Local Government Energy Audit Report

Building F - Nursing and Health Sciences

January 7, 2020

Prepared for:

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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 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. Cost estimates include material and labor pricing associated with installation of primary recommended equipment only. Cost estimates do not include demolition or removal of hazardous waste. We encourage the owner of the facility to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual measures and conditions. TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

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

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

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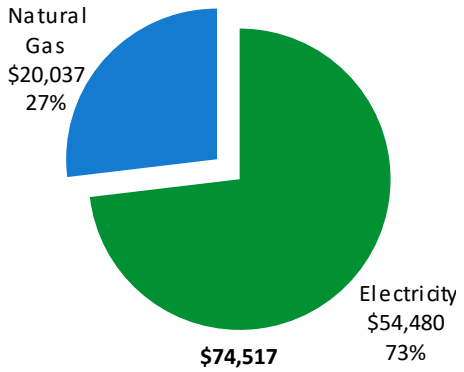
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Building F Nursing and Health Sciences. 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 conducted this study as part of a comprehensive effort to assist New Jersey school districts and local governments in controlling their energy costs and to help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $74,517 Electricity: 429,961 kWh Natural Gas: 20,398 Therms	
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.

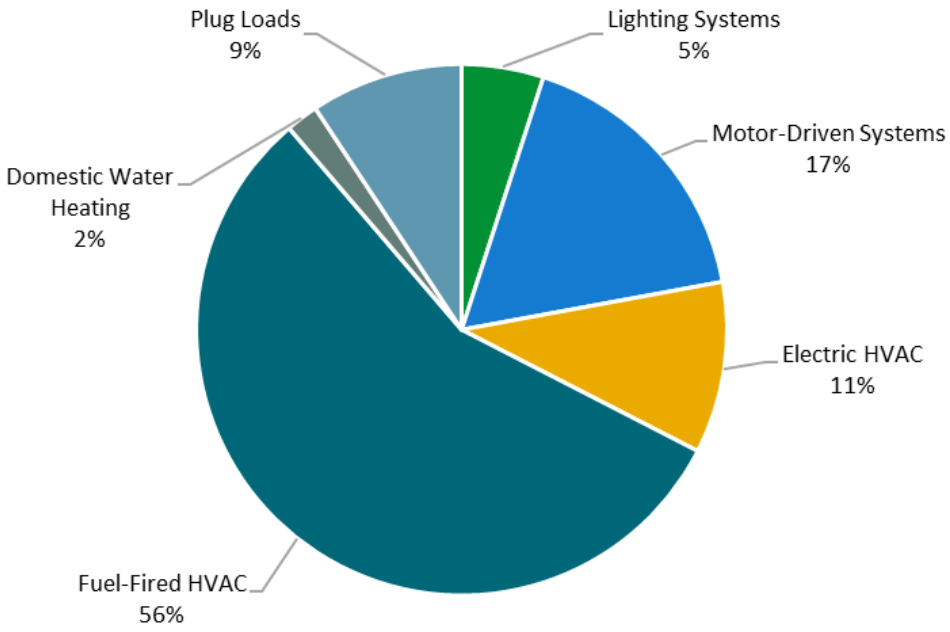


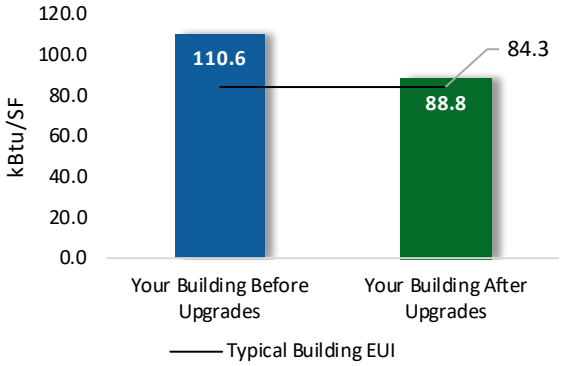
Figure 1 - Energy Use by System

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.

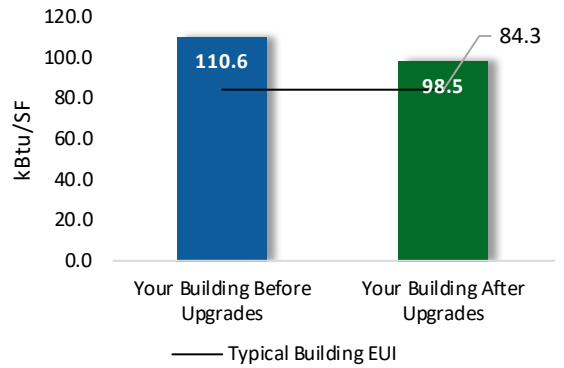
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$166,499
Potential Rebates & Incentives[1]	$37,847
Annual Cost Savings	$16,067
Annual Energy Savings	Electricity: 99,582 kWh Natural Gas: 3,511 Therms
Greenhouse Gas Emission Savings	71 Tons
Simple Payback	8.0 Years
Site Energy Savings (all utilities)	20%



Scenario 2: Cost Effective Package[2]

Installation Cost	$78,455
Potential Rebates & Incentives	$21,847
Annual Cost Savings	$12,542
Annual Energy Savings	Electricity: 94,226 kWh Natural Gas: 614 Therms
Greenhouse Gas Emission Savings	51 Tons
Simple Payback	4.5 Years
Site Energy Savings (all utilities)	11%



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	Cost Effective?	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			**3,014**	**0.4**	**-1**	**$377**	**$943**	**$184**	**$759**	**2.0**	**2,975**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	3,014	0.4	-1	$377	$943	$184	$759	2.0	2,975
Lighting Control Measures			**11,349**	**2.0**	**-2**	**$1,415**	**$12,718**	**$5,420**	**$7,298**	**5.2**	**11,151**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	8,162	1.4	-2	$1,017	$9,568	$2,270	$7,298	7.2	8,020
ECM 3	Install High/Low Lighting Controls	Yes	3,187	0.6	-1	$397	$3,150	$3,150	$0	0.0	3,131
Motor Upgrades			**945**	**0.2**	**0**	**$120**	**$2,687**	**$0**	**$2,687**	**22.4**	**951**
ECM 4	Premium Efficiency Motors	No	945	0.2	0	$120	$2,687	$0	$2,687	22.4	951
Variable Frequency Drive (VFD) Measures			**68,993**	**20.0**	**0**	**$8,742**	**$41,663**	**$15,950**	**$25,713**	**2.9**	**69,475**
ECM 5	Install VFD on Variable Air Volume (VAV) Fans	Yes	64,582	19.0	0	$8,183	$32,540	$15,950	$16,590	2.0	65,034
ECM 6	Install VFDs on Heating Water Pumps	No	4,411	1.0	0	$559	$9,122	$0	$9,122	16.3	4,441
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**290**	**$2,846**	**$76,235**	**$16,000**	**$60,235**	**21.2**	**33,926**
ECM 7	Install High Efficiency Hot Water Boilers	No	0	0.0	290	$2,846	$76,235	$16,000	$60,235	21.2	33,926
Domestic Water Heating Upgrade			**0**	**0.0**	**5**	**$49**	**$93**	**$93**	**$0**	**0.0**	**582**
ECM 8	Install Low-Flow DHW Devices	Yes	0	0.0	5	$49	$93	$93	$0	0.0	582
Food Service & Refrigeration Measures			**3,224**	**0.4**	**0**	**$408**	**$460**	**$200**	**$260**	**0.6**	**3,246**
ECM 9	Vending Machine Control	Yes	3,224	0.4	0	$408	$460	$200	$260	0.6	3,246
Custom Measures			**12,057**	**0.0**	**59**	**$2,110**	**$31,700**	**$0**	**$31,700**	**15.0**	**19,083**
ECM 10	Replace Energy Management System	Yes	12,057	0.0	59	$2,110	$31,700	$0	$31,700	15.0	19,083
TOTALS (COST EFFECTIVE MEASURES)			**94,226**	**21.7**	**61**	**$12,542**	**$78,455**	**$21,847**	**$56,608**	**4.5**	**102,071**
TOTALS (ALL MEASURES)			**99,582**	**23.0**	**351**	**$16,067**	**$166,499**	**$37,847**	**$128,652**	**8.0**	**141,391**

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

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

Figure 2 – Evaluated Energy Improvements

For more detail on each evaluated energy improvement and a break out of cost-effective improvements, see **Section 4: Energy Conservation Measures**.

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's 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 Fixtures with LED Lamps	x	x	
ECM 2	Install Occupancy Sensor Lighting Controls	x	x	
ECM 3	Install High/Low Lighting Controls	x	x	
ECM 4	Premium Efficiency Motors		x	
ECM 5	Install VFD on Variable Air Volume (VAV) Fans	x		
ECM 6	Install VFDs on Heating Water Pumps		x	
ECM 7	Install High Efficiency Hot Water Boilers	x	x	
ECM 8	Install Low-Flow DHW Devices	x	x	
ECM 9	Vending Machine Control	x	x	
ECM 10	Replace Energy Management System			

Figure 3 – Funding Options

New Jersey's 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. 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.

