Local Government Energy Audit Report

Packer Hall

May 6, 2021

Prepared for:

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Disclaimer

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

TRC reviewed the energy conservation measures and estimates of energy savings 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 material and labor costs primarily on RS Means cost manuals as well as on our experience at similar facilities. This approach is based on standard cost estimating manuals and is vendor neutral. Cost estimates include material and labor pricing associated with one for one equipment replacements. Cost estimates do not include demolition or removal of hazardous waste. The actual implementation costs for energy savings projects are anticipated to be significantly higher based on the specific conditions at your site(s). We strongly recommend that you work with your design engineer or contractor to develop actual project costs for your specific scope of work for the installation of high efficiency equipment. We encourage you to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on selected products and installers. TRC and NJBPU do not guarantee cost estimates and shall in no event be held liable should actual installed costs vary from these material and labor 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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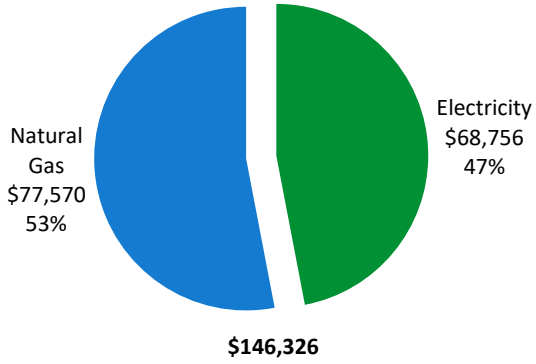
1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Packer Hall. 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: $146,326 Electricity: 2,413,455 kWh Natural Gas: 183,333 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.

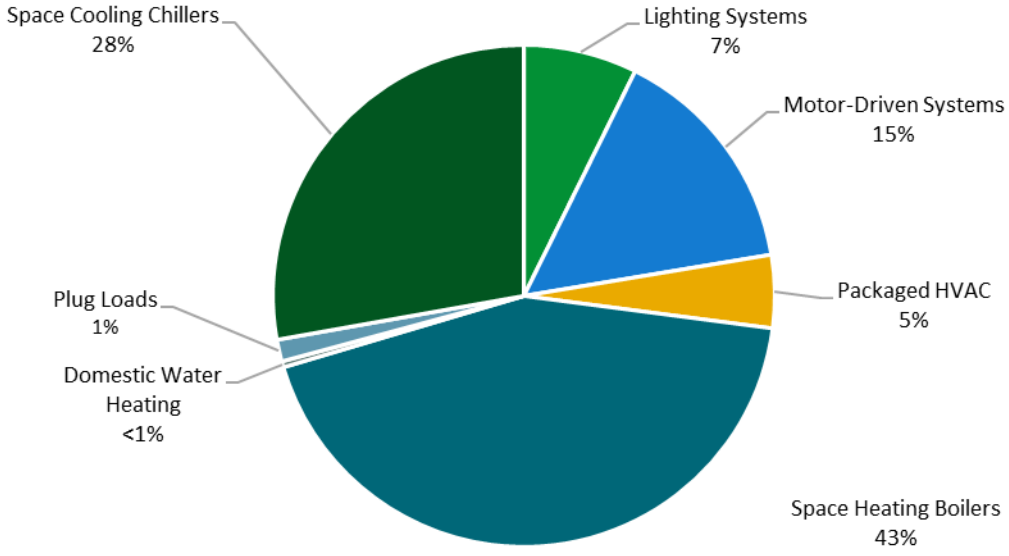


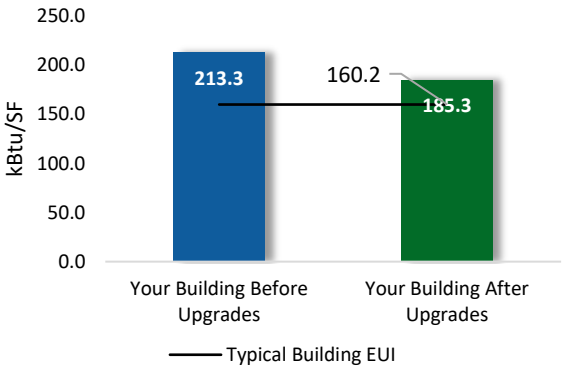
Figure 1 - Energy Use by System

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.

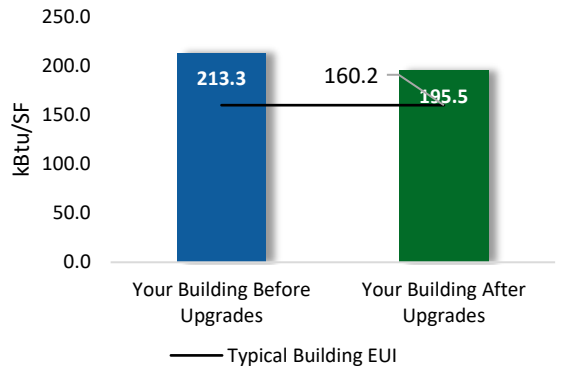
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$491,643
Potential Rebates & Incentives[1]	$32,490
Annual Cost Savings	$88,373
Annual Energy Savings	Electricity: 554,772 kWh Natural Gas: 15,970 Therms
Greenhouse Gas Emission Savings	373 Tons
Simple Payback	5.2 Years
Site Energy Savings (all utilities)	13%



Scenario 2: Cost Effective Package[2]

Installation Cost	$197,681
Potential Rebates & Incentives	$24,940
Annual Cost Savings	$75,668
Annual Energy Savings	Electricity: 499,762 kWh Natural Gas: 5,070 Therms
Greenhouse Gas Emission Savings	281 Tons
Simple Payback	2.3 Years
Site Energy Savings (all utilities)	8%



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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**349,397**	**35.3**	**-73**	**$51,093**	**$62,853**	**$11,276**	**$51,577**	**1.0**	**343,289**
ECM 1	Install LED Fixtures	Yes	194,351	17.9	-41	$28,421	$33,070	$3,790	$29,280	1.0	190,952
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	378	0.0	0	$55	$69	$10	$59	1.1	371
ECM 3	Retrofit Fixtures with LED Lamps	Yes	154,668	17.4	-32	$22,618	$29,715	$7,476	$22,239	1.0	151,966
Lighting Control Measures			**64,862**	**6.8**	**-14**	**$9,485**	**$35,829**	**$10,405**	**$25,424**	**2.7**	**63,727**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	53,769	5.6	-11	$7,863	$27,504	$3,780	$23,724	3.0	52,829
ECM 5	Install High/Low Lighting Controls	Yes	11,093	1.2	-2	$1,622	$8,325	$6,625	$1,700	1.0	10,899
Motor Upgrades			**1,185**	**0.2**	**0**	**$174**	**$4,049**	**$0**	**$4,049**	**23.2**	**1,193**
ECM 6	Premium Efficiency Motors	No	1,185	0.2	0	$174	$4,049	$0	$4,049	23.2	1,193
Variable Frequency Drive (VFD) Measures			**71,543**	**7.1**	**0**	**$10,525**	**$184,098**	**$8,150**	**$175,948**	**16.7**	**72,043**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	Yes	17,719	2.6	0	$2,607	$16,484	$600	$15,884	6.1	17,843
ECM 8	Install VFDs on Heating Water Pumps	No	52,506	4.2	0	$7,725	$161,833	$7,450	$154,383	20.0	52,874
ECM 9	Install VFDs on Condensate Pumps	No	1,318	0.3	0	$194	$5,780	$100	$5,680	29.3	1,327
Unitary HVAC Measures			**12,025**	**2.9**	**0**	**$1,769**	**$25,397**	**$1,106**	**$24,291**	**13.7**	**12,109**
ECM 10	Install High Efficiency Air Conditioning Units	Yes	12,025	2.9	0	$1,769	$25,397	$1,106	$24,291	13.7	12,109
HVAC System Improvements			**0**	**0.0**	**14**	**$61**	**$153**	**$38**	**$115**	**1.9**	**1,675**
ECM 11	Install Pipe Insulation	Yes	0	0.0	14	$61	$153	$38	$115	1.9	1,675
Domestic Water Heating Upgrade			**0**	**0.0**	**31**	**$132**	**$7,806**	**$1,465**	**$6,341**	**48.0**	**3,657**
ECM 12	Install Low-Flow DHW Devices	Yes	0	0.0	31	$132	$7,806	$1,465	$6,341	48.0	3,657
Food Service & Refrigeration Measures			**1,954**	**0.2**	**0**	**$288**	**$460**	**$50**	**$410**	**1.4**	**1,968**
ECM 13	Vending Machine Control	Yes	1,954	0.2	0	$288	$460	$50	$410	1.4	1,968
Custom Measures			**53,806**	**0.0**	**1,638**	**$14,846**	**$170,998**	**$0**	**$170,998**	**11.5**	**245,973**
ECM 14	Retro-Commissioning Study	Yes	29,671	0.0	365	$5,908	$29,898	$0	$29,898	5.1	72,579
ECM 15	Sub Metering	Yes	24,135	0.0	183	$4,326	$18,800	$0	$18,800	4.3	45,769
ECM 16	Automatic Pool Cover	No	0	0.0	1,090	$4,612	$122,300	$0	$122,300	26.5	127,625
TOTALS (COST EFFECTIVE MEASURES)			**499,762**	**47.9**	**507**	**$75,668**	**$197,681**	**$24,940**	**$172,741**	**2.3**	**562,617**
TOTALS (ALL MEASURES)			**554,772**	**52.5**	**1,597**	**$88,373**	**$491,643**	**$32,490**	**$459,153**	**5.2**	**745,636**

* - 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	Install LED Fixtures	x		x
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x		x
ECM 3	Retrofit Fixtures with LED Lamps	x		x
ECM 4	Install Occupancy Sensor Lighting Controls	x		x
ECM 5	Install High/Low Lighting Controls	x		x
ECM 6	Premium Efficiency Motors			x
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	x		x
ECM 8	Install VFDs on Heating Water Pumps	x		x
ECM 9	Install VFDs on Condensate Pumps	x		x
ECM 10	Install High Efficiency Air Conditioning Units	x		x
ECM 11	Install Pipe Insulation	x		x
ECM 12	Install Low-Flow DHW Devices	x		x
ECM 13	Vending Machine Control	x		x
ECM 14	Retro-Commissioning Study			
ECM 15	Sub Metering			
ECM 16	Automatic Pool Cover			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.	Incentives are paid out in three installments. The first installment is meant to help offset the costs of the initial engineering study. The subsequent incentives are paid based on the level of energy savings up to 50% of the total project cost. See Section 7.3 for all incentive details.
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 percent 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 percent 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 Packer Hall. 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 28, 2020, TRC performed an energy audit at The College of New Jersey's Packer Hall located in Ewing, New Jersey. TRC met with Ben Paraan to review the facility operations and help focus our investigation on specific energy-using systems.

Packer Hall is a two-story, 124,577 square foot building built in 1932. Spaces include gymnasiums, a pool room, classrooms, offices, team rooms, a concession stand, lounges, trainer's rooms, work out rooms, conference rooms, a laundry rooms, hallways, vestibules, stairwells, storage rooms, closets, rest rooms, locker rooms, electrical rooms, and mechanical spaces.

Facility concerns include installing utility sub-meters, which is addressed in Section 4.

2.2 Building Occupancy

The facility is occupied year-round. Typical weekday occupancy is 71 staff and 782 students.

Typical occupancy is from 7:00 AM to 11:00 PM during the school year, with varied use during the summer months.

Building Name	Weekday/Weekend	Operating Schedule
Packer Hall	Weekday	7:00 AM - 11:00 PM
	Weekend	7:00 AM - 11:00 PM
	Summer	Varies

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete masonry units over structural steel with a brick façade and stone features. Most of the roof is flat, covered with black membrane, while a raised section housing the pool area is pitched and is covered in slate tile roofing. Overall, the roof is in fair condition.

Most of the windows are double-pane, clear, operable, and have aluminum frames with insulated glass. Most windows have 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. There are also skylights with glazed windows over the pool hallways. Exterior doors have steel frames and are in fair condition with undamaged door seals.

Building Envelope

Roof Material

Exterior Window

Exterior Door

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear and U-bend fluorescent T8 lamps. There is also a 40-Watt T12 fixture in the elevator room. Additionally, there are some compact fluorescent lamps (CFL), incandescent, metal halide, and LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts, and T12 fluorescent lamps use magnetic ballasts.

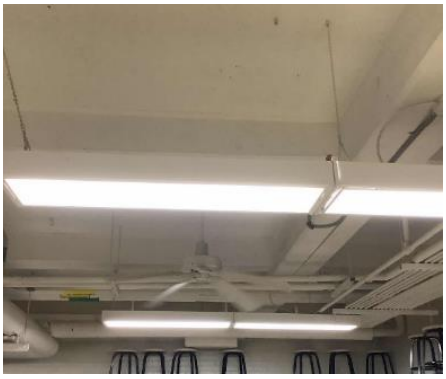
Fixture types include 1- 2- or 3-lamp, 2- 3- or 4-foot long troffer, recessed, and surface-mounted fixtures. Additionally, there are several other fixture types including wall mounted, recessed can, high bay, chain mounted, ceiling mounted, pendent mounted, LED panels, and 2-foot fixtures with U-bend lamps.

The pool room has high bay fixtures with metal halide lamps. The north gymnasium has recessed can fixtures with metal halide lamps while the south gymnasium has high bay LED fixtures. Pool and gymnasium area fixtures are manually controlled.

All exit signs are LED.

Interior lighting levels were generally sufficient. Most fixtures are in fair condition. Most lighting fixtures are controlled manually by wall switches or breaker panels.

Pool Room High Bay Fixtures



Locker Room Pendent Mounted Fixtures

Stairwell Wall Mounted Fixture

Hallway Recessed Can Fixture

Wall Switches

Exterior fixtures include recessed can, wall packs, wall mounted, arm mounted, and pole mounted fixtures with a combination of CFL and LED lamps.

