Local Government Energy Audit Report

Rutgers University Marine Field Station

February 6, 2019

Prepared for:

Rutgers University
800 Great bay Blvd.
Tuckerton, NJ 08087

Prepared by:

TRC Energy Services
900 Route 9 North
Woodbridge, NJ 07095

Disclaimer

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

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual measures and conditions. TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

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

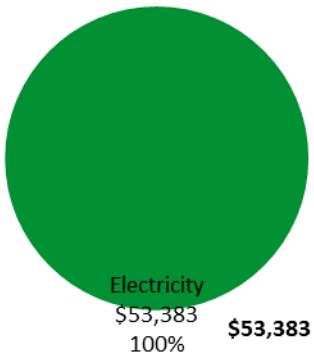
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

Table of Contents

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Rutgers University Marine Field Station. This report provides you with information about your facility's energy use, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help make changes in your facility. TRC Energy Services (TRC) conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $53,383 Electricity: 341,086 kWh	
ENERGY STAR® Benchmarking Score	N/A *(1-100 scale)*	A standard energy use benchmark is not available for this facility type. This report contains suggestions about how to improve building performance and reduce energy costs.

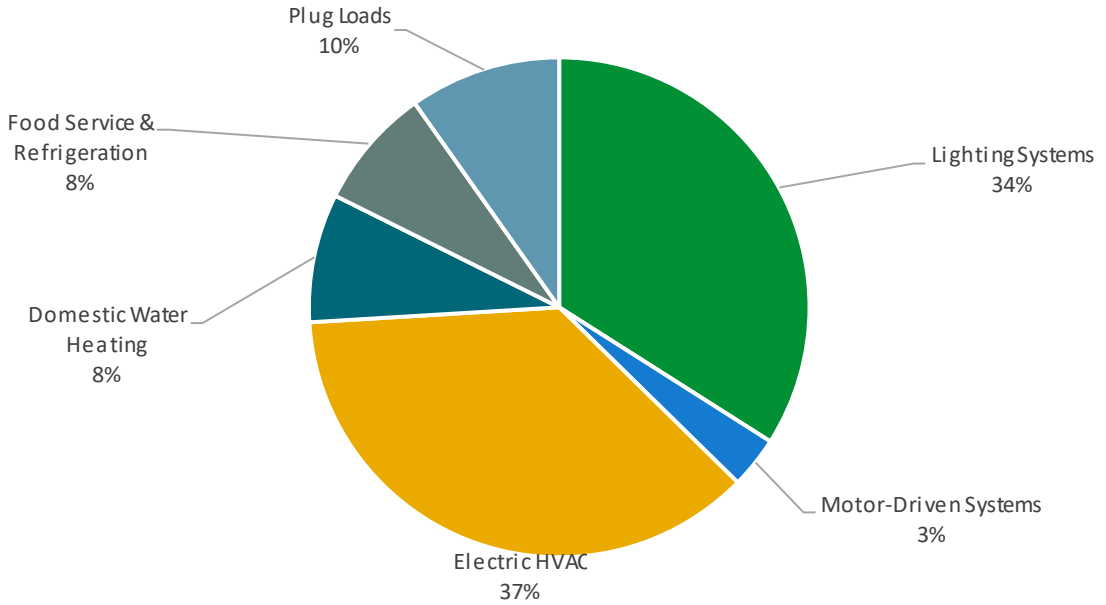


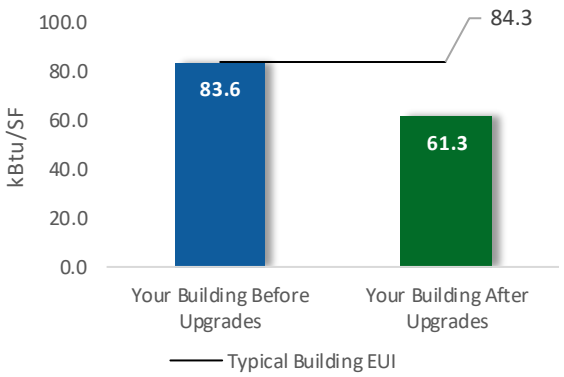
Figure 1 - Energy Use by System

POTENTIAL IMPROVEMENTS

This energy audit considered a range of potential energy improvements in your building. Costs and savings will vary between improvements. Presented below are two potential scopes of work for your consideration.

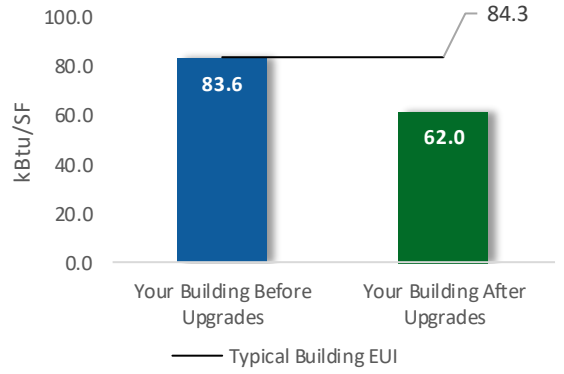
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$52,327
Potential Rebates & Incentives[1]	$4,551
Annual Cost Savings	$14,192
Annual Energy Savings	Electricity: 90,678 kWh
Greenhouse Gas Emission Savings	46 Tons
Simple Payback	3.4 Years
Site Energy Savings (all utilities)	27%



Scenario 2: Cost Effective Package[2]

Installation Cost	$32,559
Potential Rebates & Incentives	$3,745
Annual Cost Savings	$13,741
Annual Energy Savings	Electricity: 87,795 kWh
Greenhouse Gas Emission Savings	44 Tons
Simple Payback	2.1 Years
Site Energy Savings (all utilities)	26%



On-site Generation Potential

Photovoltaic	None
Combined Heat and Power	None

[1] Incentives are based on current SmartStart Prescriptive incentives. Other program incentives may apply.

[2] A cost-effective measure is defined as one where the simple payback does not exceed two-thirds of the expected proposed equipment useful life. Simple payback is based on the net measure cost after potential incentives.

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Lifetime Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**58,017**	**6.3**	**0**	**$9,080**	**$136,203**	**$9,465**	**$2,395**	**$7,070**	**0.8**	**58,423**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	138	0.1	0	$22	$325	$194	$18	$176	8.1	139
ECM 2	Retrofit Fixtures with LED Lamps	57,879	6.2	0	$9,059	$135,878	$9,271	$2,377	$6,894	0.8	58,283
Lighting Control Measures		**14,850**	**1.5**	**0**	**$2,324**	**$18,593**	**$13,020**	**$1,120**	**$11,900**	**5.1**	**14,954**
ECM 3	Install Occupancy Sensor Lighting Controls	14,256	1.5	0	$2,231	$17,850	$12,420	$1,120	$11,300	5.1	14,356
ECM 4	Install High/Low Lighting Controls	594	0.1	0	$93	$743	$600	$0	$600	6.5	598
Electric Unitary HVAC Measures		**7,225**	**1.8**	**0**	**$1,131**	**$16,961**	**$25,441**	**$1,036**	**$24,405**	**21.6**	**7,275**
	Install High Efficiency Air Conditioning Units	2,883	1.3	0	$451	$6,768	$19,768	$806	$18,962	42.0	2,903
ECM 5	Install High Efficiency Heat Pumps	4,342	0.5	0	$680	$10,194	$5,672	$230	$5,442	8.0	4,372
Domestic Water Heating Upgrade		**2,502**	**0.0**	**0**	**$392**	**$3,916**	**$22**	**$0**	**$22**	**0.1**	**2,520**
ECM 6	Install Low-Flow DHW Devices	2,502	0.0	0	$392	$3,916	$22	$0	$22	0.1	2,520
Food Service & Refrigeration Measures		**8,084**	**0.9**	**0**	**$1,265**	**$15,183**	**$4,380**	**$0**	**$4,380**	**3.5**	**8,141**
ECM 7	Replace Refrigeration Equipment	8,084	0.9	0	$1,265	$15,183	$4,380	$0	$4,380	3.5	8,141
TOTALS		**90,678**	**10.6**	**0**	**$14,192**	**$190,856**	**$52,327**	**$4,551**	**$47,776**	**3.4**	**91,312**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance criteria for that pro
** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Figure 2 – Evaluated Energy Improvements

1.1 Planning Your Project

Careful planning makes for a successful energy project. When considering this scope of work, you will have some decisions to make, such as:

- How will the project be funded and/or financed?
- Is it best to pursue individual ECMs, groups of ECMs, or use a comprehensive approach where all ECMs are installed together?
- Are there other facility improvements that should happen at the same time?

