Local Government Energy Audit Report

Technology Building

March 11, 2020

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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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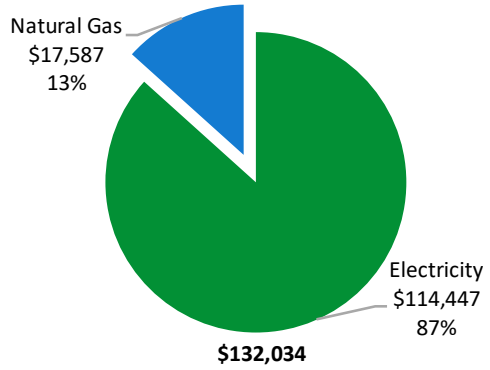
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Technology Building. 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: $132,034 Electricity: 1,012,956 kWh Natural Gas: 26,485 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.

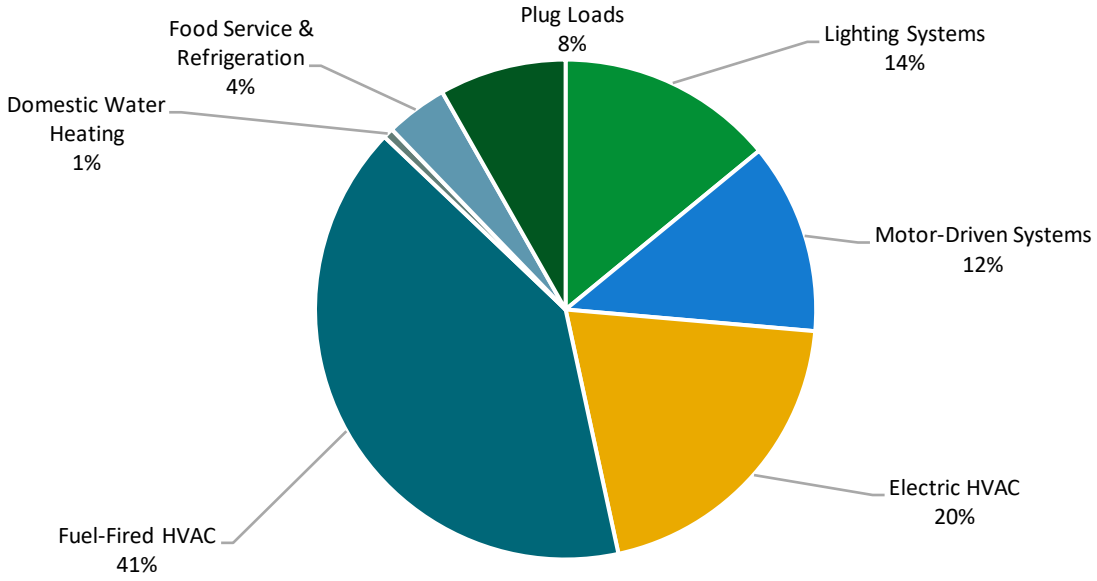


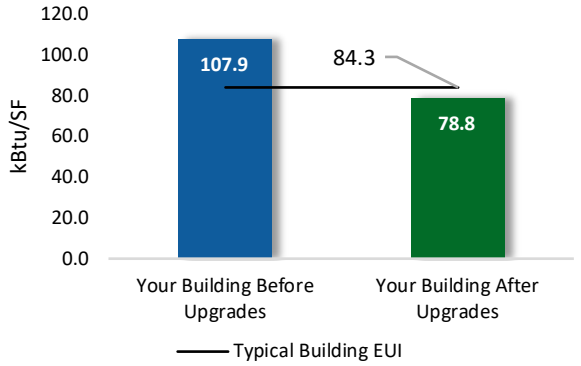
Figure 1 - Energy Use by System

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.

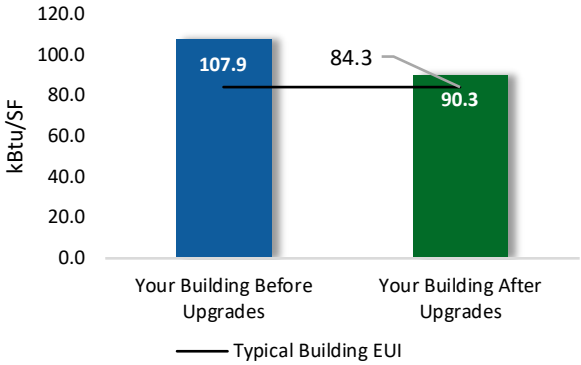
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$896,942
Potential Rebates & Incentives[1]	$26,790
Annual Cost Savings	$45,655
Annual Energy Savings	Electricity: 384,491 kWh Natural Gas: 3,335 Therms
Greenhouse Gas Emission Savings	213 Tons
Simple Payback	19.1 Years
Site Energy Savings (all utilities)	27%



Scenario 2: Cost Effective Package[2]

Installation Cost	$228,260
Potential Rebates & Incentives	$20,882
Annual Cost Savings	$31,281
Annual Energy Savings	Electricity: 272,888 kWh Natural Gas: 677 Therms
Greenhouse Gas Emission Savings	141 Tons
Simple Payback	6.6 Years
Site Energy Savings (all utilities)	16%



On-site Generation Potential

Photovoltaic	High
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			**90,236**	**13.4**	**-19**	**$10,071**	**$19,224**	**$4,367**	**$14,857**	**1.5**	**88,677**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	90,236	13.4	-19	$10,071	$19,224	$4,367	$14,857	1.5	88,677
Lighting Control Measures			**45,557**	**6.6**	**-10**	**$5,084**	**$23,814**	**$7,305**	**$16,509**	**3.2**	**44,760**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	36,933	5.5	-8	$4,122	$14,814	$1,795	$13,019	3.2	36,287
ECM 3	Install High/Low Lighting Controls	Yes	8,623	1.0	-2	$962	$9,000	$5,510	$3,490	3.6	8,472
Variable Frequency Drive (VFD) Measures			**104,470**	**34.1**	**0**	**$11,803**	**$99,832**	**$9,120**	**$90,712**	**7.7**	**105,201**
ECM 4	Install VFDs on Constant Volume (CV) Fans	Yes	101,047	33.6	0	$11,417	$93,051	$9,120	$83,931	7.4	101,754
ECM 5	Install VFDs on Heating Water Pumps	Yes	3,423	0.4	0	$387	$6,781	$0	$6,781	17.5	3,447
Electric Unitary HVAC Measures			**111,108**	**34.3**	**0**	**$12,553**	**$579,823**	**$2,633**	**$577,190**	**46.0**	**111,885**
ECM 6	Install High Efficiency Air Conditioning Units	No	111,108	34.3	0	$12,553	$579,823	$2,633	$577,190	46.0	111,885
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**266**	**$1,765**	**$87,185**	**$3,200**	**$83,985**	**47.6**	**31,122**
ECM 7	Install High Efficiency Furnaces	No	0	0.0	266	$1,765	$87,185	$3,200	$83,985	47.6	31,122
Food Service & Refrigeration Measures			**1,968**	**0.2**	**0**	**$222**	**$2,207**	**$165**	**$2,042**	**9.2**	**1,982**
ECM 8	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	264	0.0	0	$30	$303	$40	$263	8.8	265
ECM 9	Refrigeration Controls	No	496	0.0	0	$56	$1,674	$75	$1,599	28.5	499
ECM 10	Vending Machine Control	Yes	1,209	0.1	0	$137	$230	$50	$180	1.3	1,217
Custom Measures			**31,152**	**0.0**	**96**	**$4,157**	**$84,857**	**$0**	**$84,857**	**20.4**	**42,600**
ECM 11	Upgrade/Replace Energy Management System	Yes	31,152	0.0	96	$4,157	$84,857	$0	$84,857	20.4	42,600
TOTALS (COST EFFECTIVE MEASURES)			**272,888**	**54.2**	**68**	**$31,281**	**$228,260**	**$20,882**	**$207,378**	**6.6**	**282,720**
TOTALS (ALL MEASURES)			**384,491**	**88.5**	**333**	**$45,655**	**$896,942**	**$26,790**	**$870,153**	**19.1**	**426,226**

* - 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	Install VFDs on Constant Volume (CV) Fans	x		x
ECM 5	Install VFDs on Heating Water Pumps			x
ECM 6	Install High Efficiency Air Conditioning Units	x		x
ECM 7	Install High Efficiency Furnaces	x		x
ECM 8	Refrigerator/Freezer Case Electrically Commutated Motors	x		x
ECM 9	Refrigeration Controls	x		x
ECM 10	Vending Machine Control	x		x
ECM 11	Upgrade/Replace Energy Management System			x

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 Technology Building. 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 October 17, 2019, TRC performed an energy audit at Technology Building located at Bergen County Community College in Paramus, New Jersey. TRC met with Pascal Ricatto to review the facility operations and help focus our investigation on specific energy-using systems.

Technology Building is a two-story, 56,571 square foot building built in 2003. Spaces include: classrooms, offices, labs, observatories, conference rooms, a manufacturing shop, computer labs, simulation labs, kitchens, storage areas, corridors, stairwells, and mechanical spaces. The building is 100% heated and cooled.

Facility concerns include: Humidity issues within the building.

2.2 Building Occupancy

The facility is occupied year-round, with typical occupancy Monday through Saturday from 8:00 AM to 10:00 PM and closed on Sundays. Typical weekday occupancy is 527 staff and 40 students.

Summer occupancy includes summer classes from 8:00 AM to 10:00 PM Monday through Thursday. There are custodial activities 24 hours per day throughout the year.