The pole mounted walkway fixtures have LED lamps and are controlled by a central campus timeclock.

Exterior light fixtures are controlled by a time clock or photocell, depending on the fixture.

Pole Mounted Fixture

Wall Pack Fixture

Arm Mounted Fixture

Recessed Can Fixture

2.5 Air Handling Systems

Cabinet Unit Heaters and Fan Coil Units

Building hallways are conditioned with cabinet unit heaters equipped with fractional hp supply fan motors and hot water coils. There are also two fan coil units serving different mechanical rooms, each equipped with a fractional hp supply fan motor and a hot water coil. Additionally, this site has radiant baseboard heating throughout the building.

The heating, ventilation, and air conditioning (HVAC) system is partially pneumatically controlled. There are two air compressors located in the basement mechanical room for pneumatic controls. One air compressor is driven by two 2.0 hp motors while the other has two 1.5 hp motors.

Packaged Units

Many areas are conditioned with packaged air conditioning units equipped with VFD controlled supply fan motors, direct expansion (DX) coils, outdoor air dampers, and re-heat coils located in the ductwork. These units are controlled by the site's energy management system (EMS). Additional information about each unit is provided below:

Area Served	Unit Tag	Cooling Capacity (Tons)	Cooling Efficiency (IEER)	Supply Fan Motor (HP)
2nd Floor Classroom 249	RTU-1	7.50	14.50	3.0
2nd Floor Classroom 247	RTU-2	3.00	15.00*	0.8
2nd Floor Classroom 245	RTU-3	7.50	14.50	3.0
2nd Floor Classroom 242	RTU-4	7.50	14.50	3.0
2nd Floor Classroom 234	RTU-5	4.00	14.20*	1.0
2nd Floor Office 229	RTU-6	3.00	15.00*	0.8
2nd Floor Classroom 250	RTU-7	10.00	14.70	3.0
2nd Floor Dance Studio 256	RTU-8	15.00	15.00	5.0

*Please note that the units marked with an asterisk have been rated in SEER instead of IEER.

Additionally, there are two other packaged air conditioning (AC) units equipped with constant speed supply and exhaust fan motors, DX coils, outdoor air dampers, and re-heat coils located in the ductwork. These units are controlled by the site's EMS. Please note that the efficiencies for both units listed below have been de-rated. De-rating allows for a unit's efficiency to be more accurately represented based on the unit's age and condition. Additional information about each unit is provided below:

Area Served	Unit Tag	Cooling Capacity (Tons)	Cooling Efficiency (EER)	Supply Fan Motor (HP)	Exhaust Fan Motor (HP)
1st Floor Locker Rooms, 2nd Floor Offices (East Wing) & Lobbies	AC-1	7.50	9.65	3.0	0.3
2nd Floor HPER Offices	AC-2	6.50	9.65	2.0	0.3

AC-1

RTU-2

RTU-6

RTU-8

Unitary Electric HVAC Equipment

There is one Sanyo ductless mini-split AC serving the computer room with a cooling capacity of 2.10-tons and a cooling efficiency of 13.82 SEER, after de-rating.

The team room classroom is equipped with three electric resistance baseboard heaters, each estimated to have a heating capacity of 3.41-MBh.

Ductless Mini-Split System AC

Electric Resistance Baseboard Heater

Heat Recovery Units (HRUs)

Several areas of the building are conditioned with HRUs as well as heat recovery ventilators (HRVs) equipped with hot water coils, chilled water coils, supply fan motors, return fan motors, outdoor air dampers, and enthalpy wheels. These units are controlled by the site's EMS. Additional information about each unit is provided in the table below.

Area Served	Unit Tag	Supply Fan Motor (HP)	Exhaust Fan Motor (HP)	VFDs?
Pool Area	HRU-1	10.0	7.5	Yes
Locker Room & Bathroom	HRU-2	7.5	5.0	Yes
Locker Rooms	HRV-1	5.0	3.0	Yes
Locker Rooms	HRV-2	5.0	3.0	Yes

HRU-2

HRV-1

Air Handling Units (AHUs)

AHUs condition multiple spaces throughout the building. These AHUs are equipped with hot water coils, chilled water coils, supply fan motors, and outdoor air dampers.

The AHU serving the pool room is a dehumidification unit equipped with DX coils and has a cooling capacity of 70.0-tons and an estimated 14.00 EER cooling efficiency. The AHUs serving the wellness center and hallways are equipped with return fan motors, while the other two are not. The AHU serving the laundry and locker rooms is exhausted through EF-B1, which is in the basement mechanical room. These units are controlled by the site's EMS, besides the pool unit, which reportedly is equipped with self-contained in-unit controls provided by the manufacturer according to the EMS display. Additional information about each unit is provided in the table below.

Area Served	Unit Tag	Supply Fan Motor (HP)	Return/Exhaust Fan Motor (HP)	VFDs?
Wellness Center	AHU-1	(2) 7.5	3.0*	Yes
Hallways	AHU-2	(2) 7.5	3.0	Yes
Pool	AHU-1	(2) 20.0*	-	No
Laundry & Locker Rooms	AHU-2	20.0	15.0	Yes

*The motors marked with an asterisk have been estimated due to lack of nameplate data during the site visit.

Additionally, there are also several heating and ventilation units equipped with hot water coils, supply fan motors, and outdoor air dampers. Air is exhausted through individual rooftop exhaust fans. Please note that the exhaust fan motor hp ratings have been estimated due to lack of nameplate data during the site visit. These units are controlled by the site's EMS. Additional information about each unit is provided in the table below.

Area Served	Unit Tag	Supply Fan Motor (HP)	Exhaust Fan Motor (HP)	VFDs?
Gymnasium South	HV-1	5.0	2.0 (EF-13)	Yes
Gymnasium South	HV-2	5.0	2.0 (EF-14)	Yes
Gymnasium South	HV-3	5.0	2.0 (EF-15)	Yes
Gymnasium South	HV-4	5.0	2.0 (EF-16)	Yes

HRV-2

EF-14 Serving HRV-2

AHU-2

AHU-1 Pool Room Dehumidification Unit

2.6 Steam System

Steam is supplied by boilers and the cogeneration heat recovery system located in the Power House/Cogen Building. Steam is used in this building to produce space heating water, pool heating water, and domestic hot water through steam heat exchangers.

Space heating water is circulated to air handling units, heating recovery units, radiant baseboard heaters, fan coil units, cabinet unit heaters, and heating and ventilation units by two 1.0 hp hot water pumps and six 5.0 hp hot water pumps. Pool heating water is circulated by two hot water pumps estimated at 5.0 hp each operating at constant speed. Domestic hot water is circulated throughout the building by one fractional hp circulation pump.

Energy use associated with producing steam was allocated to individual buildings served by the cogeneration system and boilers. Please see the Power House/Cogen building report for details regarding the steam system.

Pool Hot Water Pumps

Heating Hot Water Pump 6

Heating Hot Water Pump 8

Heat Exchanger

2.7 Chilled Water Systems

Chilled water is supplied by chillers located in the Power House/Cogen Building. Energy use associated with the steam engine and electric chillers used to produce chilled water was allocated to the individual buildings served by the chiller plant.

Site staff indicated that since the chilled water system plant shifted from tertiary to secondary distribution, the two 10.0 hp and two 7.5 hp CHW pumps located in the building are not used. Chilled water is provided by the chilled water pumps located at the Power House/Cogen Building.

Please see the Power House/Cogen Building report for details regarding the chiller plant.

Chilled Water Pumps

VFD Controls

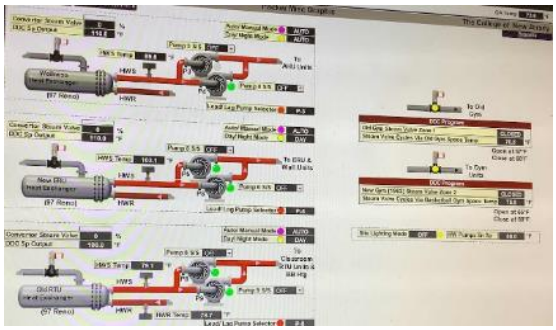
Chilled Water Pumps

2.8 Building EMS

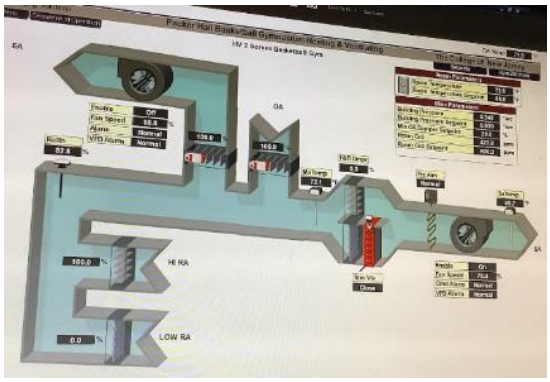
A Honeywell EMS controls the air handling units, packaged ACs, heating recovery units and ventilators, heating and ventilation units, exhaust fans, chilled water system, and hot water system. The EMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, return air temperatures, outdoor air damper position, supply fan operation status and speed, exhaust fan operation status and speed, heating valve position, CO2 levels and setpoints, economizer operation status, heating and cooling statuses, energy wheel operation status and speed, humidity, heating water loop temperatures, pump status operation, lead/lag controls, and chilled water loop temperatures.

The site staff is pleased with the current EMS, but we are recommending that a retro-commissioning study be performed, which is addressed in Section 4.

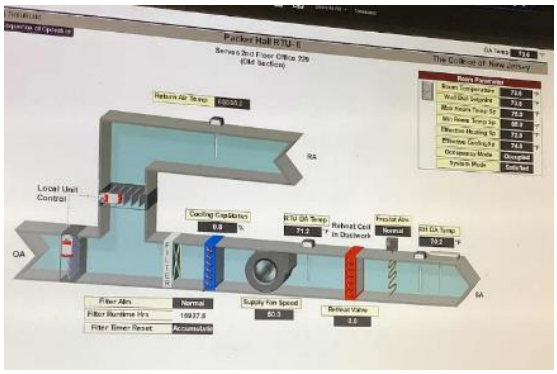
Packer Hall EMS Display



Hot Water System EMS Display



HV-2 EMS Display



RTU-6 EMS Display

2.9 Domestic Hot Water

Hot water is produced by heat exchangers using steam from the space heating boilers at the Power House/Cogen Building.

One fractional hp circulation pump distributes water to end uses. The circulation pump operates continuously. The domestic hot water pipes are partially insulated, and the insulation is in fair condition.

DHW Circulation Pump

2.10 Plug Load and Vending Machines

The location is doing a great job managing their electrical plug loads. This report makes additional suggestions for ECMs in this area as well as energy efficient best practices.

There are approximately 48 computer workstations throughout the facility. Plug loads throughout the building include general café, classroom, and office equipment. There are typical loads such as coffee machines, fans, laptops, microwaves, a projection screen, paper shredders, printers, projectors, mini fridges, speakers, televisions, and water coolers.

There are additional loads that are not as typically found in campus buildings, including clothes washers, clothes dryers, tread mills, a medical freezer, medical beds, food warmers, body composition equipment, and other medical equipment.

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

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

Tread Mills

Printer

Typical Office Equipment

Residential Refrigerator

2.11 Water-Using Systems

There are 16 restrooms and locker rooms with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher.

Men's and women's locker rooms are frequently used. The showerheads are estimated to be rated at 2.5 gpm.

Sink Faucet Flow

Locker Room Shower

2.12 Process Equipment

This site has an Olympic sized swimming pool that is heated year-round through a steam heat exchanger. There is one constant speed 2.0 hp hot water supply pump, and two constant speed hot water recovery pumps that are each estimated to be about 5.0 hp. There is also a 25.0 hp filter pump equipped with VFD control as well as a fractional hp chlorine pump.

