Local Government Energy Audit Report

Knollwood School

October 14, 2019

Prepared for:

Fair Haven Public Schools
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Prepared by:

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

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

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

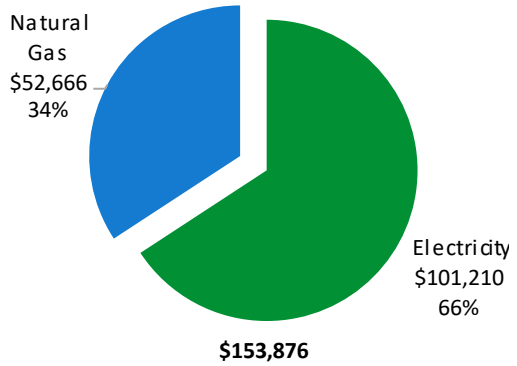
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

Table of Contents

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Knollwood School. 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 Companies Inc. (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: $153,876 Electricity: 845,200 kWh Natural Gas: 56,571 Therms	
ENERGY STAR® Benchmarking Score	20 *(1-100 scale)*	This building performs below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

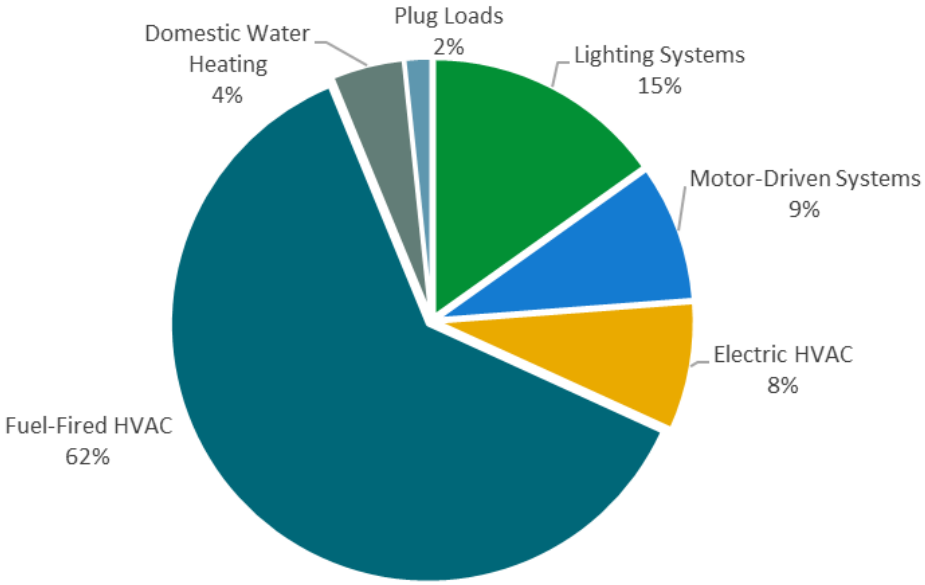


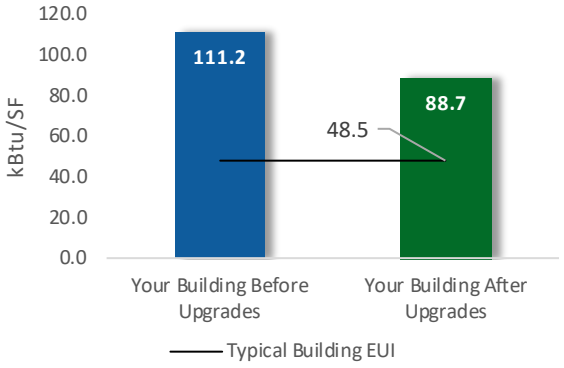
Figure 1 - Energy Use by System

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.

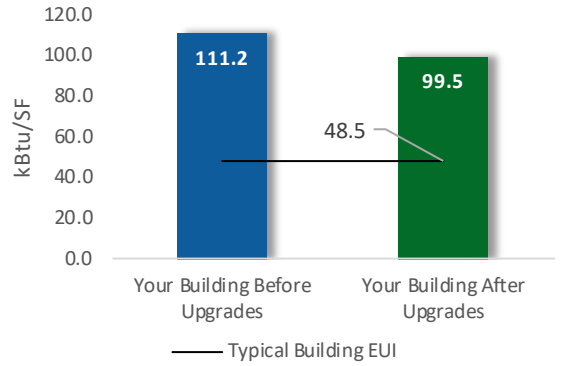
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$639,383
Potential Rebates & Incentives[1]	$33,347
Annual Cost Savings	$42,550
Annual Energy Savings	Electricity: 351,194 kWh Natural Gas: 5,311 Therms
Greenhouse Gas Emission Savings	208 Tons
Simple Payback	14.2 Years
Site Energy Savings (all utilities)	20%



Scenario 2: Cost Effective Package[2]

Installation Cost	$128,030
Potential Rebates & Incentives	$22,877
Annual Cost Savings	$32,957
Annual Energy Savings	Electricity: 279,434 kWh
Greenhouse Gas Emission Savings	138 Tons
Simple Payback	3.2 Years
Site Energy Savings (all utilities)	11%



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 ($)	Lifetime Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**224,728**	**40.8**	**-44**	**$26,497**	**$397,460**	**$94,372**	**$19,767**	**$74,605**	**2.8**	**221,104**
ECM 1	Install LED Fixtures	Yes	43,025	6.9	-6	$5,092	$76,384	$37,149	$6,155	$30,994	6.1	42,573
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	6,815	1.8	-1	$803	$12,041	$2,486	$420	$2,066	2.6	6,695
ECM 3	Retrofit Fixtures with LED Lamps	Yes	172,957	31.9	-36	$20,375	$305,621	$53,507	$13,192	$40,315	2.0	169,937
ECM 4	Install LED Exit Signs	Yes	1,932	0.1	0	$228	$3,415	$1,231	$0	$1,231	5.4	1,899
Lighting Control Measures			**46,664**	**8.6**	**-10**	**$5,497**	**$43,976**	**$26,081**	**$2,590**	**$23,491**	**4.3**	**45,848**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	41,764	7.7	-9	$4,920	$39,358	$20,906	$2,590	$18,316	3.7	41,034
ECM 6	Install High/Low Lighting Controls	Yes	4,900	0.9	-1	$577	$4,618	$5,175	$0	$5,175	9.0	4,814
Variable Frequency Drive (VFD) Measures			**27,366**	**4.4**	**0**	**$3,277**	**$49,155**	**$37,403**	**$520**	**$36,883**	**11.3**	**27,557**
ECM 7	Install VFDs on Constant Volume (CV) Fans	Yes	8,042	1.9	0	$963	$14,445	$7,577	$520	$7,057	7.3	8,098
ECM 8	Install VFDs on Heating Water Pumps	No	19,324	2.5	0	$2,314	$34,710	$29,826	$0	$29,826	12.9	19,459
Electric Unitary HVAC Measures			**29,339**	**25.1**	**0**	**$3,513**	**$52,699**	**$224,988**	**$6,311**	**$218,677**	**62.2**	**29,544**
ECM 9	Install High Efficiency Air Conditioning Units	No	29,339	25.1	0	$3,513	$52,699	$224,988	$6,311	$218,677	62.2	29,544
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**45**	**$418**	**$8,366**	**$70,023**	**$4,159**	**$65,863**	**157.5**	**5,261**
ECM 10	Install High Efficiency Steam Boilers	No	0	0.0	45	$418	$8,366	$70,023	$4,159	$65,863	157.5	5,261
HVAC System Improvements			**1,718**	**0.0**	**17**	**$362**	**$5,432**	**$9,516**	**$0**	**$9,516**	**26.3**	**3,697**
ECM 11	Implement Demand Control Ventilation (DCV)	No	1,718	0.0	17	$362	$5,432	$9,516	$0	$9,516	26.3	3,697
Custom Measures			**21,379**	**0.0**	**524**	**$2,985**	**$44,770**	**$177,000**	**$0**	**$177,000**	**59.3**	**82,827**
ECM 12	Installation of an Energy Management System	No	21,379	0.0	524	$2,985	$44,770.04	$177,000	$0	$177,000	59.3	82,827
TOTALS (COST EFFECTIVE MEASURES)			**279,434**	**51.3**	**-54**	**$32,957**	**$455,882**	**$128,030**	**$22,877**	**$105,153**	**3.2**	**275,050**
TOTALS (ALL MEASURES)			**351,194**	**78.9**	**531**	**$42,550**	**$601,858**	**$639,383**	**$33,347**	**$606,036**	**14.2**	**415,839**

* - 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 LED Exit Signs			x
ECM 5	Install Occupancy Sensor Lighting Controls	X		x
ECM 6	Install High/Low Lighting Controls			x
ECM 7	Install VFDs on Constant Volume (CV) HVAC	X		x
ECM 8	Install VFDs on Hot Water Pumps			x
ECM 9	Install High Efficiency Electric AC	X		x
ECM 10	Install High Efficiency Steam Boilers	X		x
ECM 11	Implement Demand Control Ventilation			x
ECM 12	Installation of an Energy management System			x

Figure 3 – Funding Options

New Jersey's Clean Energy Programs At-A-Glance

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

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

Individual Measures with SmartStart

For facilities wishing to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate, you can use internal resources or an outside firm or contractor to perform the final design of the ECM(s) and install the equipment. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation.

Turnkey Installation with Direct Install

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

Whole Building Approach with Pay for Performance

Pay for Performance can be a good option for medium to large sized facilities to achieve deep energy savings. Pay for Performance allows you to install as many measures as possible under a single project as well as address measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also use this program. Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings.

More Options from Around the State

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the ESIP. Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. You have already taken the first step as an LGEA customer, because this report is required to participate in ESIP.

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

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

Ongoing Electric Savings with Demand Response

The Demand Response Energy Aggregator program reduces electric loads at commercial facilities when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. By enabling commercial facilities to reduce electric demand during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment service providers provide regular payments to medium and large consumers of electric power for their participation in demand response (DR) programs. Program participation is voluntary, and facilities receive payments regardless of whether they are called upon to curtail their load during times of peak demand.