Pick Your Installation Approach

New Jersey Clean Energy Programs give you the flexibility to do a little or a lot. Rebates, incentives, and financing are available to help reduce both your installation costs and your energy bills. If you are planning to take advantage of these programs, make sure to review incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives before purchasing materials or starting installation.

The potential ECMs identified for this building likely qualify for multiple incentive and funding programs. Based on current program rules and requirements, your measures are likely to qualify for the following programs:

Energy Conservation Measure		SmartStart	Direct Install	Pay For Performance
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X	X	
ECM 2	Retrofit Fixtures with LED Lamps	X	X	
ECM 3	Install Occupancy Sensor Lighting Controls		X	
ECM 4	Install High/Low Lighting Controls	X	X	
ECM 5	Install High Efficiency Heat Pumps		X	
ECM 6	Install Low-Flow Domestic Hot Water Devices		X	
ECM 7	Replace Refrigeration Equipment			

Figure 3 – Funding Options

New Jersey Clean Energy Programs At-A-Glance

	SmartStart Flexibility to install at your own pace	**Direct Install** Turnkey installation	**Pay for Performance** Whole building upgrades
Who should use it?	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together. Peak demand should be below 200 kW. Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time. Peak demand should be over 200 kW.
How does it work?	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
What are the Incentives?	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to $125,000 per project. You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified partner to develop your energy reduction plan and set your energy savings targets.

Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.

Individual Measures with SmartStart

For facilities wishing 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, you can use internal resources or an outside firm or contractor to perform the final design of the ECM(s) and install the equipment. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation.

Turnkey Installation with Direct Install

The Direct Install program provides turnkey installation of multiple measures through an authorized network of participating contractors. This program can provide substantially higher incentives than SmartStart, up to 70% of the cost of selected measures. Direct Install contractors will assess and verify individual measure eligibility, and, in most cases, they perform the installation work. The Direct Install program is available to sites with an average peak demand of less than 200 kW.

Whole Building Approach with Pay for Performance

Pay for Performance can be a good option for medium to large sized facilities to achieve deep energy savings. Pay for Performance allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also use this program. Pay for Performance works for larger customers with a peak demand over 200 kW. 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.

More Options from Around the State

Financing and Planning Support with the Energy Savings Improvement Program (ESIP)

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the 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. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

Resiliency with Return on Investment through Combined Heat & Power (CHP)

The CHP program provides incentives for combined heat and power (aka cogeneration) and waste heat to power projects. Combined heat and power systems generate power on-site and recover heat from the generation system to meet on-site thermal loads. Waste heat to power systems use waste heat to generate power. You will work with a qualified developer who will design a system that meets your building's heating and cooling needs.

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces 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. By enabling commercial facilities to reduce their electric demand 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 demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Rutgers University Marine Field Station. This report provides information on how your facility uses energy, identifies energy conservation measures (ECMs) that can reduce your energy use, and provides information and assistance to help you implement the ECMs. This report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

TRC conducted this study as part of a comprehensive effort to assist New Jersey educational and local government facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

2.1 Site Overview

On August 14, 2018, TRC performed an energy audit at Rutgers University Marine Field Station located in Tuckerton, NJ. TRC Auditor met with Michael D. Kornitas to review the facility operations and help focus our investigation on specific energy-using systems.

Rutgers University Marine Field Station consist of two buildings. Fire station building is three stories and veterinary lab building is two stories tall, 13,929 square foot building built in 1972. Spaces include: classroom, veterinary lab, auditorium, lunch room, storage area, offices, corridors, stairwells, offices, pantry and basement mechanical space.

Over the last several years, the facility has a comprehensive interior lighting retrofit project that consisted of replacing its existing fluorescent T12 fixtures to T8 fluorescent fixtures. The facility is interested in the implementation of new energy conservation measures that can help reduce its overall energy consumption.

Facility concerns include: Old HVAC Equipment, inefficient lighting system, high electric bills.

2.2 Building Occupancy

The facility is occupied year-round and open 24 hours a day, seven days a week. Typical weekday occupancy is 15 staff and 20 students. Summer occupancy includes a summer lab research and continuing maintenance activities. The site is also open on weekends.

Building Name	Weekday/Weekend	Operating Schedule
Rutgers University Marine Field Station	Weekday	12:00 AM - 12:00 AM
	Weekend	12:00 AM - 12:00 AM

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building exterior walls are finished with vinyl siding and cladding. The roof is gable and valley with dormer windows (rooftop windows) consist of wood roof shingles and in good condition.

The walls are made of concrete masonry units (CMUs) with a decorative CMU veneer and gypsum drywall interior finish. The shingles roof is supported with steel trusses and a wood deck and finished with an insulated layer. Steel trusses support a gabled roof with a wood deck covered with slate shingles. Roof encloses conditioned space. The thermal barrier is between this space and the conditioned space below.

Most of the windows are single as well as double glazed with low-e glass and have wood frames. The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, showing signs of excessive wear. Exterior doors have wood frames and are in fair condition as well. Degraded window and door seals increase drafts and outside air infiltration.

Image 1: Building Exterior

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also couple of 2 feet 20-Watt T12 fixtures. Additionally, there are some compact fluorescent lamps (CFL), incandescent and LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

Fixture types include 2- 3- or 4-lamp, 2- or 4-foot long troffer mounted fixtures and 2-foot fixtures with linear tube lamps. Most fixtures are in good condition. Interior lighting levels were generally sufficient. Most lighting fixtures are controlled manually by wall switches.

Exterior fixtures include wall packs and canopy lights with high intensity discharge (HID), CFL and LED lamps. The pole mounted flood fixtures are LED. Exterior light fixtures are controlled by photocells.

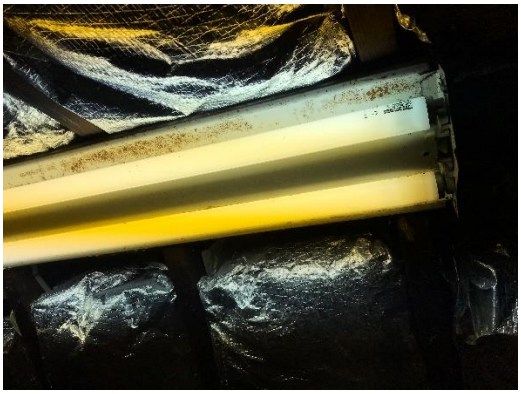


Image 2: T8 Fixture

Image 3: T12 Fixture

2.5 Air Handling Systems

Packaged Units

Second floor areas are served with five Lennox packaged air source heat pump units controlled by room thermostats. These 10.30 EER units have heating capacity ranging from 14.30 MBh to 47.50 MBh and cooling capacity ranging from 1.5-ton to 4 ton.

First floor building area is also served by packaged air conditioning units as well. There are five Lennox units ranging in size from 2 to 6-tons. These units are constant volume and are not equipped with economizers. They are in good condition.

There is one Lennox electric forced air furnace unit with heating output of 68.24 MBh that serves the second-floor corridor and lounge room, also one electric resistance unit heater with heating output of 51.18 MBh serves the first-floor corridor.

Refer to Appendix A for detailed information about each unit.

Image 5: Packaged Heat pump

Image 4: Packaged AC

Air Conditioners

Cooling in offices and classrooms is provided by 12 window air conditioners (ACs). All window units have cooling capacity of 12,000 Btu/hr. The units are in good condition. They range in efficiency between 11.30 EER to 12 EER. They are ENERGY STAR® labeled. A 7.5-ton Trane split system AC is also used to provide supplemental cooling to second floor.

Image 6: Window AC in office

Image 7: Window AC in Lunch room

Image 8: Split system AC in vestibule

Image 9: Window AC in office

2.6 Heating Systems

There is no natural gas service at the facility. The HVAC equipment is all electric. Heating is provided by packaged air source heat pumps, electric forced air furnace and electric resistance heaters.

2.7 Domestic Hot Water

Hot water is produced with a 65-gallon 9 kW electric storage water heater and 40-gallon 4.5 kW electric storage water heater. The water heaters appear in good condition.

The domestic hot water pipes are partially insulated, and the insulation is in good condition.

Image: 10 DHW Heater

Image 11: DHW Heater 2

2.8 Refrigeration

The lab has two stand-up energy efficient ULT freezers with solid doors and four chest type freezers to store samples of sea creatures for research purposes. All equipment is high efficiency and in good condition.

Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high efficiency food service equipment.

Image 12: ULT Freezer

2.9 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 9.79% percent of total building energy use. This is higher than a typical building.