Building Name	Weekday/Weekend	Operating Schedule
Technology Building	Weekdays	8:00 AM - 10:00 PM
	Saturday	8:00 AM - 10:00 PM
	Sunday	Closed
Custodial Activities	Everyday	24/7
Summer Schedule	Monday - Thursday	8:00 AM - 10:00 PM
	Friday - Sunday	No Use

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are brick veneer and concrete with stone pillars around the exterior of the building. The front of the building is made up of mostly large, metal framed windows. The roof is flat and covered with black membrane and is in fair condition. From the roof, two observatories covered by a metal dome can be seen, along with a skylight used to bring natural light into the space.

Most of the windows are operable, double pane with metal frames and internal shading. The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors have metal frames and are in fair condition with worn door seals. Degraded window and door seals increase drafts and outside air infiltration.

Building Envelope

Roof Envelope

Exterior Door with Worn Seal

Exterior Window

2.4 Lighting Systems

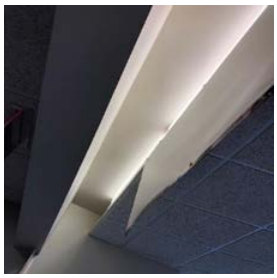
The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. There are also several LED lamp types including linear and U-tube lamps, screw-based lamps, plug-in "Biax" lamps, and a few 7-Watt stairwell wall-mounted fixtures. Additionally, there are some plug-in and Biax compact fluorescent lamps (CFL) and a few incandescent general-purpose lamps.

Fixture types include 2-lamp or 3-lamp, 4-foot long recessed troffer fixtures and 2-foot fixtures with U-bend tube lamps. There are also many recessed can fixtures throughout the building. Several cove-type fixtures were seen, along with direct/indirect, pendent-mount, explosion proof, wall-wash, and wall-mount fixtures. Most fixtures are in fair condition, many with reflectors. Interior lighting levels were generally sufficient. All exit signs are LED.

Recessed Troffer Fixture

Recessed Can Fixture

Recessed Can Fixture



Cove Lighting

Most lighting fixtures are controlled manually by a wall switch and the remainder by occupancy sensors. Lighting fixtures in the corridors are controlled by a timeclock.

Wall Switch

Wall Switches and Dimmable Switch

Corridor Timeclock

Wall-Mount Occupancy Sensor

Exterior fixtures include LED walkway bollard fixtures, under-canopy recessed can LED fixtures, 26-Watt recessed can CFL fixtures, and decorative LED wall-mount fixtures. Exterior fixtures are controlled by a timeclock.

Under Canopy Recessed Can Fixtures

Exterior Bollard Fixture

Exterior Lighting Timeclock

2.5 Air Handling Systems

Building Exhaust

The building has a kitchen hood exhaust fan which is approximately 2 hp, standard efficiency, and constant speed. There is also a shop exhaust fan that is about 1.5 hp as well as general fractional hp exhaust fans for the building and restrooms. These are all in fair condition.

Packaged Units

The classrooms and machine shop are served with packaged roof top units (RTUs), the majority of which are 40 tons in cooling capacity and have an estimated efficiency of 9.14 EER. There is one 15-ton unit serving the hallways with an efficiency of 10 EER. One of the classroom units has a cooling capacity of 12.5-tons with an efficiency rating of 9.14 EER. EER is the energy efficiency ratio with higher values indicating higher efficiencies.

These packaged roof top units (RTUs) are equipped with a DX Coil for cooling and a gas-fired burner for heating. Packaged units are equipped with economizers which are in fair operating condition. The majority of the units have a 15 HP standard efficiency supply fan motor which is constant speed. Most exhaust fans are 1 hp. The RTUs are mostly beyond their useful life and in fair condition. RTUs are controlled by the building energy management system (BMS).

Unit (Area Served)	Cooling Capacity (Tons)	Cooling Efficiency (EER)	Heating Capacity (MBH)	Heating Efficiency (AFUE)
RTU-1E (Serves Classrooms)	40.00	9.14	486.00	81.00%
RTU-2C (Serves Classrooms)	40.00	9.14	486.00	81.00%
RTU-1D (Serves Classrooms)	40.00	9.14	486.00	81.00%
RTU-1C (Serves Classrooms)	40.00	9.14	486.00	81.00%
RTU-2B (Serves Classrooms)	40.00	9.14	486.00	81.00%
RTU-2A (Serves Classrooms)	12.50	9.14	486.00	81.00%
RTU-1A (Serves Shop Machine Area)	40.00	9.14	648.00	81.00%
RTU-1B (Serves Hallways)	15.00	10.00	284.00	81.14%

Refer to Appendix A for detailed information about each unit.

Roof Top Unit

Roof Top Unit

Air Conditioners

The editing room has portable air-conditioning (AC) units that are 1-ton in capacity with an efficiency of 10.5 EER. There are two split AC systems which are 2.5-ton in capacity with an efficiency rating of 10 EER. These units are in fair condition and are not ENERGY STAR® labeled. They are manually controlled by occupants in the space.

Split AC System – Outdoor Condensing Unit

2.6 Heating Hot Water Systems

There is one 1,263 Mbh non condensing hot water boiler that serves the variable air volume (VAV) boxes, providing a reheat function throughout the facility. The burners are modulating with a nominal efficiency of about 81%. The boiler is within its useful life and in fair operating condition. The hydronic distribution system is a two-pipe, heating only system. The boiler serves a primary-only distribution system with two constant speed 1.5 hp heating hot water pumps operating in lead/lag fashion. These pipes have insulation which is in good condition. Hot water is supplied at 180°F. It is unknown if there is also an outdoor air reset schedule set in place.

Boiler

Hot Water Pump

2.7 HVAC Controls

The RTU's are controlled by a Trane Tracer system. There is a control box that allows for the scheduling of units and setting of temperature set points. Per discussions with facility personnel, the complete functionality is unknown. The space temperature-maintained year-round is 72°F. The site staff expressed an interest in expanding HVAC controls and upgrading to an energy management system (EMS).

Trane Tracer

2.8 Domestic Hot Water

Hot water is produced with two 40 Mbh gas-fired storage tank water heaters with an 80% efficiency. These AO Smith water heaters each have a tank capacity of 50 gallons. They were installed in 2012 and are in good condition. There are fractional hp circulation pumps which distribute water to end uses. The circulation pumps operate continuously. The domestic hot water pipes are insulated and the insulation is in good condition.

Storage Tank Water Heaters

2.9 Food Service Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare meals for students and staff. Most cooking is done using a gas-fired combination oven. Bulk prepared foods are held in several electric insulated food holding cabinets. Equipment is not high efficiency and is in fair condition.

The dishwasher is an ENERGY STAR®, high temperature, door type unit.

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

Insulated Food Holding Cabinet

Dishwasher

2.10 Refrigeration

The walk-in refrigerator has an estimated 0.75-ton compressor located in room TEC127 and one fan evaporator. The ice making head is ENERGY STAR® qualified.

Walk-In Refrigerator

Ice Maker

2.11 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 406 computer work stations throughout the facility. Plug loads throughout the building include general classroom, office, and machine shop equipment. There are classroom typical loads such as laptops, TVs, projectors, and printers. There are also office typical loads such as coffee machines, toasters, mini fridges, and microwaves. There is one residential-style refrigerator in the building that is used to storage personal food and beverage items. These vary in condition and efficiency.

The machine shop has several milling machines, lathes, and other miscellaneous machinery. There are two elevators in the building. There is one refrigerated beverage vending machine and one non-refrigerated vending machine in the hallway. Vending machines are not equipped with occupancy-based controls.

Office Typical Load

Vending Machines

Classroom Typical Load

Miscellaneous Manufacturing Equipment

2.12 Water-Using Systems

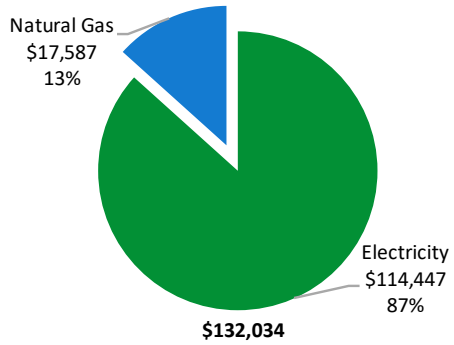
There are ten restrooms with toilets, urinals, and sinks. Faucet flow rates are at 1.0 gallons per minute (gpm) or higher.

Low Flow Faucet Aerator

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	1,012,956 kWh	$114,447
Natural Gas	26,485 Therms	$17,587
Total		**$132,034**



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.

Campus buildings are served by main electrical and gas meters, therefore, the historical use for this building was apportioned. Please see the following sections, “Electricity” and “Natural Gas” for further discussion.