2 EXISTING CONDITIONS

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Knollwood School. 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 June 27, 2019, TRC performed an energy audit at Knollwood School located in Fair Haven, New Jersey. TRC met with Thomas Buffa to review the facility operations and help focus our investigation on specific energy-using systems.

Knollwood School is a 2-story, 76,790 square foot building built in 1925. Spaces include classrooms, gymnasium, media center, an all-purpose room, offices, cafeteria, corridors, and stairwells. The building is 100% heated and 90% cooled. Sections of the newer addition house the Fair Haven Board of Education offices.

2.2 Building Occupancy

The facility is occupied year-round, from September through June. Typical weekday occupancy is 650 staff and students. The facility is also open on Saturdays from 8 am to 3 pm for 6 months of the year. It should be noted that the energy and economic analysis for this building is based on the use of the building during the utility billing period, and that results will vary based on changes to building use patterns. The typical schedule is presented in the table below.

Building Name	Weekday/Weekend	Operating Schedule
Knollwood School - General Operation Hours	Weekday	6:00 am - 10:30 pm
	Weekend	Closed
Knollwood School - General Class Hours	Weekday	8:05 am - 2:55 pm
	Weekend	Closed

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

The Knollwood School was constructed in two phases. The original building was built in 1925 and another building was constructed alongside the original one to accommodate additional classrooms, offices, a multipurpose room, and other spaces. The original building is two-story, while the newer addition is a one-story building. The two buildings are connected.

Building walls are formed from concrete of masonry units (CMU) over structural steel, with a brick facade. The building has flat and pitched roof sections. The white membrane flat roofing was replaced within the last five years. It is in good condition. The asphalt shingled roof sections are also in good condition. The windows are double paned with aluminum frames. The glass-to-frame seals are in good condition. Window frame seals are in good condition, showing little evidence of excessive wear. Exterior doors are metal or aluminum frames with glass. Overall, the building envelope is in good condition.

Old & Newer Buildings

Pitched & Flat Roofs, Metal Frame Exterior Door

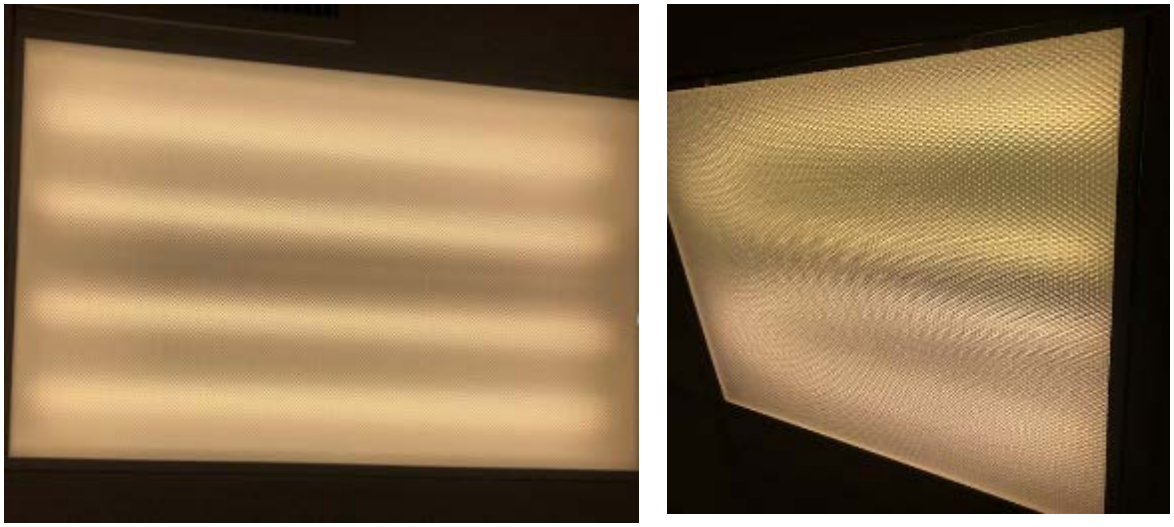
Aluminum Frames Exterior Doors & Windows

2.4 Lighting Systems

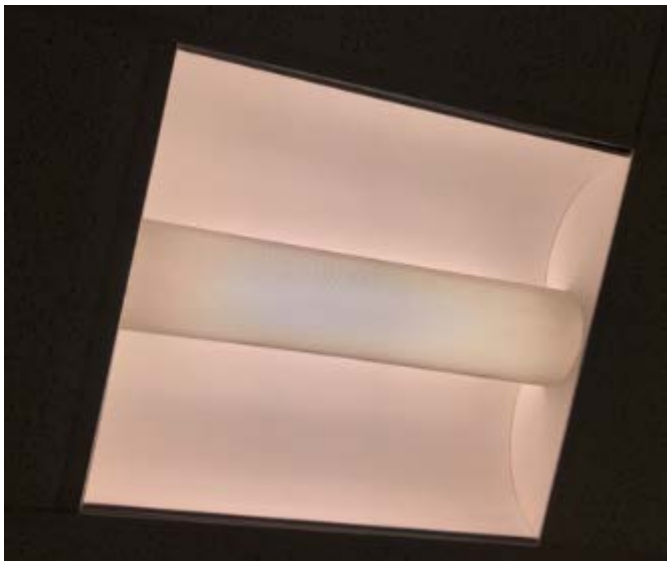
The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps with electronic ballasts. Fixtures include 2, 3 and 4-lamp, 4-foot long surface mounted wraparound, recessed troffers and pendant mounted units. The hallways and the main lobby are lit with 2-lamp, 4-foot linear fluorescent T8 fixtures. The restrooms are lit with linear fluorescent 32-Watt U-bend lamps. Some classrooms are equipped with 3-lamp, 4-foot T8 linear fluorescent fixtures, while others are equipped with 4-lamp, 4-foot T8 linear fluorescent fixtures. The gymnasium is lit with 400-Watt metal halide lamps while the all-purpose room is illuminated by T5HO linear fluorescent sources. Additionally, there are several compact fluorescent lamps (CFLs) and linear fluorescent T12 lamps. The linear fluorescent T12 lamps are found in the maintenance shop, the garage, and the storage shed. CFLs are located in the building entrances and in some rest rooms and classrooms. Exit signs are a combination of LED, fluorescent, and incandescent fixtures.

Interior lights are controlled mostly by wall switches except the restrooms, which are equipped with ceiling mounted occupancy sensors. Interior lighting levels were generally sufficient. Some fixtures are in poor condition.

Exterior fixtures include two 100-Watt high pressure sodium (HPS), nine 50-Watt metal halide, and four 32-Watt CFLs recessed mounted fixtures, and 23 100-Watt metal halide wall mounted fixtures. Exterior light fixtures are controlled timers and wall switches.



Linear Fluorescent T8 & U-Bend Fixtures



Surfaced & Recessed Mounted T8 Fixtures

Recessed CFL & Exit Sign, Ceiling Mounted Occupancy Sensor

Exterior Recessed & Wall Mounted Fixtures

2.5 Air Handling Systems

Packaged Units

There are 15 rooftop units (RTUs) that provide cooling to various building spaces including classrooms. They are a mix of Carrier and AAON direct expansion (DX) units. Most are constant volume, however, RTU7 and RTU8 are variable volume packaged units. They range from 6 to 40 ton and use R-22 as a refrigerant. The only Trane unit, RTU13, serves the all-purpose room and is equipped with a gas-fired section that has a heating capacity of 320 MBh and a combustion efficiency of 80%.

Air is distributed through supply air registers using ducts concealed above the ceilings. Return air grilles are located in each space. Heated and/or cooled air is distributed through ducts to variable air volume (VAV) terminals that are damper operated and concealed above the ceilings in each space. The AAON RTUs are nearing the end of their useful live. The RTUs are controlled with a building management system (BMS) that has limited capacity. Staff believes it should be upgraded.

Refer to Appendix A for detailed information about each unit.

Carrier & AAON RTUs

Trane RTU & Supply/Return Fans VFDs

Air Conditioners

Building areas including the server room, the main office, and other small offices are cooled using split system air conditioning (AC) units. There are five split system ACs that vary in capacity between 0.8 to 5 ton. Three of the units are in poor condition while the remaining two appear in good working condition. The AC units are controlled with local and programmable thermostats.

Room 108 is served by a 1 ton Emerson window unit which appears in poor condition.

Split System ACs

Indoor Evaporator & Programmable Thermostat

General Building Exhaust System

There are numerous fractional horsepower exhaust fans located throughout the building serving the restrooms and other areas. Exhaust fans are controlled by manual switch.

2.6 Heating Hot Water/Steam Systems

Two Smith 1,733 MBh forced draft steam boilers serve the building "old section" heating load. The boilers have a nominal combustion efficiency of 80%. Each boiler has a 1 hp forced draft fan with discharge dampers to control the volume of combustion air. There are two 0.8 hp boiler feed water pumps. Heating hot water is supplied to hydronic baseboards and unit heaters through two heat exchangers. The heating loop is equipped with two 2 hp (3 & 4) and four 3 hp (1, 2, 5 & 6) constant flow hot water pumps. The boilers operate during the summer months for reheat. These boilers are 23 years and appear in poor condition and have been evaluated for replacement.

The newer section of the building heating load is served by a 1,200 MBh output Hydro Therm modular hot water boiler. The boiler is within its useful life and appears to be in good condition. It has a combustion efficiency of 80%. Heating hot water is supplied to hydronic baseboards and unit heaters using two 3 hp constant flow hot water pumps.

There is an opportunity for energy savings by installing variable frequency drives (VFDs) to control the hot water pump motors. Space heating control is provided by local thermostats, which are tied into the BMS.

Steam Boilers & Hot Water Pump

Hydro Therm Modular Boiler & Hot 3 hp Water Pump

2.7 Building Energy Management Systems (EMS)

The site reported that the HVAC system is controlled using a BMS system with very limited capacity. We were not able to access the control system as a part of the audit. The site has expressed a great interest in upgrading the BMS system.

