	128	0.0	$21.02	$322.52	$0.00	15.35
Dance Rm	28	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,800	Relamp & Reballast	Yes	28	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,260	1.67	4,180	0.0	$684.61	$5,611.33	$700.00	7.17
Class Rm	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,800	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,260	0.36	896	0.0	$146.70	$1,241.00	$155.00	7.40

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Equip Rm 147	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,400	Relamp & Reballast	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	980	0.18	348	0.0	$57.05	$601.50	$80.00	9.14
Conf Rm 145	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,400	Relamp & Reballast	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	980	0.32	615	0.0	$100.79	$1,440.00	$35.00	13.94
Conf Rm 145	1	Compact Fluorescent: Recessed Cans	Wall Switch	26	1,400	LED Retrofit	Yes	1	LED - Fixtures: Downlight Recessed	Occupancy Sensor	17	980	0.01	22	0.0	$3.65	$173.51	$25.00	40.65
Closet	2	Compact Fluorescent: Recessed Cans	Wall Switch	26	500	LED Retrofit	No	2	LED - Fixtures: Downlight Recessed	Wall Switch	9	500	0.03	19	0.0	$3.15	$139.52	$10.00	41.17
Storage Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	800	Relamp & Reballast	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	560	0.06	66	0.0	$10.87	$277.83	$40.00	21.89
Storage Closet	4	Compact Fluorescent: Recessed Cans	Wall Switch	26	800	LED Retrofit	Yes	4	LED - Fixtures: Downlight Recessed	Occupancy Sensor	17	560	0.05	51	0.0	$8.35	$230.04	$20.00	25.15
Rm 143	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,600	Relamp & Reballast	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,120	0.54	1,194	0.0	$195.60	$1,726.50	$215.00	7.73
Elec Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	200	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	200	0.03	7	0.0	$1.22	$117.00	$10.00	87.60
Rm 153	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,600	Relamp & Reballast	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,120	0.06	133	0.0	$21.73	$277.83	$40.00	10.94
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,732	0.05	353	0.0	$57.80	$234.00	$20.00	3.70
Lobby	17	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,732	Relamp & Reballast	No	17	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	4,732	0.40	2,636	0.0	$431.73	$1,989.00	$0.00	4.61
Offices	19	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,732	Relamp & Reballast	Yes	19	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,312	0.60	3,952	0.0	$647.24	$3,033.00	$105.00	4.52
G102	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,312	0.09	434	0.0	$71.11	$468.00	$0.00	6.58
G102	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	800	0.01	16	0.0	$2.59	$98.00	$5.00	35.90
G103	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,312	0.09	434	0.0	$71.11	$468.00	$0.00	6.58
G103	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	800	0.01	16	0.0	$2.59	$98.00	$5.00	35.90
G104	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,312	0.09	434	0.0	$71.11	$468.00	$0.00	6.58
G104	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	800	0.01	16	0.0	$2.59	$98.00	$5.00	35.90
G105	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,312	0.09	434	0.0	$71.11	$468.00	$0.00	6.58
G105	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	800	0.01	16	0.0	$2.59	$98.00	$5.00	35.90
G106	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp & Reballast	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,312	0.09	434	0.0	$71.11	$468.00	$0.00	6.58
G106	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	800	0.01	16	0.0	$2.59	$98.00	$5.00	35.90
G107	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp & Reballast	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.16	741	0.0	$121.37	$702.00	$60.00	5.29
G107	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	800	0.01	16	0.0	$2.59	$98.00	$5.00	35.90
Front Entrance	4	Compact Fluorescent: Recessed Cans	Wall Switch	32	4,732	LED Retrofit	No	4	LED - Fixtures: Downlight Recessed	Wall Switch	21	4,732	0.04	235	0.0	$38.53	$200.04	$20.00	4.67