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 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 Building F Nursing and Health Sciences. 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 September 3, 2019, TRC performed an energy audit at Building F Nursing and Health Sciences at Hudson County Community College located in Jersey City, New Jersey. TRC met with Luis De Los Santos to review the facility operations and help focus our investigation on specific energy-using systems.

Building F Nursing and Health Sciences is a two-story structure with a third-floor mezzanine. The facility is a 31,700 square foot building built in 1919. Spaces include: classrooms, offices, corridors, stairwells, labs, rest rooms, lounges, storage closets, and mechanical spaces.

Recent improvements include: this site was renovated about three years ago. The site is interested in a new EMS but has been unable to fund the project.

Facility concerns include: Old equipment serving building which needs replacement.

2.2 Building Occupancy

The facility is occupied year-round. Typical weekday occupancy is 50 staff and 300 students during the semester.

Summer occupancy includes summer classes and continuing maintenance activities. There are no weekend activities.

Building Name	Weekday/Weekend	Operating Schedule
Building F Nursing and Health Sciences	Weekday	7:00 AM - 10:00 PM
	Weekend	Closed

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete masonry units with brick veneer. The roof is flat and covered with grey membrane and is in fair condition. Most of the windows are double pane and have metal frames. The glass-to-frame seals are in fair condition. Some windows have interior shading to block direct sunlight. There is a skylight above the stairwell with a metal frame and glass-to-frame seals in good condition. Exterior doors have metal frames and are in fair condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.

Building Envelope


Building Roof


Building Windows


Skylight

2.4 Lighting Systems

The primary interior lighting system uses 17-Watt, 2-lamp, 2-foot LED fixtures. There are also several 29-Watt, 2-lamp, 4-foot LED fixtures. Additionally, there are some LED can, wall-wash 8-foot strip, and various 1-lamp, 2-lamp, 3-lamp, and 4-lamp, U bend, 2-foot, 3-foot, 4-foot, or 8-foot fixtures. All exit signs are LED.

There a few 13-Watt and 26-Watt compact fluorescent lamps (CFL) plug-ins and 32-Watt, 1-lamp, 4-foot linear fluorescent T8 fixtures. Most fixtures are in fair condition. Interior lighting levels were generally sufficient.

Most lighting fixtures are controlled manually and the remainder by occupancy sensors.

Hallway Fixtures

Classroom Fixtures

LED Strip Fixtures

Occupancy Sensors

Exterior fixtures include LED wall packs and flood lights, and there is a halogen spotlight. Exterior light fixtures are controlled by a time clock.

Wall-Mount LED Fixture

Timeclock

2.5 Air Handling Systems

Packaged Units

Each floor of the building is served with two packaged air conditioning units with the exception of the third-floor mezzanine which is served by one. These units are controlled by the EMS. The only packaged unit equipped with a gas-fired furnace is RTU-3 which has a 140.0 MBh heating capacity and 76.8% efficiency. The other units are cooling only. All units are equipped with economizers.

The building is served by multiple packaged roof top units, including:

Unit	Area Served	Cooling Capacity (Tons)	Efficiency (EER)
RTU 1	First Floor	50.0	11.6
RTU 2	First Floor	40.0	11.6
RTU 3	Third Floor	10.0	11.0
RTU 4	Second Floor	27.0	10.3
RTU 5	Second Floor	50.0	11.6

Refer to Appendix A for detailed information about each unit.

Air Conditioners

The building uses split-system air conditioning (AC) units located on the roof for supplemental cooling. These all have a capacity of 1.5 tons with 14.0 EER efficiency rating. The units are in fair condition and controlled by programmable thermostats.

Packaged Roof Top Units

Split-System AC Units

Packaged Roof Top Unit

2.6 Heating Hot Water Systems

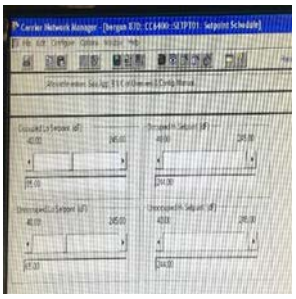
Eight Hydrotherm 397.0 MBh non-condensing hot water boilers serve the building heating load. Installed over 20 years ago, they are in poor condition. The boilers serve a primary-only distribution system with two 5.0 HP constant speed heating hot water pumps. The boilers provide hot water to the various VAV boxes throughout the building.

According to the EMS control logic, hot water is supplied at 244°F when the outside air temperature is low, and the setpoint is adjusted linearly to 85°F when the outside air temperature is high.

Hydrotherm Hot Water Boilers

Hydrotherm Hot Water Boilers

Heating Hot Water Pumps



Hot Water System Temperature Set-Points

2.7 Building Energy Management Systems (EMS)

A Carrier EMS controls the packaged rooftop units and the hot water system. The EMS provides equipment scheduling controls and monitors space temperatures, supply air temperatures, humidity, and allows for temperature set-points to be controlled relative to outside air temperature.

The site staff expressed an interest in replacing the EMS because the current system is nearing the end of its useful life. The EMS was addressed as a main maintenance concern, and there have been issues with access.

The EMS has an occupancy scheduling function. The general operating schedule for the RTUs is set from Monday at 1:00 AM through 10:00 PM, and Tuesday through Friday from 6:00 AM to 10:00 PM. No operation was scheduled for Saturday, Sunday, and holidays as the building is generally unoccupied. These schedules coincide with building occupancy, with the early Monday start up to account for the lack of conditioning during the weekend. One of the RTUs labeled "C48/50" in the EMS, however, had an occupancy schedule of 24 hours a day, 7 days a week. The site may wish to consider adjusting the scheduled operation of this unit.

The EMS also allows for the maintenance team to set supply air temperature set-points and target space temperatures in the different VAV zones. Set-back temperatures are appropriately used, with the building cooled, heated, and dehumidified less when the building is unoccupied as compared to occupied periods. The following table provides sample zone temperature setpoints recorded from the EMS:

Area	Heating Set-points		Cooling Set-points		Humidity	
	Unoccupied (°F)	Occupied (°F)	Unoccupied (°F)	Occupied (°F)	Unoccupied (%)	Occupied (%)
Office (VAV-1-13)	55	74	80	78	100	60
Classroom (VAV-1-9)	55	70	80	72	100	60

Office VAV Temperature Set-points

Classroom VAV Temperature Set-points

RTU Occupancy Schedule

Hot Water System Temperature Set-Points

2.8 Domestic Hot Water

Hot water is produced by two Lochinvar 117 gallon, 500.0 MBh gas-fired storage water heaters, each with an efficiency rating of 96%. There are also two Rheem Ruud 28, 36-gallon, 4.5 kW electric storage water heaters serving the slop sinks.

The domestic hot water pipes are insulated and the insulation is in fair condition.

DHW Storage Tank

DHW Tank for Slop Sink

2.9 Plug Load & Vending Machines

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

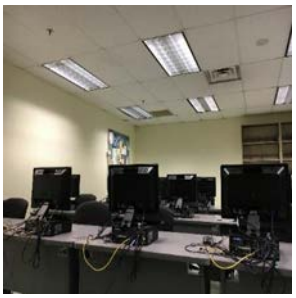
There are 129 computer work stations throughout the facility. Plug loads throughout the building include general classroom, office and medical equipment. There are classroom typical loads such as smart boards, projectors, and small fans. There are also office typical loads such as printers, TVs, coffee machines, mini fridges, and microwaves. There are approximately 20 electric hospital beds and various other miscellaneous medical equipment.

There are several residential-style refrigerators throughout the building that are used to store personal food and beverage items. These vary in condition and efficiency.

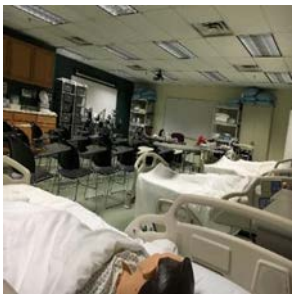
There are two refrigerated beverage vending machines and two non-refrigerated vending machines. Vending machines are not equipped with occupancy-based controls.

Kitchenette Typical Loads

Vending Machines



Classroom Typical Loads



Electric Hospital Beds

2.10 Water-Using Systems

There are six restrooms with toilets, urinals, and sinks. Most faucet flow rates are at 1 gallon per minute (gpm) or higher, with two sinks being 2.2 gpm or higher.