2.8 Domestic Hot Water

Hot water is produced by three A. O Smith gas-fired water heaters. The old section is served with a 100 gallon 250 MBh storage water heater. The hot water for the newer section is produced by two water heaters: one 74 gallon 75 MBh storage tank water heater and one 65 gallon 65 MBh unit. The water heaters are 80% efficient and all appear in good condition. They are located in boiler room A, B ,and the electrical room respectively.

100 gallon & 74 gallon Water Heaters

2.9 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 2% percent of total building energy use. This is lower than a typical building.

The location is doing a great job managing the electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 38 computer work stations and 600 chrome books throughout the facility. Plug loads throughout the building include general office equipment. There are classroom typical loads such as smart boards and projectors.

There are several residential style refrigerators, microwaves, and coffee machines throughout the building.

Copy Machines

2.10 Water-Using Systems

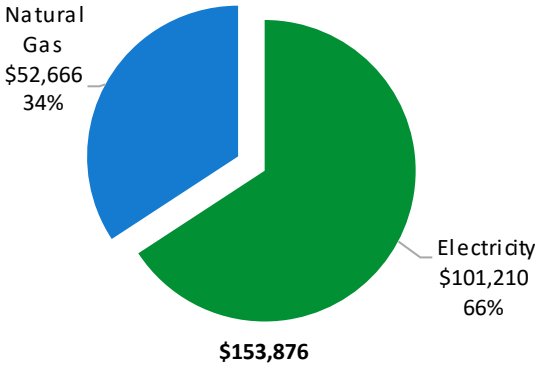
There are several restrooms with toilets, urinals, and sinks. Faucet flow are rated as low.

Typical Restroom Sinks

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	845,200 kWh	$101,210
Natural Gas	56,571 Therms	$52,666
Total		**$153,876**



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.

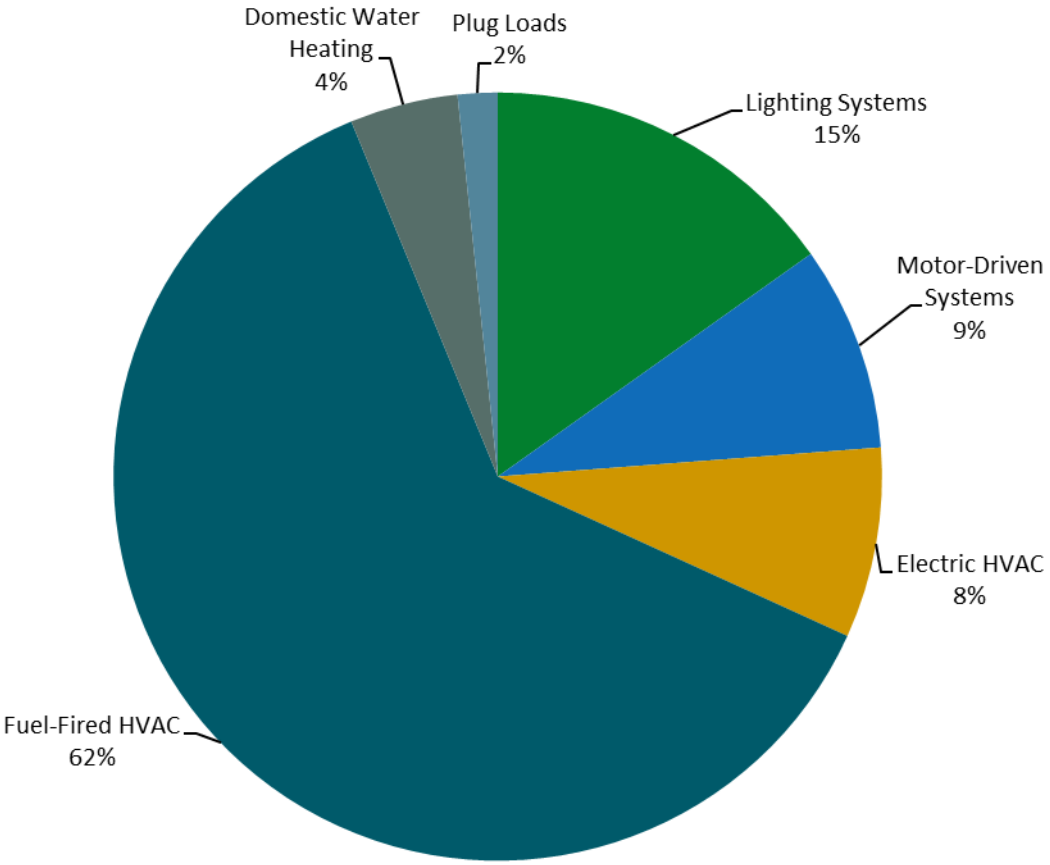
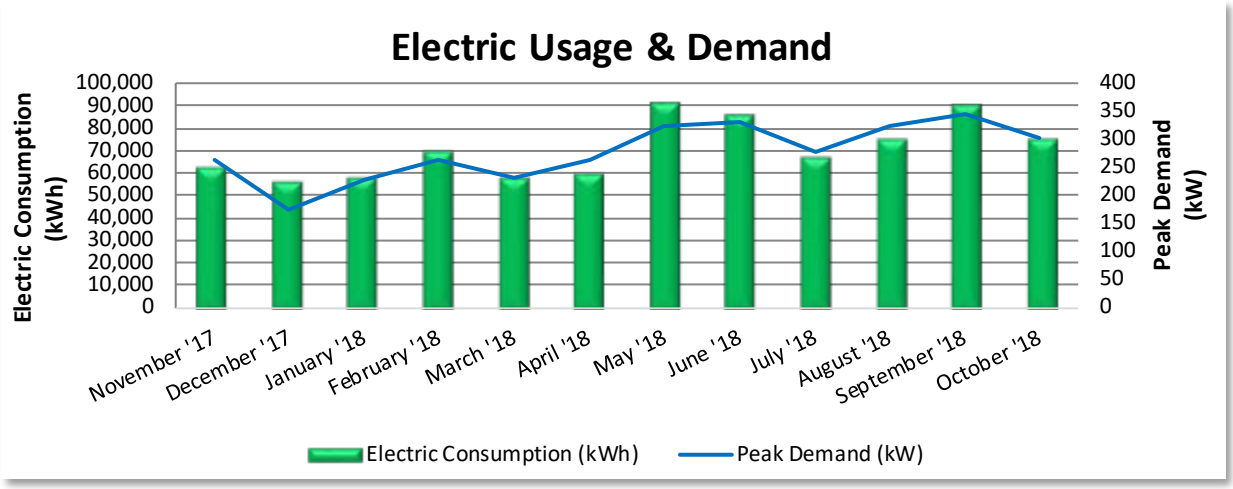


Figure 5 - Energy Balance

3.1 Electricity

JCP&L delivers electricity under rate class General Services Secondary 3 Phase.



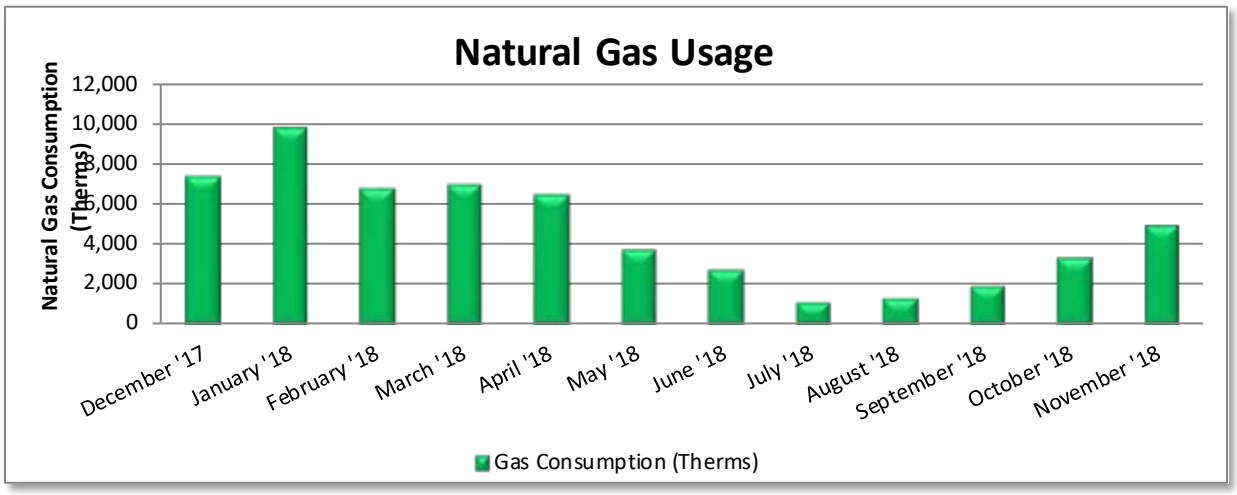
Electric Billing Data					
Period Ending	**Days in Period**	**Electric Usage (kWh)**	**Demand (kW)**	**Demand Cost**	**Total Electric Cost**
12/5/17	31	62,000	264	$1,679	$7,401
1/5/18	31	56,000	173	$1,091	$6,260
2/2/18	28	58,080	229	$1,447	$6,803
3/6/18	31	69,200	263	$1,671	$8,040
4/4/18	30	57,440	230	$1,444	$6,739
5/3/18	31	59,440	263	$1,586	$7,076
6/4/18	30	90,960	325	$2,123	$10,495
7/5/18	31	85,120	330	$2,151	$9,992
8/3/18	31	66,960	279	$1,808	$7,996
9/4/18	30	75,120	325	$2,121	$9,056
10/3/18	31	89,840	347	$2,110	$11,599
11/2/18	30	75,040	303	$1,836	$9,753
Totals	**365**	**845,200**	**347**	**$21,068**	**$101,210**
Annual	**365**	**845,200**	**347**	**$21,068**	**$101,210**

Notes:

- Peak demand of 347 kW occurred in October '18.
- The average electric cost over the past 12 months was $0.120/kWh, which is the blended rate that includes energy supply, distribution, demand, and other charges. This report uses this blended rate to estimate energy cost savings.