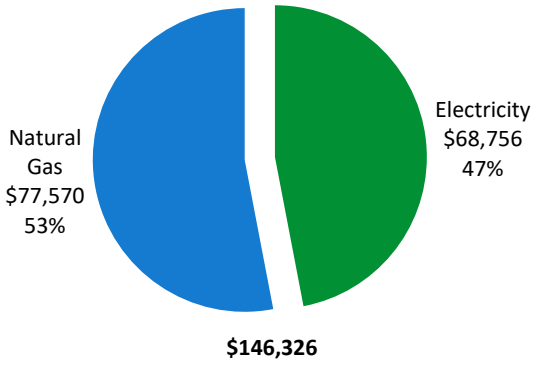
Chlorine System

Pool Filter Pump

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	2,413,455 kWh	$68,756
Natural Gas	183,333 Therms	$77,570
Total		**$146,326**



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

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

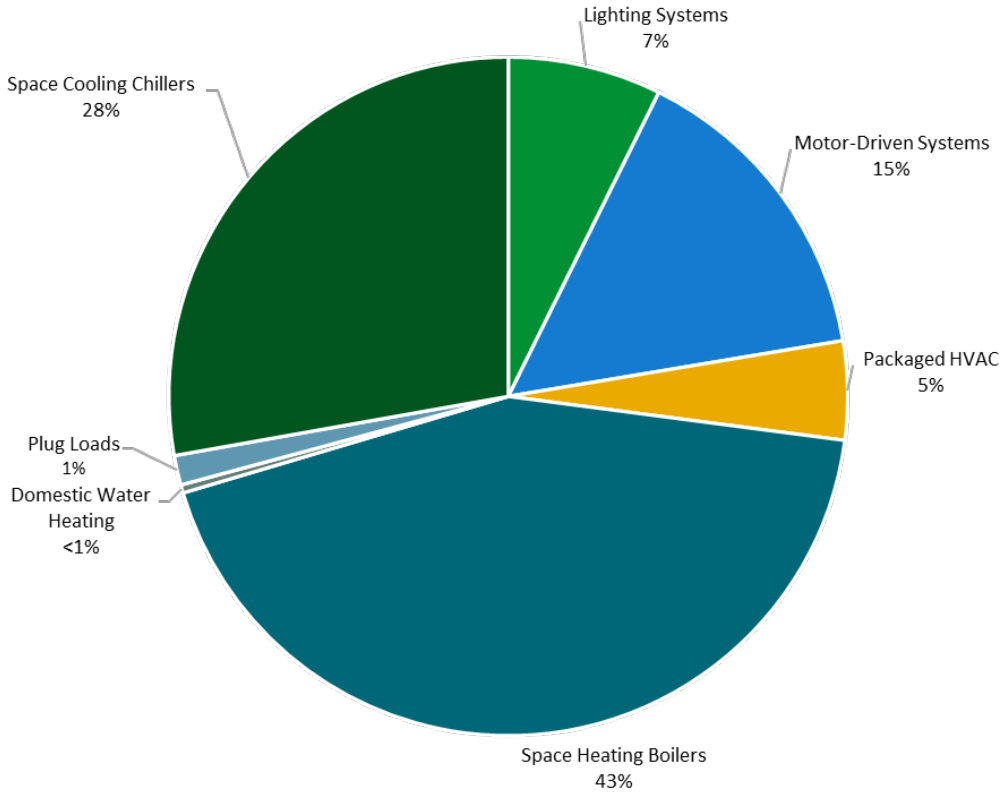
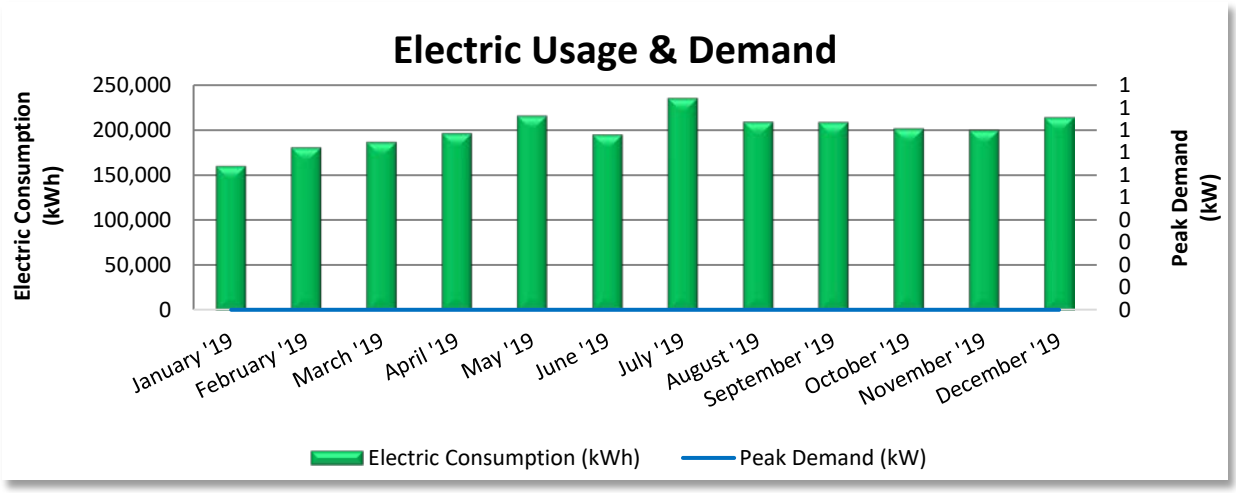


Figure 5 - Energy Balance

3.1 Electricity

PSE&G delivers electricity under rate class High Tension Service (HTS). Electricity for the building is supplemented by the cogeneration plant.



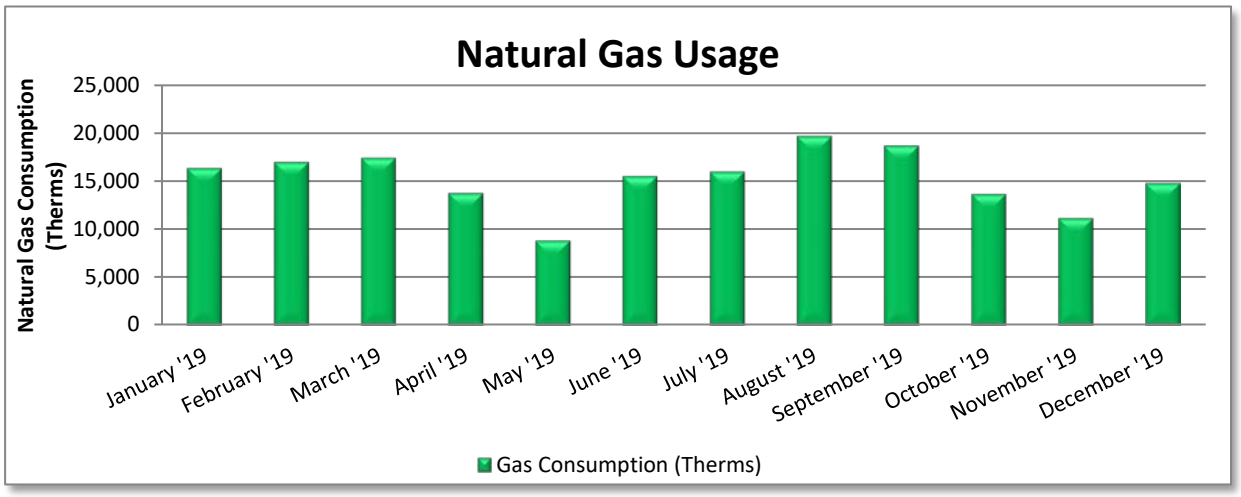
Electric Billing Data						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
1/28/19	31	160,742	0	$0	$3,508	Yes
2/28/19	31	181,423	0	$0	$4,464	Yes
3/28/19	28	187,679	0	$0	$4,080	Yes
4/28/19	31	197,185	0	$0	$4,438	Yes
5/29/19	31	216,560	0	$0	$7,985	Yes
6/27/19	29	195,679	0	$0	$6,218	Yes
7/29/19	32	236,259	0	$0	$8,516	Yes
8/27/19	29	209,851	0	$0	$5,958	Yes
9/26/19	30	209,737	0	$0	$6,524	Yes
10/25/19	29	202,680	0	$0	$5,625	Yes
11/25/19	31	200,756	0	$0	$4,851	Yes
12/11/19	33	214,904	0	$0	$6,589	Yes
Totals	**365**	**2,413,455**	**0**	**$0**	**$68,756**	
Annual	**365**	**2,413,455**	**0**	**$0**	**$68,756**	

Notes:

- Electric data has been estimated based on a campus wide approach and utilization of sub metered data. Please refer to the Power House/Cogen Building report for details regarding utility baseline and campus building utility desegregation.
- The peak demand for this facility was unavailable because the building is served with electricity from the master meter.
- The average purchased electric cost over the past 12 months was $0.147/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.
- Effectively all of the electricity generated on-site is used on-site.

3.2 Natural Gas

PSE&G delivers natural gas for the main boiler meter under rate class TSGNF.



Gas Billing Data				
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**	**TRC Estimated Usage?**
1/31/19	31	16,390	$6,149	Yes
2/28/19	28	17,041	$8,109	Yes
3/31/19	31	17,460	$7,837	Yes
4/30/19	30	13,788	$5,772	Yes
5/31/19	31	8,871	$3,837	Yes
6/30/19	30	15,578	$6,719	Yes
7/31/19	31	16,044	$6,486	Yes
8/31/19	31	19,737	$7,730	Yes
9/30/19	30	18,721	$7,495	Yes
10/31/19	31	13,680	$5,842	Yes
11/30/19	30	11,200	$4,929	Yes
12/31/19	31	14,823	$6,665	Yes
Totals	**365**	**183,333**	**$77,570**	
Annual	**365**	**183,333**	**$77,570**	

Notes:

- Natural gas data has been estimated based on a campus wide approach. Please refer to the Power House/Cogen Building report for details regarding the utility baseline and campus building utility desegregation analysis.
- The average gas cost for the past 12 months is $0.423/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

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

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

Benchmarking Score	**N/A**

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

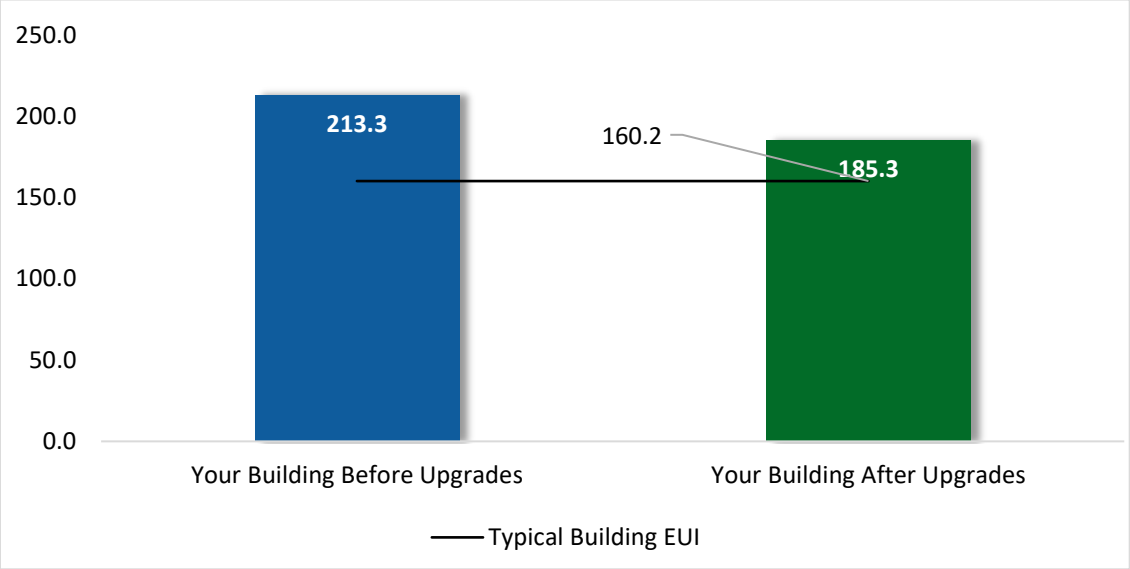


Figure 6 - Energy Use Intensity Comparison[3]

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

Benchmarking is provided for The College of New Jersey's campus. Please refer to the Power House/Cogen report for additional details regarding the benchmarking approach within Portfolio Manager®.

[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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**349,397**	**35.3**	**-73**	**$51,093**	**$62,853**	**$11,276**	**$51,577**	**1.0**	**343,289**
ECM 1	Install LED Fixtures	Yes	194,351	17.9	-41	$28,421	$33,070	$3,790	$29,280	1.0	190,952
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	378	0.0	0	$55	$69	$10	$59	1.1	371
ECM 3	Retrofit Fixtures with LED Lamps	Yes	154,668	17.4	-32	$22,618	$29,715	$7,476	$22,239	1.0	151,966
Lighting Control Measures			**64,862**	**6.8**	**-14**	**$9,485**	**$35,829**	**$10,405**	**$25,424**	**2.7**	**63,727**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	53,769	5.6	-11	$7,863	$27,504	$3,780	$23,724	3.0	52,829
ECM 5	Install High/Low Lighting Controls	Yes	11,093	1.2	-2	$1,622	$8,325	$6,625	$1,700	1.0	10,899
Motor Upgrades			**1,185**	**0.2**	**0**	**$174**	**$4,049**	**$0**	**$4,049**	**23.2**	**1,193**
ECM 6	Premium Efficiency Motors	No	1,185	0.2	0	$174	$4,049	$0	$4,049	23.2	1,193
Variable Frequency Drive (VFD) Measures			**71,543**	**7.1**	**0**	**$10,525**	**$184,098**	**$8,150**	**$175,948**	**16.7**	**72,043**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	Yes	17,719	2.6	0	$2,607	$16,484	$600	$15,884	6.1	17,843
ECM 8	Install VFDs on Heating Water Pumps	No	52,506	4.2	0	$7,725	$161,833	$7,450	$154,383	20.0	52,874
ECM 9	Install VFDs on Condensate Pumps	No	1,318	0.3	0	$194	$5,780	$100	$5,680	29.3	1,327
Unitary HVAC Measures			**12,025**	**2.9**	**0**	**$1,769**	**$25,397**	**$1,106**	**$24,291**	**13.7**	**12,109**
ECM 10	Install High Efficiency Air Conditioning Units	Yes	12,025	2.9	0	$1,769	$25,397	$1,106	$24,291	13.7	12,109
HVAC System Improvements			**0**	**0.0**	**14**	**$61**	**$153**	**$38**	**$115**	**1.9**	**1,675**
ECM 11	Install Pipe Insulation	Yes	0	0.0	14	$61	$153	$38	$115	1.9	1,675
Domestic Water Heating Upgrade			**0**	**0.0**	**31**	**$132**	**$7,806**	**$1,465**	**$6,341**	**48.0**	**3,657**
ECM 12	Install Low-Flow DHW Devices	Yes	0	0.0	31	$132	$7,806	$1,465	$6,341	48.0	3,657
Food Service & Refrigeration Measures			**1,954**	**0.2**	**0**	**$288**	**$460**	**$50**	**$410**	**1.4**	**1,968**
ECM 13	Vending Machine Control	Yes	1,954	0.2	0	$288	$460	$50	$410	1.4	1,968
Custom Measures			**53,806**	**0.0**	**1,638**	**$14,846**	**$170,998**	**$0**	**$170,998**	**11.5**	**245,973**
ECM 14	Retro-Commissioning Study	Yes	29,671	0.0	365	$5,908	$29,898	$0	$29,898	5.1	72,579
ECM 15	Sub Metering	Yes	24,135	0.0	183	$4,326	$18,800	$0	$18,800	4.3	45,769
ECM 16	Automatic Pool Cover	No	0	0.0	1,090	$4,612	$122,300	$0	$122,300	26.5	127,625
TOTALS			**554,772**	**52.5**	**1,597**	**$88,373**	**$491,643**	**$32,490**	**$459,153**	**5.2**	**745,636**