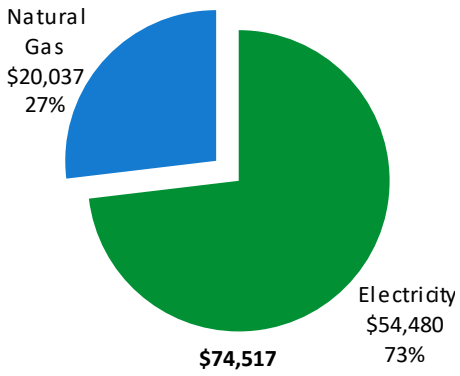
Bathroom Sinks

1.0 GPM Faucet Flow Rate

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	429,961 kWh	$54,480
Natural Gas	20,398 Therms	$20,037
Total		**$74,517**



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.

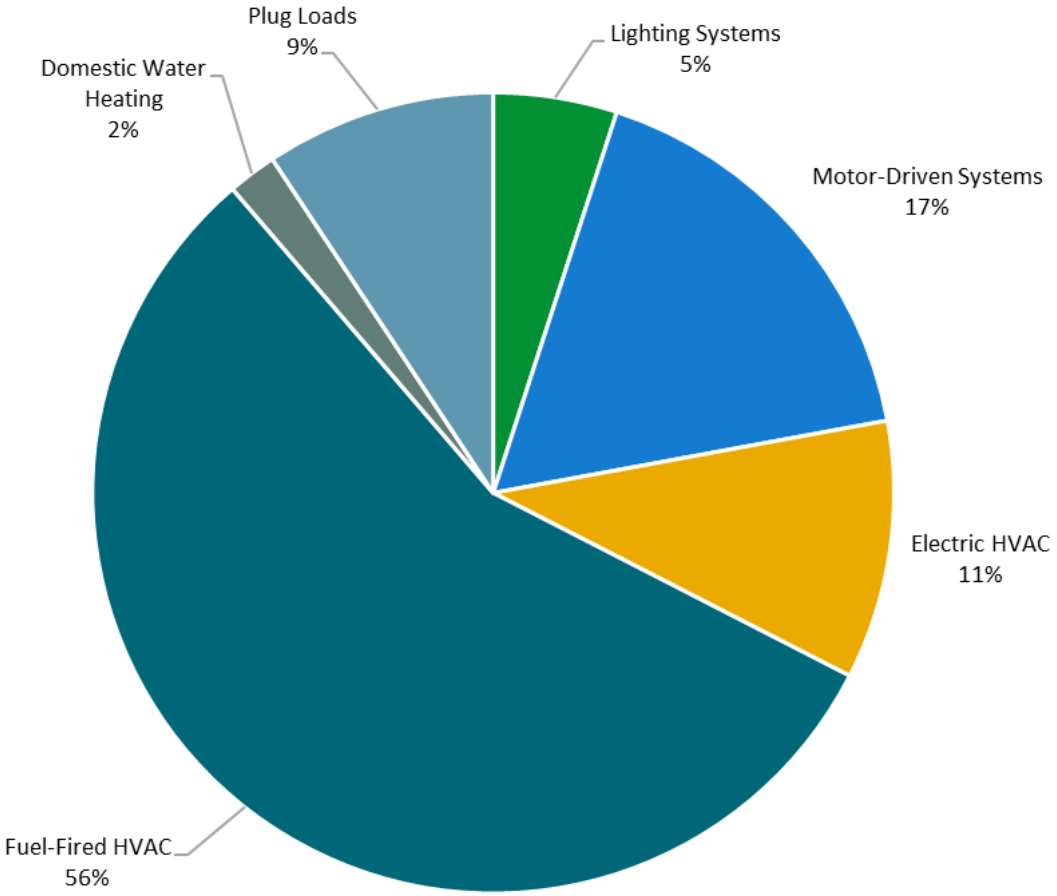
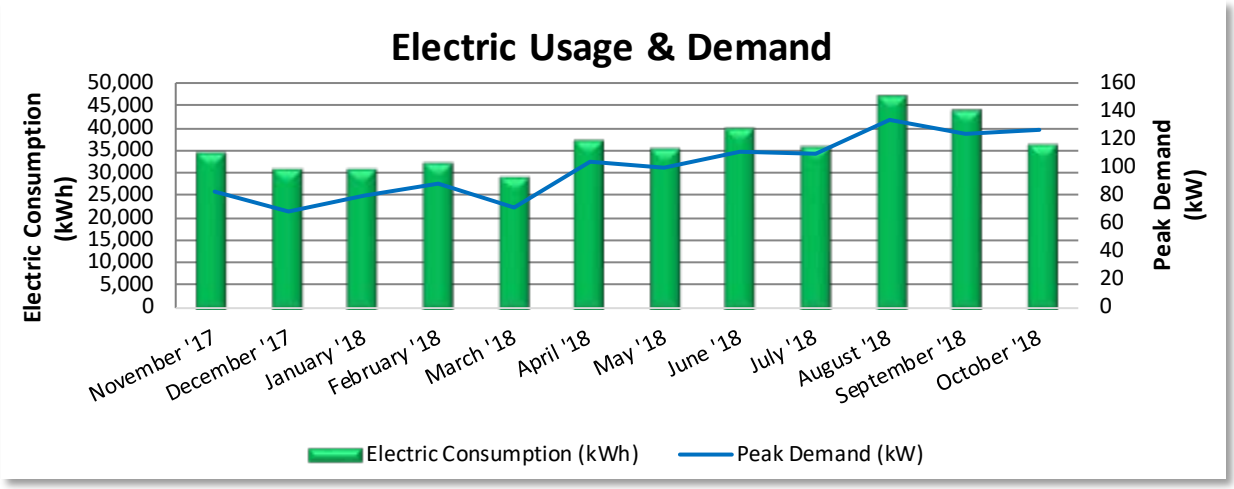


Figure 5 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class LPLS, with electric production provided by Direct Energy, a third-party supplier.



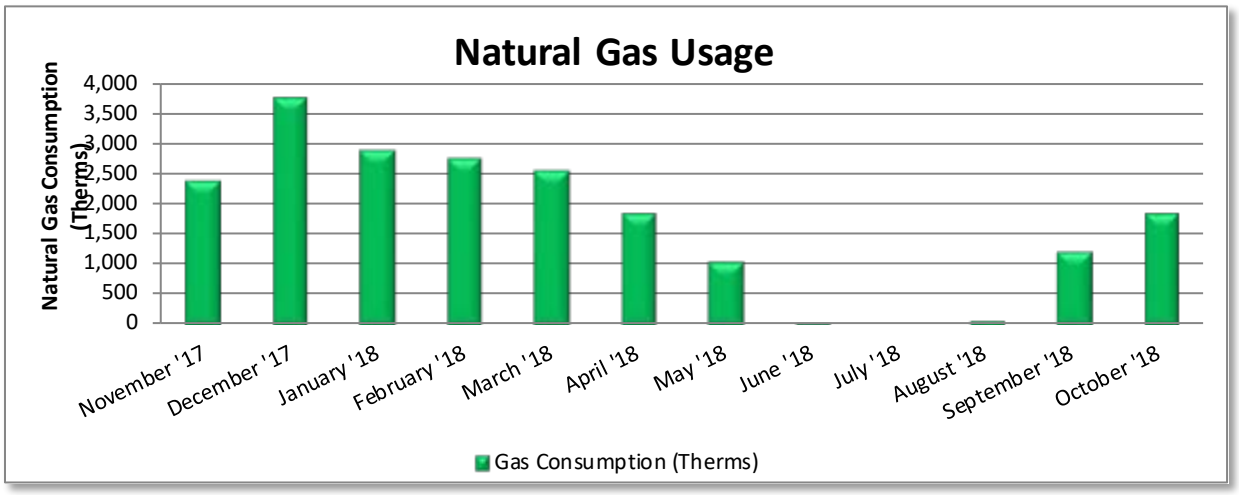
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
12/8/17	33	34,292	82	$314	$3,901
1/10/18	31	30,488	68	$259	$3,482
2/9/18	29	30,584	79	$302	$3,534
3/13/18	32	32,038	89	$341	$3,885
4/12/18	30	29,092	71	$265	$3,363
5/11/18	29	36,794	104	$371	$4,075
6/12/18	32	35,295	100	$358	$5,035
7/11/18	30	39,625	111	$395	$5,587
8/10/18	29	35,384	109	$391	$5,250
9/11/18	32	46,774	134	$478	$6,737
10/9/18	29	43,643	124	$443	$5,199
11/8/18	29	35,952	127	$461	$4,432
Totals	**365**	**429,961**	**134**	**$4,378**	**$54,480**
Annual	**365**	**429,961**	**134**	**$4,378**	**$54,480**

Notes:

- Peak demand of 134 kW occurred in August 2018.
- Average demand over the past 12 months was 100 kW.
- The average electric cost over the past 12 months was $0.127/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 Natural Gas

PSE&G delivers natural gas under rate class LVG, with natural gas supply provided by South Jersey Energy, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
12/8/17	31	2,387	$2,328
1/10/18	33	3,739	$3,580
2/9/18	29	2,884	$2,913
3/13/18	32	2,763	$2,816
4/12/18	30	2,550	$1,864
5/11/18	29	1,835	$1,367
6/12/18	32	1,056	$833
7/11/18	30	52	$143
8/10/18	29	0	$107
9/11/18	32	83	$164
10/9/18	29	1,211	$1,930
11/8/18	29	1,838	$1,993
Totals	**365**	**20,398**	**$20,037**
Annual	**365**	**20,398**	**$20,037**

Notes:

- The average gas cost for the past 12 months is $0.982/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's (EPA) *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.

