Local Government Energy Audit Report

Benjamin Franklin School

July 31, 2019

Prepared for:
Elizabeth Public Schools
248 Ripley Place
Elizabeth, NJ 07206

Prepared by:
TRC Energy Services
900 Route 9 North
Woodbridge, NJ 07095

Disclaimer

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

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility 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.

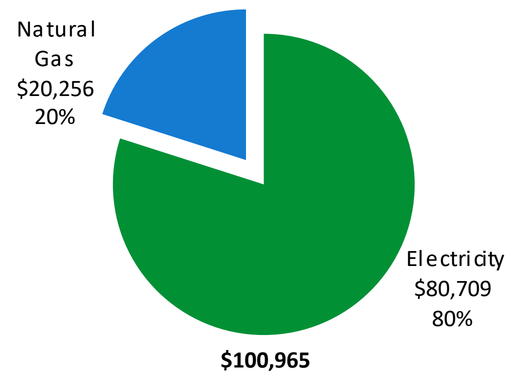
The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

Table of Contents

1 Executive Summary

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

BUILDING PERFORMANCE REPORT

Annual Utilities	Costs: $100,965 Electricity: 523,607 kWh Natural Gas: 24,155 Therms	
ENERGY STAR® Benchmarking Score	43 *(1-100 scale)*	This building performs at or below the national average. This report contains suggestions about how to improve building performance and reduce energy costs.

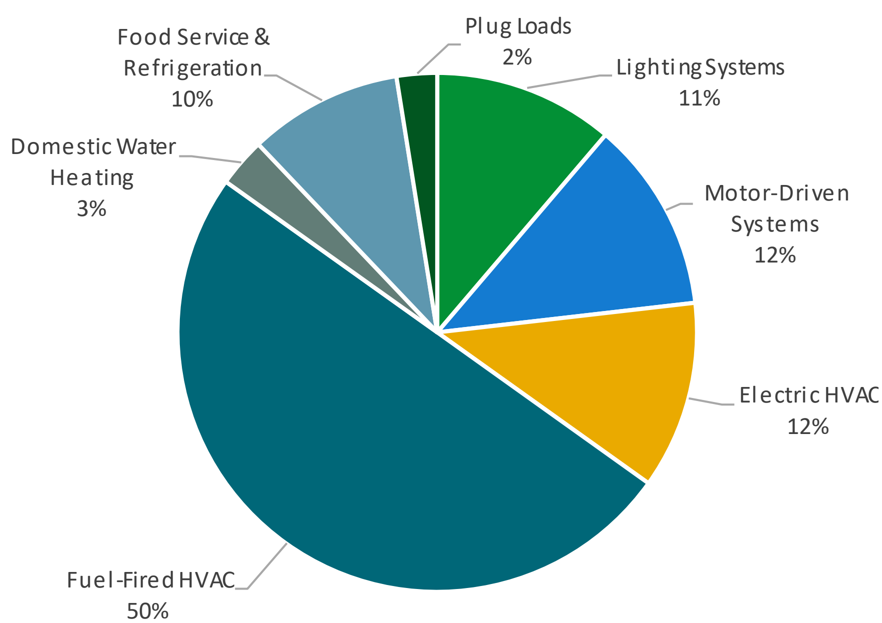


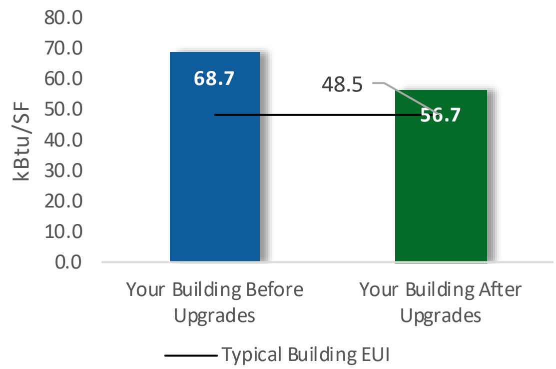
Figure 1 - Energy Use by System

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.

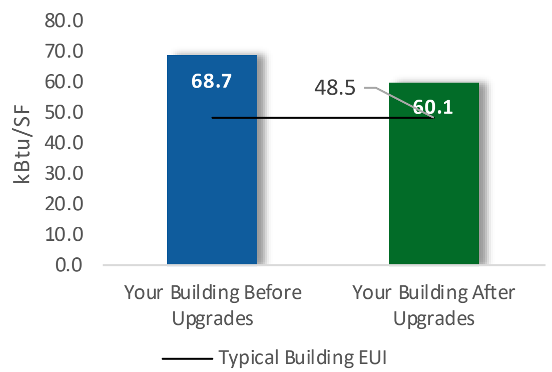
Scenario 1: Full Package (all evaluated measures)

Installation Cost	$349,792
Potential Rebates & Incentives[1]	$30,070
Annual Cost Savings	$31,502
Annual Energy Savings	Electricity: 201,905 kWh Natural Gas: 454 Therms
Greenhouse Gas Emission Savings	104 Tons
Simple Payback	10.1 Years
Site Energy Savings (all utilities)	17%



Scenario 2: Cost Effective Package[2]

Installation Cost	$102,027
Potential Rebates & Incentives	$11,670
Annual Cost Savings	$23,558
Annual Energy Savings	Electricity: 152,485 kWh Natural Gas: 64 Therms
Greenhouse Gas Emission Savings	77 Tons
Simple Payback	3.8 Years
Site Energy Savings (all utilities)	13%