You may wish to consider paying attention to minimizing your plug load usage. This report makes suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 28 computer work stations throughout the facility. Plug loads throughout the building include general lab and office equipment. There are veterinary lab typical loads such as microscopes, fume hoods and digital incubators.

The kitchen has two refrigerators to store food and cold beverages for staff and students.

There are no vending machines at the facility.

Image 13: Fume hood

2.10 Water-Using Systems

There are two restrooms with toilets and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher. Toilets are rated at 2.5 gallons per flush (gpf).

2.11 Process Equipment

There is an air compressor with 0.75 hp motor on second floor MER used to circulate the refrigerant in packaged air conditioning system under pressure.

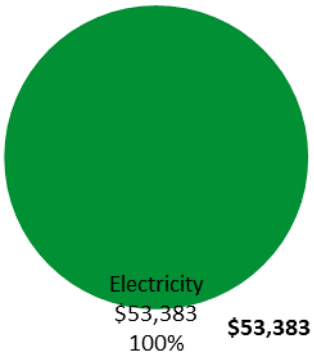
Image 14 Air Compressor

Image 15 Air compressor motor

3 Energy Use and Costs

Twelve months of utility billing data are used to develop annual energy consumption and cost data. This information creates a profile of the annual energy consumption and energy costs.

Utility Summary		
Fuel	**Usage**	**Cost**
Electricity	341,086 kWh	$53,383
Propane		
Total		**$53,383**



An energy balance identifies and quantifies energy use in your various building systems. This can highlight areas with the most potential for improvement. This energy balance was developed using calculated energy use for each of the end uses noted in the figure.

The energy auditor collects information regarding equipment operating hours, capacity, efficiency and other operational parameters from facility staff, drawings, and on-site observations. This information is used as the inputs to calculate the existing conditions energy use for the site. The calculated energy use is then compared to the historical energy use and the initial inputs are revised, as necessary, to balance the calculated energy use to the historical energy use.

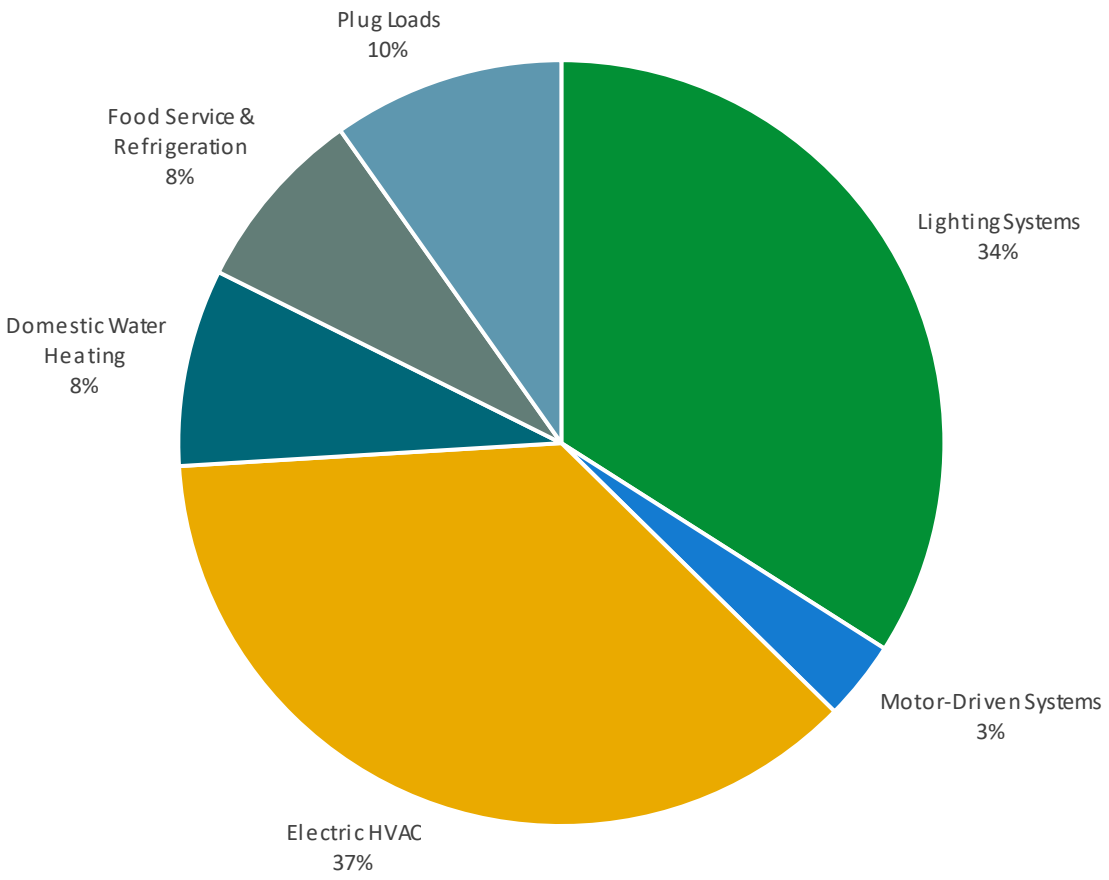
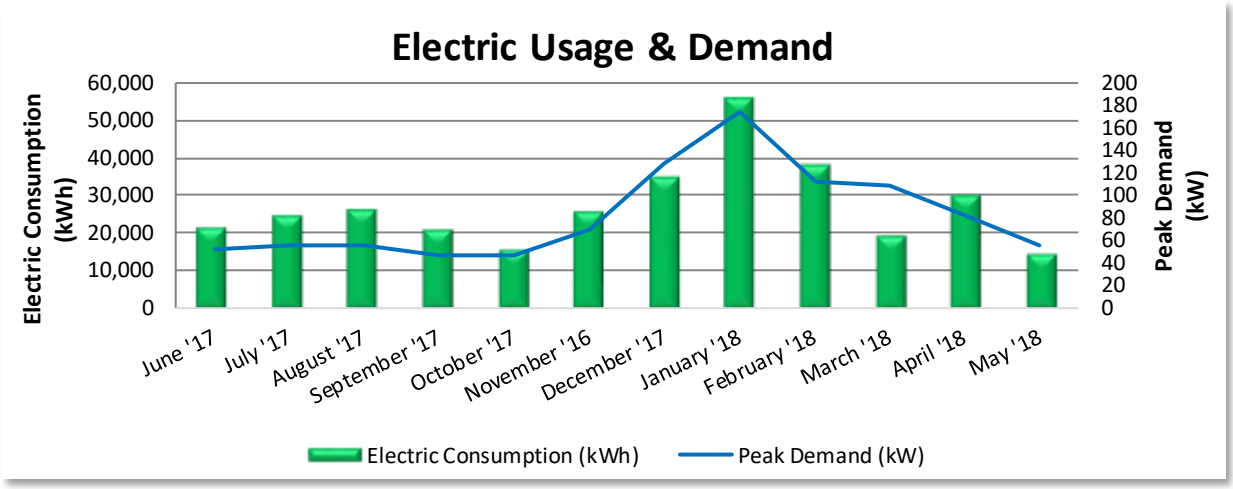


Figure 5 - Energy Balance

3.1 Electricity

Atlantic City Electric delivers electricity under rate class Annual General Service Secondary.



Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
6/28/17	31	21,480	51	$495	$2,596
7/29/17	30	24,840	56	$476	$5,578
8/29/17	29	26,100	56	$541	$3,806
9/26/17	26	20,580	47	$385	$2,987
10/26/17	29	15,420	46	$446	$2,446
11/28/16	31	25,380	70	$748	$3,850
12/27/17	28	34,680	128	$1,213	$5,242
1/26/18	28	55,560	175	$1,709	$8,171
2/23/18	26	37,860	112	$1,016	$5,529
3/27/18	33	19,140	109	$1,129	$3,608
4/25/18	27	29,820	82	$754	$4,375
5/26/18	30	14,340	55	$399	$2,709
Totals	**348**	**325,200**	**175**	**$9,310**	**$50,897**
Annual	**365**	**341,086**	**175**	**$9,764**	**$53,383**

Notes:

- Peak demand of 175 kW occurred in January 2018.
- The average electric cost over the past 12 months was $0.157/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's Portfolio Manager® software. Benchmarking compares your building's energy use to that of similar buildings across the country, while neutralizing variations due to location, occupancy and operating hours. Some building types can be scored with a 1-100 ranking of a building's energy performance relative to the national building market. A score of 50 represents the national average and a score of 100 is best.

This ENERGY STAR® benchmarking score provides a comprehensive snapshot of your building's energy performance. It assesses the building's physical assets, operations, and occupant behavior, which is compiled into a quick and easy-to-understand score.