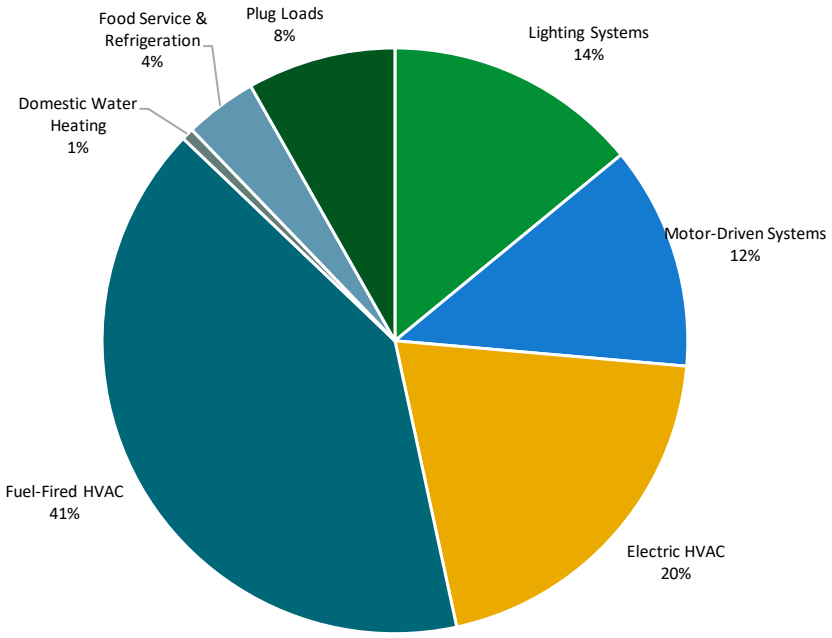
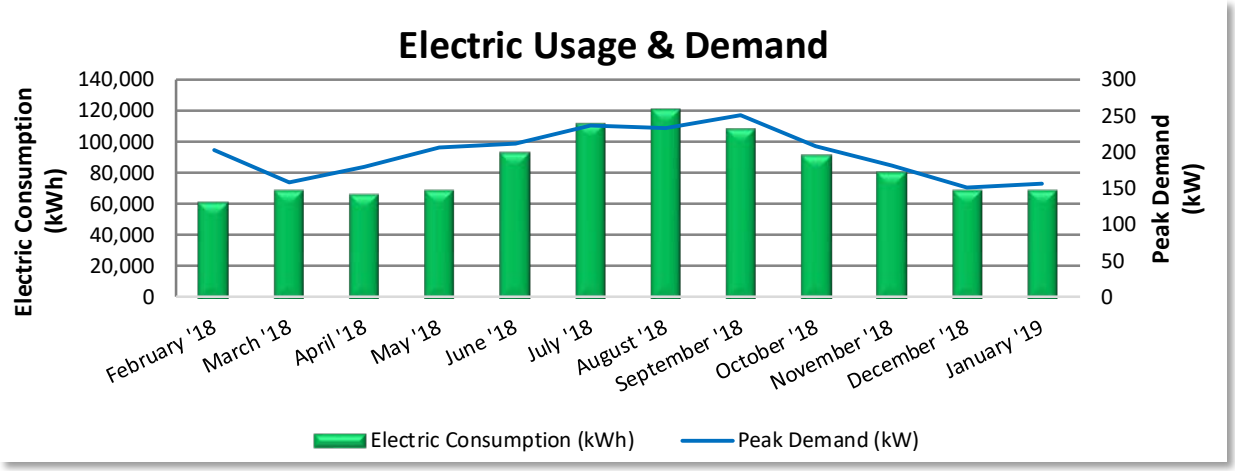


Figure 5 - Energy Balance

3.1 Electricity

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



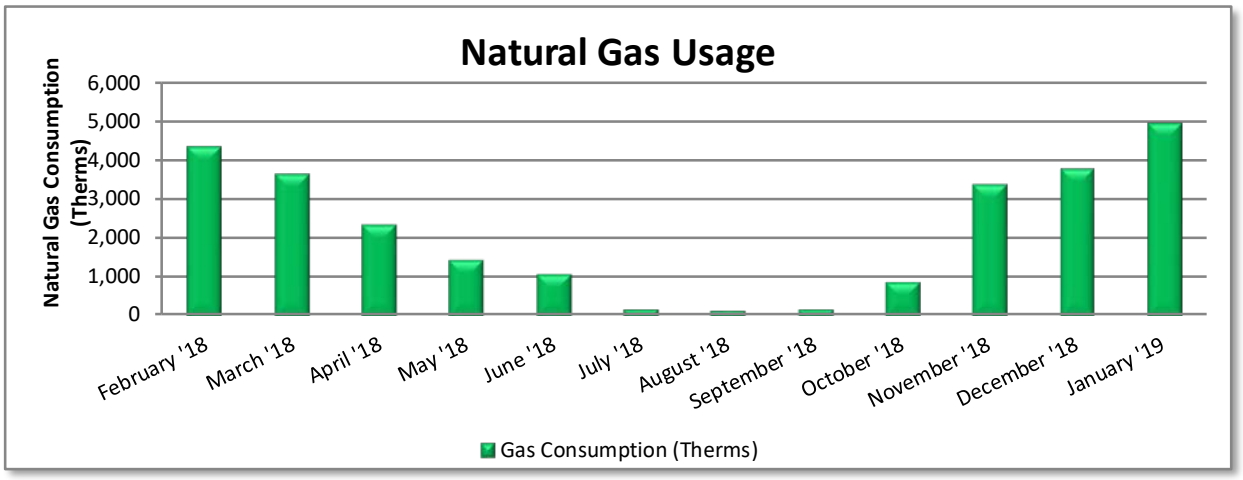
Electric Billing Data						
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**	**TRC Estimated Usage?**
2/28/18	28	62,168	203	$788	$7,024	Yes
3/31/18	31	69,076	158	$614	$7,804	Yes
4/30/18	30	66,773	180	$699	$7,544	Yes
5/31/18	31	69,076	206	$799	$7,804	Yes
6/30/18	30	93,223	211	$819	$10,533	Yes
7/31/18	31	111,711	237	$918	$12,621	Yes
8/31/18	31	121,306	234	$907	$13,706	Yes
9/30/18	30	108,640	251	$972	$12,274	Yes
10/31/18	31	91,927	208	$805	$10,386	Yes
11/30/18	30	80,907	181	$703	$9,141	Yes
12/31/18	31	69,076	151	$584	$7,804	Yes
1/31/19	31	69,076	156	$606	$7,804	Yes
Totals	**365**	**1,012,956**	**251**	**$9,212**	**$114,447**	
Annual	**365**	**1,012,956**	**251**	**$9,212**	**$114,447**	

Notes:

- Peak demand of 251 kW occurred in September 2018.
- Average demand over the past 12 months was 198 kW.
- The average electric cost over the past 12 months was $0.113/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.
- For the purposes of this report, the baseline data has been estimated based on the main meter for the campus, equipment at this building and the square footage of the building in comparison to the campus.

3.2 Natural Gas

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



Gas Billing Data				
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**	**TRC Estimated Usage?**
2/27/18	28	4,366	$3,118	Yes
3/28/18	31	3,652	$2,604	Yes
4/27/18	30	2,365	$1,464	Yes
5/29/18	31	1,456	$904	Yes
6/21/18	30	1,089	$676	Yes
7/30/18	31	186	$124	Yes
8/28/18	31	138	$92	Yes
9/28/18	30	172	$114	Yes
10/26/18	31	891	$554	Yes
11/28/18	30	3,391	$2,066	Yes
12/27/18	31	3,806	$2,275	Yes
1/28/19	31	4,973	$3,597	Yes
Totals	**365**	**26,485**	**$17,587**	
Annual	**365**	**26,485**	**$17,587**	

Notes:

- The average gas cost for the past 12 months is $0.664/therm, which is the blended rate used throughout the analysis.
- For the purposes of this report, the baseline data has been estimated based on the main meter for the campus, equipment at this building and the square footage of the building in comparison to the campus.

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 and being a part of a master metered college campus, this building is not able to receive a benchmarking score. This report contains suggestions about how to improve building performance and reduce energy costs.

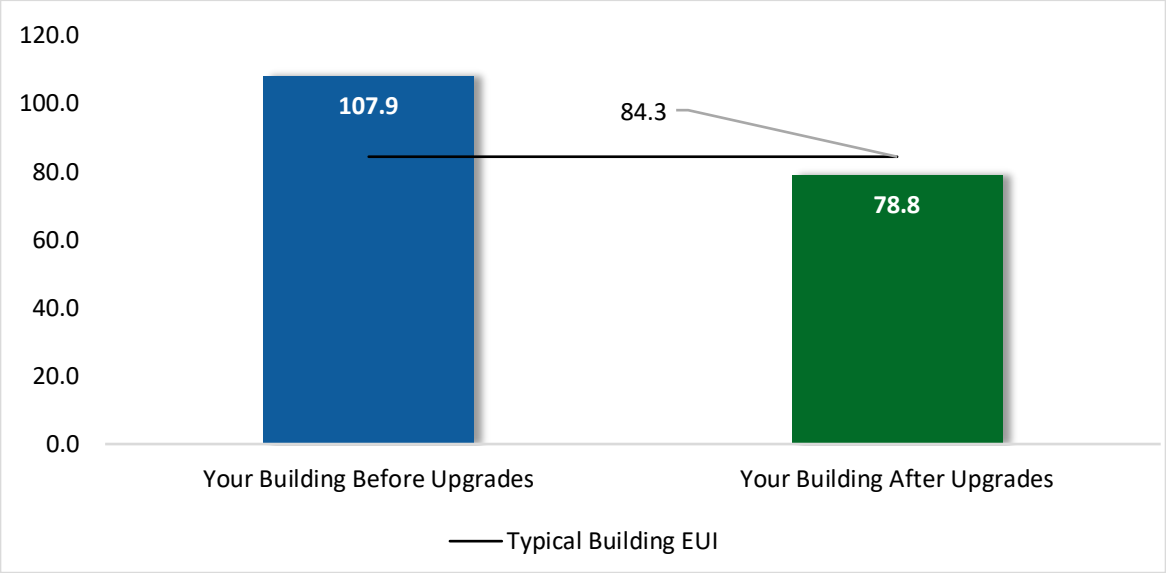


Figure 6 - Energy Use Intensity Comparison[3]

This building performs at, or below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

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.