3.2 Natural Gas

New Jersey Natural Gas delivers natural gas under rate class Monthly 057CNN2G, with natural gas supply provided by SJE, a third-party supplier.



Gas Billing Data			
Period Ending	**Days in Period**	**Natural Gas Usage (Therms)**	**Natural Gas Cost**
12/22/17	31	7,319	$6,744
1/23/18	31	9,741	$8,460
2/21/18	28	6,786	$6,092
3/22/18	31	6,962	$6,231
4/23/18	30	6,458	$5,697
5/23/18	31	3,790	$3,590
6/21/18	30	2,723	$2,759
7/24/18	31	1,149	$1,538
8/21/18	31	1,331	$1,678
9/19/18	30	1,964	$2,168
10/19/18	31	3,392	$3,258
11/19/18	30	4,955	$4,451
Totals	**365**	**56,571**	**$52,666**
Annual	**365**	**56,571**	**$52,666**

Notes:

- The average gas cost for the past 12 months is $0.931/therm, which is the blended rate used throughout the analysis.
- Some of the gas use during the summer months can be attributed to the boilers usage as part of the reheat system.

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	20

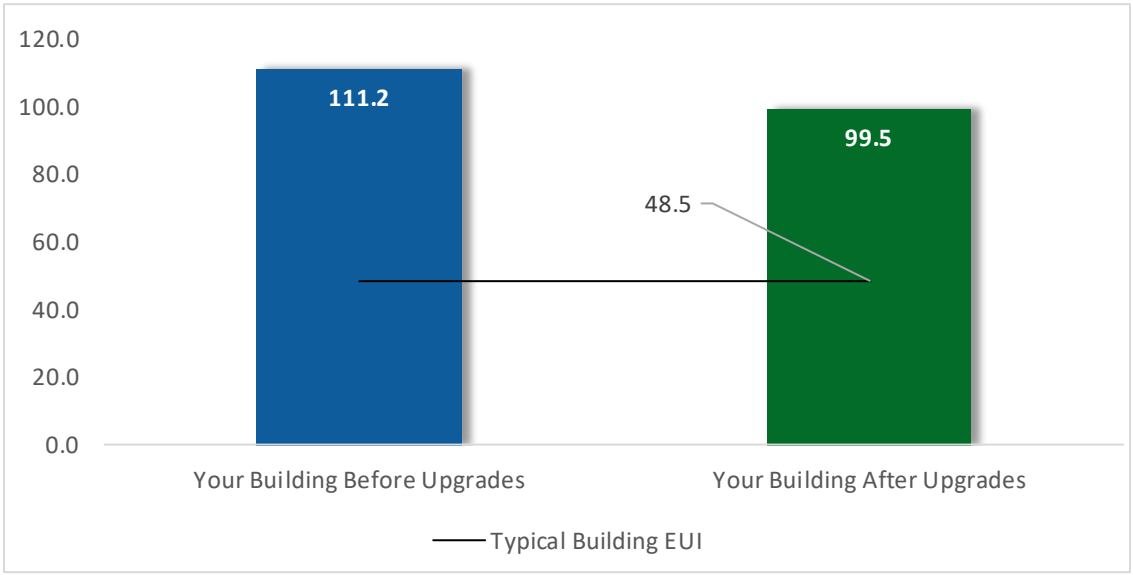


Figure 6 - Energy Use Intensity Comparison

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

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

Tracking Your Energy Performance

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

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

Free online training is available to help you use ENERGY STAR® Portfolio Manager® to track your building's performance at: https://www.energystar.gov/buildings/training.

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

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

4 Energy Conservation Measures

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

Calculations of energy use and savings are based on the current version of the *New Jersey'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	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**224,728**	**40.8**	**-44**	**$26,497**	**$94,372**	**$19,767**	**$74,605**	**2.8**	**221,104**
ECM 1	Install LED Fixtures	43,025	6.9	-6	$5,092	$37,149	$6,155	$30,994	6.1	42,573
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	6,815	1.8	-1	$803	$2,486	$420	$2,066	2.6	6,695
ECM 3	Retrofit Fixtures with LED Lamps	172,957	31.9	-36	$20,375	$53,507	$13,192	$40,315	2.0	169,937
ECM 4	Install LED Exit Signs	1,932	0.1	0	$228	$1,231	$0	$1,231	5.4	1,899
Lighting Control Measures		**46,664**	**8.6**	**-10**	**$5,497**	**$26,081**	**$2,590**	**$23,491**	**4.3**	**45,848**
ECM 5	Install Occupancy Sensor Lighting Controls	41,764	7.7	-9	$4,920	$20,906	$2,590	$18,316	3.7	41,034
ECM 6	Install High/Low Lighting Controls	4,900	0.9	-1	$577	$5,175	$0	$5,175	9.0	4,814
Variable Frequency Drive (VFD) Measures		**27,366**	**4.4**	**0**	**$3,277**	**$37,403**	**$520**	**$36,883**	**11.3**	**27,557**
ECM 7	Install VFDs on Constant Volume (CV) Fans	8,042	1.9	0	$963	$7,577	$520	$7,057	7.3	8,098
ECM 8	Install VFDs on Heating Water Pumps	19,324	2.5	0	$2,314	$29,826	$0	$29,826	12.9	19,459
Electric Unitary HVAC Measures		**29,339**	**25.1**	**0**	**$3,513**	**$224,988**	**$6,311**	**$218,677**	**62.2**	**29,544**
ECM 9	Install High Efficiency Air Conditioning Units	29,339	25.1	0	$3,513	$224,988	$6,311	$218,677	62.2	29,544
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**45**	**$418**	**$70,023**	**$4,159**	**$65,863**	**157.5**	**5,261**
ECM 10	Install High Efficiency Steam Boilers	0	0.0	45	$418	$70,023	$4,159	$65,863	157.5	5,261
HVAC System Improvements		**1,718**	**0.0**	**17**	**$362**	**$9,516**	**$0**	**$9,516**	**26.3**	**3,697**
ECM 11	Implement Demand Control Ventilation (DCV)	1,718	0.0	17	$362	$9,516	$0	$9,516	26.3	3,697
Custom Measures		**21,379**	**0.0**	**524**	**$2,985**	**$177,000**	**$0**	**$177,000**	**59.3**	**82,827**
ECM 12	Installation of an Energy Management System	21,379	0.0	524	$2,985	$177,000	$0	$177,000	59.3	82,827
TOTALS		**351,194**	**78.9**	**531**	**$42,550**	**$639,383**	**$33,347**	**$606,036**	**14.2**	**415,839**

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

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

Figure 7 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**224,728**	**40.8**	**-44**	**$26,497**	**$94,372**	**$19,767**	**$74,605**	**2.8**	**221,104**
ECM 1	Install LED Fixtures	43,025	6.9	-6	$5,092	$37,149	$6,155	$30,994	6.1	42,573
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	6,815	1.8	-1	$803	$2,486	$420	$2,066	2.6	6,695
ECM 3	Retrofit Fixtures with LED Lamps	172,957	31.9	-36	$20,375	$53,507	$13,192	$40,315	2.0	169,937
ECM 4	Install LED Exit Signs	1,932	0.1	0	$228	$1,231	$0	$1,231	5.4	1,899
Lighting Control Measures		**46,664**	**8.6**	**-10**	**$5,497**	**$26,081**	**$2,590**	**$23,491**	**4.3**	**45,848**
ECM 5	Install Occupancy Sensor Lighting Controls	41,764	7.7	-9	$4,920	$20,906	$2,590	$18,316	3.7	41,034
ECM 6	Install High/Low Lighting Controls	4,900	0.9	-1	$577	$5,175	$0	$5,175	9.0	4,814
Variable Frequency Drive (VFD) Measures		**8,042**	**1.9**	**0**	**$963**	**$7,577**	**$520**	**$7,057**	**7.3**	**8,098**
ECM 7	Install VFDs on Constant Volume (CV) Fans	8,042	1.9	0	$963	$7,577	$520	$7,057	7.3	8,098
TOTALS		**279,434**	**51.3**	**-54**	**$32,957**	**$128,030**	**$22,877**	**$105,153**	**3.2**	**275,050**

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

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

Figure 8 – Cost Effective ECMs

4.1 Lighting

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**224,728**	**40.8**	**-44**	**$26,497**	**$94,372**	**$19,767**	**$74,605**	**2.8**	**221,104**
ECM 1	Install LED Fixtures	43,025	6.9	-6	$5,092	$37,149	$6,155	$30,994	6.1	42,573
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	6,815	1.8	-1	$803	$2,486	$420	$2,066	2.6	6,695
ECM 3	Retrofit Fixtures with LED Lamps	172,957	31.9	-36	$20,375	$53,507	$13,192	$40,315	2.0	169,937
ECM 4	Install LED Exit Signs	1,932	0.1	0	$228	$1,231	$0	$1,231	5.4	1,899

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

ECM 1: Install LED Fixtures

Replace existing fixtures containing HID (metal halide and HPS) 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: gymnasium and exterior fixtures.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Retrofit fluorescent T12 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: maintenance shop, garage, and storage shed.

ECM 3: Retrofit Fixtures with LED Lamps

Replace fluorescent T8, HID, CFL lamps with LED lamps. Many LED tubes are direct replacements for existing fluorescent tubes and can be installed while leaving the fluorescent fixture ballast in place. LED lamps can be used in existing fixtures as a direct replacement for most other lighting technologies.

This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Maintenance savings may also be available, as longer-lasting LEDs lamps will not need to be replaced as often as the existing lamps.

Affected building areas: all interior areas with fluorescent fixtures with T8 tubes and the front recessed CFL lamps.

ECM 4: Install LED Exit Signs

Replace incandescent and compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output. Maintenance savings and improved reliability may also be achieved, as the longer-lasting LED lamps will not need to be replaced as often as the existing lamps.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**46,664**	**8.6**	**-10**	**$5,497**	**$26,081**	**$2,590**	**$23,491**	**4.3**	**45,848**
ECM 5	Install Occupancy Sensor Lighting Controls	41,764	7.7	-9	$4,920	$20,906	$2,590	$18,316	3.7	41,034
ECM 6	Install High/Low Lighting Controls	4,900	0.9	-1	$577	$5,175	$0	$5,175	9.0	4,814

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 5: 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: Offices, conference rooms, classrooms, library, restrooms, and storage rooms.