Benchmarking Score	**N/A**

Due to its unique characteristics, this building type is not able to receive a benchmarking score. This report contains suggestions about how to improve building performance and reduce energy costs.

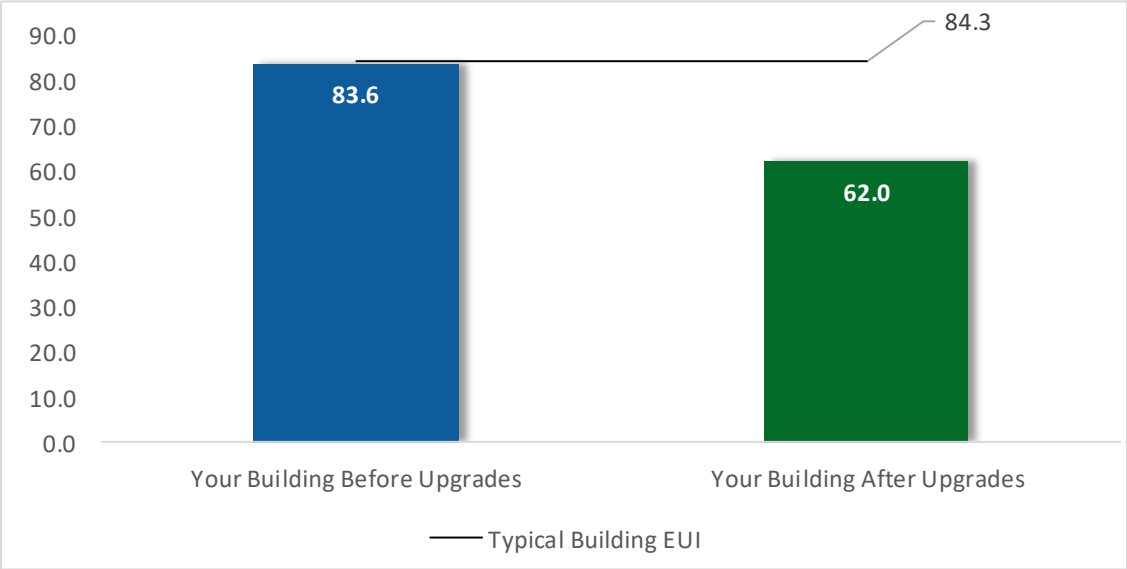


Figure 6 - Energy Use Intensity Comparison

The site and source energy use intensities (EUIs) calculated using the data from the utility bills is an effective method to track energy efficiency efforts. However, the median EUIs are not relevant for this property. The Rutgers University Marine Field Station cannot be compared to other facilities nationwide.

The EUI measures energy consumption per square foot and is the standard metric for comparing buildings' energy performance. A lower EUI means better performance and less energy consumed. A number of factors can cause a building to vary from the "typical" energy usage. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and occupant behavior all contribute to a building's energy use and the benchmarking score.

Tracking Your Energy Performance

Keeping track of your energy use on a monthly basis is one of the best ways to keep energy costs in check. Update your utility information in Portfolio Manager® regularly, so that you can keep track of your building's performance.

We have created a Portfolio Manager® account for your facility and we have already entered the monthly utility data shown above for you. Account login information for your account will be sent via email.

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.

For more information on ENERGY STAR® and Portfolio Manager®, visit their website[3].

[3] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

4 Energy Conservation Measures

The goal of this audit report is to identify and evaluate potential energy efficiency improvements, provide information about the cost effectiveness of those improvements, and recognize potential financial incentives from NJBPU. Most energy conservation measures have received preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is typically sufficient to demonstrate project cost-effectiveness and help prioritize energy measures.

Calculations of energy use and savings are based on the current version of the *New Jersey Clean Energy Program Protocols to Measure Resource Savings*, which is approved by the NJBPU. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances.

Operation and maintenance costs for the proposed new equipment will generally be lower than the current costs for the existing equipment—especially if the existing equipment is at or past its normal useful life. We have conservatively assumed there to be no impact on overall maintenance costs over the life of the equipment.

Financial incentives are based on the current NJCEP prescriptive SmartStart program. A higher level of investigation may be necessary to support any SmartStart Custom, Pay for Performance, or Direct Install incentive applications. Some measures and proposed upgrades may be eligible for higher incentives than those shown below through other NJCEP programs described in a following section of this report.

Appendix A: Equipment Inventory & Recommendations provides a detailed list of the locations and recommended upgrades for each energy conservation measure.

#	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		**58,017**	**6.3**	**0**	**$9,080**	**$9,465**	**$2,395**	**$7,070**	**0.8**	**58,423**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	138	0.1	0	$22	$194	$18	$176	8.1	139
ECM 2	Retrofit Fixtures with LED Lamps	57,879	6.2	0	$9,059	$9,271	$2,377	$6,894	0.8	58,283
Lighting Control Measures		**14,850**	**1.5**	**0**	**$2,324**	**$13,020**	**$1,120**	**$11,900**	**5.1**	**14,954**
ECM 3	Install Occupancy Sensor Lighting Controls	14,256	1.5	0	$2,231	$12,420	$1,120	$11,300	5.1	14,356
ECM 4	Install High/Low Lighting Controls	594	0.1	0	$93	$600	$0	$600	6.5	598
Electric Unitary HVAC Measures		**7,225**	**1.8**	**0**	**$1,131**	**$25,441**	**$1,036**	**$24,405**	**21.6**	**7,275**
	Install High Efficiency Air Conditioning Units	2,883	1.3	0	$451	$19,768	$806	$18,962	42.0	2,903
ECM 5	Install High Efficiency Heat Pumps	4,342	0.5	0	$680	$5,672	$230	$5,442	8.0	4,372
Domestic Water Heating Upgrade		**2,502**	**0.0**	**0**	**$392**	**$22**	**$0**	**$22**	**0.1**	**2,520**
ECM 6	Install Low-Flow DHW Devices	2,502	0.0	0	$392	$22	$0	$22	0.1	2,520
Food Service & Refrigeration Measures		**8,084**	**0.9**	**0**	**$1,265**	**$4,380**	**$0**	**$4,380**	**3.5**	**8,141**
ECM 7	Replace Refrigeration Equipment	8,084	0.9	0	$1,265	$4,380	$0	$4,380	3.5	8,141
TOTALS		**90,678**	**10.6**	**0**	**$14,192**	**$52,327**	**$4,551**	**$47,776**	**3.4**	**91,312**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance criteria

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

Figure 7 – All Evaluated 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		**58,017**	**6.3**	**0**	**$9,080**	**$9,465**	**$2,395**	**$7,070**	**0.8**	**58,423**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	138	0.1	0	$22	$194	$18	$176	8.1	139
ECM 2	Retrofit Fixtures with LED Lamps	57,879	6.2	0	$9,059	$9,271	$2,377	$6,894	0.8	58,283
Lighting Control Measures		**14,850**	**1.5**	**0**	**$2,324**	**$13,020**	**$1,120**	**$11,900**	**5.1**	**14,954**
ECM 3	Install Occupancy Sensor Lighting Controls	14,256	1.5	0	$2,231	$12,420	$1,120	$11,300	5.1	14,356
ECM 4	Install High/Low Lighting Controls	594	0.1	0	$93	$600	$0	$600	6.5	598
Electric Unitary HVAC Measures		**4,342**	**0.5**	**0**	**$680**	**$5,672**	**$230**	**$5,442**	**8.0**	**4,372**
ECM 5	Install High Efficiency Heat Pumps	4,342	0.5	0	$680	$5,672	$230	$5,442	8.0	4,372
Domestic Water Heating Upgrade		**2,502**	**0.0**	**0**	**$392**	**$22**	**$0**	**$22**	**0.1**	**2,520**
ECM 6	Install Low-Flow DHW Devices	2,502	0.0	0	$392	$22	$0	$22	0.1	2,520
Food Service & Refrigeration Measures		**8,084**	**0.9**	**0**	**$1,265**	**$4,380**	**$0**	**$4,380**	**3.5**	**8,141**
ECM 7	Replace Refrigeration Equipment	8,084	0.9	0	$1,265	$4,380	$0	$4,380	3.5	8,141
TOTALS		**87,795**	**9.2**	**0**	**$13,741**	**$32,559**	**$3,745**	**$28,814**	**2.1**	**88,409**

* - All incentives presented in this table are based on NJ SmartStart equipment incentives and assume proposed equipment meets minimum performance criteria

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

Figure 8 – Cost Effective ECMs

4.1 Lighting

#	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		**58,017**	**6.3**	**0**	**$9,080**	**$9,465**	**$2,395**	**$7,070**	**0.8**	**58,423**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	138	0.1	0	$22	$194	$18	$176	8.1	139
ECM 2	Retrofit Fixtures with LED Lamps	57,879	6.2	0	$9,059	$9,271	$2,377	$6,894	0.8	58,283

When considering lighting upgrades, we suggest using a comprehensive design approach that simultaneously upgrades lighting fixtures and controls to maximize energy savings and improve occupant lighting. Comprehensive design will also consider appropriate lighting levels for different space types to make sure that the right amount of light is delivered where needed. If conversion to LED light sources are proposed, we suggest converting all of a specific lighting type (e.g. linear fluorescent) to LED lamps to minimize the number of lamp types in use at the facility, which should help reduce future maintenance costs.