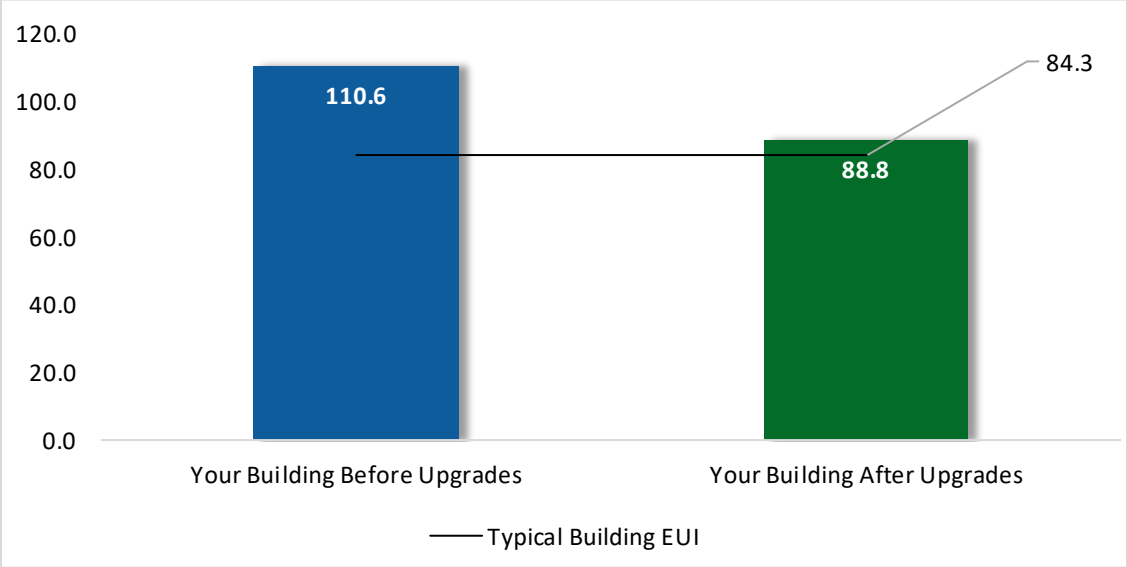


Figure 6 - Energy Use Intensity Comparison[3]

Energy use intensity (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. Due to this site building a college, it does not qualify for a benchmarking score.

[3] Based on all evaluated ECMs

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[4].

[4] 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's 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.

For a detailed list of the locations and recommended energy conservation measures for all inventoried equipment, see **Appendix A: Equipment Inventory & Recommendations.**

#	Energy Conservation Measure	Cost Effective?	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			**3,014**	**0.4**	**-1**	**$377**	**$943**	**$184**	**$759**	**2.0**	**2,975**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	3,014	0.4	-1	$377	$943	$184	$759	2.0	2,975
Lighting Control Measures			**11,349**	**2.0**	**-2**	**$1,415**	**$12,718**	**$5,420**	**$7,298**	**5.2**	**11,151**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	8,162	1.4	-2	$1,017	$9,568	$2,270	$7,298	7.2	8,020
ECM 3	Install High/Low Lighting Controls	Yes	3,187	0.6	-1	$397	$3,150	$3,150	$0	0.0	3,131
Motor Upgrades			**945**	**0.2**	**0**	**$120**	**$2,687**	**$0**	**$2,687**	**22.4**	**951**
ECM 4	Premium Efficiency Motors	No	945	0.2	0	$120	$2,687	$0	$2,687	22.4	951
Variable Frequency Drive (VFD) Measures			**68,993**	**20.0**	**0**	**$8,742**	**$41,663**	**$15,950**	**$25,713**	**2.9**	**69,475**
ECM 5	Install VFD on Variable Air Volume (VAV) Fans	Yes	64,582	19.0	0	$8,183	$32,540	$15,950	$16,590	2.0	65,034
ECM 6	Install VFDs on Heating Water Pumps	No	4,411	1.0	0	$559	$9,122	$0	$9,122	16.3	4,441
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**290**	**$2,846**	**$76,235**	**$16,000**	**$60,235**	**21.2**	**33,926**
ECM 7	Install High Efficiency Hot Water Boilers	No	0	0.0	290	$2,846	$76,235	$16,000	$60,235	21.2	33,926
Domestic Water Heating Upgrade			**0**	**0.0**	**5**	**$49**	**$93**	**$93**	**$0**	**0.0**	**582**
ECM 8	Install Low-Flow DHW Devices	Yes	0	0.0	5	$49	$93	$93	$0	0.0	582
Food Service & Refrigeration Measures			**3,224**	**0.4**	**0**	**$408**	**$460**	**$200**	**$260**	**0.6**	**3,246**
ECM 9	Vending Machine Control	Yes	3,224	0.4	0	$408	$460	$200	$260	0.6	3,246
Custom Measures			**12,057**	**0.0**	**59**	**$2,110**	**$31,700**	**$0**	**$31,700**	**15.0**	**19,083**
ECM 10	Replace Energy Management System	Yes	12,057	0.0	59	$2,110	$31,700	$0	$31,700	15.0	19,083
TOTALS			**99,582**	**23.0**	**351**	**$16,067**	**$166,499**	**$37,847**	**$128,652**	**8.0**	**141,391**

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

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

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		**3,014**	**0.4**	**-1**	**$377**	**$943**	**$184**	**$759**	**2.0**	**2,975**
ECM 1	Retrofit Fixtures with LED Lamps	3,014	0.4	-1	$377	$943	$184	$759	2.0	2,975
Lighting Control Measures		**11,349**	**2.0**	**-2**	**$1,415**	**$12,718**	**$5,420**	**$7,298**	**5.2**	**11,151**
ECM 2	Install Occupancy Sensor Lighting Controls	8,162	1.4	-2	$1,017	$9,568	$2,270	$7,298	7.2	8,020
ECM 3	Install High/Low Lighting Controls	3,187	0.6	-1	$397	$3,150	$3,150	$0	0.0	3,131
Variable Frequency Drive (VFD) Measures		**64,582**	**19.0**	**0**	**$8,183**	**$32,540**	**$15,950**	**$16,590**	**2.0**	**65,034**
ECM 5	Install VFD on Variable Air Volume (VAV) Fans	64,582	19.0	0	$8,183	$32,540	$15,950	$16,590	2.0	65,034
Domestic Water Heating Upgrade		**0**	**0.0**	**5**	**$49**	**$93**	**$93**	**$0**	**0.0**	**582**
ECM 8	Install Low-Flow DHW Devices	0	0.0	5	$49	$93	$93	$0	0.0	582
Food Service & Refrigeration Measures		**3,224**	**0.4**	**0**	**$408**	**$460**	**$200**	**$260**	**0.6**	**3,246**
ECM 9	Vending Machine Control	3,224	0.4	0	$408	$460	$200	$260	0.6	3,246
Custom Measures		**12,057**	**0.0**	**59**	**$2,110**	**$31,700**	**$0**	**$31,700**	**15.0**	**19,083**
ECM 10	Replace Energy Management System	12,057	0.0	59	$2,110	$31,700	$0	$31,700	15.0	19,083
TOTALS		**94,226**	**21.7**	**61**	**$12,542**	**$78,455**	**$21,847**	**$56,608**	**4.5**	**102,071**

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

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

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		**3,014**	**0.4**	**-1**	**$377**	**$943**	**$184**	**$759**	**2.0**	**2,975**
ECM 1	Retrofit Fixtures with LED Lamps	3,014	0.4	-1	$377	$943	$184	$759	2.0	2,975

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 Fixtures with LED Lamps

Replace fluorescent or incandescent 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: stairwells, roof, room F115, rest rooms, and file room F215.

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		**11,349**	**2.0**	**-2**	**$1,415**	**$12,718**	**$5,420**	**$7,298**	**5.2**	**11,151**
ECM 2	Install Occupancy Sensor Lighting Controls	8,162	1.4	-2	$1,017	$9,568	$2,270	$7,298	7.2	8,020
ECM 3	Install High/Low Lighting Controls	3,187	0.6	-1	$397	$3,150	$3,150	$0	0.0	3,131

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 2: 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 that 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: rest rooms, storage rooms, closets, lounges, offices, classrooms, computer labs, labs, file rooms, and copy rooms.