[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			**90,236**	**13.4**	**-19**	**$10,071**	**$19,224**	**$4,367**	**$14,857**	**1.5**	**88,677**
ECM 1	Retrofit Fixtures with LED Lamps	Yes	90,236	13.4	-19	$10,071	$19,224	$4,367	$14,857	1.5	88,677
Lighting Control Measures			**45,557**	**6.6**	**-10**	**$5,084**	**$23,814**	**$7,305**	**$16,509**	**3.2**	**44,760**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	36,933	5.5	-8	$4,122	$14,814	$1,795	$13,019	3.2	36,287
ECM 3	Install High/Low Lighting Controls	Yes	8,623	1.0	-2	$962	$9,000	$5,510	$3,490	3.6	8,472
Variable Frequency Drive (VFD) Measures			**104,470**	**34.1**	**0**	**$11,803**	**$99,832**	**$9,120**	**$90,712**	**7.7**	**105,201**
ECM 4	Install VFDs on Constant Volume (CV) Fans	Yes	101,047	33.6	0	$11,417	$93,051	$9,120	$83,931	7.4	101,754
ECM 5	Install VFDs on Heating Water Pumps	Yes	3,423	0.4	0	$387	$6,781	$0	$6,781	17.5	3,447
Electric Unitary HVAC Measures			**111,108**	**34.3**	**0**	**$12,553**	**$579,823**	**$2,633**	**$577,190**	**46.0**	**111,885**
ECM 6	Install High Efficiency Air Conditioning Units	No	111,108	34.3	0	$12,553	$579,823	$2,633	$577,190	46.0	111,885
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**266**	**$1,765**	**$87,185**	**$3,200**	**$83,985**	**47.6**	**31,122**
ECM 7	Install High Efficiency Furnaces	No	0	0.0	266	$1,765	$87,185	$3,200	$83,985	47.6	31,122
Food Service & Refrigeration Measures			**1,968**	**0.2**	**0**	**$222**	**$2,207**	**$165**	**$2,042**	**9.2**	**1,982**
ECM 8	Refrigerator/Freezer Case Electrically Commutated Motors	Yes	264	0.0	0	$30	$303	$40	$263	8.8	265
ECM 9	Refrigeration Controls	No	496	0.0	0	$56	$1,674	$75	$1,599	28.5	499
ECM 10	Vending Machine Control	Yes	1,209	0.1	0	$137	$230	$50	$180	1.3	1,217
Custom Measures			**31,152**	**0.0**	**96**	**$4,157**	**$84,857**	**$0**	**$84,857**	**20.4**	**42,600**
ECM 11	Upgrade/Replace Energy Management System	Yes	31,152	0.0	96	$4,157	$84,857	$0	$84,857	20.4	42,600
TOTALS			**384,491**	**88.5**	**333**	**$45,655**	**$896,942**	**$26,790**	**$870,153**	**19.1**	**426,226**

* - 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		**90,236**	**13.4**	**-19**	**$10,071**	**$19,224**	**$4,367**	**$14,857**	**1.5**	**88,677**
ECM 1	Retrofit Fixtures with LED Lamps	90,236	13.4	-19	$10,071	$19,224	$4,367	$14,857	1.5	88,677
Lighting Control Measures		**45,557**	**6.6**	**-10**	**$5,084**	**$23,814**	**$7,305**	**$16,509**	**3.2**	**44,760**
ECM 2	Install Occupancy Sensor Lighting Controls	36,933	5.5	-8	$4,122	$14,814	$1,795	$13,019	3.2	36,287
ECM 3	Install High/Low Lighting Controls	8,623	1.0	-2	$962	$9,000	$5,510	$3,490	3.6	8,472
Variable Frequency Drive (VFD) Measures		**104,470**	**34.1**	**0**	**$11,803**	**$99,832**	**$9,120**	**$90,712**	**7.7**	**105,201**
ECM 4	Install VFDs on Constant Volume (CV) Fans	101,047	33.6	0	$11,417	$93,051	$9,120	$83,931	7.4	101,754
ECM 5	Install VFDs on Heating Water Pumps	3,423	0.4	0	$387	$6,781	$0	$6,781	17.5	3,447
Food Service & Refrigeration Measures		**1,472**	**0.2**	**0**	**$166**	**$533**	**$90**	**$443**	**2.7**	**1,483**
ECM 8	Refrigerator/Freezer Case Electrically Commutated Motors	264	0.0	0	$30	$303	$40	$263	8.8	265
ECM 10	Vending Machine Control	1,209	0.1	0	$137	$230	$50	$180	1.3	1,217
Custom Measures		**31,152**	**0.0**	**96**	**$4,157**	**$84,857**	**$0**	**$84,857**	**20.4**	**42,600**
ECM 11	Upgrade/Replace Energy Management System	31,152	0.0	96	$4,157	$84,857	$0	$84,857	20.4	42,600
TOTALS		**272,888**	**54.2**	**68**	**$31,281**	**$228,260**	**$20,882**	**$207,378**	**6.6**	**282,720**

* - 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		**90,236**	**13.4**	**-19**	**$10,071**	**$19,224**	**$4,367**	**$14,857**	**1.5**	**88,677**
ECM 1	Retrofit Fixtures with LED Lamps	90,236	13.4	-19	$10,071	$19,224	$4,367	$14,857	1.5	88,677

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 linear fluorescent, U-bend fluorescent, compact 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: vestibule, entrance, hallways, labs, offices, conference rooms, observatories, exterior fixtures, and all areas with fluorescent fixtures with T8 tubes.

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		**45,557**	**6.6**	**-10**	**$5,084**	**$23,814**	**$7,305**	**$16,509**	**3.2**	**44,760**
ECM 2	Install Occupancy Sensor Lighting Controls	36,933	5.5	-8	$4,122	$14,814	$1,795	$13,019	3.2	36,287
ECM 3	Install High/Low Lighting Controls	8,623	1.0	-2	$962	$9,000	$5,510	$3,490	3.6	8,472

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: computer labs, conference rooms, classrooms, offices, rest rooms, labs, storage rooms, and kitchen.

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: vestibule, entrance, hallways, and stairwells.

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 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		**104,470**	**34.1**	**0**	**$11,803**	**$99,832**	**$9,120**	**$90,712**	**7.7**	**105,201**
ECM 4	Install VFDs on Constant Volume (CV) Fans	101,047	33.6	0	$11,417	$93,051	$9,120	$83,931	7.4	101,754
ECM 5	Install VFDs on Heating Water Pumps	3,423	0.4	0	$387	$6,781	$0	$6,781	17.5	3,447

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 4: Install VFDs on Constant Volume (CV) Fans

air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one.

Zone thermostats signal the VFD to adjust fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature.

VAV system controls should not raise the supply air temperature at the expense of the fan power. A common mistake is to reset the supply air temperature to achieve chiller energy savings, which can lead to additional air flow requirements. Supply air temperature should be kept low (e.g. 55°F) until the minimum fan speed (typically about 50%) is met. At this point, it is efficient to raise the supply air temperature as the load decreases, but not such that additional air flow and thus fan energy is required.

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing must be determined during the final project design. The control system programming should maintain the minimum air flow whenever the compressor is operating. Prior to implementation, verify minimum fan speed in cooling mode with the manufacturer. Note that savings will vary depending on the operating characteristics of each AHU.

Energy savings result from reducing the fan speed (and power) when conditions allow for reduced air flow.

Affected air handlers: eight (8) RTUs.

ECM 5: Install VFDs on Heating Water Pumps

Install 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: heating hot water pumps.

4.4 Electric Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**111,108**	**34.3**	**0**	**$12,553**	**$579,823**	**$2,633**	**$577,190**	**46.0**	**111,885**
ECM 6	Install High Efficiency Air Conditioning Units	111,108	34.3	0	$12,553	$579,823	$2,633	$577,190	46.0	111,885

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

ECM 6: Install High Efficiency Air Conditioning Units

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

This measure is part of a measure to replace package units at this site and as such must be considered in combination with ECM 7.

Affected units: all split AC, portable AC, and packaged RTUs.

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**	**266**	**$1,765**	**$87,185**	**$3,200**	**$83,985**	**47.6**	**31,122**
ECM 7	Install High Efficiency Furnaces	0	0.0	266	$1,765	$87,185	$3,200	$83,985	47.6	31,122

ECM 7: Install High Efficiency Furnaces

Replace standard efficiency furnaces with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases which can significantly improve furnace efficiency. Savings result from improved system efficiency.

Note: these units produce acidic condensate that requires proper drainage.

This measure is part of a measure to replace package units at this site and as such must be considered in combination with ECM 6.

Affected units: eight (8) RTUs.

4.6 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		**1,968**	**0.2**	**0**	**$222**	**$2,207**	**$165**	**$2,042**	**9.2**	**1,982**
ECM 8	Refrigerator/Freezer Case Electrically Commutated Motors	264	0.0	0	$30	$303	$40	$263	8.8	265
ECM 9	Refrigeration Controls	496	0.0	0	$56	$1,674	$75	$1,599	28.5	499
ECM 10	Vending Machine Control	1,209	0.1	0	$137	$230	$50	$180	1.3	1,217

ECM 8: Refrigerator/Freezer Case Electrically Commutated Motors

Replace shaded pole or permanent split capacitor (PSC) motors with electronically commutated (EC) motors in the walk-in cooler. Fractional horsepower EC motors are significantly more efficient than mechanically commutated, brushed motors, particularly at low speeds or partial load. By using variable-speed technology, EC motors can optimize fan usage. Because these motors are brushless and use DC power, losses due to friction and phase shifting are eliminated.