ECM 1: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit fluorescent fixtures by removing the T12 fluorescent tubes and ballasts and replacing them with LED tubes and LED drivers (if necessary), which are designed to be used in retrofitted fluorescent fixtures.

The measure uses the existing fixture housing but replaces the electric components with more efficient lighting technology which use less power than other lighting technologies but provides equivalent lighting output. Maintenance savings may also be achieved since LED tubes last longer than fluorescent tubes and therefore do not need to be replaced as often.

Affected building areas: Mechanical room with T12 fixtures

ECM 2: Retrofit Fixtures with LED Lamps

Replace fluorescent T8, incandescent and CFL lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps 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. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

Affected building areas: Interior lighting system

4.2 Lighting Controls

#	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		**14,850**	**1.5**	**0**	**$2,324**	**$13,020**	**$1,120**	**$11,900**	**5.1**	**14,954**
ECM 3	Install Occupancy Sensor Lighting Controls	14,256	1.5	0	$2,231	$12,420	$1,120	$11,300	5.1	14,356
ECM 4	Install High/Low Lighting Controls	594	0.1	0	$93	$600	$0	$600	6.5	598

Lighting controls reduce energy use by turning off or lowering, lighting fixture power levels when not in use. A comprehensive approach to lighting design should upgrade the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 3: Install Occupancy Sensor Lighting Controls

Install occupancy sensors to control lighting fixtures in areas that are frequently unoccupied, even for short periods. For most spaces, we recommend lighting controls use dual technology sensors, which reduce the possibility of lights turning off unexpectedly.

Occupancy sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Most occupancy sensor lighting controls allow users to manually turn fixtures on/off, as needed. Some controls can also provide dimming options.

Occupancy sensors can be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are best suited to single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in large spaces, locations without local switching, and where wall switches are not in the line-of-sight of the main work area.

This measure provides energy savings by reducing the lighting operating hours.

Affected building areas: offices, lunch room and classroom

ECM 4: Install High/Low Lighting Controls

Install occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons.

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low level after a predefined period of vacancy. In parking lots and parking garages with significant ambient lighting, this control can sometimes be combined with photocell controls to turn the lights off when there is sufficient daylight.

This measure provides energy savings by reducing the light fixture power draw when reduced light output is appropriate.

Affected building areas: hallways

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

4.3 Electric Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**7,225**	**1.8**	**0**	**$1,131**	**$25,441**	**$1,036**	**$24,405**	**21.6**	**7,275**
	Install High Efficiency Air Conditioning Units	2,883	1.3	0	$451	$19,768	$806	$18,962	42.0	2,903
ECM 5	Install High Efficiency Heat Pumps	4,342	0.5	0	$680	$5,672	$230	$5,442	8.0	4,372

Install High Efficiency Air Conditioning Units

Replace standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Replacing the unitary HVAC units has a long payback period and may not be justifiable based simply on energy considerations. However, two packaged units on outside of second floor at this facility are nearing or have reached the end of their normal useful life. Typically, the marginal cost of purchasing a high efficiency unit can be justified by the marginal savings from the improved efficiency. When one Lennox packaged AC and two carriers packaged ACs are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

ECM 5: Install High Efficiency Heat Pumps

Replace standard efficiency heat pumps with high efficiency heat pumps. A higher EER or SEER rating indicates a more efficient cooling system and a higher HPSF rating indicates more efficient heating mode. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average heating and cooling loads, and the estimated annual operating hours.

4.4 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**2,502**	**0.0**	**0**	**$392**	**$22**	**$0**	**$22**	**0.1**	**2,520**
ECM 6	Install Low-Flow DHW Devices	2,502	0.0	0	$392	$22	$0	$22	0.1	2,520

ECM 6: Install Low-Flow DHW Devices

Install low-flow devices to reduce overall hot water demand. The following low flow devices are recommended to reduce hot water usage:

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm
Faucet aerator (kitchen)	1.5 gpm
Showerhead	2.0 gpm
Pre-rinse spray valve (kitchen)	1.28 gpm

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing.

Additional cost savings may result from reduced water usage.

4.5 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**8,084**	**0.9**	**0**	**$1,265**	**$4,380**	**$0**	**$4,380**	**3.5**	**8,141**
ECM 7	Replace Refrigeration Equipment	8,084	0.9	0	$1,265	$4,380	$0	$4,380	3.5	8,141

ECM 7: Replace Refrigeration Equipment

Replace two existing chest type freezers in room 106 with new ENERGY STAR® rated equipment. The energy savings associated with this measure come from reduced energy usage, due to more efficient technology, and reduced run times.

5 Energy Efficient Best Practices

A whole building maintenance plan will extend equipment life; improve occupant comfort, health, and safety; and reduce energy and maintenance costs. You may already be doing some of these things— see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR® Portfolio Manager®

You've heard it before - you can't manage what you don't measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions.[4] Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Window Treatments/Coverings

Use high-reflectivity films or cover windows with shades or shutters to reduce solar heat gain and reduce the load on cooling and heating systems. Older, single pane windows and east or west-facing windows are especially prone to solar heat gain. In addition, use shades or shutters at night during cold weather to reduce heat loss.

Lighting Maintenance

Clean lamps, reflectors and lenses of dirt, dust, oil, and smoke buildup every six to twelve months. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust. Together, this can reduce total light output by up to 60% while still drawing full power.

In addition to routine cleaning, developing a maintenance schedule can ensure that maintenance is performed regularly, and it can reduce the overall cost of fixture re-lamping and re-ballasting. Group re-lamping and re-ballasting maintains lighting levels and minimizes the number of site visits by a lighting technician or contractor, decreasing the overall cost of maintenance.

Lighting Controls

As part of a lighting maintenance schedule, test lighting controls to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight and photocell sensors, maintenance involves cleaning sensor lenses and confirming that setpoints and sensitivity are configured properly.

[4] https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager.

Motor Maintenance

Motors have many moving parts. As these parts degrade over time, the efficiency of the motor is reduced. Routine maintenance prevents damage to motor components. Routine maintenance should include 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.

Thermostat Schedules and Temperature Resets

Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. 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 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.

HVAC Filter Cleaning and Replacement

Air filters should be checked regularly (often monthly) and cleaned or replaced when appropriate. Air filters reduce indoor air pollution, increase occupant comfort, and help keep equipment operating efficiently. If the building has a building management system, consider installing a differential pressure switch across filters to send an alarm about premature fouling or overdue filter replacement. Over time, filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the air conditioning or heat pump system, which increases the load on the distribution fans.

Furnace Maintenance

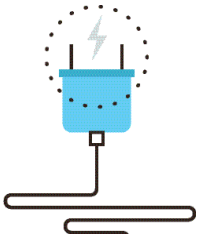
Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should : check for gas / carbon monoxide leaks; change the air and fuel filters; check components for cracks, corrosion, dirt, or debris build-up; ensure the ignition system is working properly; test and adjust operation and safety controls; inspect electrical connections; and lubricate motors and bearings.

Water Heater Maintenance

Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to 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. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- 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 signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank.
- For water heaters more than three years old, have a technician inspect the sacrificial anode annually.

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips[5]. Your local utility may offer incentives or rebates for this equipment.

Computer Monitor Replacement

ENERGY STAR® labeled computer monitors can be up to 25% more efficient than standard monitors. ENERGY STAR® rated monitors have power consumption requirements for different operating modes such as on, idle, and sleep.

Water Conservation

Installing dual flush or low-flow toilets and low-flow/waterless urinals are ways to reduce water use. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and for flush valve toilets is 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

For more information regarding water conservation go to the EPA's WaterSense website[6] or download a copy of EPA's "WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities"[7] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

Water conservation devices that do not reduce hot water consumption will not provide energy savings at the site level, but they may significantly affect your water and sewer usage costs. Any reduction in water use does however ultimately reduce grid-level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users.