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	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		**77,840**	**16.5**	**-15**	**$11,870**	**$178,050**	**$44,647**	**$9,370**	**$35,277**	**3.0**	**76,594**
ECM 1	Install LED Fixtures	6,848	1.0	0	$1,052	$15,775	$19,531	$2,650	$16,881	16.1	6,841
ECM 2	Retrofit Fixtures with LED Lamps	70,992	15.4	-15	$10,818	$162,275	$25,116	$6,720	$18,396	1.7	69,752
Lighting Control Measures		**18,802**	**4.1**	**-4**	**$2,865**	**$22,921**	**$14,940**	**$1,575**	**$13,365**	**4.7**	**18,473**
ECM 3	Install Occupancy Sensor Lighting Controls	16,004	3.5	-3	$2,439	$19,511	$12,690	$1,575	$11,115	4.6	15,724
ECM 4	Install High/Low Lighting Controls	2,798	0.6	-1	$426	$3,411	$2,250	$0	$2,250	5.3	2,749
Variable Frequency Drive (VFD) Measures		**53,243**	**9.2**	**0**	**$8,207**	**$123,103**	**$39,273**	**$600**	**$38,673**	**4.7**	**53,615**
ECM 5	Install VFDs on Constant Volume (CV) Fans	8,999	2.2	0	$1,387	$20,807	$4,738	$600	$4,138	3.0	9,062
ECM 6	Install VFDs on Chilled Water Pumps	34,387	5.1	0	$5,300	$79,507	$19,779	$0	$19,779	3.7	34,628
ECM 7	Install VFDs on Heating Water Pumps	6,024	0.7	0	$929	$13,929	$7,768	$0	$7,768	8.4	6,067
ECM 8	Install Boiler Draft Fan VFDs	3,832	1.2	0	$591	$8,860	$6,987	$0	$6,987	11.8	3,859
Electric Unitary HVAC Measures		**2,907**	**2.4**	**0**	**$448**	**$6,720**	**$66,479**	**$0**	**$66,479**	**148.4**	**2,927**
ECM 9	Install High Efficiency Air Conditioning Units	2,907	2.4	0	$448	$6,720	$66,479	$0	$66,479	148.4	2,927
Electric Chiller Replacement		**46,514**	**67.7**	**0**	**$7,170**	**$143,392**	**$170,637**	**$18,000**	**$152,637**	**21.3**	**46,839**
ECM 10	Install High Efficiency Chillers	46,514	67.7	0	$7,170	$143,392	$170,637	$18,000	$152,637	21.3	46,839
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**39**	**$327**	**$6,535**	**$10,649**	**$400**	**$10,249**	**31.4**	**4,562**
ECM 11	Install High Efficiency Furnaces	0	0.0	39	$327	$6,535	$10,649	$400	$10,249	31.4	4,562
Domestic Water Heating Upgrade		**0**	**0.0**	**26**	**$215**	**$2,149**	**$65**	**$0**	**$65**	**0.3**	**3,000**
ECM 12	Install Low-Flow DHW Devices	0	0.0	26	$215	$2,149	$65	$0	$65	0.3	3,000
Food Service & Refrigeration Measures		**2,599**	**0.1**	**0**	**$401**	**$6,302**	**$3,103**	**$125**	**$2,978**	**7.4**	**2,617**
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	701	0.1	0	$108	$1,620	$910	$0	$910	8.4	706
ECM 14	Refrigeration Controls	1,899	0.0	0	$293	$4,682	$2,193	$125	$2,068	7.1	1,912
TOTALS (COST EFFECTIVE MEASURES)		**152,485**	**29.8**	**6**	**$23,558**	**$332,525**	**$102,027**	**$11,670**	**$90,357**	**3.8**	**154,299**
TOTALS (ALL MEASURES)		**201,905**	**100.0**	**45**	**$31,502**	**$489,172**	**$349,792**	**$30,070**	**$319,722**	**10.1**	**208,627**

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

** - 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 Fixtures with LED Lamps	x	x	
ECM 3	Install Occupancy Sensor Lighting Controls	x	x	
ECM 4	Install High/Low Lighting Controls		x	
ECM 5	Install VFDs on Constant Volume (CV) HVAC	x	x	
ECM 6	Install VFDs on Chilled Water Pumps		x	
ECM 7	Install VFDs on Hot Water Pumps		x	
ECM 8	Install Boiler Draft Fan VFDs		x	
ECM 9	Install High Efficiency Electric AC			
ECM 10	Install High Efficiency Chillers	x		
ECM 11	Install High Efficiency Furnaces	x	x	
ECM 12	Install Low-Flow Domestic Hot Water Devices		x	
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors		x	
ECM 14	Refrigeration Controls		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 Benjamin Franklin 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 February 21, 2019, TRC performed an energy audit at Benjamin Franklin School located in Elizabeth, New Jersey. TRC met with Ligia Alvarez and Cornell Sims to review the facility operations and help focus our investigation on specific energy-using systems.

Benjamin Franklin School is a three-story, 61,180 square foot building built in 1914. Spaces include: classrooms, gymnasium, offices, cafeteria, restrooms, storage rooms, corridors, stairwells, a commercial kitchen and basement mechanical space.

2.2 Building Occupancy

The facility is occupied 11 months out of the year. Typical weekday occupancy is 70 staff and 443 students.

Building Name	Weekday/Weekend	Operating Schedule
Benjamin Franklin School	Weekday	7:00 AM - 4:30 PM
	Weekend	7:00 AM - 4:30 PM (Saturdays)

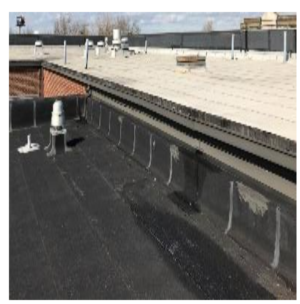
Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

The building is constructed of concrete block and structural steel with a brick facade. The roof is flat and covered with asphalt and is in fair condition.

Most of the windows in the building are double glazed with aluminum frames. The exterior doors have aluminum frames. Degraded window and door seals increase drafts and outside air infiltration.

Building Envelope



Roof

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt and 17-Watt linear fluorescent T8 lamps. There are also several fixtures with compact fluorescent spiral light bulbs (CFL) with estimated ratings of 26-Watts and 42-Watts. Additionally, there are some fixtures with 17-Watt LED light bulbs or 32-Watt U-tube fluorescent lamps. Typically, T8 fluorescent lamps use electronic ballasts.

Fluorescent fixture types include 1-lamp, 2-lamp 3-lamp, or 4-lamp, 2-foot or 4-foot long and U-Bend troffers, recessed or surface mounted fixtures. Similarly, CFL, incandescent, and LED lamps are situated in a mix of suspended, recessed, and surface mounted fixtures.

The gym has several CFL “Sportlite” fixtures that are estimated to be rated at 252-Watts. Most exit signs use LED sources.

Most fixtures are in fair condition. Interior lighting levels were generally sufficient. Interior lighting fixtures are manually controlled.