ECM 3: 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 code requirements for egress. 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.

The controller lowers the light level by dimming the fixture output. Therefore, the controlled fixtures need to have a dimmable ballast or driver. This will need to be taken into account when selecting retrofit lamps and bulbs for the areas proposed for high/low control.

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

Affected building areas: stairwells and 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 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**945**	**0.2**	**0**	**$120**	**$2,687**	**$0**	**$2,687**	**22.4**	**951**
ECM 4	Premium Efficiency Motors	945	0.2	0	$120	$2,687	$0	$2,687	22.4	951

ECM 4: Premium Efficiency Motors

We evaluated replacing standard efficiency motors with IHP 2014 efficiency motors. This evaluation assumes that existing motors will be replaced with motors of equivalent size and type. In some cases, additional savings may be possible by downsizing motors to better meet the motor's current load requirements.

Affected motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Roof	Building	1	Exhaust Fan	10.0	EF-5
Roof	Building	1	Exhaust Fan	10.0	EF-1

Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours. The base case motor energy consumption is estimated using the efficiencies found on nameplates or estimated based on the age of the motor and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the current *New Jersey's Clean Energy Program Protocols to Measure Resource Savings*.

4.4 Variable Frequency Drives (VFD)

#	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)
Variable Frequency Drive (VFD) Measures		**68,993**	**20.0**	**0**	**$8,742**	**$41,663**	**$15,950**	**$25,713**	**2.9**	**69,475**
ECM 5	Install VFD on Variable Air Volume (VAV) Fans	64,582	19.0	0	$8,183	$32,540	$15,950	$16,590	2.0	65,034
ECM 6	Install VFDs on Heating Water Pumps	4,411	1.0	0	$559	$9,122	$0	$9,122	16.3	4,441

Variable frequency drives control motors for fans, pumps, and process equipment based on the actual output required of the driven equipment. Energy savings result from more efficient control of motor energy usage when equipment operates at partial load. The magnitude of energy savings depends on the estimated amount of time that the motor would operate at partial load. For equipment with proposed VFDs, we have included replacing the controlled motor with a new inverter duty rated motor to conservatively account for the cost of an inverter duty rated motor.

ECM 5: Install VFD on Variable Air Volume (VAV) Fans

Replace existing air volume control devices on variable volume fans, such as inlet vanes and variable pitch fan blades, with VFDs. Inlet guide vanes and variable pitch fan blades are an inefficient means of controlling the air volume compared to VFDs. The existing volume control device will be removed or permanently disabled, and the control signal will be redirected to the VFD to determine proper fan motor speed.

Energy savings result from using a more efficient control device to regulate the air flow provided by the fan. Additional maintenance savings may result from this measure. VFDs are solid state electronic devices, which generally requires less maintenance than mechanical air volume control devices.

Affected air handlers: RTU-1, RTU-2, RTU-3, RTU-4, and RTU-5.

ECM 6: Install VFDs on Heating Water Pumps

Evaluate variable frequency drives (VFD) to control heating water pumps. Two-way valves must serve the hot water coils and the hot water loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the hot water distribution they will need to be modified when this measure is implemented. As the hot water valves close, the differential pressure increases and the VFD modulates the pump speed to maintain a differential pressure setpoint.

Energy savings result from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

Affected pumps: one Dayton 5N250 and one Baldor M3309T.

4.5 Gas-Fired 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)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**290**	**$2,846**	**$76,235**	**$16,000**	**$60,235**	**21.2**	**33,926**
ECM 7	Install High Efficiency Hot Water Boilers	0	0.0	290	$2,846	$76,235	$16,000	$60,235	21.2	33,926

ECM 7: Install High Efficiency Hot Water Boilers

Evaluate older inefficient hot water boilers with high efficiency hot water boilers. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers which can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F. Therefore, condensing hydronic boilers are evaluated when the return water temperature is less than 130°F during most of the operating hours.

For the purposes of this analysis, we evaluated the replacement of boilers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your mechanical design team to select boilers that are sized appropriately for the heating load at this facility. In many cases installing multiple modular boilers rather than one or two large boilers will result in higher overall plant efficiency while providing additional system redundancy.

Replacing the boilers has a long payback and may not be justifiable based simply on energy considerations. However, the boilers have reached the end of their normal useful life. Typically, the marginal cost of purchasing high efficiency boilers can be justified by the marginal savings from the improved efficiency. When the boiler is eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes. We also recommend working with your mechanical design team to determine whether the heating system can operate with return water temperatures below 130°F, which would allow the use of condensing boilers.

4.6 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		**0**	**0.0**	**5**	**$49**	**$93**	**$93**	**$0**	**0.0**	**582**
ECM 8	Install Low-Flow DHW Devices	0	0.0	5	$49	$93	$93	$0	0.0	582

ECM 8: 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

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.

4.7 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		**3,224**	**0.4**	**0**	**$408**	**$460**	**$200**	**$260**	**0.6**	**3,246**
ECM 9	Vending Machine Control	3,224	0.4	0	$408	$460	$200	$260	0.6	3,246

ECM 9: Vending Machine Control

Vending machines operate continuously, even during unoccupied hours. Install occupancy sensor controls to reduce energy use. These controls power down vending machines when the vending machine area has been vacant for some time, and they power up the machines at necessary regular intervals or when the surrounding area is occupied. Energy savings are dependent on the vending machine and activity level in the area surrounding the machines.

4.8 Custom 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)
Custom Measures		**12,057**	**0.0**	**59**	**$2,110**	**$31,700**	**$0**	**$31,700**	**15.0**	**19,083**
ECM 10	Replace Energy Management System	12,057	0.0	59	$2,110	$31,700	$0	$31,700	15.0	19,083

ECM 10: Replace Energy Management System

Facility staff reported an interest in improving the HVAC control system. The greatest operational and maintenance concern was the functionality and sustainability of the building energy management system. This measure estimates the potential of replacing the Building Energy Management System. This measure has been evaluated at a high level.

Replacing the building's Energy Management System can lead to savings by increasing control of the HVAC systems. The average cost for EMS installation is estimated as $1.50/sq. ft, based on a comprehensive study by the Environmental Protection Agency (EPA). Our high-level savings analysis is based on estimated savings of 5% motor use, 3% of electrical cooling, and 3% of heating fuel use. This compares conservatively with the EPA study's estimated savings range of 10 – 30%.

The HVAC systems should have proper temperature setbacks and operate according to occupancy schedules. Electronic control should be provided to all HVAC equipment and systems, eliminating manual control, allowing for most savings captured by EMS. Heating hot water should be controlled with an outdoor air temperature reset schedule. Unit ventilator dampers should be controlled based on the needs of the space. Air-handling units should be equipped with outdoor air damper controls and CO2 sensors for demand control ventilation where applicable. Roof top units should be equipped with economizer controls. All HVAC sensors throughout the building should be evaluated for replacement.

It is likely that considerable savings could be realized by simply adjusting schedules and setpoints while a replacement system is under design. We recommend immediate attention in this regard.

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[5]. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

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.

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.

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

Fans to Reduce Cooling Load

Install ceiling fans to supplement your cooling system. Thermostat settings can typically be increased by 4°F with no change in overall occupant comfort due to the wind chill effect of moving air.

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°F-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.

AC System Evaporator/Condenser Coil Cleaning

Dirty evaporator and condenser coils restrict air flow and restrict heat transfer. This increases the loads on the evaporator and condenser fan and decreases overall cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

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.

Duct Sealing

Duct leakage in commercial buildings can account for five to twenty-five percent of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building wasting conditioned air. Eliminating duct leaks can improve ventilation system performance and reduce heating and cooling system operation.

Boiler Maintenance

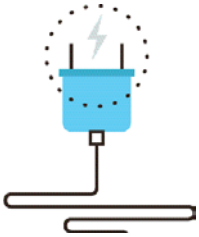
Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Boilers should be cleaned according to the manufacturer's instructions to remove soot and scale from the water side or fire side of the boiler.

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[6]. Your local utility may offer incentives or rebates for this equipment.

[6] For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" http://www.nrel.gov/docs/fy13osti/54175.pdf, or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Water Conservation

Installing 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[7] or download a copy of EPA's "WaterSense® at Work: Best Management Practices for Commercial and Institutional Facilities"[8] 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.

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.

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

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

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, 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.