Savings for this measure consider both the increased efficiency of the motor as well as the reduction in refrigeration load due to motor heat loss.

ECM 9: Refrigeration Controls

Install additional controls to optimize the operation of the walk-in cooler.

Many walk-in coolers and freezers have evaporator fans that run continuously. The measure adds a control system feature to automatically shut off evaporator fans when not needed.

Energy savings for this control measure accounts for reduction in compressor and fan operating hours as well as reduction in the refrigeration heat load as appropriate.

ECM 10: 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.

4.7 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		**31,152**	**0.0**	**96**	**$4,157**	**$84,857**	**$0**	**$84,857**	**20.4**	**42,600**
ECM 11	Upgrade/Replace Energy Management System	31,152	0.0	96	$4,157	$84,857	$0	$84,857	20.4	42,600

ECM 11: Upgrade/Replace Energy Management System

Based on our site survey and on conversations with facility staff, it appears that the existing energy management system (EMS) is substantially limited in its capabilities, means of control, monitoring/ reporting function, or condition relative to new systems available in the marketplace. A substantial upgrade to your site's EMS could increase the efficiency of your building HVAC system operation.

The current generation EMS typically provides building systems with a network of temperature and pressure sensors that obtain feedback about field conditions and provide signals to control systems to adjust system operation for optimal functioning. Contemporary DDC systems afford tighter controls and enhanced monitoring and trending capabilities as compared to the older systems.

A controls upgrade would enable automated equipment "start" and "stop" times, temperature setpoints, lockouts and deadbands to be programmed remotely using a graphic interface. Controls can be configured to optimize ventilation and outside air intake by adjusting economizer position, damper function and fan speed. Existing chilled and hot water distribution system controls are typically "tied in", including associated pumps and valves. Coordinated control of HVAC systems is dependent on a network of sensors and status points. A comprehensive building control system provides monitoring and control for all HVAC systems so operators can adjust system programming for optimal comfort and energy savings.

It is recommended that an HVAC engineer or contractor who specializes in energy management systems be contacted for a detailed evaluation and implementation costs. A controls expert will be able to tell you to what extent an existing system can be refurbished or expanded, what sensors should be replaced, what additional HVAC systems could be controlled, and what monitoring and graphic capabilities can be added. For the purposes of this report, the potential energy savings and measure costs were estimated based on industry standards and previous project experience. Further analysis should be conducted for the feasibility of this measure. This is not an investment grade analysis nor should be used as a basis for design and construction.

A high-level evaluation of potential savings and costs is provided for demonstration purposes only. It is a screening evaluation for the potential in upgrading or replacing an EMS. Estimates are based on industry standards and previous project experience. Actual savings and costs will need to be outlined by the specific contractor engaged to implement the system upgrade/replacement.

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.

Weatherization

Caulk or weather strip leaky doors and windows to reduce drafts and loss of heated or cooled air. Sealing cracks and openings can reduce heating and cooling costs, improve building durability, and create a healthier indoor environment.

Doors and Windows

Close exterior doors and windows in heated and cooled areas. Leaving doors and windows open leads to a loss of heat during the winter and chilled air during the summer. Reducing air changes per hour (ACH) can lead to increased occupant comfort as well as heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Window Treatments/Coverings

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

Lighting Maintenance

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

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

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

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.

Economizer Maintenance

Economizers can significantly reduce cooling system load. A malfunctioning economizer can increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air. Common economizer malfunctions include broken outdoor thermostat or enthalpy control, or dampers that are stuck or improperly adjusted.

Periodic inspection and maintenance will keep economizers working in sync with the heating and cooling system. This maintenance should be part of annual system maintenance, and it should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position.

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.

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.

Furnace Maintenance

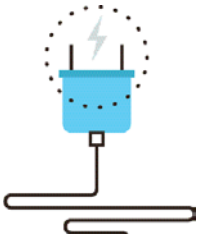
Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should: check for gas / carbon monoxide leaks; change the air and fuel filters; check components for cracks, corrosion, dirt,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

Water Heater Maintenance

Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. At least once a year, follow manufacturer instructions to drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Annual checks should include checks for:

- Leaks or heavy corrosion on the pipes and valves.
- Corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot, or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional.
- For electric water heaters, look for signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank.
- For water heaters more than three years old, have a technician inspect the sacrificial anode annually.

Plug Load Controls



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

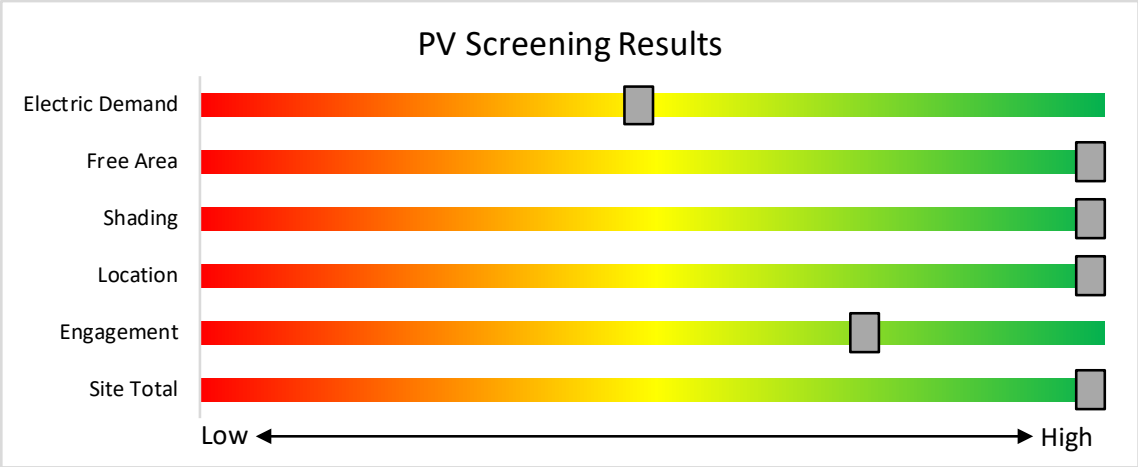
6.1 Solar Photovoltaic

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 **high** potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the **high** potential. A PV array located on the roof may be feasible. If you are interested in pursuing the installation of PV, we recommend conducting a full feasibility study.

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	High	
System Potential	150	kW DC STC
Electric Generation	178,705	kWh/yr
Displaced Cost	$20,190	/yr
Installed Cost	$390,000	

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 low or infrequent thermal load is the most significant factor contributing to the lack of CHP potential.

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

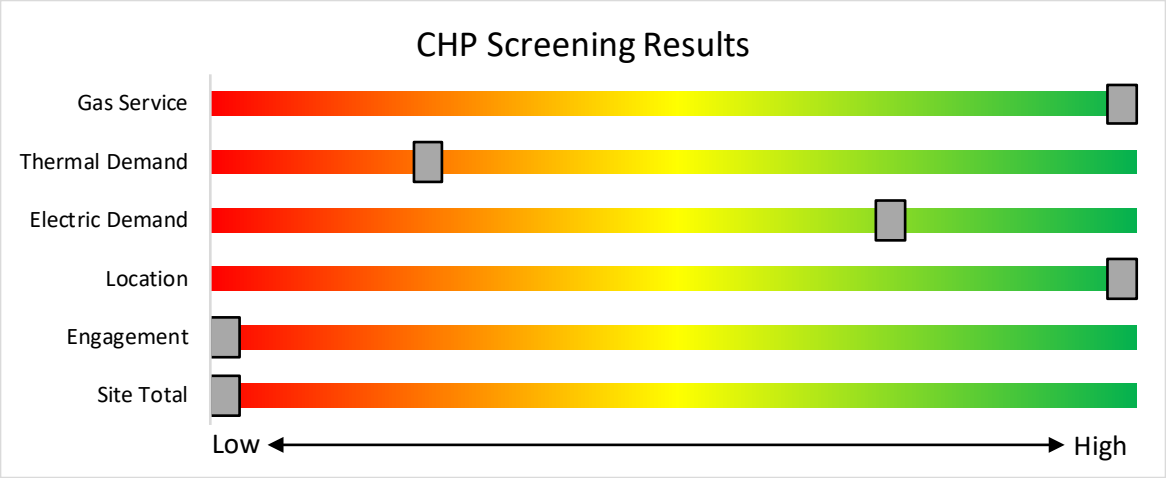


Figure 10 - Combined Heat and Power Screening

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

7 PROJECT FUNDING AND INCENTIVES

Ready to improve your building's performance? 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.

Based on the master metering situation for the campus, the work proposed by this energy audit report would not be eligible for the DI program.