Troffer Fixtures in Classroom

LED Light Bulb

Exterior fixtures include wall packs and pole mounted area lights located throughout the perimeter and parking lot of the building. These fixtures have high intensity discharge (HID) lamps and one fixture with linear fluorescent lamps.

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

Exterior Wallpack Fixture

2.5 Air Handling Systems

Unit Ventilators/Fan Coil Units (FCU)

Most of the building is served with single zone unit ventilator/fan coil unit that serves their respective cooling or heating requirements. These units have supply fan motors and zone valves for the two pipe water lines that are operated through a pneumatic control system. This system is original to the building and appears to be in fair operating condition.

Packaged Units

The gym is served by a packaged heating and cooling unit located outside the gym on ground level. The unit has a capacity of 30-tons and is equipped with a built-in furnace to serve the heating requirement of the gym. This unit is controlled by the central EMS.

Air Conditioners

The server room and mail room are served by split system AC units that are rated at 3-tons and 1.5-tons, respectively. Some small classrooms are served by window air conditioning (AC) units. These units are estimated at 1-ton capacity each.

Refer to Appendix A for detailed information about each unit.

Fan Coil Unit

Unit Ventilator

Packaged Unit

Split System AC Condensing Unit

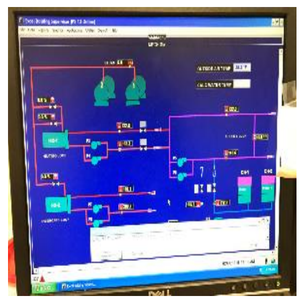
2.6 Steam Heating to Hot Water Systems

One A.O. Smith 3,567 MBh steam boiler serves the majority of the building heating load. The burners are modulating with a nominal efficiency of 80%. The boiler supplies steam to two heat exchangers that are used to transfer heat from the steam to two hot water distribution loops, a baseboard loop, and a building loop. The baseboard loop heating hot water (HHW) is circulated by two HHW pumps (P7 and P8), rated at ¾ hp each. Baseboard radiators provide heat to some of the classrooms and offices located in the perimeter of the building.

The building loop has a primary-secondary configuration. The primary loop is served by two 3 hp constant speed pumps (P3 and P4). The secondary loop is a dual temperature loop that circulates water to all unit ventilators in the building. This loop has a seasonal changeover between HHW and chilled water circulation based on the building's heating or cooling requirement. This loop is served by two constant speed 10 hp pumps (P5 and P6). The schematic of the water distribution system is shown in the below image.

The packaged unit serving the gym has a built-in 470 MBH gas furnace that is used to supply the gym's heating requirement.

Steam Boiler



EMS Screenshot of Water Distribution Schematic

2.7 Chilled Water Systems

The chiller plant consists of two 100-ton McQuay R-22 air cooled reciprocating chillers located on the roof of the building. The chillers are configured in a primary-secondary distribution loop with two constant speed 7.5 hp primary pumps (P1 and P2) and the two constant speed dual temperature pumps (P6 and P6) described above.

Chillers

2.8 Building Energy Management Systems (EMS)

A Honeywell EMS controls the HVAC equipment, boilers, chillers, air handlers, and the gym package unit. The EMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, heating water loop temperatures, and chilled water loop temperatures.

EMS Screenshot

2.9 Domestic Hot Water

Hot water is produced with a 74 gallon 75.10 MBh gas-fired storage water heater with an estimated 80% efficiency.

DHW Heater

2.10 Food Service Equipment

The kitchen has a mixture of gas and electric equipment that is used to prepare breakfast and lunch for students and staff. Most cooking is done using a gas-fired convection oven. Bulk prepared foods are held in an electric holding cabinet. Equipment is high efficiency and in fair condition.

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

Rack Oven

Food Holding Cabinet

Serving Heated Tables

Gas Fired Steamer

2.11 Refrigeration

The kitchen has several stand-up refrigerator chests used to store milk. All equipment is high efficiency and in fair condition.

The walk-in cooler has an estimated 0.5-ton compressor located on the roof and a 1/20-hp, two-fan evaporator. The walk-in medium temperature freezer has a 2-ton compressor located on the roof and a 1/20-hp, two-fan evaporator. These units do not have any evaporator fan or defroster controls.

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

Refrigerator Chest

Walk-In Units Condenser Units

2.12 Plug Load & Vending Machines

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

You seem to already be doing a great job managing your electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are 69 computer work stations throughout the facility. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as projectors and printers.

There are several residential style refrigerators throughout the building that are used to store perishables. These vary in condition and efficiency.

Computer and Printer

Projector

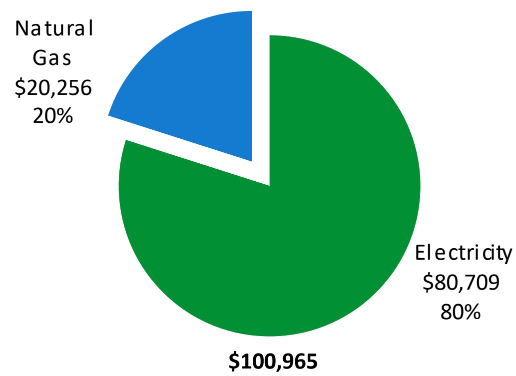
2.13 Water-Using Systems

The restrooms in the building are equipped with toilets, urinals, and sinks. Faucet flow rates are at 2.2 gallons per minute (gpm) or higher.

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	523,607 kWh	$80,709
Natural Gas	24,155 Therms	$20,256
Total		**$100,965**