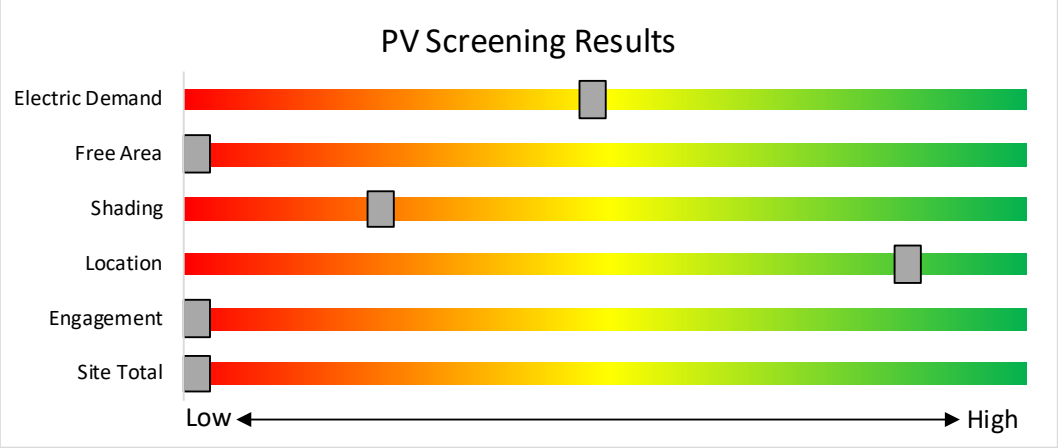
6.1 Solar Photovoltaic

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 **no** potential for installing a PV array.

This facility does **not** appear to 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 sufficient and sustained electric demand and sufficient 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.



Potential	None	
System Potential	28	kW DC STC
Electric Generation	21,068	kWh/yr
Displaced Cost	$2,670	/yr
Installed Cost	$80,100	

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.

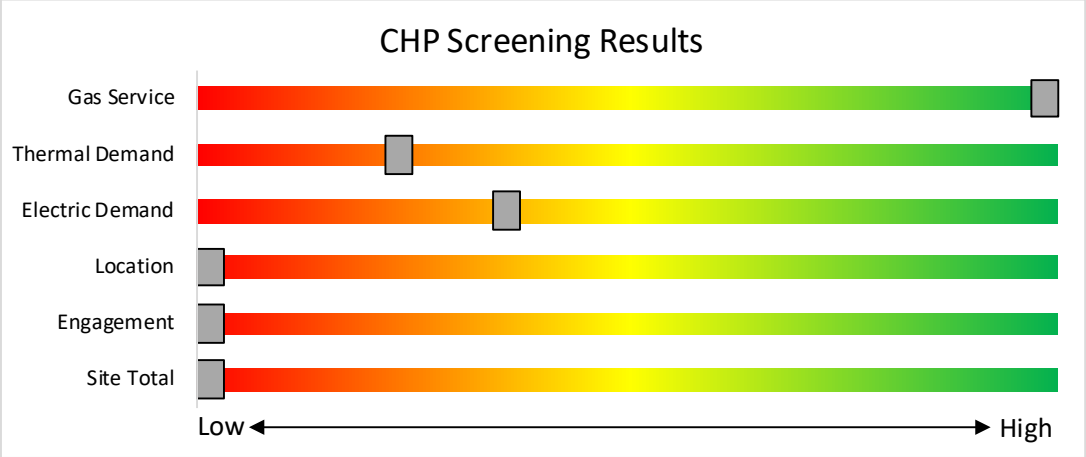
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be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



Potential	None	
System Type	None	
System Potential	40	kW
Electric Generation	283,280	kWh/yr
Thermal Generation	4,498,486	MBtu/yr
Displaced Cost	$15,828	/yr
Installed Cost	$152,000	

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? New Jersey's 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 New Jersey 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-efficient 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 Direct Install 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 Pay for Performance - Existing Buildings

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 that results in at least 15% source energy savings, and lighting cannot make up the majority of the savings. P4P is a generally a good option for medium-to-large sized facilities looking to implement as many measures as possible under a single project to achieve deep energy savings. This program has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program.

Incentives

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

How to Participate

Contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, they will help further evaluate the measures identified in this report through development of the energy reduction plan), assist you in implementing selected measures, and verify actual savings one year after the installation. Your Partner will also help you apply for incentives.

Approval of the final scope of work is required by the program prior to installation. Installation can be done by the contractor of your choice (some P4P Partners are also contractors) or by internal staff, but the Partner remains involved throughout construction to ensure compliance with the program requirements.

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

7.4 Combined Heat and Power

The Combined Heat & Power (CHP) program provides incentives for eligible CHP or waste heat to power (WHP) projects. Eligible CHP or WHP projects must achieve an annual system efficiency of at least 65% (lower heating value, or LHV), based on total energy input and total utilized energy output. Mechanical energy may be included in the efficiency evaluation.

Incentives

Eligible Technologies	Size (Installed Rated Capacity)[1]	Incentive ($/kW)	% of Total Cost Cap per Project[3]	$ Cap per Project[3]
Powered by non-renewable or renewable fuel source[4]	≤500 kW	$2,000	30-40%[2]	$2 million
Gas Internal Combustion Engine	>500 kW - 1 MW	$1,000		
Gas Combustion Turbine	> 1 MW - 3 MW	$550	30%	$3 million
Microturbine Fuel Cells with Heat Recovery	>3 MW	$350		
Waste Heat to Power*	<1 MW	$1,000	30%	$2 million
	> 1MW	$500		$3 million

*Waste Heat to Power: Powered by non-renewable fuel source, heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbine).

Check the NJCEP website for details on program availability, current incentive levels, and requirements.

How to Participate

You work with a qualified developer or consulting firm to complete the CHP application. Once the application is approved the project can be installed. Information about the CHP program can be found at: www.njcleanenergy.com/CHP.

7.5 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 description 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.

7.6 SREC Registration Program

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

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

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

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar Renewable Portfolio Standard. Purchasing SRECs can help them meet those requirements. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period fluctuates depending on supply and demand.

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

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[9].

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[10].

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

[10] 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
Building	29	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	29	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Lobby Entrance	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Stairs	30	Compact Fluorescent: (2) 26W Plug-In Lamps	None		52	3,900	1, 3	Relamp	Yes	30	LED Lamps: (2) 18.5W Plug-In Lamps	High/Low Control	37	2,691	0.6	3,407	-1	$425	$1,875	$1,245	1.5
Roof	1	Halogen Incandescent: 150 W FL	Timeclock		150	4,380	1	Relamp	No	1	LED Lamps: 23 W LED Bulb	Timeclock	23	4,380	0.0	558	0	$71	$27	$2	0.4
Mechanical Room 128	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900		None	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,900	0.0	0	0	$0	$0	$0	0.0
Storage 131	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.0	270	0	$34	$270	$0	8.0
Storage 130	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,900	0.0	0	0	$0	$0	$0	0.0
Classroom 129	17	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	17	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Classroom 125	21	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	21	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Hallway	13	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	13	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
F115	1	Compact Fluorescent: (2) 13W Plug-In Lamps	Wall Switch	S	26	3,900	1	Relamp	No	1	LED Lamps: (2) 10.5W Plug-In Lamps	Wall Switch	21	3,900	0.0	21	0	$3	$25	$4	7.9
Lounge/Hall	10	LED - Fixtures: CAN	Occupancy Sensor	S	10	2,691		None	No	10	LED - Fixtures: CAN	Occupancy Sensor	10	2,691	0.0	0	0	$0	$0	$0	0.0
Rest Room	4	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	3,900	2	None	Yes	4	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	2,691	0.0	181	0	$23	$270	$70	8.9
Rest Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	3,900	1, 2	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,691	0.1	472	0	$59	$361	$120	4.1
Lounge/Hall	2	LED - Fixtures: Wall-Wash Lights	Occupancy Sensor	S	112	2,691		None	No	2	LED - Fixtures: Wall-Wash Lights	Occupancy Sensor	112	2,691	0.0	0	0	$0	$0	$0	0.0
Lounge/Hall	6	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	6	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Rest Room	4	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	3,900	2	None	Yes	4	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	2,691	0.0	181	0	$23	$270	$70	8.9
Rest Room	2	LED - Linear Tubes: (2) 3' Lamps	Wall Switch	S	21	3,900	2	None	Yes	2	LED - Linear Tubes: (2) 3' Lamps	Occupancy Sensor	21	2,691	0.0	56	0	$7	$0	$0	0.0
Closet	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	3,900	2	None	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	45	0	$6	$116	$0	20.6
Staff Lounge 120	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	3,900	2	None	Yes	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	90	0	$11	$270	$70	17.7
Conference Room 119	9	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	9	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Hallway	14	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	14	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Classroom 109	9	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	9	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Administrative Office	8	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	8	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
112	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0