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
Mechanical Room TEC126	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	S	29	4,368		None	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	0	0	$0	$0	$0	0.0
Mechanical Room TEC126	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.2	1,268	0	$142	$292	$80	1.5
Janitor Closet to Roof	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.0	109	0	$12	$37	$10	2.2
Slop Sink to Roof	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.0	109	0	$12	$37	$10	2.2
Exterior of Building	10	LED - Fixtures: Architectural Flood/Spot Luminaire	Timeclock		7	4,380		None	No	10	LED - Fixtures: Architectural Flood/Spot Luminaire	Timeclock	7	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior of Building	12	LED Lamps: (1) 16.5 W LED	Timeclock		17	4,380		None	No	12	LED Lamps: (1) 16.5 W LED	Timeclock	17	4,380	0.0	0	0	$0	$0	$0	0.0
Vestibule	2	Compact Fluorescent: (2) 32W Plug-In Lamp	Timeclock	S	64	5,460	1, 3	Relamp	Yes	2	LED Lamps: (2) 18.5W Plug-In Lamps	High/Low Control	37	3,767	0.1	462	0	$52	$275	$74	3.9
Entrance	6	LED - Fixtures: Architectural Flood/Spot Luminaire	Timeclock	S	14	5,460	3	None	Yes	6	LED - Fixtures: Architectural Flood/Spot Luminaire	High/Low Control	14	3,767	0.0	156	0	$17	$225	$210	0.9
Entrance	6	LED Lamps: 16.5 W LED	Timeclock	S	17	5,460	3	None	Yes	6	LED Lamps: 16.5 W LED	High/Low Control	17	3,767	0.0	184	0	$21	$225	$210	0.7
Entrance	2	Compact Fluorescent: (1) 32W Plug-In Lamp	Timeclock	S	32	5,460	1, 3	Relamp	Yes	2	LED Lamps: (1) 18.5W Plug-In Lamp	High/Low Control	19	3,767	0.0	231	0	$26	$250	$72	6.9
First Floor Hallway	3	LED Lamps: 16.5 W LED	Timeclock	S	17	5,460	3	None	Yes	3	LED Lamps: 16.5 W LED	High/Low Control	17	3,767	0.0	95	0	$11	$225	$105	11.3
First Floor Hallway	3	Compact Fluorescent: (1) 32W Plug-In Lamp	Timeclock	S	32	5,460	1, 3	Relamp	Yes	3	LED Lamps: (1) 18.5W Plug-In Lamp	High/Low Control	19	3,767	0.0	347	0	$39	$263	$108	4.0
Computer Lab TEC114	20	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	4,368	2	None	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,296	0	$145	$540	$70	3.3
Building	37	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	37	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Computer Lab TEC114A	16	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	4,368	2	None	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,037	0	$116	$270	$35	2.0
ITU TEC117	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	1.1	7,263	-2	$811	$540	$70	0.6
ITU TEC117	17	Incandescent: I60	Wall Switch	S	60	4,368	1, 2	Relamp	Yes	17	LED Lamps: (1) 10.5W Plug-In Lamp	Occupancy Sensor	11	3,014	0.6	4,309	-1	$481	$293	$17	0.6
Storage TEC117A	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	44	3,014		None	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.0	0	0	$0	$0	$0	0.0
Storage TEC114B	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	S	44	3,014		None	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.0	0	0	$0	$0	$0	0.0
Entrance	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Timeclock	S	62	5,460	1, 3	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,767	0.5	4,287	-1	$478	$846	$395	0.9
Storage TEC111	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,014	1	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	492	0	$55	$164	$45	2.2
IDF Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	159	0	$18	$37	$10	1.5
First Floor Hallway	3	LED Lamps: 16.5 W LED	Timeclock	S	17	5,460	3	None	Yes	3	LED Lamps: 16.5 W LED	High/Low Control	17	3,767	0.0	95	0	$11	$225	$105	11.3
First Floor Hallway	2	LED Lamps: (1) 23W Biax Lamp	Timeclock	S	23	5,460	3	None	Yes	2	LED Lamps: (1) 23W Biax Lamp	High/Low Control	23	3,767	0.0	86	0	$10	$225	$70	16.2
First Floor Hallway	1	Compact Fluorescent: (1) 40W Biax Lamps	Timeclock	S	40	5,460	1, 3	Relamp	Yes	1	LED Lamps: (1) 23W Biax Lamps	High/Low Control	23	3,767	0.0	145	0	$16	$239	$36	12.5

	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
Rest Room	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	S	33	4,368	2	None	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	49	0	$5	$0	$0	0.0
Rest Room	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	4,368	2	None	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.0	194	0	$22	$270	$35	10.8
Rest Room	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	S	33	4,368	2	None	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	49	0	$5	$0	$0	0.0
Rest Room	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	4,368	2	None	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.0	194	0	$22	$270	$35	10.8
First Floor Hallway	3	Compact Fluorescent: (1) 40W Biax Lamps	Timeclock	S	40	5,460	1, 3	Relamp	Yes	3	LED Lamps: (1) 23W Biax Lamps	High/Low Control	23	3,767	0.1	435	0	$49	$266	$108	3.2
First Floor Hallway	3	LED Lamps: (1) 23W Biax Lamp	Timeclock	S	23	5,460	3	None	Yes	3	LED Lamps: (1) 23W Biax Lamp	High/Low Control	23	3,767	0.0	128	0	$14	$225	$105	8.4
Classroom TEC107	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	1.1	7,263	-2	$811	$1,855	$430	1.8
First Floor Hallway	2	LED Lamps: (1) 23W Biax Lamp	Timeclock	S	23	5,460	3	None	Yes	2	LED Lamps: (1) 23W Biax Lamp	High/Low Control	23	3,767	0.0	86	0	$10	$225	$70	16.2
Helicopter Flight Lab TEC105	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.4	2,724	-1	$304	$763	$170	2.0
Helicopter Flight Lab TEC106	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.4	2,724	-1	$304	$763	$170	2.0
Lab TEC104	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.7	4,842	-1	$540	$1,416	$310	2.0
Storage TEC103	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$68	$226	$30	2.9
Lab TEC102	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.7	4,842	-1	$540	$1,416	$310	2.0
Office TEC102A	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	S	69	3,014		None	No	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.0	0	0	$0	$0	$0	0.0
Lab TEC101	3	Compact Fluorescent: (1) 40W Biax Lamps	Wall Switch	S	40	4,368	1, 2	Relamp	Yes	3	LED Lamps: (1) 23W Biax Lamps	Occupancy Sensor	23	3,014	0.1	348	0	$39	$41	$3	1.0
Lab TEC101	15	LED Lamps: 16.5 W LED	Wall Switch	S	17	4,368	2	None	Yes	15	LED Lamps: 16.5 W LED	Occupancy Sensor	17	3,014	0.1	380	0	$42	$540	$70	11.1
First Floor Hallway	2	LED Lamps: (2) 23W Biax Lamps	Timeclock	S	46	5,460	3	None	Yes	2	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	3,767	0.0	171	0	$19	$225	$70	8.1
First Floor Hallway	1	Compact Fluorescent: (2) 40W Biax Lamps	Timeclock	S	80	5,460	1, 3	Relamp	Yes	1	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	3,767	0.0	290	0	$32	$252	$37	6.6
Office TEC101A	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.4	2,724	-1	$304	$763	$170	2.0
Tools TEC101B	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	S	93	3,014	1	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	328	0	$37	$110	$30	2.2
Stair A	6	LED - Fixtures: Stairwell/Passageway Lighting	Timeclock		7	5,460	3	None	Yes	6	LED - Fixtures: Stairwell/Passageway Lighting	High/Low Control	7	3,767	0.0	78	0	$9	$225	$210	1.7
Continuing Education	3	Compact Fluorescent: (1) 32W Plug-In Lamp	Timeclock	S	32	5,460	1	Relamp	No	3	LED Lamps: (1) 18.5W Plug-In Lamp	Timeclock	19	5,460	0.0	243	0	$27	$38	$3	1.3
First Floor Hallway	8	Compact Fluorescent: (2) 40W Biax Lamps	Timeclock	S	80	5,460	1, 3	Relamp	Yes	8	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	3,767	0.3	2,319	0	$259	$666	$296	1.4
First Floor Hallway	10	LED Lamps: (2) 23W Biax Lamps	Timeclock	S	46	5,460	3	None	Yes	10	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	3,767	0.1	856	0	$96	$450	$350	1.0
Office TEC115	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.1	754	0	$84	$290	$40	3.0

	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
Office TEC115	16	LED Lamps: (2) 23W Biax Lamps	Wall Switch	S	46	4,368	2	None	Yes	16	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	3,014	0.2	1,096	0	$122	$540	$70	3.8
Kitchenette TEC115A	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	S	33	3,014		None	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	0	0	$0	$0	$0	0.0
Kitchenette TEC115A	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	1	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	96	0	$11	$72	$10	5.8
Office TEC115B	4	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	S	46	3,014		None	No	4	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	3,014	0.0	0	0	$0	$0	$0	0.0
Office TEC115F	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.1	565	0	$63	$333	$50	4.5
Office TEC115C	2	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	4,368	1, 2	Relamp	Yes	2	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	3,014	0.1	464	0	$52	$170	$24	2.8
Office TEC115D	2	Compact Fluorescent: (2) 40W Biax Lamps	Wall Switch	S	80	4,368	1, 2	Relamp	Yes	2	LED Lamps: (2) 23W Biax Lamps	Occupancy Sensor	46	3,014	0.1	464	0	$52	$170	$24	2.8
Office TEC115E	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	1	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	96	0	$11	$72	$10	5.8
Office TEC115E	3	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	3,014	1	Relamp	No	3	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.1	507	0	$57	$122	$9	2.0
Office TEC115G	1	LED Lamps: (3) 23W Biax Lamps	Wall Switch	S	69	4,368		None	No	1	LED Lamps: (3) 23W Biax Lamps	Wall Switch	69	4,368	0.0	0	0	$0	$0	$0	0.0
Office TEC115G	1	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	4,368	1	Relamp	No	1	LED Lamps: (3) 23W Biax Lamps	Wall Switch	69	4,368	0.0	245	0	$27	$41	$3	1.4
Continuing Education	12	LED Lamps: (3) 23W Biax Lamps	Timeclock	S	69	5,460		None	No	12	LED Lamps: (3) 23W Biax Lamps	Timeclock	69	5,460	0.0	0	0	$0	$0	$0	0.0
Continuing Education	2	LED - Linear Tubes: (2) U-Lamp	Timeclock	S	33	5,460		None	No	2	LED - Linear Tubes: (2) U-Lamp	Timeclock	33	5,460	0.0	0	0	$0	$0	$0	0.0
Office TEC115H	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	S	69	3,014		None	No	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.0	0	0	$0	$0	$0	0.0
Office TEC115I	2	LED Lamps: (3) 23W Biax Lamps	Wall Switch	S	69	4,368	2	None	Yes	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.0	206	0	$23	$116	$20	4.2
Office TEC116	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	S	69	3,014		None	No	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.0	0	0	$0	$0	$0	0.0
Office TEC115J	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	S	69	3,014		None	No	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.0	0	0	$0	$0	$0	0.0
Office TEC115K	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	S	69	3,014		None	No	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.0	0	0	$0	$0	$0	0.0
Conference Room TEC118	8	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	4,368	1, 2	Relamp	Yes	8	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.4	2,783	-1	$311	$864	$94	2.5
Conference Room TEC118	10	Compact Fluorescent: (1) 32W Plug-In Lamp	Wall Switch	S	32	4,368	1, 2	Relamp	Yes	10	LED Lamps: (1) 18.5W Plug-In Lamp	Occupancy Sensor	19	3,014	0.1	924	0	$103	$125	$10	1.1
Office TEC115L	4	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	3,014	1	Relamp	No	4	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.1	676	0	$75	$162	$12	2.0
Office TEC115M	2	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	3,014	1	Relamp	No	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.1	338	0	$38	$81	$6	2.0
Office TEC115M	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	1	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	192	0	$21	$145	$20	5.8
Storage	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.9	6,053	-1	$675	$1,365	$300	1.6
Data Closet TEC120	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	1	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.0	219	0	$24	$73	$20	2.2