ECM 6: Install High/Low Lighting Controls

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

Lighting fixtures with these controls operate at default low levels when the area is unoccupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. When an occupant enters the space, the lighting fixtures switch to full lighting levels. Fixtures automatically switch back to low levels 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 control lowers the light level by dimming the fixture output. Therefore, the controlled fixtures need to have a dimmable ballast or driver. This will need to be taken into account when selecting retrofit lamps and bulbs for the areas proposed for high/low control.

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

Affected building areas: hallways.

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

4.3 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**27,366**	**4.4**	**0**	**$3,277**	**$37,403**	**$520**	**$36,883**	**11.3**	**27,557**
ECM 7	Install VFDs on Constant Volume (CV) Fans	8,042	1.9	0	$963	$7,577	$520	$7,057	7.3	8,098
ECM 8	Install VFDs on Heating Water Pumps	19,324	2.5	0	$2,314	$29,826	$0	$29,826	12.9	19,459

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 motor to conservatively account for the cost of an inverter duty rated motor.

Premium efficiency motors have been proposed to be installed only in conjunction with proposed variable frequency drive (VFD) motor measures. Non inverter duty rated motors will need to be replaced when the VFD measure is implemented.

ECM 7: Install VFDs on Constant Volume (CV) Fans

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

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

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

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

Affected air system: RTU5.

ECM 8: Install VFDs on Heating Water Pumps

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

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

Affected pumps: 2 and 3 hp hot water pumps serving the old and newer sections heating hot water loops.

4.4 Electric Unitary HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**29,339**	**25.1**	**0**	**$3,513**	**$224,988**	**$6,311**	**$218,677**	**62.2**	**29,544**
ECM 9	Install High Efficiency Air Conditioning Units	29,339	25.1	0	$3,513	$224,988	$6,311	$218,677	62.2	29,544

ECM 9: Install High Efficiency Air Conditioning Units

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

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

4.5 Gas-Fired Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**45**	**$418**	**$70,023**	**$4,159**	**$65,863**	**157.5**	**5,261**
ECM 10	Install High Efficiency Steam Boilers	0	0.0	45	$418	$70,023	$4,159	$65,863	157.5	5,261

ECM 10: Install High Efficiency Steam Boilers

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

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

Replacing the two steam boilers serving the old section has a long payback based on energy savings and may not be justifiable based simply on energy considerations. However, the boilers [are nearing, have reached] the end of their normal useful life. Typically, the marginal cost of purchasing high efficiency boilers can be justified by the marginal savings from the improved efficiency. When the boilers are eventually replaced, consider purchasing boilers that exceed the minimum efficiency required by building codes.

4.6 HVAC

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**1,718**	**0.0**	**17**	**$362**	**$9,516**	**$0**	**$9,516**	**26.3**	**3,697**
ECM 11	Implement Demand Control Ventilation (DCV)	1,718	0.0	17	$362	$9,516	$0	$9,516	26.3	3,697

ECM 11: Implement Demand Control Ventilation (DCV)

Demand control ventilation (DCV) monitors the indoor air's carbon dioxide (CO_2) content to measure room occupancy. This data is used to regulate the amount of outdoor air provided to the space for ventilation.

Standard ventilation systems often provide outside air based on a space's estimated maximum occupancy but not actual occupancy. During low occupancy periods, the space may then be over ventilated. This wastes energy through heating and cooling the excess outside air flow. DCV reduces unnecessary outdoor air intake by regulating ventilation based on actual occupancy levels. DCV is most suited for facilities where occupancy levels vary significantly from hour to hour and day to day.

Energy savings associated with DCV are based on hours of operation, space occupancy, outside air reduction, and other factors. Energy savings results from eliminating unnecessary ventilation and space conditioning.

Affected building areas: all-purpose room and library.

4.7 Custom Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Custom Measures		**21,379**	**0.0**	**524**	**$2,985**	**$177,000**	**$0**	**$177,000**	**59.3**	**82,827**
ECM 12	Installation of an Energy Management System	21,379	0.0	524	$2,985	$177,000	$0	$177,000	59.3	82,827

ECM 12: Installation of an Energy Management System

The installation of an Energy Management System (EMS) would increase the efficiency of the building HVAC system operation. This evaluation is provided at a high level as it is of great interest for facility personnel.

Upgrade of controls to optimize the start/stop of all key HVAC equipment and tying in all space temperature controls will minimize the amount of wasted energy. Schedules may be put in place to limit system operation when the building is closed. Temperature set back controls may be applied to operate systems only to the point necessary. Ventilation and economizer controls and programming would allow air handling units to operate according to room schedules, occupancy and availability for “free cooling” or “free heating”.

It is recommended that an HVAC engineer or contractor who specializes in energy management systems be contacted for a detailed evaluation and implementation costs. For the purposes of this report, the potential energy savings and measure costs were estimated based on industry standards and previous project experience. Further analysis should be conducted for the feasibility of this measure. This is not an investment grade analysis nor should be used as a basis for design and construction.

5 ENERGY EFFICIENT BEST PRACTICES

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

Energy Tracking with ENERGY STAR® Portfolio Manager®

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

Doors and Windows

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

Lighting Maintenance

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

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

Lighting Controls

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

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

Motor Maintenance

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

Thermostat Schedules and Temperature Resets

Use thermostat setback temperatures and schedules to reduce heating and cooling energy use during periods of low or no occupancy. Thermostats should be programmed for a setback of 5-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

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.

Duct Sealing

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

Steam Trap Repair and Replacement

Steam traps are a crucial part of delivering heat from the boiler to the space heating units. Repair or replace traps that are blocked or allowing steam to pass. Inspect steam traps as part of a regular steam system maintenance plan.

Boiler Maintenance

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

Furnace Maintenance

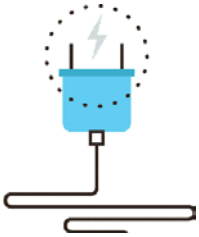
Preventative maintenance can extend the life of the system, maintain energy efficiency, and ensure safe operation. Following the manufacturer's instructions, a yearly tune-up should: check for gas / carbon monoxide leaks; change the air and fuel filters; check components for cracks, corrosion, dirt,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

Water Heater Maintenance

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

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

Plug Load Controls



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

Water Conservation

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

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

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

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

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

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.

[5] 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.

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

[7] 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.

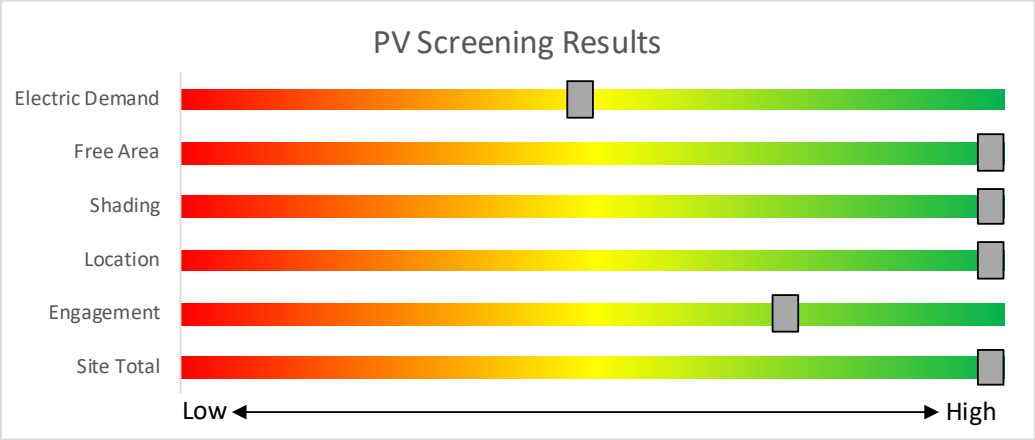
6.1 Solar Photovoltaic

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	268	kW DC STC
Electric Generation	319,287	kWh/yr
Displaced Cost	$38,230	/yr
Installed Cost	$696,800	

Figure 9 - Photovoltaic Screening

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

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

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

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

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

6.2 Combined Heat and Power

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

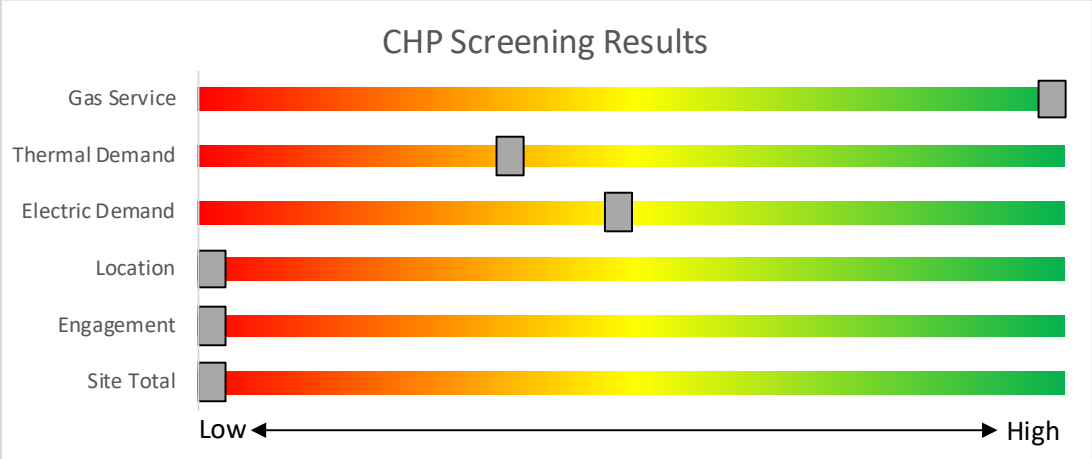
CHP systems typically produce a portion of the electric power used on-site, with the balance of electric power needs supplied by the local utility company. The heat is used to supplement (or replace) existing boilers and provide space heating and/or domestic hot water heating. Waste heat can also be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

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

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

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

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



Potential	None	
System Type	None	
System Potential	30	kW
Electric Generation	66,526	kWh/yr
Thermal Generation	1,115,705	MBtu/yr
Displaced Cost	$3,430	/yr
Installed Cost	$118,000	

Figure 10 - Combined Heat and Power Screening

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

7 PROJECT FUNDING AND INCENTIVES

Ready to improve your building's performance? 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.	Up to 25% of installation cost, calculated based on level of energy savings per square foot.
How do I participate?	Submit an application for the specific equipment to be installed.	Contact a participating contractor in your region.	Contact a pre-qualified Partner to develop your Energy Reduction Plan and set your energy savings targets.
Take the next step by visiting **www.njcleanenergy.com** for program details, applications, and to contact a qualified contractor.			