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

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

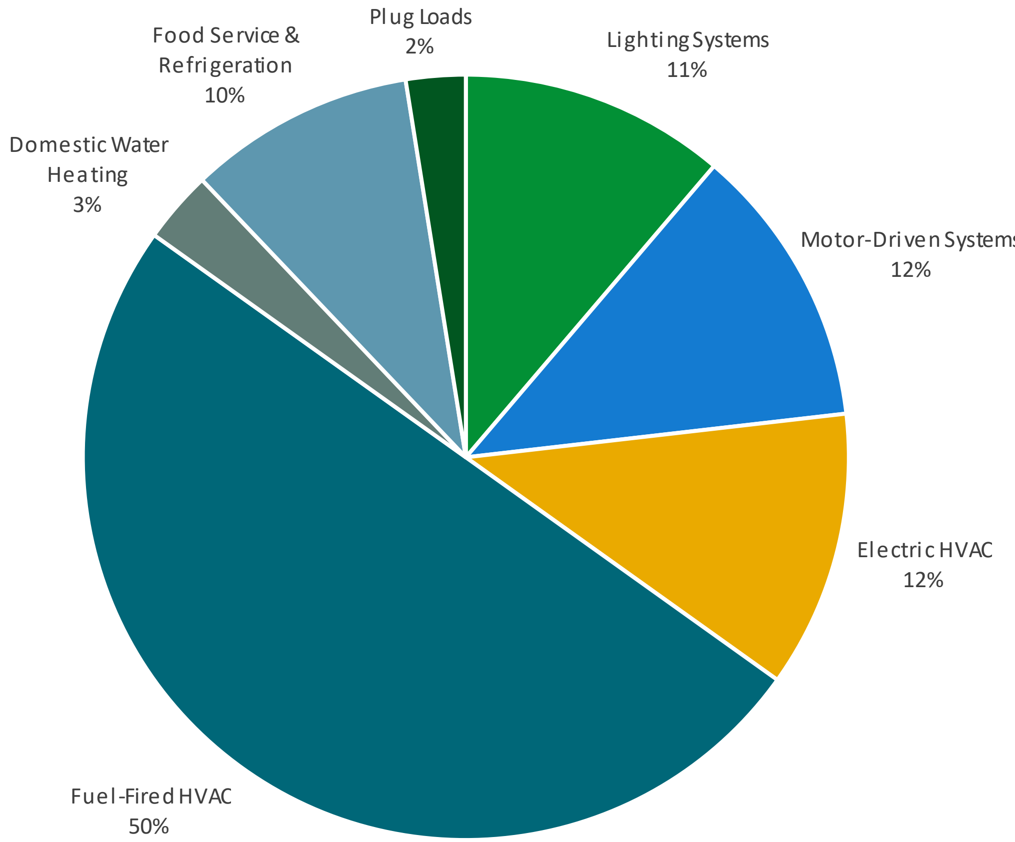
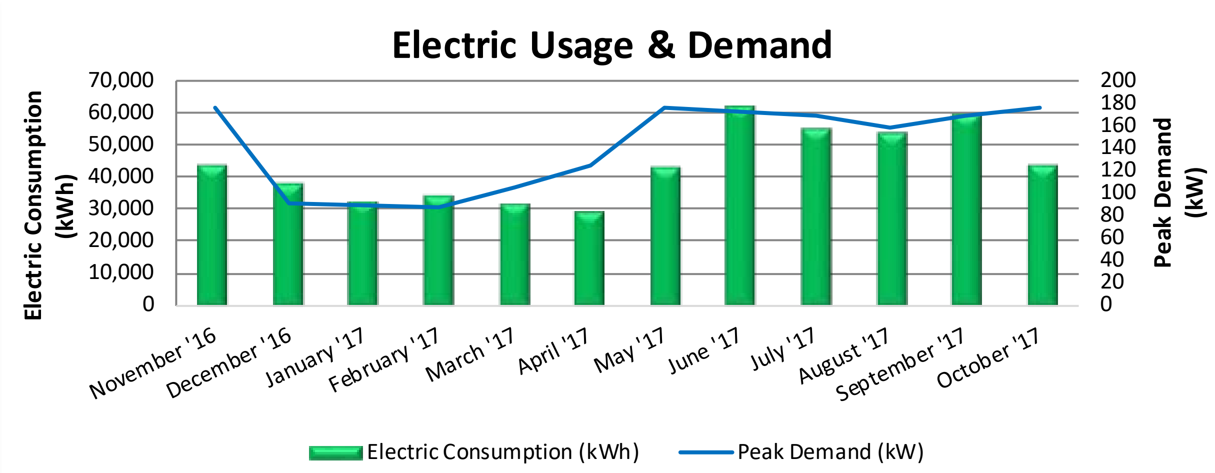


Figure 5 - Energy Balance

3.1 Electricity

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



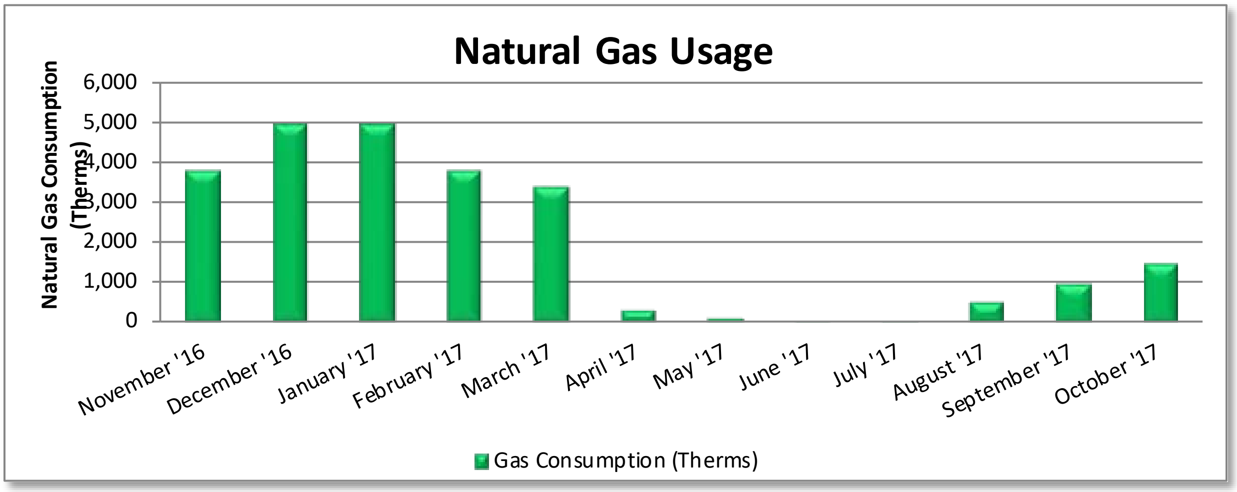
Electric Billing Data						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
12/15/16	30	43,389	176	$665	$7,802	Yes
1/18/17	34	37,733	90	$335	$5,207	No
2/15/17	28	32,226	88	$328	$4,545	Yes
3/17/17	30	34,212	86	$324	$4,783	No
4/18/17	32	31,819	105	$391	$4,455	Yes
5/17/17	29	29,402	124	$466	$4,366	No
6/16/17	30	43,133	176	$665	$7,796	No
7/18/17	32	61,845	173	$652	$9,980	No
8/16/17	29	54,872	169	$636	$9,096	No
9/15/17	30	53,780	158	$600	$8,842	No
10/16/17	31	59,242	169	$668	$8,116	No
11/16/17	31	43,389	176	$665	$5,943	Yes
Totals	**366**	**525,042**	**176**	**$6,394**	**$80,930**	
Annual	**365**	**523,607**	**176**	**$6,376**	**$80,709**	

Notes:

- Peak demand of 176 kW occurred in both June and November 2017.
- The average electric cost over the past 12 months was $0.154/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

Elizabethtown Gas delivers natural gas under rate class general delivery services, with natural gas supply provided by UGI Energy Services, a third-party supplier.