	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
113	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
111	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
110	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Office 118	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Office 117	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
116	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
115	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Copy Room 114	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Office 106	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Office 107	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Storage 105	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Power Data 104	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Simulation Lab 103	9	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,691		None	No	9	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,691	0.0	0	0	$0	$0	$0	0.0
Simulation Lab 103	10	LED - Linear Tubes: (1) 8' Lamp	Occupancy Sensor	S	36	2,691		None	No	10	LED - Linear Tubes: (1) 8' Lamp	Occupancy Sensor	36	2,691	0.0	0	0	$0	$0	$0	0.0
108A	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
103	9	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	S	15	2,691		None	No	9	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,691	0.0	0	0	$0	$0	$0	0.0
Office 103	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
103A	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.0	77	0	$10	$116	$40	7.9
Supply 103C	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
Elevator Room F102	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900		None	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,900	0.0	0	0	$0	$0	$0	0.0
Basement	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.0	116	0	$14	$270	$70	13.9
Hallway	36	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	2,691	3	None	Yes	36	LED - Linear Tubes: (4) 2' Lamps	High/Low Control	34	1,857	0.3	1,123	0	$140	$1,350	$1,350	0.0
Electrical Room 201	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	3,900		None	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,900	0.0	0	0	$0	$0	$0	0.0
Office 203	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	S	58	3,900	2	None	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,691	0.0	231	0	$29	$270	$70	6.9
Office 205	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.0	77	0	$10	$116	$40	7.9

	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
Office 211	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	3,900	2	None	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	45	0	$6	$116	$40	13.5
Office 207	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	3,900	2	None	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	45	0	$6	$116	$40	13.5
Office 209	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	3,900	2	None	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	45	0	$6	$116	$40	13.5
Classroom 213	32	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	32	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.2	1,234	0	$154	$810	$210	3.9
202	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
202	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	S	33	2,691		None	No	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,691	0.0	0	0	$0	$0	$0	0.0
202	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	S	29	2,691		None	No	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.0	0	0	$0	$0	$0	0.0
Office 204	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.0	77	0	$10	$116	$40	7.9
Closet	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	S	26	3,900		None	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	3,900	0.0	0	0	$0	$0	$0	0.0
Classroom 206	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.1	540	0	$67	$540	$140	5.9
Rest Room	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.0	116	0	$14	$0	$0	0.0
Rest Room	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	3,900	2	None	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,691	0.0	39	0	$5	$270	$70	41.6
Lab 208	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.1	463	0	$58	$270	$70	3.5
221	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,900	0.0	0	0	$0	$0	$0	0.0
Rest Room	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.0	116	0	$14	$0	$0	0.0
Rest Room	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	3,900	2	None	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,691	0.0	58	0	$7	$270	$70	27.7
Classroom 210	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.1	463	0	$58	$270	$70	3.5
Storage 221	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	3,900		None	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,900	0.0	0	0	$0	$0	$0	0.0
Computer Lab 212	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.1	463	0	$58	$270	$70	3.5
Office 223	5	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	3,900	2	None	Yes	5	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	113	0	$14	$270	$70	14.2
220	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	S	17	2,691		None	No	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	0	0	$0	$0	$0	0.0
220A	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	3,900	2	None	Yes	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	90	0	$11	$270	$70	17.7
218A	6	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	S	36	3,900	2	None	Yes	6	LED - Linear Tubes: (1) 8' Lamp	Occupancy Sensor	36	2,691	0.0	287	0	$36	$270	$70	5.6
218B	2	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	S	36	3,900	2	None	Yes	2	LED - Linear Tubes: (1) 8' Lamp	Occupancy Sensor	36	2,691	0.0	96	0	$12	$270	$70	16.8
File Room 215	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.0	116	0	$14	$270	$0	18.7

	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
File Room 215	2	Compact Fluorescent: (2) 26W Plug-In Lamps	Wall Switch	S	52	3,900	1, 2	Relamp	Yes	2	LED Lamps: (2) 18.5W Plug-In Lamps	Occupancy Sensor	37	2,691	0.0	227	0	$28	$320	$78	8.5
Lounge 214	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	3,900	2	None	Yes	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	68	0	$8	$270	$0	31.9
Hallway Floor 3	13	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	3,900	3	None	Yes	13	LED - Linear Tubes: (4) 2' Lamps	High/Low Control	34	2,691	0.1	588	0	$73	$675	$675	0.0
Exercise Lab 301	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900	2	None	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,691	0.1	463	0	$58	$270	$70	3.5
Housekeeping 304	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	S	15	3,900		None	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,900	0.0	0	0	$0	$0	$0	0.0
Rest Room	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,900	0.0	0	0	$0	$0	$0	0.0
Rest Room	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	3,900		None	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,900	0.0	0	0	$0	$0	$0	0.0
Office 302	15	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	3,900	2	None	Yes	15	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	2,691	0.1	678	0	$85	$540	$140	4.7
Copy Room 302A	4	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	S	26	3,900	2	None	Yes	4	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	2,691	0.0	136	0	$17	$270	$70	11.8
Office 302B	6	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	S	26	3,900	2	None	Yes	6	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	2,691	0.0	203	0	$25	$270	$70	7.9
302C	6	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	S	34	3,900	2	None	Yes	6	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	2,691	0.0	271	0	$34	$270	$70	5.9
302D	6	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	S	26	3,900	2	None	Yes	6	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	2,691	0.0	203	0	$25	$270	$70	7.9
302E	5	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	S	26	3,900	2	None	Yes	5	LED - Linear Tubes: (3) 2' Lamps	Occupancy Sensor	26	2,691	0.0	170	0	$21	$270	$70	9.5
Closet 303	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	3,900	2	None	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	2,691	0.0	45	0	$6	$116	$0	20.6
Exterior	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock		15	4,380		None	No	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	15	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior	2	LED - Fixtures: Architectural Flood/Spot Luminaire	Timeclock		4	4,380		None	No	2	LED - Fixtures: Architectural Flood/Spot Luminaire	Timeclock	4	4,380	0.0	0	0	$0	$0	$0	0.0

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
Roof	Building	1	Exhaust Fan	0.3	74.0%	No	W	3,150		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Building	1	Exhaust Fan	10.0	89.5%	Yes	W	3,150	4	Yes	91.7%	No		0.1	472	0	$60	$1,344	$0	22.4
Roof	Building	1	Exhaust Fan	10.0	89.5%	Yes	W	3,150	4	Yes	91.7%	No		0.1	472	0	$60	$1,344	$0	22.4
Mechanical Room	Pump 1	1	Heating Hot Water Pump	5.0	90.2%	No	B	1,373	6	No	90.2%	Yes	1	0.5	2,128	0	$270	$4,505	$0	16.7
Mechanical Room	Pump 2	1	Heating Hot Water Pump	5.0	87.5%	No	B	1,373	6	No	89.5%	Yes	1	0.5	2,282	0	$289	$4,617	$0	16.0
Roof	Building	1	Exhaust Fan	0.1	74.0%	No	W	3,150		No	74.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Carrier Unit	1	Supply Fan	15.0	91.0%	No	B	3,150	5	No	92.4%	Yes	1	4.4	14,922	0	$1,891	$7,086	$3,600	1.8
Roof	Carrier Unit	1	Supply Fan	15.0	91.0%	No	B	3,150	5	No	92.4%	Yes	1	4.4	14,922	0	$1,891	$7,086	$3,600	1.8
Roof	Carrier Unit	1	Supply Fan	15.0	91.0%	No	B	3,150	5	No	92.4%	Yes	1	4.4	14,922	0	$1,891	$7,086	$3,600	1.8
Roof	Carrier Unit	1	Supply Fan	5.0	90.0%	No	W	3,150	5	No	90.0%	Yes	1	1.4	4,896	0	$620	$4,197	$1,550	4.3
Roof	Carrier Unit	1	Supply Fan	15.0	91.0%	No	B	3,150	5	No	92.4%	Yes	1	4.4	14,922	0	$1,891	$7,086	$3,600	1.8
Elevator Room	Building	1	Other	40.0	94.1%	No	B	391		No	94.1%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Building	1	Other	0.0	74.0%	No	W	8,760		No	74.0%	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
Roof	Building	1	Split-System AC	1.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	First Floor	1	Packaged AC	50.00		B		No							0.0	0	0	$0	$0	$0	0.0
Roof	Building	1	Split-System AC	1.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Second Floor	1	Packaged AC	50.00		B		No							0.0	0	0	$0	$0	$0	0.0
Roof	First Floor	1	Packaged AC	40.00		B		No							0.0	0	0	$0	$0	$0	0.0
Roof	Building	1	Split-System AC	1.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Building	1	Split-System AC	1.50		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Third Floor	1	Packaged AC	10.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Second Floor	1	Packaged AC	27.00		B		No							0.0	0	0	$0	$0	$0	0.0

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Third Floor	1	Furnace	140.00	W		No						0.0	0	0	$0	$0	$0	0.0
Mechanical Room	Building	8	Non-Condensing Hot Water Boiler	397.00	B	7	Yes	8	Condensing Hot Water Boiler	397.00	91.00%	Et	0.0	0	290	$2,846	$76,235	$16,000	21.2