7.1 SmartStart

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

SmartStart routinely adds, removes, or modifies incentives from year-to-year for various energy efficient equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

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

Incentives

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

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

How to Participate

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

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

7.2 Direct Install

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

Incentives

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

How to Participate

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

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

7.3 Pay for Performance - Existing Buildings

Pay for Performance works for larger customers with a peak demand over 200 kW. The minimum installed scope of work must include at least two unique measures that results in at least 15% source energy savings, and lighting cannot make up the majority of the savings. P4P is a generally a good option for medium-to-large sized facilities looking to implement as many measures as possible under a single project to achieve deep energy savings. This program has an added benefit of addressing measures that may not qualify for other programs. Many facilities pursuing an Energy Savings Improvement Program loan also use this program.

Incentives

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

How to Participate

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

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

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

7.4 Combined Heat and Power

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

Incentives

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

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

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

How to Participate

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

7.5 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) serves New Jersey's government agencies by financing energy projects. An ESIP is a type of performance contract, whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. Annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive for the life of the contract.

ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs described above can also be used to help further reduce the total project cost of eligible measures.

How to Participate

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an energy services company or "ESCO."

(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.

(3) Use a hybrid approach of the two options described above where the ESCO is used for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the energy savings plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program 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 SREC Registration Program

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

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

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

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

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

8 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third-party supplier, consider shopping for a reduced rate from third-party electric suppliers. If your facility already buys electricity from a third-party supplier, review and compare prices at the end of each contract year.

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

8.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate monthly. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third-party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier typically depends on whether a customer prefers budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third-party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility does not already purchase natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility already purchases natural gas from a third-party supplier, review and compare prices at the end of each contract year.

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

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
External Wall Pack	23	Metal Halide: (1) 100W Lamp	Timeclock		128	4,380	1	Fixture Replacement	No	23	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	38	4,380	1.0	9,026	0	$1,081	$14,950	$2,300	11.7
Front Recessed	4	Compact Fluorescent: 4PIN	Wall Switch		32	3,630	3	Relamp	No	4	LED Lamps: LED Lamps	Wall Switch	22	3,630	0.0	139	0	$17	$101	$4	5.8
Back Recessed	2	High-Pressure Sodium: (1) 100W Lamp	Timeclock		138	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Downlight Recessed	Timeclock	41	4,380	0.1	846	0	$101	$304	$10	2.9
Courtyard Recessed	9	Metal Halide: (1) 50W Lamp	Timeclock		72	4,380	1	Fixture Replacement	No	9	LED - Fixtures: Downlight Recessed	Timeclock	22	4,380	0.2	1,987	0	$238	$1,366	$45	5.6
Courtyard Recessed	1	Exit Signs: Fluorescent	None		12	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	53	0	$6	$72	$0	11.5
Exit 14 Recessed	1	Compact Fluorescent: 4PIN	Timeclock		32	4,380	3	Relamp	No	1	LED Lamps: LED Lamps	Timeclock	22	4,380	0.0	42	0	$5	$25	$1	4.8
Boiler Room A	4	Compact Fluorescent: Screw In	Wall Switch	S	42	3,630	3	Relamp	No	4	LED Lamps: LED Lamps	Wall Switch	29	3,630	0.0	201	0	$24	$69	$4	2.7
Boiler Room A	1	Exit Signs: Incandescent	None		45	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	376	0	$44	$72	$0	1.6
Boiler Room B	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,630	0.1	527	0	$62	$146	$40	1.7
Boiler Room B	1	Exit Signs: Fluorescent	None		12	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	58	0	$7	$72	$0	10.6
Old Section 1st Room Hallway	27	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3, 6	Relamp	Yes	27	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,505	0.8	4,527	-1	$533	$1,886	$270	3.0
Old Section 1st Room Hallway	10	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	10	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Old Section 1st Room Hallway	1	Compact Fluorescent: 4PIN	Wall Switch	S	26	3,630	3	Relamp	No	1	LED Lamps: LED Lamps	Wall Switch	18	3,630	0.0	31	0	$4	$25	$1	6.6
Electric Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,630	0.2	1,054	0	$124	$292	$80	1.7
Electric Room	1	Exit Signs: Fluorescent	None		12	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	58	0	$7	$72	$0	10.6
Girls RestRoom	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	2,505	3	Relamp	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,505	0.1	479	0	$56	$435	$60	6.6
Janitor Closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,500	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,500	0.0	80	0	$9	$72	$10	6.6
Boys Rest Room	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	2,505	3	Relamp	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,505	0.1	479	0	$56	$435	$60	6.6
Storage B	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3, 5	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,725	0.2	577	0	$68	$453	$50	5.9
Room 103	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.3	1,509	0	$178	$599	$125	2.7
Mrs Elgrim	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,630	0.0	264	0	$31	$73	$20	1.7
Room 101	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.9	5,030	-1	$593	$1,365	$335	1.7
Room 101	1	Exit Signs: Fluorescent	None		12	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	58	0	$7	$72	$0	10.6
Room 100	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.9	5,030	-1	$593	$1,365	$335	1.7
Custodian Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3, 5	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,505	0.1	503	0	$59	$380	$65	5.3

	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Elevator Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,630	0.0	264	0	$31	$73	$20	1.7
Room 102	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.7	3,772	-1	$444	$1,092	$260	1.9
Room 102	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
Room 105	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Room 105	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 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.1	591	0	$70	$416	$75	4.9
Office 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.2	1,006	0	$119	$489	$95	3.3
Office 3	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.1	591	0	$70	$416	$75	4.9
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,500	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,500	0.0	136	0	$16	$55	$15	2.5
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,630	0.0	198	0	$23	$55	$15	1.7
Main Office Entrance	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,630	0.0	198	0	$23	$55	$15	1.7
Main Office Entrance	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
Room 104	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.4	2,263	0	$267	$763	$170	2.2
Office D	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.1	754	0	$89	$434	$80	4.0
Office C	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.1	503	0	$59	$380	$65	5.3
Office B	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.1	503	0	$59	$380	$65	5.3
Conference Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.1	754	0	$89	$434	$80	4.0
Office A	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.1	754	0	$89	$434	$80	4.0
Room 107	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.5	2,659	-1	$313	$927	$215	2.3
Room 109	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.5	2,659	-1	$313	$927	$215	2.3
Room 106	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,630	3, 5	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,505	0.1	627	0	$74	$560	$75	6.6
Restroom	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,630	0.0	232	0	$27	$145	$20	4.6
Exam Room	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,630	0.0	232	0	$27	$145	$20	4.6
Room 108	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.1	503	0	$59	$380	$65	5.3
Room 111	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3, 5	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,505	0.1	671	0	$79	$416	$75	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	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 111	1	Exit Signs: Fluorescent	None		12	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	58	0	$7	$72	$0	10.6
Boys Rest Room	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	2,505	3	Relamp	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,505	0.1	479	0	$56	$435	$60	6.6
Girls RestRoom	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	2,505	3	Relamp	No	6	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,505	0.1	479	0	$56	$435	$60	6.6
Hallway Old Section	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3, 6	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,505	0.5	2,683	-1	$316	$1,259	$160	3.5
Hallway Old Section	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Room 309	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Room 307	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Room 305	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Room 306	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Room 303	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Room 304	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Room 301	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Room 302	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Staff Restroom	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	2,505	3	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,505	0.1	320	0	$38	$290	$40	6.6
Room 332	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.8	4,527	-1	$533	$1,256	$305	1.8
Staff Restroom	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	2,505	3	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,505	0.1	320	0	$38	$290	$40	6.6
Stairwell 2	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,630	0.1	395	0	$47	$110	$30	1.7
Stairwell 2	1	Exit Signs: Fluorescent	None		12	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	58	0	$7	$72	$0	10.6
2nd Room Hallway	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3, 6	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,505	0.7	4,024	-1	$474	$1,776	$240	3.2
2nd Room Hallway	7	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
2nd Room Hallway	3	Compact Fluorescent: 4PIN	Wall Switch	S	32	3,630	3, 6	Relamp	Yes	3	LED Lamps: LED Lamps	High/Low Control	22	2,505	0.0	198	0	$23	$301	$3	12.8
Room 211	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.5	3,018	-1	$356	$927	$215	2.0
Room 209	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,630	0.0	198	0	$23	$55	$15	1.7
Room 207	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.2	886	0	$104	$489	$95	3.8
Front Stair well	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,630	0.1	395	0	$47	$110	$30	1.7