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Rest Room	7	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	7	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.2	1,319	0	$147	$777	$105	4.6
Rest Room	7	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	7	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.2	1,319	0	$147	$777	$105	4.6
Rest Room	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	S	33	3,014		None	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	0	0	$0	$0	$0	0.0
Rest Room	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	S	33	3,014		None	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	0	0	$0	$0	$0	0.0
Janitor Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.0	109	0	$12	$37	$10	2.2
Kitchen TEC127	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.4	2,421	-1	$270	$708	$155	2.0
Storage TEC127A	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$68	$226	$30	2.9
Storage TEC129	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1, 2	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.2	1,009	0	$113	$453	$50	3.6
Elevator Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	4,368	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,368	0.0	159	0	$18	$37	$10	1.5
Meeting Room TEC128	2	Compact Fluorescent: (3) 40W Biax Lamps	Wall Switch	S	120	4,368	1, 2	Relamp	Yes	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.1	696	0	$78	$81	$6	1.0
Meeting Room TEC128	48	LED Lamps: (3) 23W Biax Lamps	Wall Switch	S	69	4,368	2	None	Yes	48	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.7	4,933	-1	$551	$810	$105	1.3
Stair B	6	LED - Fixtures: Stairwell/Passageway Lighting	Timeclock		7	5,460	3	None	Yes	6	LED - Fixtures: Stairwell/Passageway Lighting	High/Low Control	7	3,767	0.0	78	0	$9	$225	$210	1.7
Storage TEC128E	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	908	0	$101	$280	$45	2.3
Storage TEC128D	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,368	0.0	238	0	$27	$55	$15	1.5
Meeting Room TEC128	22	LED Lamps: (1) 16.5 W	Wall Switch	S	17	4,368	2	None	Yes	22	LED Lamps: (1) 16.5 W	Occupancy Sensor	17	3,014	0.1	557	0	$62	$540	$70	7.6
Conference Room TEC118B	28	LED Lamps: (3) 23W Biax Lamps	Wall Switch	S	69	4,368	2	None	Yes	28	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.4	2,878	-1	$321	$810	$105	2.2
Conference Room TEC118B	12	Compact Fluorescent: (1) 32W Plug-In Lamp	Wall Switch	S	32	4,368	1, 2	Relamp	Yes	12	LED Lamps: (1) 18.5W Plug-In Lamp	Occupancy Sensor	19	3,014	0.2	1,109	0	$124	$150	$12	1.1
First Floor Hallway	20	Compact Fluorescent: (1) 32W Plug-In Lamp	Timeclock	S	32	5,460	1, 3	Relamp	Yes	20	LED Lamps: (1) 18.5W Plug-In Lamp	High/Low Control	19	3,767	0.3	2,311	0	$258	$1,150	$720	1.7
First Floor Hallway	7	LED Lamps: (1) 16.5 W	Timeclock	S	17	5,460	3	None	Yes	7	LED Lamps: (1) 16.5 W	High/Low Control	17	3,767	0.0	222	0	$25	$450	$245	8.3
Vestibule	3	LED Lamps: (1) 16.5 W	Timeclock	S	17	5,460	3	None	Yes	3	LED Lamps: (1) 16.5 W	High/Low Control	17	3,767	0.0	95	0	$11	$225	$105	11.3
Exterior of Building	3	LED Lamps: (1) 16.5 W LED	Timeclock		17	4,380		None	No	3	LED Lamps: (1) 16.5 W LED	Timeclock	17	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior of Building	7	LED - Fixtures: Architectural Flood/Spot Luminaire	Timeclock		7	4,380		None	No	7	LED - Fixtures: Architectural Flood/Spot Luminaire	Timeclock	7	4,380	0.0	0	0	$0	$0	$0	0.0
TEC222	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.7	4,842	-1	$540	$1,146	$275	1.6
Observatory TEC222B	6	Compact Fluorescent: (1) 32W Plug-In Lamp	Wall Switch		32	4,368	1	Relamp	No	6	LED Lamps: (1) 18.5W Plug-In Lamp	Wall Switch	19	4,368	0.1	389	0	$43	$75	$6	1.6
Storage TEC222D	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$68	$226	$30	2.9