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Front Door	1	Metal Halide: (1) 400W Lamp	None	458	4,380	LED Retrofit	No	1	LED Screw-In Lamps: 30W LED Bulb (Moghul Base)	None	90	4,380	0.30	1,821	0.0	$298.29	$440.04	$0.00	1.48
Bollards	10	LED - Fixtures: Bollard Fixture	None	21	4,380	None	No	10	LED - Fixtures: Bollard Fixture	None	21	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Perimeter	2	Metal Halide: (1) 250W Lamp	None	295	4,380	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	46	4,380	0.41	2,465	0.0	$403.67	$833.08	$200.00	1.57
Perimeter	2	Compact Fluorescent: Surface Mounts	None	23	4,380	LED Retrofit	No	2	LED - Fixtures: Downlight Surface Mount	None	15	4,380	0.01	84	0.0	$13.78	$117.52	$10.00	7.80
Perimeter	4	Metal Halide: (1) 175W Lamp	None	215	4,380	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	40	4,380	0.57	3,465	0.0	$567.40	$1,335.16	$400.00	1.65
Door 2	1	Compact Fluorescent: Recessed Cans	None	32	4,380	LED Retrofit	No	1	LED - Fixtures: Downlight Recessed	None	21	4,380	0.01	54	0.0	$8.92	$50.01	$5.00	5.05
Door 3	1	Compact Fluorescent: Surface Mounts	None	23	4,380	LED Retrofit	No	1	LED - Fixtures: Downlight Surface Mount	None	15	4,380	0.01	42	0.0	$6.89	$58.76	$0.00	8.53
Perimeter	1	Compact Fluorescent: Surface Mounts	None	23	4,380	LED Retrofit	No	1	LED - Fixtures: Downlight Surface Mount	None	15	4,380	0.01	42	0.0	$6.89	$58.76	$0.00	8.53
Perimeter	4	Compact Fluorescent: Recessed Cans	None	26	4,380	LED Retrofit	No	4	LED - Fixtures: Downlight Recessed	None	17	4,380	0.03	178	0.0	$29.18	$230.04	$20.00	7.20
Perimeter	1	Halogen Incandescent: Par 38 Spotlights	None	150	4,380	Relamp	No	1	LED Screw-In Lamps: 17W LED Spotlight Bulb	None	17	4,380	0.11	658	0.0	$107.81	$31.75	$5.00	0.25
Door 4	1	High-Pressure Sodium: (1) 70W Lamp	None	95	4,380	Fixture Replacement	No	1	LED - Fixtures: Outdoor Porch Wall Mount	None	27	4,380	0.06	337	0.0	$55.12	$239.19	$5.00	4.25
Men's Locker Rm	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,400	Relamp & Reballast	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,680	0.47	1,583	0.0	$259.30	$2,178.00	$210.00	7.59
Men's Locker Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,400	Relamp & Reballast	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,680	0.04	119	0.0	$19.41	$312.00	$30.00	14.53
Faculty Locker Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,400	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,680	0.07	226	0.0	$37.04	$350.00	$40.00	8.37
Faculty Locker Rm	10	Compact Fluorescent: Recessed Cans	Wall Switch	17	2,400	LED Retrofit	Yes	10	LED - Fixtures: Downlight Recessed	Occupancy Sensor	10	1,680	0.08	281	0.0	$45.97	$967.60	$85.00	19.20
Faculty Locker Rm	1	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	69	0.0	$11.35	$107.56	$0.00	9.48
Laundry Area	3	Compact Fluorescent: Recessed Cans	Occupancy Sensor	13	1,600	LED Retrofit	Yes	3	LED - Fixtures: Downlight Recessed	Occupancy Sensor	10	1,120	0.02	34	0.0	$5.64	$325.28	$35.00	51.46
Laundry Area	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,400	Relamp & Reballast	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,680	0.14	452	0.0	$74.08	$468.00	$40.00	5.78
Laundry Area	1	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	69	0.0	$11.35	$107.56	$0.00	9.48
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,600	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,120	0.03	75	0.0	$12.35	$233.00	$30.00	16.44
Closet	1	Compact Fluorescent: Recessed Cans	Wall Switch	13	500	LED Retrofit	No	1	LED Screw-In Lamps: 9W LED Bulb	Wall Switch	9	500	0.00	2	0.0	$0.37	$15.50	$5.00	28.37
Uniform Room (Rm 115)	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,200	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	840	0.07	113	0.0	$18.52	$350.00	$40.00	16.74
Rm 114	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,000	Relamp & Reballast	No	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,000	0.16	224	0.0	$36.64	$702.00	$60.00	17.52
Rm 114	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	None	32	1,800	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 4' Lamp	None	15	1,800	0.01	36	0.0	$5.83	$98.00	$5.00	15.95
Rm G113	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,000	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,000	0.18	253	0.0	$41.45	$647.33	$80.00	13.69

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Media Storage Rm G112	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,200	Relamp & Reballast	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	840	0.06	100	0.0	$16.30	$277.83	$40.00	14.59
Housekeeping Closet	1	Compact Fluorescent: Recessed Cans	None	26	500	LED Retrofit	No	1	LED Screw-In Lamps: Downlight Recessed	None	17	500	0.01	5	0.0	$0.83	$23.31	$5.00	21.99
Men's Restroom (Rm 110)	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,600	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,120	0.10	226	0.0	$37.04	$621.00	$65.00	15.01
Women's Restroom (Rm 111)	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,600	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,120	0.10	226	0.0	$37.04	$621.00	$65.00	15.01
Trainer's Office (Rm G108)	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,600	Relamp & Reballast	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,600	0.12	268	0.0	$43.97	$394.50	$45.00	7.95
Trainer's Office (Rm G108)	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,600	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,120	0.10	226	0.0	$37.04	$621.00	$65.00	15.01
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,600	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,120	0.03	70	0.0	$11.52	$233.00	$20.00	18.49
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,600	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,120	0.03	70	0.0	$11.52	$233.00	$20.00	18.49
Storage Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,200	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	840	0.03	57	0.0	$9.26	$233.00	$30.00	21.92
Boiler Rm	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	1,200	Relamp & Reballast	No	6	LED - Linear Tubes: (2) 4' Lamps	None	29	1,200	0.16	268	0.0	$43.97	$702.00	$60.00	14.60
Dining Area	10	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp & Reballast	Yes	10	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,319	0.32	1,456	0.0	$238.46	$1,440.00	$35.00	5.89
Loading Dock	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	3,600	Relamp & Reballast	No	3	LED - Linear Tubes: (2) 4' Lamps	None	29	3,600	0.08	403	0.0	$65.96	$351.00	$30.00	4.87
Fitness Rm	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,600	Relamp & Reballast	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,520	0.27	1,357	0.0	$222.25	$1,206.00	$115.00	4.91
Fitness Rm	2	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	139	0.0	$22.70	$215.11	$0.00	9.48
Boiler Rm	1	Exit Signs: Fluorescent	None	9	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	2	8,760	0.01	69	0.0	$11.35	$107.56	$0.00	9.48