* - 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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**349,397**	**35.3**	**-73**	**$51,093**	**$62,853**	**$11,276**	**$51,577**	**1.0**	**343,289**
ECM 1	Install LED Fixtures	194,351	17.9	-41	$28,421	$33,070	$3,790	$29,280	1.0	190,952
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	378	0.0	0	$55	$69	$10	$59	1.1	371
ECM 3	Retrofit Fixtures with LED Lamps	154,668	17.4	-32	$22,618	$29,715	$7,476	$22,239	1.0	151,966
Lighting Control Measures		**64,862**	**6.8**	**-14**	**$9,485**	**$35,829**	**$10,405**	**$25,424**	**2.7**	**63,727**
ECM 4	Install Occupancy Sensor Lighting Controls	53,769	5.6	-11	$7,863	$27,504	$3,780	$23,724	3.0	52,829
ECM 5	Install High/Low Lighting Controls	11,093	1.2	-2	$1,622	$8,325	$6,625	$1,700	1.0	10,899
Variable Frequency Drive (VFD) Measures		**17,719**	**2.6**	**0**	**$2,607**	**$16,484**	**$600**	**$15,884**	**6.1**	**17,843**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	17,719	2.6	0	$2,607	$16,484	$600	$15,884	6.1	17,843
Unitary HVAC Measures		**12,025**	**2.9**	**0**	**$1,769**	**$25,397**	**$1,106**	**$24,291**	**13.7**	**12,109**
ECM 10	Install High Efficiency Air Conditioning Units	12,025	2.9	0	$1,769	$25,397	$1,106	$24,291	13.7	12,109
HVAC System Improvements		**0**	**0.0**	**14**	**$61**	**$153**	**$38**	**$115**	**1.9**	**1,675**
ECM 11	Install Pipe Insulation	0	0.0	14	$61	$153	$38	$115	1.9	1,675
Domestic Water Heating Upgrade		**0**	**0.0**	**31**	**$132**	**$7,806**	**$1,465**	**$6,341**	**48.0**	**3,657**
ECM 12	Install Low-Flow DHW Devices	0	0.0	31	$132	$7,806	$1,465	$6,341	48.0	3,657
Food Service & Refrigeration Measures		**1,954**	**0.2**	**0**	**$288**	**$460**	**$50**	**$410**	**1.4**	**1,968**
ECM 13	Vending Machine Control	1,954	0.2	0	$288	$460	$50	$410	1.4	1,968
Custom Measures		**53,806**	**0.0**	**548**	**$10,234**	**$48,698**	**$0**	**$48,698**	**4.8**	**118,348**
ECM 14	Retro-Commissioning Study	29,671	0.0	365	$5,908	$29,898	$0	$29,898	5.1	72,579
ECM 15	Sub Metering	24,135	0.0	183	$4,326	$18,800	$0	$18,800	4.3	45,769
TOTALS		**499,762**	**47.9**	**507**	**$75,668**	**$197,681**	**$24,940**	**$172,741**	**2.3**	**562,617**

* - 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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**349,397**	**35.3**	**-73**	**$51,093**	**$62,853**	**$11,276**	**$51,577**	**1.0**	**343,289**
ECM 1	Install LED Fixtures	194,351	17.9	-41	$28,421	$33,070	$3,790	$29,280	1.0	190,952
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	378	0.0	0	$55	$69	$10	$59	1.1	371
ECM 3	Retrofit Fixtures with LED Lamps	154,668	17.4	-32	$22,618	$29,715	$7,476	$22,239	1.0	151,966

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 is 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: Install LED Fixtures

Replace existing fixtures containing HID lamps with new LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

In some cases, HID fixtures can be retrofit with screw-based LED lamps. Replacing an existing HID fixture with a new LED fixture will generally provide better overall lighting optics; however, replacing the HID lamp with a LED screw-in lamp is typically a less expensive retrofit. We recommend you work with your lighting contractor to determine which retrofit solution is best suited to your needs and will be compatible with the existing fixtures.

Maintenance savings may also be achieved since LED lamps last longer than other light sources and therefore do not need to be replaced as often.

Affected building areas: pool room, pool hallway, and gymnasium north.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

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

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

Affected building areas: elevator room with a fluorescent fixture with T12 tubes.

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent and 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: hallways, janitorial closets, main vestibule, basement mechanical room, stairwells, storage rooms, 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 ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**64,862**	**6.8**	**-14**	**$9,485**	**$35,829**	**$10,405**	**$25,424**	**2.7**	**63,727**
ECM 4	Install Occupancy Sensor Lighting Controls	53,769	5.6	-11	$7,863	$27,504	$3,780	$23,724	3.0	52,829
ECM 5	Install High/Low Lighting Controls	11,093	1.2	-2	$1,622	$8,325	$6,625	$1,700	1.0	10,899

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 4: 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: classrooms, team rooms, concession stand, conference rooms, gymnasium south, laundry room, locker rooms, lounges, offices, recreation rooms, trainer's room, team weight room, rest rooms, and storage rooms.

ECM 5: 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 considered 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: hallways, stairwells, main vestibule, and corridors.

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

4.3 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**1,185**	**0.2**	**0**	**$174**	**$4,049**	**$0**	**$4,049**	**23.2**	**1,193**
ECM 6	Premium Efficiency Motors	1,185	0.2	0	$174	$4,049	$0	$4,049	23.2	1,193

ECM 6: Premium Efficiency Motors

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

Affected motors (on next page):

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Exterior Roof	Gymnasium South	1	Exhaust Fan	2.0	Exhaust Fan Motor (EF-13)
Exterior Roof	Gymnasium South	1	Exhaust Fan	2.0	Exhaust Fan Motor (EF-14)
Exterior Roof	Gymnasium South	1	Exhaust Fan	2.0	Exhaust Fan Motor (EF-15)
Exterior Roof	Gymnasium South	1	Exhaust Fan	2.0	Exhaust Fan Motor (EF-16)
Exterior Roof	Building Ventilation	1	Exhaust Fan	0.5	Exhaust Fan Motor (GEF-1)
Basement Mechanical Room	Basement Mechanical Room	1	Exhaust Fan	0.5	Exhaust Fan Motor

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

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**71,543**	**7.1**	**0**	**$10,525**	**$184,098**	**$8,150**	**$175,948**	**16.7**	**72,043**
ECM 7	Install VFD on Variable Air Volume (VAV) Fans	17,719	2.6	0	$2,607	$16,484	$600	$15,884	6.1	17,843
ECM 8	Install VFDs on Heating Water Pumps	52,506	4.2	0	$7,725	$161,833	$7,450	$154,383	20.0	52,874
ECM 9	Install VFDs on Condensate Pumps	1,318	0.3	0	$194	$5,780	$100	$5,680	29.3	1,327

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 7: Install VFD on Variable Air Volume (VAV) Fans

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

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

Affected air handlers: AHU-1 return fan, AC-1 & AC-2 supply and exhaust fans.

ECM 8: Install VFDs on Heating Water Pumps

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

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

Affected pumps: one 2.0 hp pool hot water pump, two 5.0 hp pool hot water recovery pumps, two 1.0 hp heating hot water pumps, and six 5.0 hp heating hot water pumps.

ECM 9: Install VFDs on Condensate Pumps

We evaluated installing VFDs to control the condensate return pumps. The condensate pump flow will have to be controlled to work in conjunction with the boiler feed water pump. The VFD control feedback should be based on a pressure transducer located in the main steam header. Before implementing this measure co-ordinate with the pump and boiler manufacturer.

Energy savings result from reducing the pump motor speed (and power) at reduced condensate flow from the condensate receiver. The magnitude of energy savings is based on the estimated amount of time that the pumping system will operate at reduced load.

Affected pumps: two 0.8 hp condensate pumps.

4.5 Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Unitary HVAC Measures		**12,025**	**2.9**	**0**	**$1,769**	**$25,397**	**$1,106**	**$24,291**	**13.7**	**12,109**
ECM 10	Install High Efficiency Air Conditioning Units	12,025	2.9	0	$1,769	$25,397	$1,106	$24,291	13.7	12,109

ECM 10: Install High Efficiency Air Conditioning Units

Replace standard efficiency packaged air conditioning units and split system AC units with high efficiency 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 and heating load and the estimated annual operating hours.

Affected units: AC-1, AC-2, and 2.10-ton ductless mini-split system AC serving the computer room.

4.6 HVAC Improvements

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**0**	**0.0**	**14**	**$61**	**$153**	**$38**	**$115**	**1.9**	**1,675**
ECM 11	Install Pipe Insulation	0	0.0	14	$61	$153	$38	$115	1.9	1,675

ECM 11: Install Pipe Insulation

Install insulation on heating water and domestic hot water system piping. Distribution system losses are dependent on system fluid temperature, the size of the distribution system, and the level of insulation of the piping. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced. This measure saves energy by reducing heat transfer in the distribution system.

Affected Systems: hot water piping, pool hot water piping, and domestic hot water piping.

4.7 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**31**	**$132**	**$7,806**	**$1,465**	**$6,341**	**48.0**	**3,657**
ECM 12	Install Low-Flow DHW Devices	0	0.0	31	$132	$7,806	$1,465	$6,341	48.0	3,657

ECM 12: Install Low-Flow DHW Devices

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

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm
Showerhead	2.0 gpm

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. Additional cost savings may result from reduced water usage.

4.8 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**1,954**	**0.2**	**0**	**$288**	**$460**	**$50**	**$410**	**1.4**	**1,968**
ECM 13	Vending Machine Control	1,954	0.2	0	$288	$460	$50	$410	1.4	1,968

ECM 13: 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.

4.9 Custom Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated M&L Cost ($)	Estimated Incentive ($)*	Estimated Net M&L Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures		**53,806**	**0.0**	**1,638**	**$14,846**	**$170,998**	**$0**	**$170,998**	**11.5**	**245,973**
ECM 14	Retro-Commissioning Study	29,671	0.0	365	$5,908	$29,898	$0	$29,898	5.1	72,579
ECM 15	Sub Metering	24,135	0.0	183	$4,326	$18,800	$0	$18,800	4.3	45,769
ECM 16	Automatic Pool Cover	0	0.0	1,090	$4,612	$122,300	$0	$122,300	26.5	127,625

ECM 14: Retro-Commissioning Study

Due to the complexity of today's HVAC systems and controls a thorough analysis and rebalance of heating, ventilation, and cooling systems should periodically be conducted. There are indications that systems may be not be operating correctly or as efficiently as they could be. One important tool available to building operators to ensure proper system operation is retro-commissioning.

Retro-commissioning is a common practice recommended by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) to be implemented every few years. We recommend that you contact a reputable engineering firm that specializes in energy control systems and retro-commissioning. Ask them to propose a scope of work and an outline of the procedures and processes to be implemented, including a schedule and the roles of all responsible parties.

Once goals and responsibilities are established, the objective of the investigation process is to understand how the building is currently operating, identify the issues, and determine the most cost-effective way to improve performance. The retro-commissioning agent will review building documentation, interview building occupants, and inspect and test the equipment. Information is then compiled into a report and shared with facility staff, who will select which recommendations to implement after reviewing the findings.

The implementation phase puts the selected processes into place. Typical measures may include sensor calibration, equipment schedule changes, damper linkage repair and similar relatively low-cost adjustments -- although more expensive sophisticated programming and building control system upgrades may be warranted. Approved measures may be implemented by the agent, the building staff, or by subcontractors. Typically, a combination of these individuals makes up the retro-commissioning team.

After the approved measures are implemented, the team will verify that the changes are working as expected. Baseline and post-case measurements will allow building staff to monitor equipment and ensure that the benefits are maintained.

A high-level evaluation of potential savings and costs is provided for demonstration purposes only. It is a screening evaluation for the potential in HVAC Control Improvements. Based on industry standards and previous project experience, the potential energy savings may be up to 15% of existing HVAC energy use. The average cost of retro-commissioning studies and control improvements is $0.30 per square foot. Actual savings and costs will need to be outlined by the specific contractor engaged to perform the study. For the purposes of this report, we have conservatively estimated savings to be 2% of the total HVAC energy consumption baseline.

ECM 15: Sub Metering

Facility staff expressed interest in utility sub metering key buildings which are currently served by a master meter and the central plant. Utility submeters alone do not save energy, but they are a useful tool under the right circumstances. Utility sub-meters can provide facility staff with real-time energy use data for specific buildings, information that enhances the potential for greater energy management activities. Revenue grade submeters are a tool that allow owners to bill tenants or departments for the energy consumed in the spaces they occupy. Better resolution on building system performance can lead to occupant behavioral changes which often result in reduced energy use.

A high-level evaluation of potential savings and costs is provided for demonstration purposes only. Based on industry standards and case studies, the potential energy savings may be up to 5% of existing energy usage. For the purposes of this report, a conservative assumed savings of 1% was applied to building allocated electrical and natural gas consumption of the sub metered buildings based on the premise of occupant behavioral changes. For this building the following submeters are proposed: smart electric meter, steam flow meter, and chilled water flow meter. Meter costs for the evaluation are based on average building use across the campus: smart electric meter $2,400, steam flow meter $6,700, and chilled water flow meter $9,700. The actual scope of work and implementation costs must be provided by a contractor in the future. This measure is recommended for implementation based on the initial energy and economic results but primarily for enhancing the potential for greater energy management activities.

ECM 16: Automatic Pool Cover

The indoor swimming pool is maintained at 82°F and is used year-round. Pool heating is provided by a steam to hot water heat exchanger using steam from the Power House/Cogen building. The pool and associated systems are in fair condition. The pool is currently uncovered; thus, heat is lost overnight due to evaporation and radiation heat losses.