If the facility has detached buildings with a master water meter for the entire campus, check for unnatural wet areas in the lawn or water seeping in the foundation at water pipe penetrations through the foundation. Periodically check overnight meter readings when the facility is unoccupied, and there is no other scheduled water usage.

Manage irrigation systems to use water more effectively outside the building. Adjust spray patterns so that water lands on intended lawns and plantings and not on pavement and walls. Consider installing an evapotranspiration irrigation controller that will prevent over-watering.

[5] For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

[6] https://www.epa.gov/watersense.

[7] https://www.epa.gov/watersense/watersense-work-0.

Procurement Strategies

Purchasing efficient products reduces energy costs without compromising quality. Consider modifying your procurement policies and language to require ENERGY STAR® or WaterSense™ products where available.

6 On-site Generation

You don't have to look far in New Jersey to see one of the thousands of solar electric systems providing clean power to homes, businesses, schools, and government buildings. On-site generation includes both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) technologies that generate power to meet all or a portion of the facility's electric energy needs. Also referred to as distributed generation, these systems contribute to greenhouse gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases reduction, which results in improved electric grid reliability through better use of transmission and distribution systems.

Preliminary screenings were performed to determine if an on-site generation measure could be a cost-effective solution for your facility. Before deciding to install an on-site generation system, we recommend conducting a feasibility study to analyze 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 Solar Photovoltaic

Photovoltaic (PV) panels convert sunlight into electricity. Individual panels are combined into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is then connected to the building's electrical distribution system.

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

This facility does appear not meet the minimum criteria for a cost-effective solar PV installation. 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.

The graphic below displays the results of the PV potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.

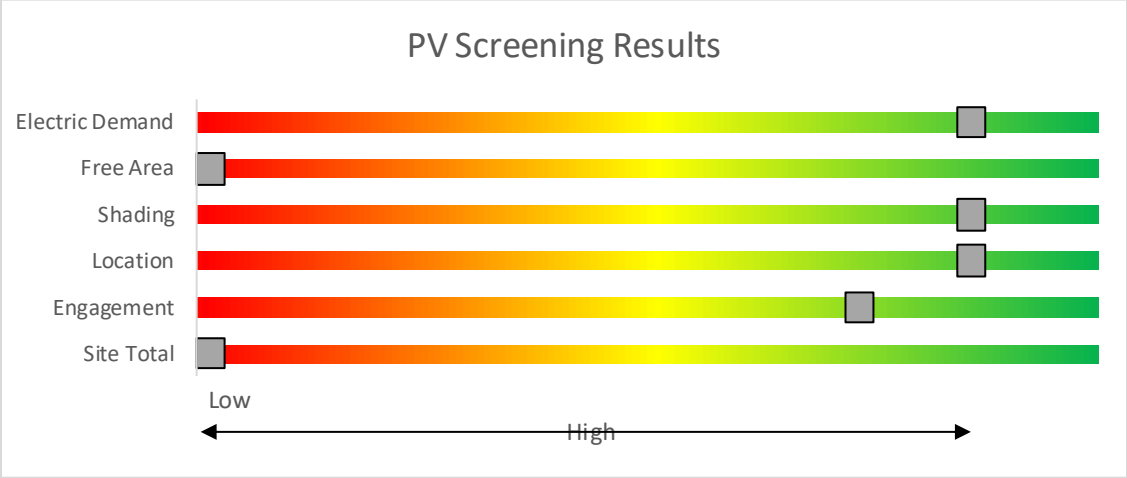


Figure 9 - Photovoltaic Screening

Solar Renewable Energy Certificate (SREC) Registration Program (SRP)

Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SREC Registration Program before starting construction. Once your PV system is up and running, you periodically earn credits, which can then be sold on the open market for up to 15 years.

If you are considering installing solar photovoltaics on your building, visit www.njcleanenergy.com/srec for more information about the SREC Registration Program.

Get more information about solar power in New Jersey or find a qualified solar installer who can help you decide if solar is right for your building:

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

6.2 Combined Heat and Power

Combined heat and power (CHP) generates electricity at the facility and puts waste heat energy to good use. Common types of CHP systems are reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines.

CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for space cooling.

The key criteria used for screening is the amount of time that the CHP system would operate at full load and the facility's ability to use the recovered heat. Facilities with a continuous need for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has no potential for installing a cost-effective CHP system.

Based on a preliminary analysis, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation. The lack of gas service, low or infrequent thermal load, and lack of space for siting the equipment are the most significant factors contributing to the lack of CHP potential.

The graphic below displays the results of the CHP potential screening conducted as a part of this audit. The position of each slider indicates the potential (potential increases to the right) that each factor contributes to the overall site potential.

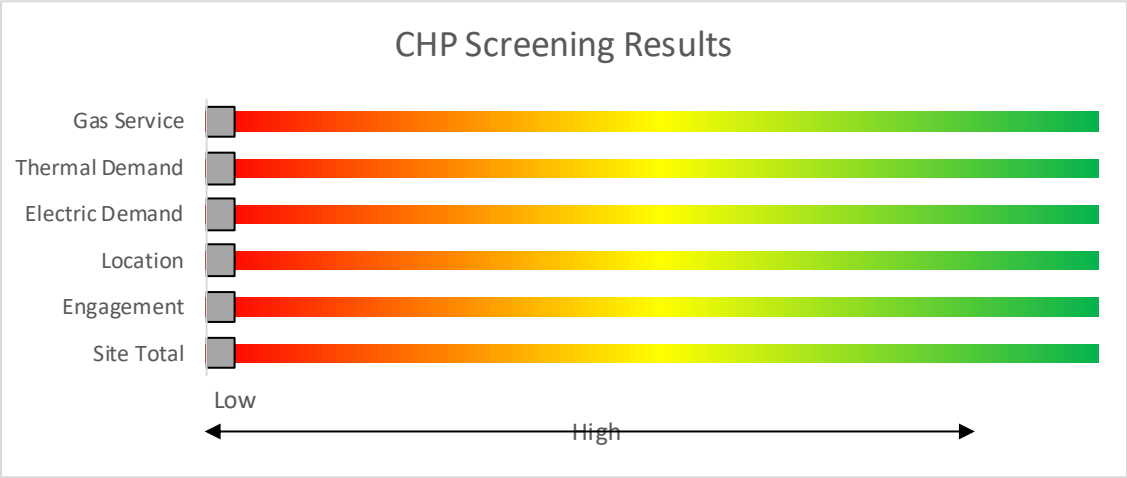


Figure 10 - Combined Heat and Power Screening

Find a qualified firm that specializes in commercial CHP cost assessment and installation: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

7 PROJECT FUNDING AND INCENTIVES

Ready to improve your building's performance? NJ Clean Energy Programs can help. Pick the program that works best for you. Incentive programs that may apply to this facility are identified in the Executive Summary. This section provides an overview of currently available NJ Clean Energy Programs.

	SmartStart *Flexibility to install at your own pace*	**Direct Install** *Turnkey installation*	**Pay for Performance** *Whole building upgrades*
Who should use it?	Buildings installing individual measures or small group of measures.	Small to mid-size facilities that can bundle multiple measures together. Average peak demand should be below 200 kW. Not suitable for significant building shell issues.	Mid to large size facilities looking to implement as many measures as possible at one time. Peak demand should be over 200 kW.
How does it work?	Use in-house staff or your preferred contractor.	Pre-approved contractors pass savings along to you via reduced material and labor costs.	Whole-building approach to energy upgrades designed to reduce energy use by at least 15%. The more you save, the higher the incentives.
What are the Incentives?	Fixed incentives for specific energy efficiency measures.	Incentives pay up to 70% of eligible costs, up to $125,000 per project. You pay the remaining 30% directly to the contractor.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your Energy Reduction Plan and set your energy savings targets.
Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.			

7.1 SmartStart

SmartStart offers incentives for installing prescriptive and custom energy efficiency measures at your facility. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades. This program serves most common equipment types and sizes.

SmartStart routinely 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

Incentives

The SmartStart Prescriptive program provides fixed incentives for specific energy efficiency measures. Prescriptive incentives vary by equipment type.

SmartStart Custom provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentives. Custom incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings. Incentives are capped at 50% of the total installed incremental project cost, or a project cost buy down to a one-year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

Submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. You can work with your preferred contractor or use internal staff to install measures.

Visit www.njcleanenergy.com/SSB for a detailed program description, instructions for applying, and applications.