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Front Stair well	1	Exit Signs: Incandescent	None		45	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	376	0	$44	$72	$0	1.6
Room 205	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.6	3,269	-1	$385	$982	$230	2.0
Room 203	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.4	2,012	0	$237	$708	$155	2.3
Room 201	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.9	5,030	-1	$593	$1,365	$335	1.7
Exit 14 Stairs	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,630	0.1	527	0	$62	$146	$40	1.7
Room 200	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.9	5,030	-1	$593	$1,365	$335	1.7
Room 202	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.1	754	0	$89	$434	$80	4.0
Restroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,630	0.0	116	0	$14	$72	$10	4.6
Boys Rest Room	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	2,505	3	Relamp	No	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,505	0.2	639	0	$75	$580	$80	6.6
Janitor Closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,500	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,500	0.0	80	0	$9	$72	$10	6.6
Room 213	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Girls RestRoom	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	S	62	2,505	3	Relamp	No	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,505	0.2	639	0	$75	$580	$80	6.6
Room 204	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.4	2,363	0	$278	$854	$195	2.4
Room 215	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.6	3,545	-1	$418	$1,146	$275	2.1
Room 206	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.5	3,018	-1	$356	$927	$215	2.0
Room 217	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.5	2,659	-1	$313	$927	$215	2.3
Room 208	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.6	3,521	-1	$415	$1,037	$245	1.9
Room 219	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3, 5	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,505	0.5	2,659	-1	$313	$927	$215	2.3
Stairwell 4	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,630	0.1	527	0	$62	$146	$40	1.7
Stairwell 4	1	Exit Signs: Incandescent	None		45	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	376	0	$44	$72	$0	1.6
Exit 13 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
Exit 13 Hallway	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3, 6	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,505	0.5	2,515	-1	$296	$1,223	$150	3.6
Room 308	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	3,630	0.0	110	0	$13	$49	$9	3.1
Room 308	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.5	2,766	-1	$326	$872	$200	2.1
Room 310	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	3,630	0.0	110	0	$13	$49	$9	3.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 310	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.5	2,766	-1	$326	$872	$200	2.1
Room 312	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	3,630	0.0	110	0	$13	$49	$9	3.1
Room 312	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.5	2,766	-1	$326	$872	$200	2.1
Room 311	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.4	2,263	0	$267	$763	$170	2.2
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,500	0.0	91	0	$11	$37	$10	2.5
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3, 5	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,725	0.1	231	0	$27	$189	$20	6.2
Room 313	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.3	1,509	0	$178	$599	$125	2.7
Room 315	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.3	1,509	0	$178	$599	$125	2.7
Room 314	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.5	3,018	-1	$356	$927	$215	2.0
Closet	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3, 5	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,725	0.1	346	0	$41	$380	$30	8.6
Tech Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,630	3	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,630	0.0	224	0	$26	$73	$20	2.0
Room 317	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.4	2,012	0	$237	$708	$155	2.3
Rest Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,630	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,630	0.0	132	0	$16	$37	$10	1.7
Room 316	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.4	2,012	0	$237	$708	$155	2.3
Room 318	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.4	2,012	0	$237	$708	$155	2.3
Room 319	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.4	2,263	0	$267	$763	$170	2.2
Exit 12 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
Exit 12 Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 6	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,505	0.4	2,012	0	$237	$663	$120	2.3
Room 320	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	1.0	5,281	-1	$622	$1,420	$350	1.7
Room 322	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	1.0	5,281	-1	$622	$1,420	$350	1.7
Server Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,630	0.0	198	0	$23	$55	$15	1.7
Room 324	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,630	0.0	198	0	$23	$55	$15	1.7
Gym Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 6	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,505	0.5	2,515	-1	$296	$998	$150	2.9
Gym 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
Room 326	24	Metal Halide: (1) 400W Lamp	Wall Switch	S	458	3,630	1	Fixture Replacement	No	24	LED - Fixtures: High-Bay	Wall Switch	137	3,630	5.5	30,724	-6	$3,619	$18,597	$3,600	4.1

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 326	4	Exit Signs: Fluorescent	None		12	8,760	4	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	231	0	$27	$290	$0	10.6
Room 321	31	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	31	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	1.4	7,796	-2	$918	$2,238	$535	1.9
Room 321	2	Compact Fluorescent: 4PIN	Wall Switch	S	40	3,630	3	Relamp	No	2	LED Lamps: LED Lamps	Wall Switch	28	3,630	0.0	96	0	$11	$50	$2	4.3
Room 321	4	Compact Fluorescent: 4PIN	Wall Switch	S	32	3,630	3	Relamp	No	4	LED Lamps: LED Lamps	Wall Switch	22	3,630	0.0	153	0	$18	$101	$4	5.4
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.1	503	0	$59	$380	$65	5.3
Room 321	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
Girls Locker Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.3	1,760	0	$207	$653	$140	2.5
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,630	0.0	198	0	$23	$55	$15	1.7
Boys Locker Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.3	1,760	0	$207	$653	$140	2.5
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,630	0.0	198	0	$23	$55	$15	1.7
Boys Rest Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.1	754	0	$89	$434	$80	4.0
Boys Rest Room	1	Compact Fluorescent: 4PIN	Wall Switch	S	40	3,630	3	Relamp	No	1	LED Lamps: LED Lamps	Wall Switch	28	3,630	0.0	48	0	$6	$25	$1	4.3
Custodian	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,630	0.0	198	0	$23	$55	$15	1.7
Girls RestRoom	1	Compact Fluorescent: 4PIN	Wall Switch	S	40	3,630	3	Relamp	No	1	LED Lamps: LED Lamps	Wall Switch	28	3,630	0.0	48	0	$6	$25	$1	4.3
Girls RestRoom	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.1	754	0	$89	$434	$80	4.0
Exit 9 Entrance	6	Compact Fluorescent: 4PIN	Wall Switch	S	32	3,630	3	Relamp	No	6	LED Lamps: LED Lamps	Wall Switch	22	3,630	0.0	230	0	$27	$151	$6	5.4
Exit 9 Entrance	1	Exit Signs: Fluorescent	None		12	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	58	0	$7	$72	$0	10.6
Exit Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 6	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,505	0.2	1,006	0	$119	$444	$60	3.2
Exit Hallway	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Room 328	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.7	4,024	-1	$474	$1,146	$275	1.8
Room 328	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
Room A	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.2	1,006	0	$119	$489	$95	3.3
Room 330	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3, 5	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,505	0.7	3,772	-1	$444	$1,092	$260	1.9
Room 330	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
Exit 20	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,630	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,630	0.0	198	0	$23	$55	$15	1.7

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Exit 20	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
Main Lobby	6	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	S	53	3,630	3, 6	Relamp	Yes	6	LED - Linear Tubes: (3) 2' Lamps	High/Low Control	26	2,505	0.2	848	0	$100	$518	$54	4.6
Main Lobby	14	Compact Fluorescent: 4PIN	Wall Switch	S	32	3,630	3, 6	Relamp	Yes	14	LED Lamps: LED Lamps	High/Low Control	22	2,505	0.2	925	0	$109	$803	$14	7.2
Main Lobby	3	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
All Purpose Room	20	Linear Fluorescent - T5HO: 4' T5HO (54W) - 4L	Wall Switch	S	234	3,630	3, 5	Relamp	Yes	20	LED - Linear Tubes: (4) 4' T5HO (25W) Lamps	Occupancy Sensor	102	2,505	2.4	13,067	-3	$1,539	$2,382	$35	1.5
All Purpose Room	2	Exit Signs: Fluorescent	None		12	8,760	4	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	116	0	$14	$145	$0	10.6
Stage	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3, 5	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,725	0.2	693	0	$82	$489	$95	4.8
Stage	1	Exit Signs: Fluorescent	None		12	8,760	4	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.0	58	0	$7	$72	$0	10.6
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,500	3	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,500	0.0	136	0	$16	$55	$15	2.5
BOE Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,500	3, 5	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,725	0.2	693	0	$82	$489	$95	4.8
BOE Office	1	Exit Signs: LED - 2 W Lamp	None		6	2,500		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	2,500	0.0	0	0	$0	$0	$0	0.0
Conference Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,500	3, 5	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,725	0.2	866	0	$102	$544	$110	4.3
Conference Room	1	Exit Signs: LED - 2 W Lamp	None		6	2,500		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	2,500	0.0	0	0	$0	$0	$0	0.0
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,500	0.0	91	0	$11	$37	$10	2.5
Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,500	3, 5	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,725	0.3	1,039	0	$122	$599	$125	3.9
Closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,500	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,500	0.0	80	0	$9	$72	$10	6.6
Rest Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,500	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,500	0.0	80	0	$9	$72	$10	6.6
Break Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,500	3	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,500	0.0	91	0	$11	$37	$10	2.5
Reception Area	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,500	3, 6	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,725	0.1	520	0	$61	$389	$45	5.6
Reception Entrance	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	2,500	3	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,500	0.0	80	0	$9	$72	$10	6.6
Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	2,500	3, 5	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,725	0.1	520	0	$61	$434	$80	5.8
Maintenance Shop	7	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	2,500	2, 5	Relamp & Reballast	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,725	0.7	2,618	-1	$308	$1,099	$175	3.0
Garage	6	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	2,500	2, 5	Relamp & Reballast	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,725	0.6	2,244	0	$264	$980	$155	3.1
External Wall Pack	2	Metal Halide: (1) 50W Lamp	Photocell		72	4,380	1	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	22	4,380	0.1	442	0	$53	$1,932	$200	32.8
Storage Shed	8	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	S	176	2,500	2, 5	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,725	0.8	2,992	-1	$352	$1,217	$160	3.0