We evaluated installing a new pool cover so the pool can be covered when unoccupied, reducing the evaporation heat loss and improving energy efficiency. Using a pool cover provides significant savings even for indoor pools and helps reduce maintenance issues due to condensate in the natatorium space by reducing the amount of water evaporated from the pool.

We suggest you provide a cover that includes an automatic or semi-automatic reel system. The automatic feature will reduce the day to day labor associated with covering and uncovering the pool and increase the likelihood that the cover will be used on a regular basis. Sufficient space will be required to mount the cover reel and to appropriately hold the cover.

It is important to note that the estimated savings will only be achieved through consistent use of the cover. Successful implementation of this project will require that in-house resources are committed to cover and uncover the pool daily.

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.

Operation and maintenance (O&M) plans enhance the operational efficiency of HVAC and other energy intensive systems and could save between 5 to 20 percent of the energy usage in your building without substantial capital investment. A successful plan includes your records of energy usage trends and costs, building equipment lists, current maintenance practices, planned capital upgrades, and incorporates your ideas for improved building operation. Your plan will address goals for energy-efficient operation, provide detail on how to reach the goals, and will outline procedures for measuring and reporting whether goals have been achieved.

You may already be doing some of these things— see our list below for potential additions to your maintenance plan. Be sure to consult with qualified equipment specialists for details on proper maintenance and system operation.

Energy Tracking with ENERGY STAR® Portfolio Manager®

You've heard it before - you can't manage what you don't measure. ENERGY STAR® Portfolio Manager® is an online tool that you can use to measure and track energy and water consumption, as well as greenhouse gas emissions[5] . Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Lighting Maintenance

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

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

Lighting Controls

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

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

Motor Maintenance

Motors have many moving parts. As these parts degrade over time, the efficiency of the motor is reduced. Routine maintenance prevents damage to motor components. Routine maintenance should include cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

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.

Steam Trap Repair and Replacement

Steam traps are a crucial part of delivering heat from the boiler to the space heating units. Steam traps are automatic valves that remove condensate from the system. If the traps fail closed, condensate can build up in the steam supply side of the trap which reduces the flow in the steam lines and thermal capacity of the radiators. Or they may fail open, allowing steam into the condensate return lines resulting in wasted energy, water and hammering. Losses can be significantly reduced by testing and replacing equipment as they start to fail. Repair or replace traps that are blocked or allowing steam to pass. Inspect steam traps as part of a regular steam system maintenance plan.

Water Heater Maintenance

The lower the supply water temperature that is used for hand washing sinks, the less energy is needed to heat the water. Reducing the temperature results in energy savings and the change is often unnoticeable to users. Be sure to review the domestic water temperature requirements for sterilizers and dishwashers as you investigate reducing the supply water temperature.

Also, 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.

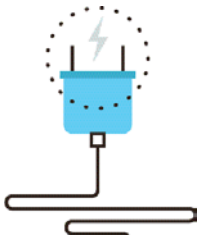
Compressed Air System Maintenance

Compressed air systems require periodic maintenance to operate at peak efficiency. A maintenance plan for compressed air systems should include:

- Inspection, cleaning, and replacement of inlet filter cartridges
- Cleaning of drain traps
- Daily inspection of lubricant levels to reduce unwanted friction
- Inspection of belt condition and tension
- Check for leaks and adjust loose connections
- Overall system cleaning

Contact a qualified technician for help with setting up periodic maintenance schedule.

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.

Computer Power Management Software

Many computers consume power during nights, weekends, and holidays. Screen savers are commonly confused as a power management strategy. This contributes to avoidable, excessive electrical energy

[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.

consumption. There are innovative power management software packages available that are designed to deliver significant energy saving and provide ongoing tracking measurements. A central power management platform helps enforce energy savings policies as well as identify and eliminate underutilized devices.

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.

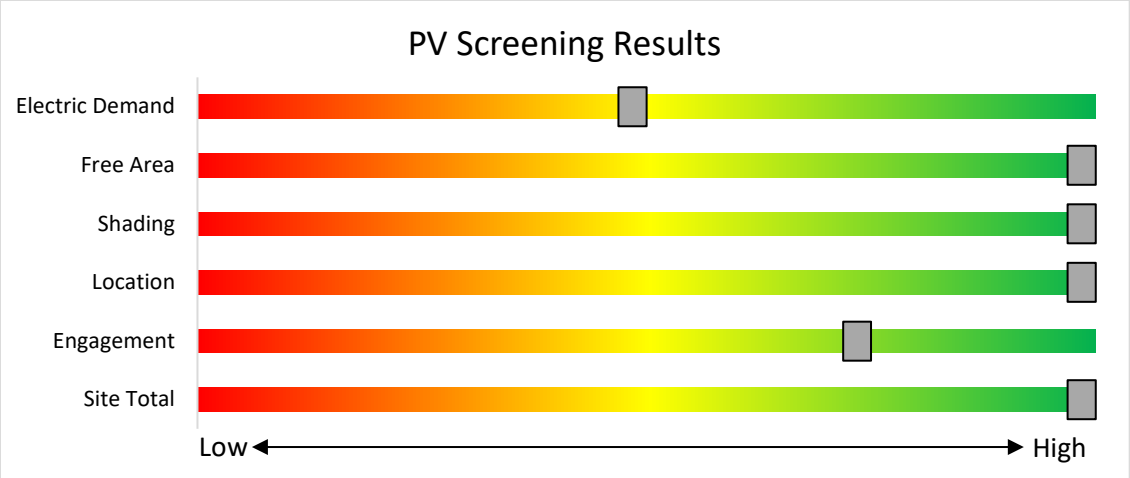
6.1 Solar Photovoltaic

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	215	kW DC STC
Electric Generation	256,145	kWh/yr
Displaced Cost	$37,680	/yr
Installed Cost	$559,000	

Figure 9 - Photovoltaic Screening

Transition Incentive (TI) Program

The TI program is a bridge between the Legacy SREC Program and a to-be determined Successor Incentive Program. The program 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 TRECs (Transition Incentive Renewable Energy Certificates). The Transition Incentive is structured as a factorized renewable energy certificate. The factors allow the TI Program to provide differentiated financial incentives for different types of solar installation.

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:

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

6.2 Combined Heat and Power

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

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

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

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

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

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

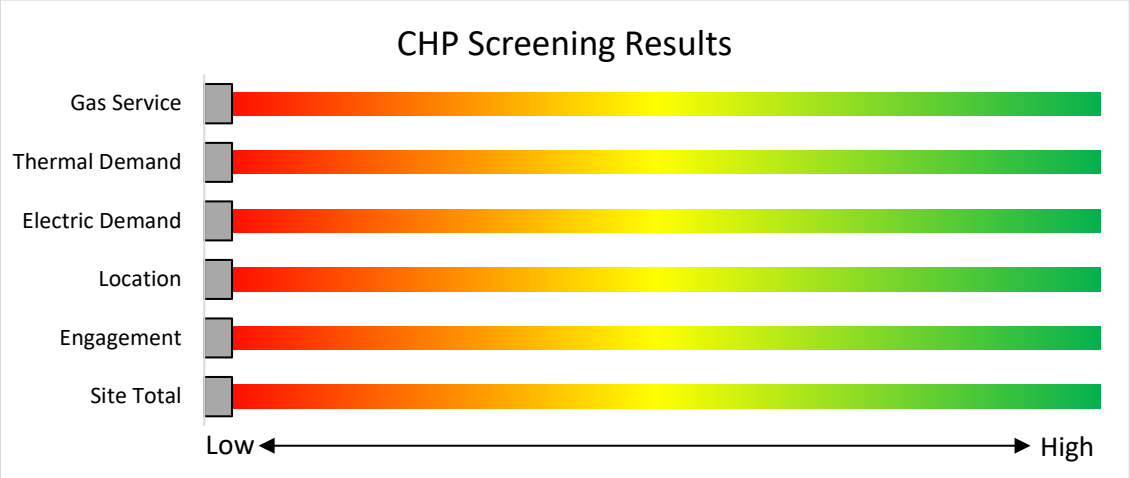


Figure 10 - Combined Heat and Power Screening

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

7 PROJECT FUNDING AND INCENTIVES

Ready to improve your building's performance? 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's 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.	Incentives are paid out in three installments. The first installment is meant to help offset the costs of the initial engineering study. The subsequent incentives are paid based on the level of energy savings up to 50% of the total project cost. See Section 7.3 for all incentive details.
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 site building and utility data provided, the facility does not meet the requirements of the current Direct Install program.

Incentives

The program pays up to 70 percent 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 percent of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30 percent 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 percent 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.

For master metered campuses, such as The College of New Jersey, P4P eligibility is evaluated at the campus level. For the purposes of reporting P4P eligibility is being presented at all of the buildings. Final eligibility will be assessed once all of the reports are completed and will be addressed at the Exit Meeting. If the campus does not meet the 15% savings threshold based on measures identified during the LGEA Program process it is possible that additional measures could be identified at a later point in time, for example through further evaluation or the Energy Savings Improvement Program process.

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 descriptions and application can be found at www.njcleanenergy.com/ESIP.

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

7.6 Transition Incentive (TI) Program

The TI program is a bridge between the Legacy SREC Program and a to-be determined Successor Incentive Program. The program 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 TRECs (Transition Incentive Renewable Energy Certificates). The Transition Incentive is structured as a factorized renewable energy certificate. The factors allow the TI Program to provide differentiated financial incentives for different types of solar installations. NJBPU calculates the value of a Transition Renewable Energy Certificate (TREC) by multiplying the base compensation rate ($152/MWh) by the project's assigned factor (i.e., $152 x 0.85 = $129.20/MWh). The TREC factors are defined based on the chart below:

Project Type	Factor
Subsection (t): landfill, brownfield, areas of historic fill	1.00
Grid supply (Subsection (r)) rooftop	1.00
Net metered non-residential rooftop and carport	1.00
Community solar	0.85
Grid supply (Subsection (r)) ground mount	0.60
Net metered residential ground mount	0.60
Net metered residential rooftop and carport	0.60
Net metered non-residential ground mount	0.60

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 TRECs.

Eligible projects may generate TRECs for 15 years following the commencement of commercial operations (also referred to as the "Transition Incentive Qualification Life"). After 15 years, projects may be eligible for a New Jersey Class I REC.

TRECs will be used by the identified compliance entities to satisfy a compliance obligation tied to a new Transition Incentive Renewable Portfolio Standard ("TI-RPS"), which will exist in parallel with, and completely separate from, the existing Solar RPS for Legacy SRECs. The TI-RPS is a carve-out of the current Class I RPS requirement. The creation of TRECs is based upon metered generation supplied to PJM-EIS General Attribute Tracking System ("GATS") by the owners of eligible facilities or their agents. GATS would create one TREC for each MWh of energy produced from a qualified facility.

TRECs will be purchased monthly by a TREC Administrator who will allocate the TRECs to the Load Serving Entities (BGS Providers and Third-Party Suppliers) annually based on their market share of retail electricity sold during the relevant Energy Year.

Solar projects help the State of New Jersey reach renewable energy goals outlined in the state's Energy Master Plan. The Transition Incentive Program online portal is now open to new applications effective May 1, 2020. There are instructions on "How and When to Transfer my SRP Registration to the Transition Incentive Program". If you are considering installing solar photovoltaics on your building, visit the following link for more information:

https://www.njcleanenergy.com/renewable-energy/programs/transition-incentive-program

8 PROJECT DEVELOPMENT

Energy conservation measures (ECMs) have been identified for your site and their energy and economic analyses are provided within this LGEA report. The next steps with project development are to set goals and create a comprehensive project plan. The graphic below provides an overview of the process flow for a typical energy efficiency or renewable energy project. We recommend implementing as many ECMs as possible prior to undertaking a feasibility study for a renewable project. The cyclical nature of this process flow demonstrates the ongoing work required to continually improve building energy efficiency over time. If your building(s) scope of work is relatively simple to implement or small in scope, the measurement and verification (M&V) step may not be required. It should be noted through a typical project cycle, there will be changes in costs based on specific scopes of work, contractor selections, design considerations, construction, etc. The estimated costs provided throughout this LGEA report demonstrate the unburdened turn-key material and labor cost only. There will be contingencies and additional costs at the time of implementation. We recommend comprehensive project planning includes the review of multiple bids for project work, incorporate potential operational & maintenance (O&M) cost savings and maximize your incentive potential.