7.2 Direct Install

Direct Install is a turnkey program available to existing small to medium-sized facilities with an average peak electric demand that does not exceed 200 kW over the recent 12-month period. You work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Each entity is limited to incentives up to $250,000 per fiscal year.

How to Participate

To participate in Direct Install, you will need to contact the participating contractor assigned to the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the DI website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

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

7.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. 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. Annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive for the life of the contract.

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 described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

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 used 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. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you can use NJCEP incentive programs to help further reduce costs when developing the energy savings plan. Refer to the ESIP guidelines at the link above for further information and guidance on next steps.

8 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

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 already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party electric suppliers is available at the NJBPU website[8].

8.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate monthly. 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 typically depends on whether a customer prefers 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 does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

A list of licensed third-party natural gas suppliers is available at the NJBPU website[9].

[8] www.state.nj.us/bpu/commercial/shopping.html.

[9] 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	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	7,644	0.0	242	0	$38	$37	$10	0.7
107 Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	7,644	0.0	242	0	$38	$37	$10	0.7
Restroom 1st Fl	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	7,644	0.0	242	0	$38	$37	$10	0.7
Electric Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	7,644	0.0	242	0	$38	$37	$10	0.7
2nd Fl Hallway	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	7,644		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	7,644	0.0	0	0	$0	$0	$0	0.0
Exterior	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	S	45	4,380		None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	45	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior	1	LED - Fixtures: Outdoor Porch Wall Mount	Photocell	S	70	4,380		None	No	1	LED - Fixtures: Outdoor Porch Wall Mount	Photocell	70	4,380	0.0	0	0	$0	$0	$0	0.0
1st Fl Hallway	1	LED - Fixtures: Decorative: Other	Wall Switch	S	36	7,644		None	No	1	LED - Fixtures: Decorative: Other	Wall Switch	36	7,644	0.0	0	0	$0	$0	$0	0.0
Fire Room	1	Incandescent: Bulb (60W) - 2L	Wall Switch	S	120	8,736	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (9W) - 2L	Wall Switch	18	8,736	0.1	855	0	$134	$34	$2	0.2
Mechanical Room 2	1	Incandescent: Bulb (60W) - 1L	Wall Switch	S	60	1,456	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (9W) - 1L	Wall Switch	9	1,456	0.0	71	0	$11	$34	$2	2.9
Mechanical Room 3	1	Incandescent: Bulb (60W) - 1L	Wall Switch	S	60	1,456	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (9W) - 1L	Wall Switch	9	1,456	0.0	71	0	$11	$17	$1	1.5
Janitor Closet	1	Incandescent: Bulb (60W) - 1L	Wall Switch	S	60	1,456	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (9W) - 1L	Wall Switch	9	1,456	0.0	71	0	$11	$17	$1	1.5
Shower	1	Incandescent: Bulb (60W) - 1L	Wall Switch	S	60	1,456	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (9W) - 1L	Wall Switch	9	1,456	0.0	71	0	$11	$17	$1	1.5
Electric Room	1	Incandescent: Bulb (60W) - 1L	Wall Switch	S	60	1,456	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (9W) - 1L	Wall Switch	9	1,456	0.0	71	0	$11	$17	$1	1.5
Room 115	1	Incandescent: Bulb (60W) - 1L	Wall Switch	S	60	1,456	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (9W) - 1L	Wall Switch	9	1,456	0.0	71	0	$11	$17	$1	1.5
Room 103	1	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
107 Hallway	1	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Lunch Room	1	Exit Signs: LED - 2 W Lamp	None	S	6	2,912		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	2,912	0.0	0	0	$0	$0	$0	0.0
Main Vestibule	1	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
3 Porches	1	Compact Fluorescent: Spiral Bulb (9W) - 1L	Wall Switch	S	9	7,644	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (6W) - 1L	Wall Switch	6	7,644	0.0	20	0	$3	$24	$1	7.5
Closet	1	Compact Fluorescent: Spiral Bulb (9W) - 1L	Wall Switch	S	9	1,456	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (6W) - 1L	Wall Switch	6	1,456	0.0	4	0	$1	$24	$1	39.3
Hallway	1	Compact Fluorescent: Spiral Bulb (9W) - 1L	Wall Switch	S	9	7,644	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (6W) - 1L	Wall Switch	6	7,644	0.0	20	0	$3	$24	$1	7.5
2nd Fl Vestibule	1	Compact Fluorescent: Spiral Bulb (9W) - 1L	Wall Switch	S	9	7,644	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (6W) - 1L	Wall Switch	6	7,644	0.0	20	0	$3	$24	$1	7.5
Room 111	1	Compact Fluorescent: Spiral Bulb (9W) - 1L	Wall Switch	S	9	7,644	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (6W) - 1L	Wall Switch	6	7,644	0.0	20	0	$3	$24	$1	7.5
Room 301	1	Compact Fluorescent: Spiral Bulb (13W) - 1L	Wall Switch	S	13	7,644	2	Relamp	No	1	LED Screw-In Lamps: LED Bulb (6W) - 1L	Wall Switch	9	7,644	0.0	29	0	$4	$24	$1	5.2

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
Kitchen	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,912	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,009	0.1	414	0	$65	$416	$75	5.3
Office 3rd floor	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.1	924	0	$145	$380	$65	2.2
Caretaker Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.1	924	0	$145	$380	$65	2.2
Room 216	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.1	924	0	$145	$380	$65	2.2
Office 3rd floor	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	616	0	$96	$343	$20	3.3
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,456	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,005	0.1	117	0	$18	$343	$20	17.6
Room 094	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	616	0	$96	$343	$20	3.3
Room 110	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	616	0	$96	$343	$20	3.3
Kitchen	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,912	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,009	0.1	235	0	$37	$343	$20	8.8
Room 096	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	616	0	$96	$343	$20	3.3
Main Vestibule	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	616	0	$96	$343	$20	3.3
Room Laundry	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	616	0	$96	$343	$20	3.3
Room 202	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	616	0	$96	$343	$20	3.3
Room 203	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	616	0	$96	$343	$20	3.3
Room 202	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	7,644	2	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	7,644	0.0	257	0	$40	$37	$10	0.7
Office 3rd floor	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	7,644		None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	7,644	0.0	0	0	$0	$0	$0	0.0
Exterior	2	LED - Fixtures: Wall Sconces	Photocell	S	19	4,380		None	No	2	LED - Fixtures: Wall Sconces	Photocell	19	4,380	0.0	0	0	$0	$0	$0	0.0
Lunch Room	2	Incandescent: Bulb (60W) - 2L	Wall Switch	S	120	2,912	2, 3	Relamp	Yes	2	LED Screw-In Lamps: LED Bulb (9W) - 2L	Occupancy Sensor	18	2,009	0.2	601	0	$94	$339	$39	3.2
Room 104	2	Incandescent: Bulb (60W) - 2L	Wall Switch	S	120	7,644	2, 3	Relamp	Yes	2	LED Screw-In Lamps: LED Bulb (9W) - 2L	Occupancy Sensor	18	5,274	0.2	1,579	0	$247	$339	$39	1.2
Storage	2	Incandescent: Bulb (60W) - 2L	Wall Switch	S	120	1,456	2, 3	Relamp	Yes	2	LED Screw-In Lamps: LED Bulb (9W) - 2L	Occupancy Sensor	18	1,005	0.2	301	0	$47	$339	$4	7.1
Hallway	2	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
2nd Fl Hallway	2	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
1st Fl Hallway	2	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
2nd Fl Hallway	2	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Exterior	2	Compact Fluorescent: 4 Pin (13W) - 2L	Wall Switch	S	26	8,736	2	Relamp	No	2	LED - Fixtures: Other	Wall Switch	18	8,736	0.0	136	0	$21	$73	$0	3.4