	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
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	605	0	$68	$226	$30	2.9
Observatory TEC222A	6	Compact Fluorescent: (1) 32W Plug-In Lamp	Wall Switch		32	4,368	1	Relamp	No	6	LED Lamps: (1) 18.5W Plug-In Lamp	Wall Switch	19	4,368	0.1	389	0	$43	$75	$6	1.6
Second Floor Hallway	15	LED Lamps: (2) 23W Biax Lamps	Timeclock	S	46	5,460	3	None	Yes	15	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	3,767	0.2	1,285	0	$143	$675	$525	1.0
Second Floor Hallway	7	Compact Fluorescent: (2) 40W Biax Lamps	Timeclock	S	80	5,460	1, 3	Relamp	Yes	7	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	3,767	0.2	2,029	0	$226	$639	$259	1.7
Second Floor Hallway	6	LED Lamps: (1) 16.5 W	Timeclock	S	17	5,460	3	None	Yes	6	LED Lamps: (1) 16.5 W	High/Low Control	17	3,767	0.0	190	0	$21	$225	$210	0.7
Second Floor Hallway	22	LED - Linear Tubes: (2) 4' Lamps	Timeclock	S	29	5,460	3	None	Yes	22	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,767	0.1	1,188	0	$133	$900	$770	1.0
Classroom TEC201	16	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	4,368	2	None	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,037	0	$116	$270	$35	2.0
Computer Lab TEC202	20	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	4,368	2	None	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,296	0	$145	$540	$70	3.3
Classroom TEC203	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.7	4,842	-1	$540	$1,146	$275	1.6
Computer Lab TEC204	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.9	6,053	-1	$675	$1,635	$370	1.9
Computer Lab TEC205	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.9	6,053	-1	$675	$1,635	$370	1.9
Classroom TEC206	15	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	4,368	2	None	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	972	0	$108	$540	$70	4.3
Classroom TEC206	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.2	1,513	0	$169	$274	$75	1.2
Conference Room TEC207	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	4,368	2	None	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.0	194	0	$22	$270	$35	10.8
IDF Room TEC213	2	LED Lamps: (3) 23W Biax Lamps	Wall Switch	S	69	4,368		None	No	2	LED Lamps: (3) 23W Biax Lamps	Wall Switch	69	4,368	0.0	0	0	$0	$0	$0	0.0
Office TEC212	2	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	3,014	1	Relamp	No	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.1	338	0	$38	$81	$6	2.0
Office TEC211	3	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	3,014	1	Relamp	No	3	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.1	507	0	$57	$122	$9	2.0
Office TEC210	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	S	69	3,014		None	No	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.0	0	0	$0	$0	$0	0.0
Office	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	S	69	3,014		None	No	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.0	0	0	$0	$0	$0	0.0
Office TEC208	2	Compact Fluorescent: (3) 40W Biax Lamps	Occupancy Sensor	S	120	3,014	1	Relamp	No	2	LED Lamps: (3) 23W Biax Lamps	Occupancy Sensor	69	3,014	0.1	338	0	$38	$81	$6	2.0
Second Floor Hallway	1	LED Lamps: (2) 23W Biax Lamps	Timeclock	S	46	5,460	3	None	Yes	1	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	3,767	0.0	86	0	$10	$225	$35	19.9
Second Floor Hallway	1	Compact Fluorescent: (2) 40W Biax Lamps	Timeclock	S	80	5,460	1, 3	Relamp	Yes	1	LED Lamps: (2) 23W Biax Lamps	High/Low Control	46	3,767	0.0	290	0	$32	$252	$37	6.6
Computer Lab TEC214	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.9	6,053	-1	$675	$1,635	$370	1.9
Rest Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	1	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	96	0	$11	$72	$10	5.8
Rest Room	7	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	S	33	3,014		None	No	7	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	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
Rest Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	1	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	96	0	$11	$72	$10	5.8
Rest Room	7	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	S	33	3,014		None	No	7	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	3,014	0.0	0	0	$0	$0	$0	0.0
Janitor Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	S	62	3,014	1	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,014	0.0	109	0	$12	$37	$10	2.2
Computer Lab TEC220	13	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	S	44	4,368	2	None	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.1	842	0	$94	$540	$70	5.0
Computer Lab TEC220	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	4,368	1, 2	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,014	0.3	2,118	0	$236	$383	$105	1.2
Exterior of Building	12	Compact Fluorescent: (2) 26W Plug-In Lamps	Timeclock		52	4,380	1	Relamp	No	12	LED Lamps: (2) 18.5W Plug-In Lamps	Timeclock	37	4,380	0.0	788	0	$89	$300	$24	3.1
Back of Building	8	LED - Fixtures: Decorative: Other	Timeclock		10	4,380		None	No	8	LED - Fixtures: Decorative: Other	Timeclock	10	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	RTU-1A	2	Exhaust Fan	1.0	82.5%	No	B	2,745	4	No	85.5%	Yes	2	0.6	1,979	0	$224	$6,020	$160	26.2
Roof	RTU-1B	1	Exhaust Fan	1.0	82.5%	No	B	2,745	4	No	85.5%	Yes	1	0.3	990	0	$112	$3,010	$80	26.2
Mechanical Room	DHW Circulation Pumps	2	Other	0.3	74.0%	No	W	2,745		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	Split AC Systems	2	Split-System AC	2.50		B	6	Yes	2	Split-System AC	2.50		14.00		0.5	1,659	0	$187	$7,481	$460	37.5
Roof	RTU-1E (Serves Classrooms)	1	Packaged AC	40.00		B	6	Yes	1	Packaged AC	40.00		13.80		5.3	17,180	0	$1,941	$88,639	$0	45.7
Roof	RTU-2C (Serves Classrooms)	1	Packaged AC	40.00		B	6	Yes	1	Packaged AC	40.00		13.80		5.3	17,180	0	$1,941	$88,639	$0	45.7
Roof	RTU-1D (Serves Classrooms)	1	Packaged AC	40.00		B	6	Yes	1	Packaged AC	40.00		13.80		5.3	17,180	0	$1,941	$88,639	$0	45.7
Roof	RTU-1C (Serves Classrooms)	1	Packaged AC	40.00		B	6	Yes	1	Packaged AC	40.00		13.80		5.3	17,180	0	$1,941	$88,639	$0	45.7
Roof	RTU-2B (Serves Classrooms)	1	Packaged AC	40.00		B	6	Yes	1	Packaged AC	40.00		13.80		5.3	17,180	0	$1,941	$88,639	$0	45.7
Roof	RTU-2A (Serves Classrooms)	1	Packaged AC	12.50		W	6	Yes	1	Packaged AC	12.50		11.50		1.0	3,265	0	$369	$17,423	$988	44.6
Roof	RTU-1A (Serves Shop Machine Area)	1	Packaged AC	40.00		B	6	Yes	1	Packaged AC	40.00		13.80		5.3	17,180	0	$1,941	$88,639	$0	45.7
Roof	RTU-1B (Serves Hallways)	1	Packaged AC	15.00		B	6	Yes	1	Packaged AC	15.00		11.50		0.7	2,272	0	$257	$20,908	$1,185	76.8
Editing Room	Portable AC Units	2	Window AC	1.00		W	6	Yes	2	Window AC	1.00		12.00		0.1	834	0	$94	$2,178	$0	23.1

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
Mechanical Room	VAV Boxes	1	Non-Condensing Hot Water Boiler	1,263.00	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	RTU-1E (Serves Classrooms)	1	Furnace	486.00	B	7	Yes	1	Furnace	486.00	95.00%	AFUE	0.0	0	34	$223	$11,011	$400	47.6
Roof	RTU-2C (Serves Classrooms)	1	Furnace	486.00	B	7	Yes	1	Furnace	486.00	95.00%	AFUE	0.0	0	34	$223	$11,011	$400	47.6
Roof	RTU-1D (Serves Classrooms)	1	Furnace	486.00	B	7	Yes	1	Furnace	486.00	95.00%	AFUE	0.0	0	34	$223	$11,011	$400	47.6
Roof	RTU-1C (Serves Classrooms)	1	Furnace	486.00	B	7	Yes	1	Furnace	486.00	95.00%	AFUE	0.0	0	34	$223	$11,011	$400	47.6
Roof	RTU-2B (Serves Classrooms)	1	Furnace	486.00	B	7	Yes	1	Furnace	486.00	95.00%	AFUE	0.0	0	34	$223	$11,011	$400	47.6
Roof	RTU-2A (Serves Classrooms)	1	Furnace	486.00	W	7	Yes	1	Furnace	486.00	95.00%	AFUE	0.0	0	34	$223	$11,011	$400	47.6
Roof	RTU-1A (Serves Shop Machine Area)	1	Furnace	648.00	B	7	Yes	1	Furnace	648.00	95.00%	AFUE	0.0	0	45	$297	$14,682	$400	48.0
Roof	RTU-1B (Serves Hallways)	1	Furnace	284.00	B	7	Yes	1	Furnace	284.00	95.00%	AFUE	0.0	0	19	$129	$6,435	$400	46.8

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	Domestic Hot Water System	2	Storage Tank Water Heater (≤ 50 Gal)	W		No						0.0	0	0	$0	$0	$0	0.0

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions				Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	ECM #	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	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
TEC127	1	Cooler (35F to 55F)	8, 9	Yes	No	Yes	0.0	759	0	$86	$1,977	$115	21.7

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Ice Making Head (≥450 lbs/day), Continuous	Yes		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	No		No	0.0	0	0	$0	$0	$0	0.0
Kitchen	2	Insulated Food Holding Cabinet (Full Size)	No		No	0.0	0	0	$0	$0	$0	0.0

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Door Type (High Temp)	Electric	Electric	Yes		No	0.0	0	0	$0	$0	$0	0.0

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Building	406	Computer	90.0	
Building	30	Laptop	50.0	
Building	3	TV	55.0	
Building	18	Smart Board/ Projector	1.5	
Building	19	Small Printer	30.0	
Building	2	Large Printer	300.0	
Building	2	Coffee Machine	800.0	
Building	3	Microwave	700.0	
Building	1	Toaster	1,800.0	
Building	1	Medium Refrigerator	800.0	
Building	2	Mini Fridge	100.0	
Building	1	Water Dispenser	75.0	
Machine Shop	6	Milling Machine	350.0	
Machine Shop	4	Lathes	2,000.0	
Machine Shop	10	Misc. Machinery	3,000.0	

Vending Machine Inventory & Recommendations

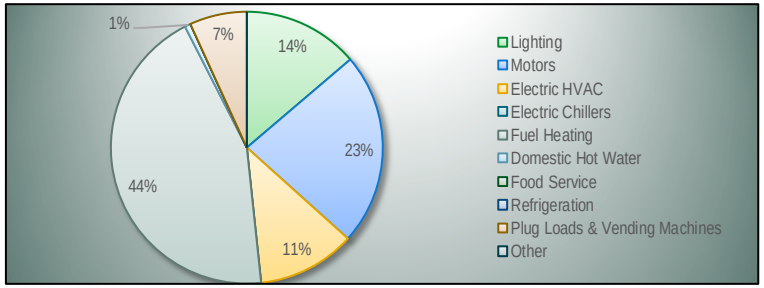
	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	1	Non-Refrigerated	N/A	No	0.0	0	0	$0	$0	$0	0.0
Hallway	1	Glass Fronted Refrigerated	10	Yes	0.1	1,209	0	$137	$230	$50	1.3

Custom (High Level Screening) Measures

Upgrade/Replace Energy Management System

Building Square Footage	56,571
Natural Gas Utility Rate ($/mmBtu)	$6.64
Blended Electric Utility Rate ($/kWh)	$0.113

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	213,974	350,863	2,398	Replace Energy Management System	8%	4%	4%	31,152	96	$4,157	$1.50	$84,857	20.4



Notes:
This measure has been evaluated at a high level. Facility staff reported a need to replace the existing EMS. The greatest operational and maintenance concern was the functionality and sustainability of a building energy management system. The existing control system is beyond its useful life and parts are no longer available in the market. This measure evaluates the savings and cost potential with replacing the EMS.

Equations: (Based on Industry Standards)
Average Cost for EMS installation is $1.50/sqft
Based on a comprehensive study by the Environmental Protection Agency, Energy savings range between 10% and 30%.
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

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]

Bergen Community College - Campus

Primary Property Type: College/University
Gross Floor Area (ft²): 867,229
Built: 1967

For Year Ending: January 31, 2019
Date Generated: July 12, 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
Bergen Community College - Campus 400 Paramus Road Paramus, New Jersey 07652	Bergen Community College 400 Paramus Road Paramus, NJ 07652 (201) 879-8921	Victor Anaya 400 Paramus Road Paramus, NJ 07652 (201) 879-8921 vanaya@bergen.edu

Property ID: 7384792

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
101.5 kBtu/ft²

Source EUI
208.5 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	37,546,840 (43%)
Electric - Grid (kBtu)	50,490,655 (57%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	87.9
National Median Source EUI (kBtu/ft²)	180.6
% Diff from National Median Source EUI	15%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	7,110

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.