Gas Billing Data				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
12/14/16	31	3,791	$2,931	No
1/13/17	30	4,932	$3,810	Yes
2/14/17	32	4,935	$3,744	No
3/15/17	29	3,783	$2,939	No
4/13/17	29	3,351	$2,598	No
5/15/17	32	314	$481	No
6/14/17	30	106	$339	No
7/14/17	30	44	$301	No
8/14/17	31	36	$304	No
9/14/17	31	503	$796	Yes
10/16/17	32	970	$770	Yes
11/14/17	29	1,457	$1,298	No
Totals	**366**	**24,221**	**$20,312**	
Annual	**365**	**24,155**	**$20,256**	

Notes:

- The average gas cost for the past 12 months is $0.839/therm, which is the blended rate used throughout the analysis.
- Winter seasonal use is indicative of a gas space heating profile with limited gas use for cooking and domestic hot water.

3.3 Benchmarking

Your building was benchmarked using the United States Environmental Protection Agency's *Portfolio Manager®* software. Benchmarking compares your building's energy use to that of similar buildings across the county, 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	43

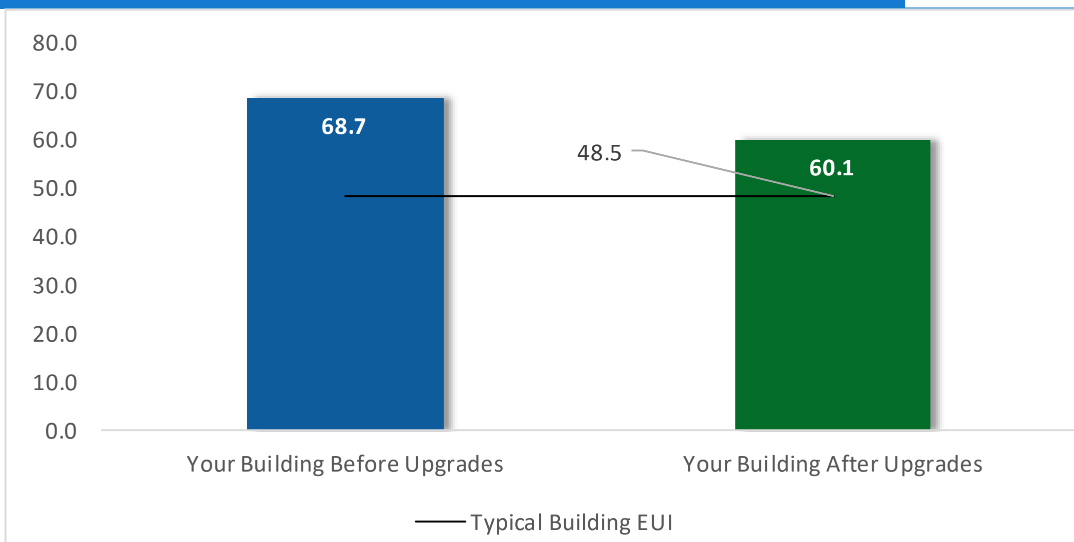


Figure 6 - Energy Use Intensity Comparison

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

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

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		**77,840**	**16.5**	**-15**	**$11,870**	**$44,647**	**$9,370**	**$35,277**	**3.0**	**76,594**
ECM 1	Install LED Fixtures	6,848	1.0	0	$1,052	$19,531	$2,650	$16,881	16.1	6,841
ECM 2	Retrofit Fixtures with LED Lamps	70,992	15.4	-15	$10,818	$25,116	$6,720	$18,396	1.7	69,752
Lighting Control Measures		**18,802**	**4.1**	**-4**	**$2,865**	**$14,940**	**$1,575**	**$13,365**	**4.7**	**18,473**
ECM 3	Install Occupancy Sensor Lighting Controls	16,004	3.5	-3	$2,439	$12,690	$1,575	$11,115	4.6	15,724
ECM 4	Install High/Low Lighting Controls	2,798	0.6	-1	$426	$2,250	$0	$2,250	5.3	2,749
Variable Frequency Drive (VFD) Measures		**53,243**	**9.2**	**0**	**$8,207**	**$39,273**	**$600**	**$38,673**	**4.7**	**53,615**
ECM 5	Install VFDs on Constant Volume (CV) Fans	8,999	2.2	0	$1,387	$4,738	$600	$4,138	3.0	9,062
ECM 6	Install VFDs on Chilled Water Pumps	34,387	5.1	0	$5,300	$19,779	$0	$19,779	3.7	34,628
ECM 7	Install VFDs on Heating Water Pumps	6,024	0.7	0	$929	$7,768	$0	$7,768	8.4	6,067
ECM 8	Install Boiler Draft Fan VFDs	3,832	1.2	0	$591	$6,987	$0	$6,987	11.8	3,859
Electric Unitary HVAC Measures		**2,907**	**2.4**	**0**	**$448**	**$66,479**	**$0**	**$66,479**	**148.4**	**2,927**
ECM 9	Install High Efficiency Air Conditioning Units	2,907	2.4	0	$448	$66,479	$0	$66,479	148.4	2,927
Electric Chiller Replacement		**46,514**	**67.7**	**0**	**$7,170**	**$170,637**	**$18,000**	**$152,637**	**21.3**	**46,839**
ECM 10	Install High Efficiency Chillers	46,514	67.7	0	$7,170	$170,637	$18,000	$152,637	21.3	46,839
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**39**	**$327**	**$10,649**	**$400**	**$10,249**	**31.4**	**4,562**
ECM 11	Install High Efficiency Furnaces	0	0.0	39	$327	$10,649	$400	$10,249	31.4	4,562
Domestic Water Heating Upgrade		**0**	**0.0**	**26**	**$215**	**$65**	**$0**	**$65**	**0.3**	**3,000**
ECM 12	Install Low-Flow DHW Devices	0	0.0	26	$215	$65	$0	$65	0.3	3,000
Food Service & Refrigeration Measures		**2,599**	**0.1**	**0**	**$401**	**$3,103**	**$125**	**$2,978**	**7.4**	**2,617**
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	701	0.1	0	$108	$910	$0	$910	8.4	706
ECM 14	Refrigeration Controls	1,899	0.0	0	$293	$2,193	$125	$2,068	7.1	1,912
TOTALS		**201,905**	**100.0**	**45**	**$31,502**	**$349,792**	**$30,070**	**$319,722**	**10.1**	**208,627**