Motor Inventory & Recommendations

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room A	Air Combustion	2	Combustion Air Fan	1.0	77.0%	No	W	2,500		No	77.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room A	Heating System	2	Heating Hot Water Pump	2.0	86.5%	No	W	2,500	8	No	86.5%	Yes	2	0.4	3,234	0	$387	$6,522	$0	16.8
Roof	RTU 10	1	Supply Fan	10.0	91.7%	Yes	W	4,000		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 10	2	Return Fan	1.0	85.5%	Yes	W	4,000		No	85.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Restroom	1	Exhaust Fan	0.3	68.5%	No	W	4,000		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Hallways	3	Exhaust Fan	0.3	68.5%	No	W	4,000		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Locker Room	2	Exhaust Fan	0.3	72.4%	No	W	4,000		No	72.4%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Storage Room	1	Exhaust Fan	0.3	68.5%	No	W	4,000		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Library	1	Exhaust Fan	0.8	81.8%	No	W	4,000		No	81.8%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Gym	4	Exhaust Fan	0.3	72.4%	No	W	4,000		No	72.4%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Restroom	3	Exhaust Fan	0.3	68.5%	No	W	4,000		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Hallways	3	Exhaust Fan	0.3	68.5%	No	W	4,000		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Science Class	4	Exhaust Fan	0.3	72.4%	No	W	4,000		No	72.4%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Boiler Fresh Air	1	Exhaust Fan	0.8	81.8%	No	W	4,000		No	81.8%	No		0.0	0	0	$0	$0	$0	0.0
Roof	BOE Restroom	2	Exhaust Fan	0.3	68.5%	No	W	4,000		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room A	Heating System	2	Heating Hot Water Pump	3.0	86.5%	No	W	2,500	8	No	89.5%	Yes	2	0.7	5,144	0	$616	$7,768	$0	12.6
Boiler Room A	Heating System	2	Heating Hot Water Pump	3.0	86.5%	No	W	2,500	8	No	89.5%	Yes	2	0.7	5,144	0	$616	$7,768	$0	12.6
Boiler Room A	Boiler Feed Water Pump	2	Boiler Feed Water Pump	0.8	81.8%	No	W	2,500		No	81.8%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room B	Heating System	2	Heating Hot Water Pump	3.0	82.5%	No	W	2,500	8	No	89.5%	Yes	2	0.8	5,802	0	$695	$7,768	$0	11.2
Elevator Room	Elevator	1	Process Pump	30.0	91.7%	No	W	200		No	91.7%	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?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU 16	1	Supply Fan	3.0	89.5%	No	W	4,000		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 6	1	Supply Fan	1.5	86.5%	No	W	4,000		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 4	1	Supply Fan	1.5	86.5%	No	W	4,000		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 3	1	Supply Fan	1.5	86.5%	No	W	4,000		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 2	1	Supply Fan	1.5	86.5%	No	W	4,000		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 1	1	Supply Fan	1.5	86.5%	No	W	4,000		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 6	1	Supply Fan	1.5	86.5%	No	W	4,000		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 7	1	Supply Fan	7.5	91.7%	Yes	B	4,000		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 7	1	Return Fan	3.0	89.5%	Yes	B	4,000		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 8	1	Supply Fan	7.5	91.7%	Yes	B	4,000		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 8	1	Return Fan	3.0	89.5%	Yes	B	4,000		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 15	1	Supply Fan	2.0	86.5%	No	B	4,000		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU14	1	Supply Fan	3.0	89.5%	No	B	4,000		No	89.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 9	1	Supply Fan	7.5	91.7%	Yes	B	4,000		No	91.7%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 9	1	Return Fan	2.0	86.5%	Yes	B	4,000		No	86.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	RTU 5	1	Supply Fan	5.0	91.7%	No	W	4,000	7	No	91.7%	Yes	1	1.4	6,101	0	$731	$4,197	$400	5.2
Roof	RTU 5	1	Return Fan	1.5	86.5%	No	W	4,000	7	No	86.5%	Yes	1	0.4	1,940	0	$232	$3,380	$120	14.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (MBh)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU 10 : Rooms 219,208,109,107,102	1	Packaged AC	30.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 16: Rooms 108,106,104	1	Packaged AC	7.00		B	9	Yes	1	Packaged AC	7.00		12.00		1.2	1,423	0	$170	$12,475	$511	70.2
Roof	RTU 9: Rooms 318, 316, 314, 315, 313, 312, 310, 308	1	Packaged AC	40.00		B	9	Yes	1	Packaged AC	40.00		12.00		10.7	12,482	0	$1,495	$88,639	$0	59.3
Roof	RTU 6: Rooms 319, 317	1	Packaged AC	6.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 4: Room 320	1	Packaged AC	6.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 3: Room 322	1	Packaged AC	6.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Server Room	2	Split-System AC	0.80		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 5: Library/ Media Center	1	Packaged AC	12.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 2: Rooms 301, 302, 303, 304	1	Packaged AC	6.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 1: Room 330	1	Packaged AC	6.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 6: Rooms 316, 319	1	Packaged AC	6.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Café Room	1	Split-System AC	2.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 8: Rooms 305, 306, 307, 309	1	Packaged AC	25.00		B	9	Yes	1	Packaged AC	25.00		12.00		4.6	5,326	0	$638	$42,185	$1,975	63.0
Roof	RTU 7: Rooms 301, 302, 303, 304	1	Packaged AC	25.00		B	9	Yes	1	Packaged AC	25.00		12.00		4.6	5,326	0	$638	$42,185	$1,975	63.0
Roof	RTU 13: Room 300	1	Packaged AC	30.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	RTU 15: Instrumental Music	1	Packaged AC	6.00		B	9	Yes	1	Packaged AC	6.00		11.50		0.9	1,037	0	$124	$10,693	$438	82.6
Ground Floor	Classroom	1	Split-System AC	2.00		B	9	Yes	1	Split-System AC	2.00		14.00		0.4	480	0	$57	$2,992	$184	48.9
Ground Floor	Main Office	1	Split-System AC	5.00		B	9	Yes	1	Split-System AC	5.00		14.00		1.0	1,200	0	$144	$7,481	$460	48.9
Roof	RTU 14: All Purpose Room Back	1	Packaged AC	8.00		B	9	Yes	1	Packaged AC	8.00		11.50		1.2	1,382	0	$166	$14,257	$584	82.6
Roof	Office	1	Split-System AC	2.00		B	9	Yes	1	Split-System AC	2.00		14.00		0.4	480	0	$57	$2,992	$184	48.9

		Existing Conditions					Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Rm 108	Rm 108	1	Window AC	1.00		B	9	Yes	1	Window AC	1.00		12.00		0.2	203	0	$24	$1,089	$0	44.7

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room A	Space Heating System Old Section	1	Forced Draft Steam Boiler	######	B	10	Yes	1	Forced Draft Steam Boiler	######	81.00%	Et	0.0	0	22	$209	$35,011	$2,080	157.5
Boiler Room A	Space Heating System Old Section	1	Forced Draft Steam Boiler	######	B	10	Yes	1	Forced Draft Steam Boiler	######	81.00%	Et	0.0	0	22	$209	$35,011	$2,080	157.5
Boiler Room B	Space Heating System New Section	1	Non-Condensing Hot Water Boiler	######	W		No						0.0	0	0	$0	$0	$0	0.0
Roof	RTU 13 - All Purpose Room	1	Furnace	320.00	W		No						0.0	0	0	$0	$0	$0	0.0

Demand Control Ventilation Recommendations

		Recommendation Inputs					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	ECM #	Number of Zones	Cooling Capacity of Controlled System (Tons)	Electric Heating Capacity of Controlled System (kBtu/hr)	Output Heating Capacity of Controlled System (MBh)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	RTU5 - Library	11	3.00	12.00	0.00		0.0	458	0	$55	$4,078	$0	74.3
Roof	RTU 13: Room 300 (All Purpose Room)	11	4.00	30.00	0.00	320.00	0.0	1,260	17	$307	$5,438	$0	17.7

DHW Inventory & Recommendations

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

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
School	38	Desktop	120.0	
School	4	Refrigerator	600.0	
School	5	Coffee Machine	400.0	
School	8	Microwave	1,500.0	
School	8	Printer	500.0	
School	6	Copy machine	515.0	
School	2	Small Fridge	360.0	
School	1	Electric Stove	1,500.0	
School	600	Chromebook	40.0	
School	1	Water Cooler	900.0	
School	1	Misc Plug Loads	1,000.0	

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

20

ENERGY STAR® Score[1]

Knollwood School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 76,790
Built: 1925

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

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Knollwood School 224 Hance Road Fair Haven, New Jersey 07704	Fair Haven Public Schools 224 Hance Road Fair Haven, NJ 07704 (____)____-_____	David Joye 224 Hance Road Fair Haven, NJ 07704 7327472294 joyed@fairhaven.edu

Property ID: 6787834

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
110.1 kBtu/ft²

Source EUI
181.5 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	2,890,783 (34%)
Natural Gas (kBtu)	5,567,250 (66%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	80.9
National Median Source EUI (kBtu/ft²)	133.3
% Diff from National Median Source EUI	36%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	589

Signature & Stamp of Verifying Professional

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

Signature: _____ Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp (if applicable)

APPENDIX C: GLOSSARY

TERM	DEFINITION
Blended Rate	Used to calculate fiscal savings associated with measures. The blended rate is calculated by dividing the amount of your bill by the total energy use. For example, if your bill is $22,217.22, and you used 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
Btu	*British thermal unit*: a unit of energy equal to the amount of heat required to increase the temperature of one pound of water by one-degree Fahrenheit.
CHP	*Combined heat and power*. Also referred to as cogeneration.
COP	*Coefficient of performance*: a measure of efficiency in terms of useful energy delivered divided by total energy input.
Demand Response	Demand response reduces or shifts electricity usage at or among participating buildings/sites during peak energy use periods in response to time-based rates or other forms of financial incentives.
DCV	*Demand control ventilation*: a control strategy to limit the amount of outside air introduced to the conditioned space based on actual occupancy need.
US DOE	*United States Department of Energy*
EC Motor	*Electronically commutated motor*
ECM	*Energy conservation measure*
EER	*Energy efficiency ratio*: a measure of efficiency in terms of cooling energy provided divided by electric input.
EUI	*Energy Use Intensity:* measures energy consumption per square foot and is a standard metric for comparing buildings' energy performance.
Energy Efficiency	Reducing the amount of energy necessary to provide comfort and service to a building/area. Achieved through the installation of new equipment and/or optimizing the operation of energy use systems. Unlike conservation, which involves some reduction of service, energy efficiency provides energy reductions without sacrifice of service.
ENERGY STAR®	ENERGY STAR® is the government-backed symbol for energy efficiency. The ENERGY STAR® program is managed by the EPA.
EPA	*United States Environmental Protection Agency*
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
GHG	*Greenhouse gas* gases that are transparent to solar (short-wave) radiation but opaque to long-wave (infrared) radiation, thus preventing long-wave radiant energy from leaving Earth's atmosphere. The net effect is a trapping of absorbed radiation and a tendency to warm the planet's surface.
gpf	*Gallons per flush*

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

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