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
Mechanical Room	Building	2	Storage Tank Water Heater (> 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
Slop Sink	Building	1	Storage Tank Water Heater (≤ 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0
Slop Sink	Building	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
Rest Room	8	11	Faucet Aerator (Lavatory)	1.00	0.50	0.0	0	3	$30	$79	$79	0.0
Rest Room	8	2	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	2	$19	$14	$14	0.0

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Building	129	Computer	90.0	
Building	11	Laptop	70.0	
Building	3	Laptop Cart	2,100.0	
Building	6	TV	55.0	
Building	10	Smart Board/Projector	1.5	
Building	18	Small Printer	30.0	
Building	1	Medium Printer	120.0	
Building	3	Large Printer	300.0	
Building	6	Coffee Machine	300.0	
Building	7	Microwave	700.0	
Building	1	Toaster	1,200.0	
Building	2	Medium Refrigerator	700.0	
Building	4	Mini Fridge	85.0	
Building	2	Water Dispenser	75.0	
Building	1	Large Floor Fan	220.0	
Building	1	Electric Scale	90.0	
Building	20	Hospital Bed	300.0	
Building	7	Small Fan	40.0	
Building	1	Tred Mill	600.0	
Building	1	Industrial Dehumidifier	782.0	
Building	10	Misc. Medical Equipment	5,500.0	

Vending Machine Inventory & Recommendations

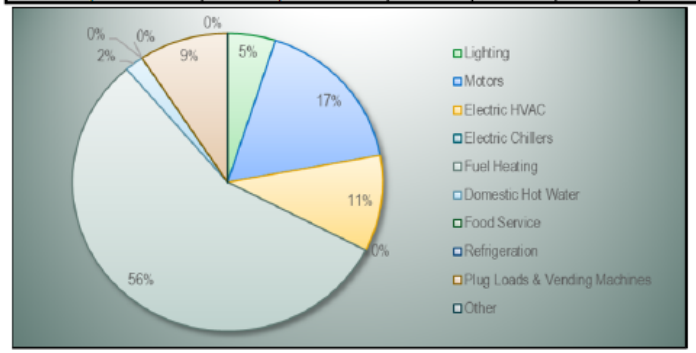
	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Lounge	1	Refrigerated	9	Yes	0.2	1,612	0	$204	$230	$100	0.6
Lounge	1	Non-Refrigerated	N/A	No	0.0	0	0	$0	$0	$0	0.0
Main Entrance	1	Refrigerated	9	Yes	0.2	1,612	0	$204	$230	$100	0.6
Main Entrance	1	Non-Refrigerated	N/A	No	0.0	0	0	$0	$0	$0	0.0

Custom Measure (High Level) Recommendations

Building Square Footage	31,700	NOTE
Percent of Conditioned Area Impacted	100%	
Natural Gas Utility Rate	$9.82	mmBtu
Blended Electric Utility Rate	$0.127	kWh

Replace Energy Management System

Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis					
Description	Area(s)/System(s) Served	Remaining Useful Life	Total HVAC Motor Usage kWh	Total HVAC Electric Usage kWh	Total HVAC Gas Usage MMBtu	Description	% Savings HVAC Motor Usage kWh	% Savings HVAC Electric Usage kWh	% Savings HVAC Gas Usage MMBtu	Total Estimated kWh Savings	Total Estimated MMBtu Savings	Total Annual Energy Cost Savings	Estimated Cost per Sqft	Total Estimated Installation Cost	Estimated Simple Payback (years)
Building Energy Management System	HVAC Equipment and Systems	B	176,507	107,708	1,976	Replace Energy Management System	5%	3%	3%	12,057	59	$2,110	$1.00	$31,700	15.0



Notes:
This measure has been evaluated at a high level. Facility staff reported an interest in improving the HVAC control system.
The greatest operational and maintenance concern was the functionality and sustainability of a building energy management system.
This measure estimates the potential with replacing the Building Energy Management System.

Equations: (Based on Industry Standards)
Average Cost for EMS installation is $1.50/sqft
Esimated Costs rounded to imply ball park cost estimates
The HVAC systems should have proper temperature set backs and operate according to occupancy schedules.
Electronic control should be provided to all HVAC equipment and systems, eliminating manual control
Heating hot water should be controlled with an outdoor air temperature reset schedule.
Unit ventilator dampers should be controlled based on the needs of the space.
Air-handling units should be equipped with outdoor air damper controls and CO2 sensors for demand control ventilation.
Roof top units should be equipped with economizer controls. All HVAC sensors throughout the building should be replaced.

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.

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

HCCC - Building F Nursing & Health Sciences

Primary Property Type: College/University
Gross Floor Area (ft²): 31,700
Built: 1919

For Year Ending: October 31, 2018
Date Generated: July 23, 2019

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
HCCC - Building F Nursing & Health Sciences 870 Bergen Avenue Jersey City, New Jersey 07306	Hudson County Community College 26 Journal Square 14th Floor Jersey City, NJ 07306 (201) 360-4693	Ilya Ashmyan 26 Journal Square 14th Floor Jersey City, NJ 07306 (201) 360-4693 iashmyan@hccc.edu

Property ID: 7424018

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
109.8 kBtu/ft²

Source EUI
196 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	2,019,590 (58%)
Electric - Grid (kBtu)	1,462,106 (42%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	101.2
National Median Source EUI (kBtu/ft²)	180.6
% Diff from National Median Source EUI	8%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	255

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 fiscal savings associated with measures. 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	*British thermal unit*: a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
CHP	*Combined heat and power*. Also referred to as cogeneration.
COP	*Coefficient of performance*: a measure of efficiency in terms of useful energy delivered divided by total energy input.
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.
DCV	*Demand control ventilation*: a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	*United States Department of Energy*
EC Motor	*Electronically commutated motor*
ECM	*Energy conservation measure*
EER	*Energy efficiency ratio*: a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	*Energy Use Intensity:* measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
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 the operation of energy use systems. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service.
ENERGY STAR®	ENERGY STAR® is the government-backed symbol for energy efficiency. The ENERGY STAR® program is managed by the EPA.
EPA	*United States Environmental Protection Agency*
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	*Greenhouse gas* gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.
gpf	*Gallons per flush*

gpm	*Gallon per minute*
HID	*High intensity discharge:* high-output lighting lamps such as high-pressure sodium, metal halide, and mercury vapor.
hp	*Horsepower*
HPS	*High-pressure sodium*: a type of HID lamp
HSPF	*Heating seasonal performance factor:* a measure of efficiency typically applied to heat pumps. Heating energy provided divided by seasonal energy input.
HVAC	*Heating, ventilating, and air conditioning*
IHP 2014	US DOE Integral Horsepower rule. The current ruling regarding required electric motor efficiency.
IPLV	*Integrated part load value:* a measure of the part load efficiency usually applied to chillers.
kBtu	One thousand British thermal units
kW	*Kilowatt*: equal to 1,000 Watts.
kWh	*Kilowatt-hour*: 1,000 Watts of power expended over one hour.
LED	*Light emitting diode*: a high-efficiency source of light with a long lamp life.
LGEA	*Local Government Energy Audit*
Load	The total power a building or system is using 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.
MH	*Metal halide*: a type of HID lamp
MBh	*Thousand Btu per hour*
MBtu	*One thousand British thermal units*
MMBtu	*One million British thermal units*
MV	*Mercury Vapor:* a type of HID lamp
NJBPU	*New Jersey Board of Public Utilities*
NJCEP	*New Jersey's Clean Energy Program:* NJCEP is a statewide program that offers financial incentives, programs and services for New Jersey residents, business owners and local governments to help them save energy, money and the environment.
psig	Pounds per square inch gauge
Plug Load	Refers to the amount of power used in a space by products that are powered by means of an ordinary AC plug.
PV	*Photovoltaic:* refers to an electronic device capable of converting incident light directly into electricity (direct current).

SEER	*Seasonal energy efficiency ratio:* a measure of efficiency in terms of annual cooling energy provided divided by total electric input.
SEP	*Statement of energy performance:* a summary document from the ENERGY STAR® Portfolio Manager®.
Simple Payback	The amount of time needed to recoup the funds expended in an investment or to reach the break-even point between investment and savings.
SREC	*Solar renewable energy credit*: a credit you can earn from the state for energy produced from a photovoltaic array.
T5, T8, T12	A reference to a linear lamp diameter. The number represents increments of 1/8th of an inch.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
therm	100,000 Btu. Typically used as a measure of natural gas consumption.
tons	A unit of cooling capacity equal to 12,000 Btu/hr.
Turnkey	Provision of a complete product or service that is ready for immediate use
VAV	*Variable air volume*
VFD	*Variable frequency drive*: a controller used to vary the speed of an electric motor.
WaterSense®	The symbol for water efficiency. The WaterSense® program is managed by the EPA.
Watt (W)	Unit of power commonly used to measure electricity use.