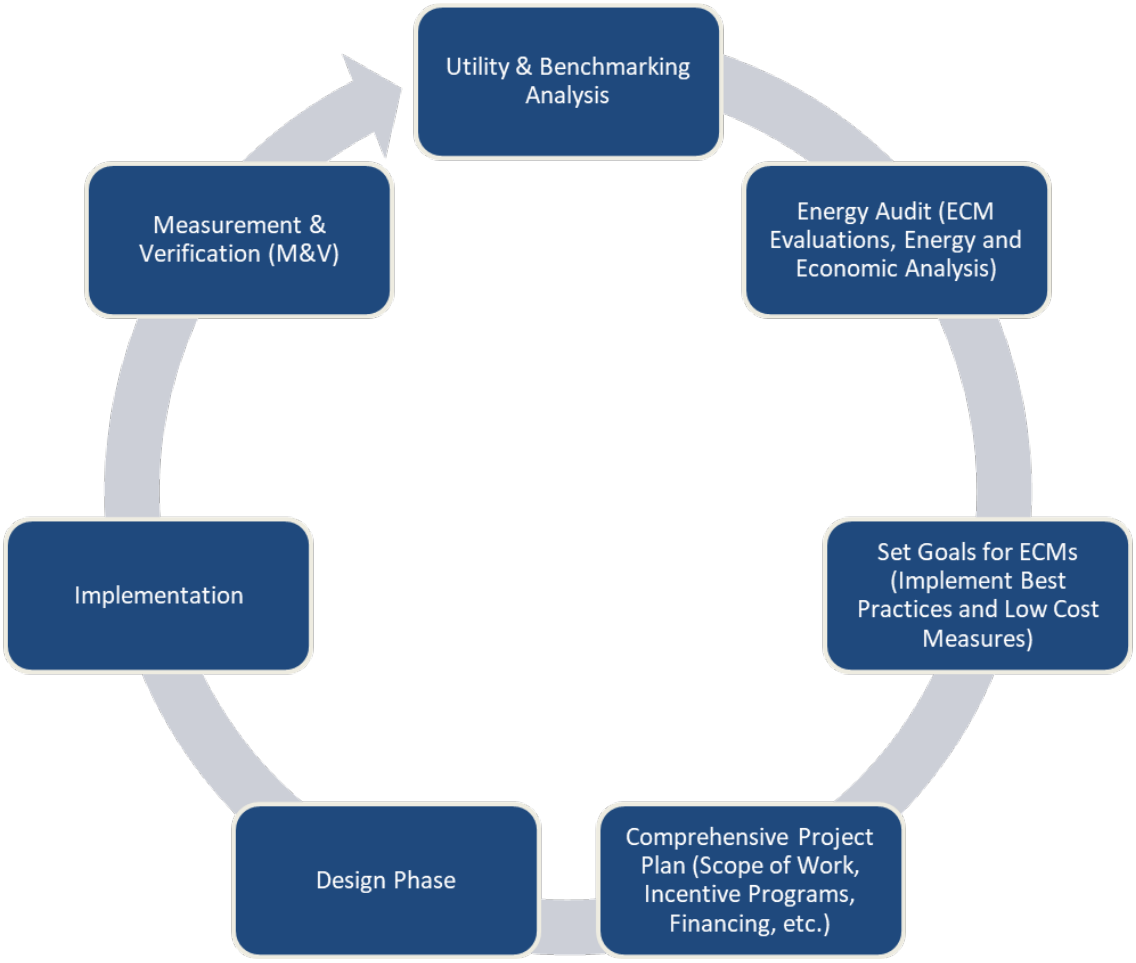


Figure 11 – Project Development Cycle

9 Energy Purchasing and Procurement Strategies

9.1 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].

9.2 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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Archive 240	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.0	211	0	$31	$37	$10	0.9
Basement Water Treatment Room	3	LED - Fixtures: Wall Pack	Wall Switch	S	10	5,824		None	No	3	LED - Fixtures: Wall Pack	Wall Switch	10	5,824	0.0	0	0	$0	$0	$0	0.0
Basement Water Treatment Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.2	1,691	0	$247	$292	$80	0.9
Classroom 242	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.3	2,421	-1	$354	$599	$125	1.3
Classroom 245	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.3	2,421	-1	$354	$599	$125	1.3
Classroom 247	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.2	1,614	0	$236	$489	$95	1.7
Classroom 249	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.3	2,421	-1	$354	$599	$125	1.3
Classroom 250	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Classroom 250	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.5	4,304	-1	$629	$854	$195	1.0
Classroom 256	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.6	5,380	-1	$787	$1,270	$270	1.3
Classroom Team Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.3	2,690	-1	$393	$635	$135	1.3
Concession Stand	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	273	0	$40	$181	$32	3.7
Conference 217	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	538	0	$79	$189	$40	1.9
Corridor Locker Rooms	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor Locker Rooms	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	4,019	0.0	273	0	$40	$65	$12	1.3
Corridor Locker Rooms	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,824	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	4,019	0.0	423	0	$62	$280	$120	2.6
Corridor North Gym	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Corridor North Gym	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 5	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	4,019	0.3	2,421	-1	$354	$779	$405	1.1
Electrical Room 2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.0	211	0	$31	$37	$10	0.9
Electrical Room 3	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.1	1,268	0	$185	$219	$60	0.9
Elevator Room	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	S	88	5,824	2	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.0	378	0	$55	$69	$10	1.1
Exterior Ground Recessed Fixtures	2	Compact Fluorescent: (2) 13W Plug-In Lamps	Timeclock		26	4,380	3	Relamp	No	2	LED Lamps: (2) 9W Plug-In Lamps	Timeclock	18	4,380	0.0	68	0	$10	$50	$4	4.6
Exterior Ground Wall Pack Fixture	1	Compact Fluorescent: (1) 42W Spiral Lamp	Timeclock		42	4,380	3	Relamp	No	1	LED Lamps: (1) 29W Screw-In Lamp	Timeclock	29	4,380	0.0	55	0	$8	$17	$1	2.0
Exterior Ground Wall Mounted Fixtures	5	LED Lamps: (1) 15W A19 Screw-In Lamp	Timeclock		15	4,380		None	No	5	LED Lamps: (1) 15W A19 Screw-In Lamp	Timeclock	15	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Ground Recessed Fixtures	2	LED - Fixtures: Ceiling Mount	Timeclock		15	4,380		None	No	2	LED - Fixtures: Ceiling Mount	Timeclock	15	4,380	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior Ground Arm Mounted Fixture	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Timeclock		50	4,380		None	No	1	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Timeclock	50	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Ground Pole Mounted Walkway Fixtures	21	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock		30	3,276		None	No	21	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Timeclock	30	3,276	0.0	0	0	$0	$0	$0	0.0
Exterior Ground Recessed Fixtures	1	LED - Fixtures: Ceiling Mount	Timeclock		15	4,380		None	No	1	LED - Fixtures: Ceiling Mount	Timeclock	15	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Ground Arm Mounted Fixture	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Timeclock		20	4,380		None	No	3	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Timeclock	20	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Ground Wall Pack Fixtures	4	LED - Fixtures: Wall Pack	Timeclock		30	4,380		None	No	4	LED - Fixtures: Wall Pack	Timeclock	30	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Ground Wall Pack Fixtures	2	LED - Fixtures: Wall Pack	Photocell		30	4,380		None	No	2	LED - Fixtures: Wall Pack	Photocell	30	4,380	0.0	0	0	$0	$0	$0	0.0
Exterior Ground Wall Pack Fixtures	2	LED - Fixtures: Wall Pack	Timeclock		30	4,380		None	No	2	LED - Fixtures: Wall Pack	Timeclock	30	4,380	0.0	0	0	$0	$0	$0	0.0
First Floor Hallway	20	Compact Fluorescent: (2) 13W Plug-In Lamps	Wall Switch	S	26	5,824	3, 5	Relamp	Yes	20	LED Lamps: (2) 9W Plug-In Lamps	High/Low Control	18	4,019	0.2	1,722	0	$252	$1,175	$715	1.8
First Floor Hallway	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
First Floor Hallway	9	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 5	Relamp	Yes	9	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	4,019	0.1	1,226	0	$179	$743	$369	2.1
First Floor Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,824	3, 5	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	4,019	0.1	564	0	$82	$73	$20	0.6
First Floor Hallway	70	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 5	Relamp	Yes	70	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	4,019	2.1	18,830	-4	$2,754	$5,256	$3,150	0.8
Gymnasium North	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gymnasium North	32	Metal Halide: (1) 400W Lamp	Breaker Panel	S	458	5,824	1	Fixture Replacement	No	32	LED - Fixtures: High-Bay	Breaker Panel	120	5,824	7.8	69,292	-14	$10,133	$15,759	$1,600	1.4
Gymnasium South	6	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	6	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Gymnasium South	30	LED - Fixtures: High-Bay (Prismatic Reflector)	Wall Switch	S	160	5,824	4	None	Yes	30	LED - Fixtures: High-Bay (Prismatic Reflector)	Occupancy Sensor	160	4,019	1.1	9,533	-2	$1,394	$6,600	$1,050	4.0
Gymnasium South	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.2	2,152	0	$315	$562	$115	1.4
Janitorial 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.0	211	0	$31	$37	$10	0.9
Janitorial 2	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.0	211	0	$31	$37	$10	0.9
Janitorial 4	1	Compact Fluorescent: (1) 42W A19 Screw-In Lamp	Wall Switch	S	42	5,824	3	Relamp	No	1	LED Lamps: (1) 29W Screw-In Lamp	Wall Switch	29	5,824	0.0	81	0	$12	$17	$1	1.4
Laundry Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.3	2,690	-1	$393	$635	$135	1.3
Locker Room 146	10	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.2	1,363	0	$199	$325	$60	1.3
Locker Room 146	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.6	5,380	-1	$787	$1,270	$270	1.3
Locker Room Football	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.6	5,380	-1	$787	$1,270	$270	1.3
Locker Room Girls	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Locker Room Girls	6	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	818	0	$120	$195	$36	1.3
Locker Room Girls	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.2	1,614	0	$236	$489	$95	1.7
Locker Room Men's Pool	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Locker Room Men's Pool	2	LED - Fixtures: Ceiling Mount	Wall Switch	S	30	5,824	4	None	Yes	2	LED - Fixtures: Ceiling Mount	Occupancy Sensor	30	4,019	0.0	119	0	$17	$0	$0	0.0
Locker Room Men's Pool	5	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	681	0	$100	$163	$30	1.3
Locker Room Men's Pool	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,824	3, 4	Relamp	Yes	4	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	4,019	0.1	564	0	$82	$343	$55	3.5
Locker Room Men's Staff	1	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	40	5,824	4	None	Yes	1	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	40	4,019	0.0	79	0	$12	$0	$0	0.0
Locker Room Men's Staff	6	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	6	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	818	0	$120	$465	$71	3.3
Locker Room Team Men's	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Locker Room Team Men's	8	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	1,090	0	$159	$260	$48	1.3
Locker Room Team Men's	33	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	33	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	1.0	8,877	-2	$1,298	$2,015	$435	1.2
Locker Room Team Women's	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Locker Room Team Women's	12	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.2	1,635	0	$239	$390	$72	1.3
Locker Room Team Women's	25	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	25	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.8	6,725	-1	$983	$1,453	$320	1.2
Locker Room Women's Staff	10	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.2	1,363	0	$199	$595	$95	2.5
Locker Room Women South Gym	12	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	12	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.2	1,635	0	$239	$930	$142	3.3
Locker Room Women South Gym	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.3	2,690	-1	$393	$635	$135	1.3
Lounge Aquatic	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Lounge Aquatic	7	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,824	3, 4	Relamp	Yes	7	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	4,019	0.1	986	0	$144	$128	$35	0.6
Lounge Aquatic	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.5	4,304	-1	$629	$1,124	$230	1.4
Lounge Workout Room	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	5,824	4	None	Yes	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	101	0	$15	$270	$0	18.2
Main Vestibule	2	Compact Fluorescent: (2) 13W Plug-In Lamps	Wall Switch	S	26	5,824	3, 5	Relamp	Yes	2	LED Lamps: (2) 9W Plug-In Lamps	High/Low Control	18	4,019	0.0	172	0	$25	$275	$4	10.8
Mechanical Basement	1	Compact Fluorescent: (1) 42W Plug-In Lamp	Wall Switch	S	42	5,824	3	Relamp	No	1	LED Lamps: (1) 29W Plug-In Lamp	Wall Switch	29	5,824	0.0	81	0	$12	$13	$1	1.0
Mechanical Basement	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.3	2,537	-1	$371	$438	$120	0.9
Mechanical Basement	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0

	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Basement	1	LED - Fixtures: Wall Pack	Wall Switch	S	30	5,824		None	No	1	LED - Fixtures: Wall Pack	Wall Switch	30	5,824	0.0	0	0	$0	$0	$0	0.0
Mechanical Basement	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.1	1,268	0	$185	$219	$60	0.9
Mechanical Basement	2	Compact Fluorescent: (1) 42W Plug-In Lamp	Wall Switch	S	42	5,824	3	Relamp	No	2	LED Lamps: (1) 29W Plug-In Lamp	Wall Switch	29	5,824	0.0	161	0	$24	$25	$2	1.0
Mechanical Basement	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.2	1,691	0	$247	$292	$80	0.9
Office - Enclosed 235	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,824	0.0	103	0	$15	$33	$6	1.8
Office - Enclosed 236	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,824	0.0	103	0	$15	$33	$6	1.8
Office 104	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	538	0	$79	$189	$40	1.9
Office 208	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	545	0	$80	$400	$59	4.3
Office 209	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	273	0	$40	$181	$32	3.7
Office 210	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	273	0	$40	$181	$32	3.7
Office 211	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	273	0	$40	$181	$32	3.7
Office 212	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	273	0	$40	$181	$32	3.7
Office 213	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	273	0	$40	$181	$32	3.7
Office 214	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	273	0	$40	$181	$32	3.7
Office 216	7	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	7	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	954	0	$139	$498	$77	3.0
Office 220	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	538	0	$79	$189	$40	1.9
Office 221	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	538	0	$79	$189	$40	1.9
Office 222	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	538	0	$79	$189	$40	1.9
Office 226	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	545	0	$80	$400	$59	4.3
Office 226-229	8	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	1,090	0	$159	$530	$83	2.8
Office 227	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	545	0	$80	$400	$59	4.3
Office 228	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.0	211	0	$31	$37	$10	0.9
Office 231	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	273	0	$40	$181	$32	3.7
Office 232	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	273	0	$40	$181	$32	3.7
Office 233	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	545	0	$80	$400	$59	4.3