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

** - 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 ($)	Lifetime Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**77,840**	**16.5**	**-15**	**$11,870**	**$178,050**	**$44,647**	**$9,370**	**$35,277**	**3.0**	**76,594**
ECM 1	Install LED Fixtures	6,848	1.0	0	$1,052	$15,775	$19,531	$2,650	$16,881	16.1	6,841
ECM 2	Retrofit Fixtures with LED Lamps	70,992	15.4	-15	$10,818	$162,275	$25,116	$6,720	$18,396	1.7	69,752
Lighting Control Measures		**18,802**	**4.1**	**-4**	**$2,865**	**$22,921**	**$14,940**	**$1,575**	**$13,365**	**4.7**	**18,473**
ECM 3	Install Occupancy Sensor Lighting Controls	16,004	3.5	-3	$2,439	$19,511	$12,690	$1,575	$11,115	4.6	15,724
ECM 4	Install High/Low Lighting Controls	2,798	0.6	-1	$426	$3,411	$2,250	$0	$2,250	5.3	2,749
Variable Frequency Drive (VFD) Measures		**53,243**	**9.2**	**0**	**$8,207**	**$123,103**	**$39,273**	**$600**	**$38,673**	**4.7**	**53,615**
ECM 5	Install VFDs on Constant Volume (CV) Fans	8,999	2.2	0	$1,387	$20,807	$4,738	$600	$4,138	3.0	9,062
ECM 6	Install VFDs on Chilled Water Pumps	34,387	5.1	0	$5,300	$79,507	$19,779	$0	$19,779	3.7	34,628
ECM 7	Install VFDs on Heating Water Pumps	6,024	0.7	0	$929	$13,929	$7,768	$0	$7,768	8.4	6,067
ECM 8	Install Boiler Draft Fan VFDs	3,832	1.2	0	$591	$8,860	$6,987	$0	$6,987	11.8	3,859
Domestic Water Heating Upgrade		**0**	**0.0**	**26**	**$215**	**$2,149**	**$65**	**$0**	**$65**	**0.3**	**3,000**
ECM 12	Install Low-Flow DHW Devices	0	0.0	26	$215	$2,149	$65	$0	$65	0.3	3,000
Food Service & Refrigeration Measures		**2,599**	**0.1**	**0**	**$401**	**$6,302**	**$3,103**	**$125**	**$2,978**	**7.4**	**2,617**
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	701	0.1	0	$108	$1,620	$910	$0	$910	8.4	706
ECM 14	Refrigeration Controls	1,899	0.0	0	$293	$4,682	$2,193	$125	$2,068	7.1	1,912
TOTALS (COST EFFECTIVE MEASURES)		**152,485**	**29.8**	**6**	**$23,558**	**$332,525**	**$102,027**	**$11,670**	**$90,357**	**3.8**	**154,299**
TOTALS (ALL MEASURES)		**201,905**	**100.0**	**45**	**$31,502**	**$489,172**	**$349,792**	**$30,070**	**$319,722**	**10.1**	**208,627**

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

** - 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		**77,840**	**16.5**	**-15**	**$11,870**	**$44,647**	**$9,370**	**$35,277**	**3.0**	**76,594**
ECM 1	Install LED Fixtures	6,848	1.0	0	$1,052	$19,531	$2,650	$16,881	16.1	6,841
ECM 2	Retrofit Fixtures with LED Lamps	70,992	15.4	-15	$10,818	$25,116	$6,720	$18,396	1.7	69,752

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 high intensity discharge (HID) and CFL gym "Sportlite" fixtures 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 fixture(s).

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 Fixtures with LED Lamps

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

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

Affected building areas: all areas with fluorescent fixtures with linear T8 tubes, U-bend T8 tubes and CFL lamp fixtures.

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		**18,802**	**4.1**	**-4**	**$2,865**	**$14,940**	**$1,575**	**$13,365**	**4.7**	**18,473**
ECM 3	Install Occupancy Sensor Lighting Controls	16,004	3.5	-3	$2,439	$12,690	$1,575	$11,115	4.6	15,724
ECM 4	Install High/Low Lighting Controls	2,798	0.6	-1	$426	$2,250	$0	$2,250	5.3	2,749

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

ECM 3: Install Occupancy Sensor Lighting Controls

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

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

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

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

Affected building areas: offices, classrooms, gymnasium, mail room, teachers' room, storage rooms and restrooms.

ECM 4: Install High/Low Lighting Controls

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

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

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

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

Affected building areas: hallways.

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

4.3 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		**53,243**	**9.2**	**0**	**$8,207**	**$39,273**	**$600**	**$38,673**	**4.7**	**53,615**
ECM 5	Install VFDs on Constant Volume (CV) Fans	8,999	2.2	0	$1,387	$4,738	$600	$4,138	3.0	9,062
ECM 6	Install VFDs on Chilled Water Pumps	34,387	5.1	0	$5,300	$19,779	$0	$19,779	3.7	34,628
ECM 7	Install VFDs on Heating Water Pumps	6,024	0.7	0	$929	$7,768	$0	$7,768	8.4	6,067
ECM 8	Install Boiler Draft Fan VFDs	3,832	1.2	0	$591	$6,987	$0	$6,987	11.8	3,859

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 —unless the existing motor meets or exceeds IHP 2014 standards—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. If the proposed VFD measure is not selected for implementation the motor replacement should be reevaluated.