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	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
Timberline Office 202	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.1	1,387	0	$217	$434	$80	1.6
Room 110	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.1	1,387	0	$217	$434	$80	1.6
Lunch Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,912	2, 3	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,009	0.1	352	0	$55	$380	$65	5.7
2nd Fl Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	5,274	0.1	924	0	$145	$310	$30	1.9
Mechanical Room	3	Linear Fluorescent - T12: 2' T12 (20W) - 2L	Wall Switch	S	50	1,456	1, 3	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,005	0.1	160	0	$25	$464	$18	17.8
Room 096	3	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Exterior	3	Compact Fluorescent: 4 Pin (13W) - 2L	Photocell	S	26	4,380	2	Relamp	No	3	LED - Fixtures: Other	Photocell	18	4,380	0.0	102	0	$16	$110	$0	6.8
Room 101	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	5,274	0.2	2,172	0	$340	$562	$115	1.3
Room 108	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	5,274	0.2	2,172	0	$340	$562	$115	1.3
Room 110	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	5,274	0.2	2,172	0	$340	$562	$115	1.3
Room 103	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.2	1,849	0	$289	$489	$95	1.4
Room 205	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	1,233	0	$193	$416	$75	1.8
Garage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	1,233	0	$193	$416	$75	1.8
Room 090	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	1,233	0	$193	$416	$75	1.8
Room 106	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	1,233	0	$193	$416	$75	1.8
1st Fl Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	5,274	0.1	1,233	0	$193	$346	$40	1.6
Room 201	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.1	1,233	0	$193	$416	$75	1.8
2nd Fl Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	7,644	2, 4	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	5,274	0.1	646	0	$101	$273	$20	2.5
Room 201	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	5,274	0.1	646	0	$101	$343	$20	3.2
Room 203	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	7,644	2, 3	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	5,274	0.1	646	0	$101	$343	$20	3.2
Exterior	4	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Room 201	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.2	2,311	0	$362	$544	$110	1.2
Room 213	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.2	2,311	0	$362	$544	$110	1.2
Room 204	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.2	2,311	0	$362	$544	$110	1.2
Room 091	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.2	2,311	0	$362	$544	$110	1.2

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 107	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	7,644	2, 3	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	5,274	0.3	3,257	0	$510	$708	$155	1.1
Room 210	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.3	2,773	0	$434	$599	$125	1.1
Room 111	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.3	2,773	0	$434	$599	$125	1.1
Room 112	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	7,644	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	5,274	0.3	2,773	0	$434	$599	$125	1.1
Room 301	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.2	1,849	0	$289	$489	$95	1.4
Office 3rd floor	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.2	1,849	0	$289	$489	$95	1.4
Room 096	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.2	1,849	0	$289	$489	$95	1.4
Lounge	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.2	2,157	0	$338	$526	$105	1.2
Room 102	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.2	2,465	0	$386	$562	$115	1.2
Room 107	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	7,644	2, 3	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	5,274	0.6	6,163	0	$965	$1,000	$235	0.8

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?	Remaining Useful Life	Annual Operating Hours	ECM #	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
Outdoor	Condensing Unit	1	Supply Fan	0.3	65.0%	No	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor	Heat Pump	1	Supply Fan	0.5	65.0%	No	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor	Heat Pump	1	Exhaust Fan	0.3	65.0%	No	B	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor	Split System Condensing Unit	1	Exhaust Fan	0.5	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor	Heat Pump	2	Supply Fan	0.3	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor	Heat Pump	1	Supply Fan	0.3	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor	Heat Pump	1	Supply Fan	0.3	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor	Heat Pump	1	Supply Fan	0.3	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor	Air Compressor	1	Air Compressor	0.8	65.0%	No	W	3,489		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor	2nd Floor	1	Supply Fan	0.3	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Indoor	2nd Floor	1	Supply Fan	0.3	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Outdoor	1st Floor	1	Other	0.3	65.0%	No	W	2,745		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0

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 (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	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
Offices/Classrooms	Rooms	12	Window AC	1.00		W		No							0.0	0	0	$0	$0	$0	0.0
Outdoor	2nd Floor	1	Packaged AC	6.00		B	NR	Yes	1	Packaged AC	6.00		11.50		0.6	1,249	0	$195	$10,693	$438	52.5
Outdoor	2nd Floor	1	Packaged Air-Source HP	2.50	30.70	B	5	Yes	1	Packaged Air-Source HP	2.50	0.03	14.00	3.80	0.5	4,342	0	$680	$5,672	$230	8.0
Outdoor	2nd Floor	1	Split-System AC	7.50		W		No							0.0	0	0	$0	$0	$0	0.0
Indoor	1st Floor	2	Electric Resistance Heat		51.18	B		No							0.0	0	0	$0	$0	$0	0.0
Indoor	Heat Pump	2	Packaged AC	2.00		B	NR	Yes	2	Packaged AC	2.00		14.00		0.8	1,634	0	$256	$9,076	$368	34.1
Indoor	Heat Pump	1	Packaged Air-Source HP	1.50	14.30	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor	Heat Pump	1	Packaged Air-Source HP	2.00	15.70	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor	Heat Pump	1	Packaged Air-Source HP	2.50	25.60	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor	Office AC	1	Ductless Mini-Split AC	0.75		N		No							0.0	0	0	$0	$0	$0	0.0
Outdoor	2nd Floor	1	Packaged Air-Source HP	4.00	47.50	W		No							0.0	0	0	$0	$0	$0	0.0
Indoor	2nd Floor	1	Packaged AC	4.00		W		No							0.0	0	0	$0	$0	$0	0.0
Indoor	2nd Floor	1	Packaged AC	4.00		W		No							0.0	0	0	$0	$0	$0	0.0
Indoor	2nd Floor	1	Electric Forced Air Furnace		68.24	W		No							0.0	0	0	$0	$0	$0	0.0

DHW Inventory & Recommendations

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

Low-Flow Device Recommendations

	Recommedation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	6	3	Faucet Aerator (Lavatory)	2.20	0.50	0.0	2,502	0	$392	$22	$0	0.1

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	ECM #	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
Room 106	2	Freezer Chest	No	7	Yes	0.9	8,084	0	$1,265	$4,380	$0	3.5
Room 102	1	Freezer Chest	Yes		No	0.0	0	0	$0	$0	$0	0.0
Room 102	2	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	Yes		No	0.0	0	0	$0	$0	$0	0.0
Room 106	1	Freezer Chest	Yes		No	0.0	0	0	$0	$0	$0	0.0

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	ENERGY STAR Qualified?	ECM #	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
Room 106	1	Ice Making Head (<450 lbs/day), Batch	Yes		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions			
Location	**Quantity**	**Equipment Description**	**Energy Rate (W)**	**ENERGY STAR Qualified?**
Offices/Classrooms	28	Computers	120.0	No
Offices	8	Small Printer	46.0	Yes
Office area	4	Medium Printer	80.0	Yes
Offices	3	Paper Shredder	80.0	No
Kitchen	2	Microwave	800.0	No
Offices	1	Small Refrigerator	120.0	Yes
Lab	2	Medium Refrigerator	150.0	Yes
Lab	5	Large Refrigerator	255.0	Yes
Kitchen	3	Coffee Machine	800.0	No
Kithcen	1	Toaster	800.0	No
Classroom	3	Ceiling Fan	80.0	Yes
Office	2	CRT TV	250.0	No
Lounge	2	LED TV	150.0	Yes
Office	2	Standing Fan	80.0	No
Laundry	1	Washer & Dryer	500.0	Yes
Lab	4	Fume Hood	150.0	Yes
Lab	8	Microscope	55.0	Yes
Lab	2	Digital Incubators	120.0	No

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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.

LEARN MORE AT energystar.gov

ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

Rutgers University Marine Field Station

Primary Property Type: Laboratory
Gross Floor Area (ft²): 13,929
Built: 1972

For Year Ending: April 30, 2018
Date Generated: October 30, 2018

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Rutgers University Marine Field Station 800 Great bay Blvd. Tuckerton, New Jersey 08087	_____ , (____)____-_____	Michael Kornitas 130 Great bay Blvd Tuckerton, NJ 08087 4125572813 michael.kornitas@rutgers.edu

Property ID: 6570982

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
84.5 kBtu/ft²

Source EUI
230.6 kBtu/ft²

Annual Energy by Fuel

Propane (kBtu)	47,472 (4%)
Electric - Grid (kBtu)	1,130,015 (96%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	116.7
National Median Source EUI (kBtu/ft²)	318.2
% Diff from National Median Source EUI	-28%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	118

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)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate financial savings. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is $22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
BTU	A British thermal unit is the amount of heat required to increase the temperature of one pound water by one-degree Fahrenheit. Commonly used to measure natural gas consumption.
Demand Response	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
Energy Efficiency	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing energy management systems.
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
HVAC	Heating, ventilation, and air conditioning.
kW	Kilowatt. Equal to 1,000 Watts.
Load	The total amount of power used by a building system at any given time.
Measure	A single activity, or installation of a single type of equipment, that is implemented in a building system to reduce total energy consumption.
MMBtu	One million British thermal units.
psig	Pounds per square inch.
Plug Load	Refers to the amount of energy used in a space by products that are powered by means of an ordinary AC plug.
Simple Payback	The amount of time needed to recoup the funds expended in an investment, or to reach the break-even point.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
Turnkey	Provision of a complete product or service that is ready for immediate use
Watt (W)	Unit of power commonly used to measure electricity use.