	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Office 234	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	545	0	$80	$400	$59	4.3
Office 256A	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Office 256A	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	1,076	0	$157	$416	$75	2.2
Office 271E	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	5,824	4	None	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	68	0	$10	$0	$0	0.0
Office 271E	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	538	0	$79	$343	$55	3.7
Office Pool	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	409	0	$60	$368	$53	5.3
Pool 1	8	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Pool 1	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	28	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.8	7,532	-2	$1,101	$1,562	$350	1.1
Pool 1	14	Metal Halide: (1) 1000W Lamp	Wall Switch	S	1,080	8,760	1, 4	Fixture Replacement	Yes	14	LED - Fixtures: High-Bay	Occupancy Sensor	300	6,044	8.8	117,771	-25	$17,222	$17,659	$2,590	0.9
Pool Hallway	7	Compact Fluorescent: (2) 13W Plug-In Lamps	Wall Switch	S	26	5,824	3, 5	Relamp	Yes	7	LED Lamps: (2) 9W Plug-In Lamps	High/Low Control	18	4,019	0.1	603	0	$88	$625	$259	4.2
Pool Hallway	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Pool Hallway	18	Linear Fluorescent - T8: 3' T8 (25W) - 2L	Wall Switch	S	48	5,824	3, 5	Relamp	Yes	18	LED - Linear Tubes: (2) 3' Lamps	High/Low Control	21	4,019	0.4	3,864	-1	$565	$1,332	$810	0.9
Pool Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,824	3, 5	Relamp	Yes	1	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	4,019	0.0	141	0	$21	$18	$5	0.6
Pool Hallway Display Case	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.1	1,268	0	$185	$219	$60	0.9
Pool Hallway	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 5	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	4,019	0.6	5,111	-1	$747	$1,369	$855	0.7
Pool Hallway	18	Metal Halide: (1) 200W Lamp	Wall Switch	S	232	5,824	1, 5	Fixture Replacement	Yes	18	LED - Fixtures: Downlight Recessed	High/Low Control	60	4,019	2.5	21,979	-5	$3,214	$3,407	$720	0.8
Pool Room Hall	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Pool Room Hall	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	136	0	$20	$33	$6	1.3
Pool Room Hall	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,824	3, 4	Relamp	Yes	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	4,019	0.0	141	0	$21	$18	$5	0.6
Pool Room Hall	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	538	0	$79	$343	$55	3.7
Recreation 106	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	40	5,824	4	None	Yes	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	40	4,019	0.0	159	0	$23	$270	$0	11.6
Recreation Performance	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Recreation Performance	5	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	5	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.1	681	0	$100	$163	$30	1.3
Recreation Performance	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	1,076	0	$157	$146	$40	0.7
Recreation Performance	44	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	5,824	3, 4	Relamp	Yes	44	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	4,019	2.0	17,754	-4	$2,596	$3,220	$765	0.9

	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Recreation Room 271	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	5,824		None	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,824	0.0	0	0	$0	$0	$0	0.0
Recreation Swimming & Diving	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	40	5,824	4	None	Yes	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	40	4,019	0.0	159	0	$23	$270	$35	10.1
Recreation Swimming & Diving	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	40	5,824	4	None	Yes	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	40	4,019	0.0	159	0	$23	$270	$35	10.1
Recreation Trainer's Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.2	2,152	0	$315	$562	$115	1.4
Recreation Weight Room Team	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Recreation Weight Room Team	50	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	50	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	1.5	13,450	-3	$1,967	$2,906	$640	1.2
Recreation Weight Room Team	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	4,019	0.1	503	0	$74	$145	$20	1.7
Restroom - Female 1	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	807	0	$118	$380	$65	2.7
Restroom - Female 2	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,824	0.0	103	0	$15	$33	$6	1.8
Restroom - Female 4	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	409	0	$60	$368	$53	5.3
Restroom - Female 4	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	4,019	0.0	282	0	$41	$37	$10	0.6
Restroom - Male 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.1	538	0	$79	$343	$20	4.1
Restroom - Male 2	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,824	0.0	103	0	$15	$33	$6	1.8
Restroom - Male 4	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 4	Relamp	Yes	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	4,019	0.0	409	0	$60	$368	$53	5.3
Restroom - Male 4	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,824	3, 4	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	4,019	0.0	282	0	$41	$37	$10	0.6
Second Floor Hallway	2	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Second Floor Hallway	6	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3, 5	Relamp	Yes	6	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	4,019	0.1	818	0	$120	$420	$246	1.5
Second Floor Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 5	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	4,019	0.2	1,614	0	$236	$444	$270	0.7
Second Floor Hallway North Gym	4	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Second Floor Hallway North Gym	29	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	29	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.9	7,801	-2	$1,141	$1,599	$360	1.1
Server Room	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Server Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.0	211	0	$31	$37	$10	0.9
Shop 1	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.1	634	0	$93	$110	$30	0.9
Stairs 1	1	Compact Fluorescent: (2) 13W Plug-In Lamps	Wall Switch	S	26	5,824	3, 5	Relamp	Yes	1	LED Lamps: (2) 9W Plug-In Lamps	High/Low Control	18	4,019	0.0	86	0	$13	$25	$2	1.8
Stairs 1	3	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,824	3, 5	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	4,019	0.0	423	0	$62	$280	$120	2.6

	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Stairs 2	1	LED - Fixtures: Wall Pack	Wall Switch	S	30	5,824	5	None	Yes	1	LED - Fixtures: Wall Pack	High/Low Control	30	4,019	0.0	60	0	$9	$0	$0	0.0
Stairs 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	S	32	5,824	3, 5	Relamp	Yes	2	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	4,019	0.0	282	0	$41	$262	$80	4.4
Stairs 3	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,824	0.0	103	0	$15	$33	$6	1.8
Stairs 4	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stairs 4	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	4,019	0.1	538	0	$79	$298	$20	3.5
Storage 1	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,824	0.0	103	0	$15	$33	$6	1.8
Storage 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.0	423	0	$62	$73	$20	0.9
Storage 245A	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.0	211	0	$31	$37	$10	0.9
Storage 3	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	5,824	0.0	211	0	$31	$37	$10	0.9
Storage 5	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	S	17	5,824		None	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	5,824	0.0	0	0	$0	$0	$0	0.0
Storage 6	1	Incandescent: (1) 100W A19 Screw-In Lamp	Wall Switch	S	100	5,824	3	Relamp	No	1	LED Lamps: (1) 15W Screw-In Lamp	Wall Switch	15	5,824	0.1	545	0	$80	$17	$1	0.2
Storage 7	1	Compact Fluorescent: (1) 42W A19 Screw-In Lamp	Wall Switch	S	42	5,824	3	Relamp	No	1	LED Lamps: (1) 29W Screw-In Lamp	Wall Switch	29	5,824	0.0	81	0	$12	$17	$1	1.4
Storage Gym	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	5,824	3, 4	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	4,019	0.3	2,690	-1	$393	$635	$100	1.4

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?	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Basement Mechanical Room	Pnuematic Controls	2	Air Compressor	2.0	86.5%	No	Baldor	EM3157T	W	600		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	Pnuematic Controls	2	Air Compressor	1.5	86.5%	No	Baldor	127466F115	B	600		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	Chilled Water System	1	Chilled Water Pump	10.0	90.2%	Yes	WEQ	01036ET3E215T-W22	B	339		No	90.2%	No		0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	Chilled Water System	1	Chilled Water Pump	10.0	90.2%	Yes	WEQ	01036ET3E215T-W22	B	339		No	90.2%	No		0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	Chilled Water System	1	Chilled Water Pump	7.5	91.0%	Yes	Baldor	EM3311T	W	339		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	Chilled Water System	1	Chilled Water Pump	7.5	91.0%	Yes	Baldor	EM3311T	W	339		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Gymnasium South	Heating Hot Water System	1	Condensate Pump	0.8	70.0%	No	Marathon	MVL 56T34F5884A	W	1,764	9	No	81.1%	Yes	1	0.1	659	0	$97	$2,890	$50	29.3
Gymnasium South	Heating Hot Water System	1	Condensate Pump	0.8	70.0%	No	Marathon	MVL 56T34F5884A	W	1,764	9	No	81.1%	Yes	1	0.1	659	0	$97	$2,890	$50	29.3
Exterior Roof	Pool Room	1	Exhaust Fan	1.0	82.5%	No			W	8,760		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Pool Room	1	Exhaust Fan	1.0	82.5%	No			W	8,760		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Pool Room	1	Exhaust Fan	1.0	82.5%	No			W	8,760		No	82.5%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Building Ventilation	1	Exhaust Fan	0.3	65.0%	No	Greenheck	GB-071-4	W	5,824		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Rest Room	1	Exhaust Fan	0.3	65.0%	No	Greenheck	GB-071-4	W	5,824		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Locker Room	1	Exhaust Fan	0.3	65.0%	No	Greenheck	GB-071-4	W	5,824		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Performance Workout Room	1	Exhaust Fan	0.5	70.0%	No	Greenheck	GB-131-5	W	5,824		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Performance Workout Room	1	Exhaust Fan	0.5	70.0%	No	Greenheck	GB-131-3	W	5,824		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Performance Workout Room	1	Exhaust Fan	0.5	70.0%	No	Greenheck	GB-131-3	W	5,824		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Building Ventilation	1	Exhaust Fan	0.3	65.0%	No			W	5,824		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Building Ventilation	1	Exhaust Fan	0.3	65.0%	No			W	5,824		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Building Ventilation	1	Exhaust Fan	0.3	65.0%	No			B	5,824		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0

		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?	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Exterior Roof	Gymnasium South	1	Exhaust Fan	2.0	85.5%	Yes	Greenheck	SWB-330-50-CW-TH	B	5,824	6	Yes	87.5%	No		0.0	174	0	$26	$836	$0	32.6
Exterior Roof	Gymnasium South	1	Exhaust Fan	2.0	85.5%	Yes	Greenheck	SWB-330-50-CW-TH	B	5,824	6	Yes	87.5%	No		0.0	174	0	$26	$836	$0	32.6
Exterior Roof	Gymnasium South	1	Exhaust Fan	2.0	85.5%	Yes	Greenheck	SWB-330-50-CW-TH	B	5,824	6	Yes	87.5%	No		0.0	174	0	$26	$836	$0	32.6
Exterior Roof	Gymnasium South	1	Exhaust Fan	2.0	85.5%	Yes	Greenheck	SWB-330-50-CW-TH	B	5,824	6	Yes	87.5%	No		0.0	174	0	$26	$836	$0	32.6
Exterior Roof	Building Ventilation	1	Exhaust Fan	0.2	65.0%	No			B	5,824		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Exterior Roof	Building Ventilation	1	Exhaust Fan	0.5	70.0%	No			B	5,824	6	Yes	78.2%	No		0.0	244	0	$36	$352	$0	9.8
Basement Mechanical Room	Basement Mechanical Room	1	Exhaust Fan	3.0	86.5%	Yes	Greenheck	33-CSW-BI	W	5,824		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	Basement Mechanical Room	1	Exhaust Fan	0.5	70.0%	No	Penn Ventilator		B	5,824	6	Yes	78.2%	No		0.0	244	0	$36	$352	$0	9.8
Basement Water Treatment Room	Pool Heating Hot Water Pump	1	Heating Hot Water Pump	2.0	86.5%	No	Baldor		W	8,760	8	No	86.5%	Yes	1	0.2	3,096	0	$455	$3,261	$100	6.9
Basement Water Treatment Room	Pool Water Pump	1	Process Pump	25.0	93.0%	Yes	Marathon	NVC 324TTDCA6082	B	8,760		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement Water Treatment Room	Pool Heating Recovery Pump	1	Heating Hot Water Pump	5.0	89.5%	No			W	4,380	8	No	89.5%	Yes	1	0.5	6,845	0	$1,007	$4,076	$900	3.2
Basement Water Treatment Room	Pool Heating Recovery Pump	1	Heating Hot Water Pump	5.0	89.5%	No			W	4,380	8	No	89.5%	Yes	1	0.5	6,845	0	$1,007	$4,076	$900	3.2
Basement Mechanical Room	Heating Hot Water System	1	Heating Hot Water Pump	1.0	85.5%	No	Century	H615V2	W	3,528	8	No	85.5%	Yes	1	0.1	1,154	0	$170	$6,760	$75	39.4
Basement Mechanical Room	Heating Hot Water System	1	Heating Hot Water Pump	1.0	82.5%	No	US Electrical Motors	P63DYB-4803	B	3,528	8	No	85.5%	Yes	1	0.1	1,272	0	$187	$6,760	$75	35.7
Basement Mechanical Room	Heating Hot Water System	1	Heating Hot Water Pump	5.0	90.2%	No	US Electrical Motors	G74262	B	3,528	8	No	90.2%	Yes	1	0.5	5,471	0	$805	$22,947	$900	27.4
Basement Mechanical Room	Heating Hot Water System	1	Heating Hot Water Pump	5.0	90.2%	No	Baldor	EJMM3218T	B	3,528	8	No	90.2%	Yes	1	0.5	5,471	0	$805	$22,826	$900	27.2
Basement Mechanical Room	Heating Hot Water System	1	Heating Hot Water Pump	5.0	90.2%	No	Baldor	EJMM3218T	B	3,528	8	No	90.2%	Yes	1	0.5	5,471	0	$805	$22,826	$900	27.2
Basement Mechanical Room	Heating Hot Water System	1	Heating Hot Water Pump	5.0	90.2%	No	Baldor	EJMM3218T	B	3,528	8	No	90.2%	Yes	1	0.5	5,471	0	$805	$22,826	$900	27.2
Basement Mechanical Room	Heating Hot Water System	1	Heating Hot Water Pump	5.0	86.5%	No	Marathon	KC 56T34D5611B	W	3,528	8	No	86.5%	Yes	1	0.5	5,705	0	$839	$22,737	$900	26.0
Basement Mechanical Room	Heating Hot Water System	1	Heating Hot Water Pump	5.0	86.5%	No	Marathon	KC 56T34D5611B	W	3,528	8	No	86.5%	Yes	1	0.5	5,705	0	$839	$22,737	$900	26.0