ECM 5: 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.

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing must be determined during the final project design. The control system programming should maintain the minimum air flow whenever the compressor is operating.

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

Affected air handlers: gymnasium package unit.

ECM 6: Install VFDs on Chilled Water Pumps

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

For systems with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping off will need to be determined during the final project design. The control system should be programmed to maintain the minimum flow through the chiller and to prevent pump cavitation.

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

Affected pumps: Chilled water pumps P1 & P2.

ECM 7: Install VFDs on Dual Temperature Water Pumps

Install variable frequency drives (VFD) to control the dual temperature water pumps. Two-way valves must serve the water coils and the dual temperature water loop must have a differential pressure sensor installed. If three-way valves or a bypass leg are used in the water distribution that will need to be modified when this measure is implemented. As the 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 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: dual temperature pumps P5 & P6.

ECM 8: Install Boiler Draft Fan VFDs

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

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

Additional maintenance savings may result from this measure. VFDs are solid state electronic devices, which generally requires less maintenance than mechanical air volume control devices.

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		**2,907**	**2.4**	**0**	**$448**	**$66,479**	**$0**	**$66,479**	**148.4**	**2,927**
ECM 9	Install High Efficiency Air Conditioning Units	2,907	2.4	0	$448	$66,479	$0	$66,479	148.4	2,927

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

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.

4.5 Electric Chillers

#	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 Chiller Replacement		**46,514**	**67.7**	**0**	**$7,170**	**$170,637**	**$18,000**	**$152,637**	**21.3**	**46,839**
ECM 10	Install High Efficiency Chillers	46,514	67.7	0	$7,170	$170,637	$18,000	$152,637	21.3	46,839

ECM 10: Install High Efficiency Chillers

Replace older inefficient electric chillers with new high efficiency chillers. The type of chiller to be installed depends on the magnitude of the cooling load and variability of the cooling load profile, for example:

- Positive displacement chillers are usually under 600 tons of cooling capacity and centrifugal chillers generally start at 150 tons of cooling capacity.
- Constant speed chillers should be used to meet cooling loads with little or no variation while variable speed chillers are more efficient for variable cooling load profiles.
- Water cooled chillers are more efficient than air cooled chillers but require cooling towers and additional pumps to circulate the cooling water.
- In any given size range, variable speed chillers tend to have better partial load efficiency, but worse full load efficiency, than constant speed chillers.

Energy savings result from the improvement in chiller efficiency and matching the right type of chiller to the cooling load. The energy savings are calculated based on the cooling capacity of the new chiller, the improvement in efficiency compared with the base case equipment, the cooling load profile, and the estimated annual operating hours of the chiller before and after the upgrade.

For the purposes of this analysis, we evaluated the replacement of chillers on a one-for-one basis with equipment of the same capacity. We recommend that you work with your design team to select chillers that are sized appropriately for the cooling load at this facility. In some cases, the plant energy use can be reduced by selecting multiple chillers that match the facility load profile rather than one or two large chillers. This can also improve the chiller plant reliability through increased redundancy. Energy savings are maximized by proper selection of new equipment based on the cooling load profile.

Replacing the chiller has a long payback based on energy savings and may not be justifiable based simply on energy considerations. However, the chiller is nearing the end of its normal useful life. Typically, the marginal cost of purchasing a high efficiency chiller can be justified by the marginal savings from the improved efficiency. When the chillers are eventually replaced, consider purchasing equipment that exceed the minimum efficiency required by building codes.

4.6 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**	**39**	**$327**	**$10,649**	**$400**	**$10,249**	**31.4**	**4,562**
ECM 11	Install High Efficiency Furnaces	0	0.0	39	$327	$10,649	$400	$10,249	31.4	4,562

ECM 11: Install High Efficiency Furnaces

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

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

This measure is part of a measure to replace package units at this site and as such must be considered in combination with ECM 9.

4.7 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**26**	**$215**	**$65**	**$0**	**$65**	**0.3**	**3,000**
ECM 12	Install Low-Flow DHW Devices	0	0.0	26	$215	$65	$0	$65	0.3	3,000

ECM 12: Install Low-Flow DHW Devices

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

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

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. Pre-rinse spray valves PRSVs — often used in commercial and institutional kitchens — remove food waste from dishes prior to dishwashing.

Additional cost savings may result from reduced water usage.

4.8 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		**2,599**	**0.1**	**0**	**$401**	**$3,103**	**$125**	**$2,978**	**7.4**	**2,617**
ECM 13	Refrigerator/Freezer Case Electrically Commutated Motors	701	0.1	0	$108	$910	$0	$910	8.4	706
ECM 14	Refrigeration Controls	1,899	0.0	0	$293	$2,193	$125	$2,068	7.1	1,912

ECM 13: Refrigerator/Freezer Case Electrically Commutated Motors

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

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

ECM 14: Refrigeration Controls

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

Defrost controllers can be used to override defrost of evaporator fans when the defrost operation is not necessary, which reduces annual energy consumption. This measure is applicable to existing evaporator fans with a traditional electric defrost mechanism.

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

Energy savings for each of the control measures account for reduction in compressor and fan operating hours as well as reduction in the refrigeration heat load as appropriate.

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.

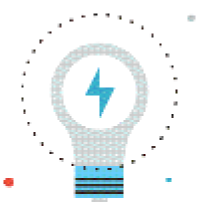
Energy Tracking with ENERGY STAR® Portfolio Manager®

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.

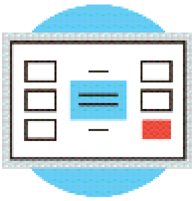
In addition to routine cleaning, developing a maintenance schedule can ensure that maintenance is performed regularly, and it can reduce the overall cost of fixture re-lamping and re-ballasting. Group re-lamping and re-ballasting maintains lighting levels and minimizes the number of site visits by a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

Thermostat Schedules and Temperature Resets



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

Chiller Maintenance

Service chillers regularly to keep them operating properly. Chillers are responsible for a substantial portion of a commercial building's overall energy usage and when they do not work well, there is usually a noticeable increase in energy bills and increased occupant complaints. Regular diagnostics and service can save five to ten percent of the cost of operating your chiller. If you already have a maintenance contract in place, your existing service company should be able to provide these services.

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.

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.