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	GEF-1	1	Exhaust Fan	0.3	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	GEF-2	1	Exhaust Fan	0.3	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Highest Roof	GEF-3	1	Exhaust Fan	0.3	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Highest Roof	GEF-4	1	Exhaust Fan	1.5	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-5	1	Exhaust Fan	0.5	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-6	1	Exhaust Fan	0.5	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-7	1	Exhaust Fan	1.0	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-8	1	Exhaust Fan	1.5	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-9	1	Exhaust Fan	1.5	84.0%	Yes	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-10	1	Exhaust Fan	1.5	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-11	1	Exhaust Fan	0.3	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-12	1	Exhaust Fan	1.0	82.5%	Yes	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-13	1	Exhaust Fan	1.0	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-14	1	Exhaust Fan	1.0	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-15	1	Exhaust Fan	1.0	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	GEF-16	1	Exhaust Fan	1.0	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mid-Roof	AHU-003, AHU-005	2	Other	1.0	82.5%	0	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ground	ACC-001, ACC-002	4	Air Compressor	10.0	89.5%	No	4,957	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Ground	ACC-001, ACC-003	4	Other	1.0	82.5%	No	2,745	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	HWP-001	1	Heating Hot Water Pump	3.0	82.0%	No	1,200	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	HWP-002	1	Heating Hot Water Pump	0.8	82.0%	No	1,200	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	HWP-005	1	Heating Hot Water Pump	0.8	82.5%	No	1,200	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	HWP-006	1	Heating Hot Water Pump	0.8	82.5%	No	1,200	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	HWP-007	1	Heating Hot Water Pump	3.0	82.0%	No	1,200	Yes	89.5%	Yes	1	0.49	1,491	0.0	$244.11	$3,884.01	$0.00	15.91
Boiler Room	HWP-008	1	Heating Hot Water Pump	3.0	82.0%	No	1,200	Yes	89.5%	Yes	1	0.49	1,491	0.0	$244.11	$3,884.01	$0.00	15.91

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Behind Building	Health & Human Performance Center	2	Split-System AC	20.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Equipment Room	Equipment Room	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	RTU-001, RTU-002	2	Packaged AC	8.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	RTU-007	3	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	RTU-004	1	Packaged AC	8.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	AHU-3, 5	2	Split-System AC	20.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Health & Human Performance Center	2	Non-Condensing Hot Water Boiler	1,684.80	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	RTUs #003, 005, 006	3	Furnace	240.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	RTU-007	1	Furnace	183.68	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	RTUs #001, 002	1	Furnace	407.70	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Health & Human Performance Center	2	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Office Area	2	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office Area	1	Stand-Up Refrigerator, Solid Door (≤15 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Gym	2	Ice Making Head (<450 lbs/day), Batch	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Offices	18	Computers	120.0	Yes
Offices	18	Monitors	41.0	Yes
Offices	4	Printers	192.0	No
Offices	3	Copiers	240.0	Yes
Offices	4	TVs	150.0	No
Fitness Area	60	Exercise Equipment	1,800.0	No
Offices	4	Microwaves	800.0	No
Laundry Area	2	Washing Machines	1,500.0	No
Laundry Area	1	Dryers	3,400.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lobby	2	Refrigerated	Yes	0.00	3,224	0.0	$527.95	$460.00	$0.00	0.87
Lobby	1	Non-Refrigerated	Yes	0.00	343	0.0	$56.09	$230.00	$0.00	4.10

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Ocean County College

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

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

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Ocean County College 1 College Drive Toms River, New Jersey 08754	_____ , (____)____-_____	____ _____ , (____)____-_____ _____

Property ID: 5093695

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
164.7 kBtu/ft²

Source EUI
315.4 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	50,787,318 (59%)
Electric - Grid (kBtu)	35,847,151 (41%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	137.1
National Median Source EUI (kBtu/ft²)	262.6
% Diff from National Median Source EUI	20%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	6,808

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)