		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?	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Basement Water Treatment Room	Pool Chlorine System	1	Process Pump	0.0	65.0%	No	Stenner Pump Company	85MP5	B	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement Water Treatment Room	Sewer System	2	Other	0.8	70.0%	No			B	500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Elevator Motor Room	Elevator	1	Other	20.0	92.4%	No	Otis Elevator Company		W	504		No	92.4%	No		0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	Sewer System	2	Other	0.8	70.0%	No			B	500		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	Domestic Hot Water System	1	DHW Circulation Pump	0.1	65.0%	No	Taco		B	8,760		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	Wellness Center (AHU-1)	2	Supply Fan	7.5	91.0%	Yes	Trane	TCPAID02IV2M3020S	W	6,552		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Basement Mechanical Room	Wellness Center (AHU-1)	1	Return Fan	3.0	89.5%	No	Trane	TCPAID02IV2M3020S	W	6,552	7	No	89.5%	Yes	1	0.9	5,364	0	$789	$3,884	$200	4.7
Basement Mechanical Room	Laundry & Locker Rooms (AHU-2)	2	Supply Fan	7.5	91.0%	Yes	Trane	TCPAID02IV2M3020S	W	8,760		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Mechanical Rooms	Mechanical Rooms	2	Fan Coil Unit	0.1	65.0%	No			W	3,780		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Hallway	Hallway	10	Supply Fan	0.1	65.0%	No			W	3,780		No	65.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor HPER Offices (AC-2)	1	Supply Fan	2.0	84.0%	No	York	DF078C00P4TAL3	B	6,552	7	No	86.5%	Yes	1	0.6	4,293	0	$632	$3,261	$100	5.0
Roof	2nd Floor HPER Offices (AC-2)	1	Exhaust Fan	0.3	65.0%	No	York	DF078C00P4TAL3	B	6,552	7	No	73.4%	Yes	1	0.1	790	0	$116	$2,728	$50	23.1
Roof	1st Floor Locker Rooms, 2nd Floor Offices (East Wing) & Lobbies (AC-1)	1	Supply Fan	3.0	86.5%	No	York	DF090C00P4TAL4	B	6,552	7	No	89.5%	Yes	1	0.9	6,483	0	$954	$3,884	$200	3.9
Roof	1st Floor Locker Rooms, 2nd Floor Offices (East Wing) & Lobbies (AC-1)	1	Exhaust Fan	0.3	65.0%	No	York	DF090C00P4TAL4	B	6,552	7	No	73.4%	Yes	1	0.1	790	0	$116	$2,728	$50	23.1
Roof	Hallways (AHU-2)	1	Supply Fan	20.0	93.0%	Yes	Aaon	RN-026-3-A-0W9K-FJN	W	8,760		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Hallways (AHU-2)	1	Return Fan	15.0	93.0%	Yes	Aaon	RN-026-3-A-0W9K-FJN	W	8,760		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Pool Area (HRU-1)	1	Supply Fan	10.0	91.7%	Yes	Aaon	RN-025-3-A-0W9M-FJN	W	8,760		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Pool Area (HRU-1)	1	Exhaust Fan	7.5	91.0%	Yes	Aaon	RN-025-3-A-0W9M-FJN	W	8,760		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Locker Room & Bathroom (HRU-2)	1	Supply Fan	7.5	91.0%	Yes	Aaon	RN-025-3-A-0W9M-000	W	6,552		No	91.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Locker Room & Bathroom (HRU-2)	1	Exhaust Fan	5.0	89.5%	Yes	Aaon	RN-025-3-A-0W9M-000	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0

		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?	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Locker Rooms (HRV-1)	1	Supply Fan	5.0	89.5%	Yes	Seasons 4	9EBE14-012A-HW.1-03EW	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Locker Rooms (HRV-1)	1	Exhaust Fan	3.0	89.5%	Yes	Seasons 4	9EBE14-012A-HW.1-03EW	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Locker Rooms (HRV-2)	1	Supply Fan	5.0	89.5%	Yes	Seasons 4	9EBE14-011A-HW.1-03EW	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Locker Rooms (HRV-2)	1	Exhaust Fan	3.0	89.5%	Yes	Seasons 4	9EBE14-011A-HW.1-03EW	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Gymnasium South (HV-1)	1	Supply Fan	5.0	89.5%	Yes	Trane	CSAA021UBK00	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Gymnasium South (HV-2)	1	Supply Fan	5.0	89.5%	Yes	Trane	CSAA021UBK00	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Gymnasium South (HV-3)	1	Supply Fan	5.0	89.5%	Yes	Trane	CSAA021UBK00	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Gymnasium South (HV-4)	1	Supply Fan	5.0	89.5%	Yes	Trane	CSAA021UBK00	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 249 (RTU-1)	1	Supply Fan	3.0	89.5%	Yes	Trane	THC092F4R0A0	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 247 (RTU-2)	1	Supply Fan	0.8	70.0%	Yes	Trane	THC037E4R0A0A	W	6,552		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 245 (RTU-3)	1	Supply Fan	3.0	89.5%	Yes	Trane	THC092F4R0A08	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 242 (RTU-4)	1	Supply Fan	3.0	89.5%	Yes	Trane	THC092F4R0A08G	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 234 (RTU-5)	1	Supply Fan	1.0	85.5%	Yes	Trane	THC047E4R0A0B	W	6,552		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Office 229 (RTU-6)	1	Supply Fan	0.8	70.0%	Yes	Trane	THC037E4R0A0D1A	W	6,552		No	70.0%	No		0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 250 (RTU-7)	1	Supply Fan	3.0	89.5%	Yes	Trane	THC120E4R0A0	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Dance Studio 256 (RTU-8)	1	Supply Fan	5.0	89.5%	Yes	Trane	THD180F4R0A0	W	6,552		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Pool (AHU-1)	2	Supply Fan	20.0	93.0%	No	Seresco	NP-070-PB-X-P3EB3353WZE3AD3	W	8,760		No	93.0%	No		0.0	0	0	$0	$0	$0	0.0

Packaged 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)	Cooling Mode Efficiency (SEER/IEER/ EER)	Heating Mode Efficiency	Manufacturer	Model	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/IEER/ EER)	Heating Mode Efficiency	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Computer Room	1	Ductless Mini-Split AC	2.10		13.82		Sanyo	C2672R	B	10	Yes	1	Ductless Mini-Split AC	2.10		18.00		0.2	1,600	0	$235	$5,784	$0	24.6
Classroom Team Room	Classroom Team Room	3	Electric Resistance Heat		3.41		1 COP			W		No							0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor HPER Offices (AC-2)	1	Package Unit	6.50		9.65		York	DF078C00P4TAL3	B	10	Yes	1	Package Unit	6.50		14.00		1.3	4,840	0	$712	$9,402	$514	12.5
Roof	1st Floor Locker Rooms, 2nd Floor Offices (East Wing) & Lobbies (AC-1)	1	Package Unit	7.50		9.65		York	DF090C00P4TAL4	B	10	Yes	1	Package Unit	7.50		14.00		1.5	5,584	0	$822	$10,211	$593	11.7
Roof	2nd Floor Classroom 249 (RTU-1)	1	Package Unit	7.50		14.50		Trane	THC092F4R0A0	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 247 (RTU-2)	1	Package Unit	3.00		15.00		Trane	THC037E4R0A0A	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 245 (RTU-3)	1	Package Unit	7.50		14.50		Trane	THC092F4R0A08	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 242 (RTU-4)	1	Package Unit	7.50		14.50		Trane	THC092F4R0A08G	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 234 (RTU-5)	1	Package Unit	4.00		14.20		Trane	THC047E4R0A0B	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Office 229 (RTU-6)	1	Package Unit	3.00		15.00		Trane	THC037E4R0A0D1A	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Classroom 250 (RTU-7)	1	Package Unit	10.00		14.70		Trane	THC120E4R0A0	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	2nd Floor Dance Studio 256 (RTU-8)	1	Package Unit	15.00		15.00		Trane	THD180F4R0A0	W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Pool (AHU-1)	1	Package Unit	70.00		14.00		Seresco	NP-070-PB-X-P3EB3353WZE3AD3	W		No							0.0	0	0	$0	$0	$0	0.0

Electric Chiller Inventory & Recommendations

		Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	**Area(s)/System(s) Served**	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Manufacturer	Model	Remaining Useful Life	ECM #	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Central Plant	Building Chilled Water	1	Water-Cooled Centrifugal Chiller	296.00	Central Plant	Proxy Chiller	W		No							0.0	0	0	$0	$0	$0	0.0

Space Heating Boiler 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)	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Central Plant	Building Space Heating	1	Forced Draft Steam Boiler	6,574	Central Plant	Proxy Boiler	W		No						0.0	0	0	$0	$0	$0	0.0
Central Plant	Building Chilled Water	1	Other	3,552	Central Plant	Proxy Steam Chiller	W		No						0.0	0	0	$0	$0	$0	0.0

Pipe Insulation Recommendations

		Recommendation Inputs			Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Basement Water Treatment Room	Pool Water	11	10	2.00	0.0	0	8	$35	$88	$20	2.0
Basement Water Treatment Room	Heating Hot Water System	11	3	1.00	0.0	0	1	$6	$22	$6	2.7
Basement Mechanical Room	Domestic Hot Water System	11	6	2.00	0.0	0	5	$20	$43	$12	1.6

DHW Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Manufacturer	Model	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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Central Plant	Building	1	Indirect System	Central Plant	Proxy Boiler	W		No						0.0	0	0	$0	$0	$0	0.0

Low-Flow Device Recommendations

	Recommendation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Rest Rooms & Locker Rooms	12	55	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	5	$22	$394	$220	7.9
Locker Rooms	12	83	Showerhead	2.50	1.50	0.0	0	26	$110	$7,412	$1,245	56.0

Plug Load Inventory

	Existing Conditions					
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?	Manufacturer	Model
Laundry Room	5	Clothes Dryer	3,000			
Laundry Room	5	Clothes Washer	1,500			
Building	4	Coffee Machine	800			
Building	48	Computer	125			
Building	4	Ceiling Fan	75			
Office 233	1	Laptop	45			
Building	5	Microwave	700			
Classroom 250 & Performance Room	4	Tread Mill	650			
Classroom 250	1	Medical Freezer	1,200		Panasonic	MDF-CRV1
Concession Stand	2	Food Warmers	800			
Office 231	1	Medical Bed	450		Lunar	Prodigy
Pool Room	1	Projection Screen	600			
Room 271	1	Body Composition Equipment	500		Bod Pod	
Weight Room	1	LED Clock	100			
Building	2	Paper Shredder	150			
Building	11	Small/Medium Printer	150			
Building	2	Large Printer/Copier	300			
Building	6	Projector	175			
Building	7	Mini Fridge	260			
Building	3	Residential Refrigerator	800			
Building	34	Small/Medium Speaker	300			
Building	9	TV	125			
Offices	1	Water Cooler	1,500			
Building	1	Misc. Equipment	24,915			

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	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
First Floor Hallway	1	Non-Refrigerated	13	Yes	0.0	343	0	$50	$230	$0	4.6
First Floor Hallway	1	Refrigerated	13	Yes	0.2	1,612	0	$237	$230	$50	0.8

Custom (High Level) Measure Analysis

Retro-Commissioning Study

Building Square Footage	99,661	Fuel Utility Rate	$4.231	MMBtu
Percent of Conditioned Area Impacted	100%	Blended Electric Utility Rate	$0.147	kWh

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 Fuel Usage MMBtu	Description	% Savings HVAC Motor Usage kWh	% Savings HVAC Electric Usage kWh	% Savings HVAC Fuel Usage MMBtu	Estimated Cost per Sqft	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
HVAC Controls Not Currently Optimized	HVAC Equipment & Systems	3	1,130,562	352,991	18,235	Retro-Commissioning Study	2%	2%	2%	$0.30	0.00	29,671	365	$5,908	$29,898	$0	5.06

Sub Metering

Existing Conditions					Proposed Conditions					Energy Impact & Financial Analysis						
Description	Existing Main Meter Annual kWh	Electric (kWh)	Steam (MMBtu)	Chilled Water (MMBtu)	Description	% Electric Savings	% Gas Savings	Number of Meters	Estimated Unit Cost	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Payback w/ Incentives in Years
Campus Wide Metering	No Current Metering	2,413,455	11,208	7,125	Electric Smart Sub Meter, Steam Flow and Chilled Water Meters	1%	1%	3	Varies	0.00	24,135	183	$4,326	$18,800	$0	4.35

Automatic Pool Cover

Existing Conditions				Proposed Conditions			Energy Impact & Financial Analysis						
Description	Pool Heating System	Evaporation Heat Loss (MMBtu/yr)	Evaporation Water Loss (gal/yr)	Description	Evaporation Heat Loss (MMBtu)	Evaporation Water Loss (gal/yr)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Estimated M&L Cost ($)	Total Incentives	Simple Payback w/ Incentives in Years
Swimming Pool	Heat Exchanger	3,739	354,752	Semi-automatic Cover for Swimming Pool	2,649	251,282	0	0	1,090	$4,612	$122,300	$0	26.52

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.

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ENERGY STAR® Statement of Energy Performance

N/A

ENERGY STAR® Score[1]

The College of New Jersey

Primary Property Type: College/University
Gross Floor Area (ft²): 2,830,421
Built: 1855

For Year Ending: January 31, 2020
Date Generated: December 13, 2020

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
The College of New Jersey 2000 Pennington Road Ewing, New Jersey 08628	The College of New Jersey 2000 Pennington Rd Ewing, NJ 08628 609-771-2874	David Matlack 2000 Pennington Road Ewing, NJ 08628 609-771-2874 sstewart@trccompanies.com

Property ID: 5984875

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
229 kBtu/ft²

Source EUI
258.3 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	619,522,872 (96%)
Electric - Grid (kBtu)	28,774,949 (4%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	160.2
National Median Source EUI (kBtu/ft²)	180.6
% Diff from National Median Source EUI	43%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	35,660

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

LP Signature: _____ Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer or Registered Architect 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.
TREC	*Transition Incentive Renewable Energy Certificate:* a factorized renewable energy certificate 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.