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[5] or download a copy of EPA's "WaterSense™ at Work: Best Management Practices for Commercial and Institutional Facilities"[6] to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

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

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

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

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

Procurement Strategies

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

6 ON-SITE GENERATION

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

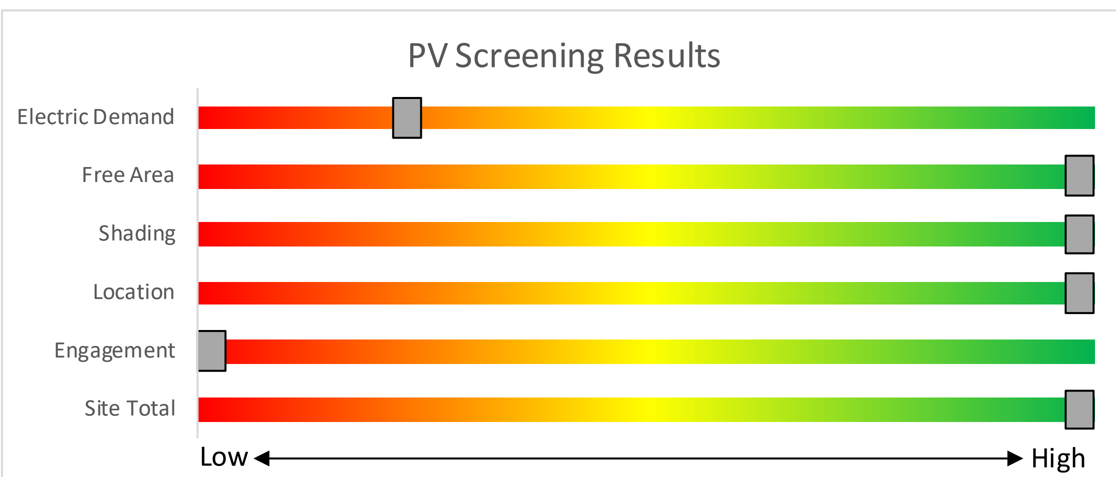
6.1 Solar Photovoltaic

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	141	kW DC STC
Electric Generation	167,983	kWh/yr
Displaced Cost	$25,890	/yr
Installed Cost	$366,600	

Figure 9 - Photovoltaic Screening

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

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

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

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

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

6.2 Combined Heat and Power

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

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

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

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

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

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

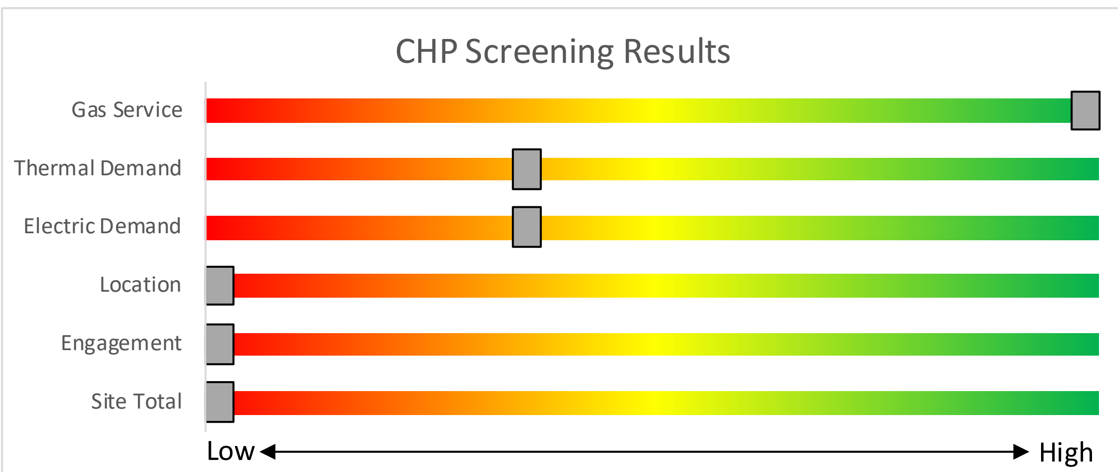


Figure 10 - Combined Heat and Power Screening

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

7 PROJECT FUNDING AND INCENTIVES

Ready to improve your building's performance? 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 from 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.

<u>Equipment with Prescriptive Incentives Currently Available</u>:

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 Energy Savings Improvement Program

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

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

How to Participate

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

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

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

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

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

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Carefully consider all alternatives to develop an approach that best meets your needs. A detailed program description and application can be found at: www.njcleanenergy.com/ESIP.

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

7.4 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 SRECs to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

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

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

8 Energy Purchasing and Procurement Strategies

8.1 Retail Electric Supply Options

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

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

A list of licensed third-party electric suppliers is available at the NJBPU website[7].

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[8].

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

[8] 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
Boiler room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,010	0.2	983	0	$150	$329	$90	1.6
Boiler room	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,010	0.2	819	0	$125	$274	$75	1.6
BR storage	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2, 3	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,077	0.2	973	0	$148	$526	$70	3.1
BR storage	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
Custodian office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.1	626	0	$95	$434	$80	3.7
Basement storage	1	LED Lamps: LED	Wall Switch	S	17	3,010		None	No	1	LED Lamps: LED	Wall Switch	17	3,010	0.0	0	0	$0	$0	$0	0.0
Bio music	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.3	1,460	0	$222	$653	$140	2.3
Sp kids bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
girls bathroom	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2, 3	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,077	0.2	973	0	$148	$526	$105	2.8
Elec room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	218	0	$33	$73	$20	1.6
B4 office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.1	417	0	$64	$380	$65	4.9
B4 office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
B3 office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.1	417	0	$64	$380	$65	4.9
B5 esc room	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,010	0.0	164	0	$25	$55	$15	1.6
B5 esc room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,077	0.1	490	0	$75	$416	$40	5.0
B6 class	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.3	1,251	0	$191	$599	$125	2.5
B6 class	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,077	0.2	695	0	$106	$453	$85	3.5
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,077	0.1	490	0	$75	$416	$75	4.6
Office 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 3	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,077	0.1	490	0	$75	$416	$75	4.6
Boys basement	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,077	0.1	556	0	$85	$416	$75	4.0
B2 class	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 3	Relamp	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,077	0.4	1,714	0	$261	$781	$175	2.3
B1 class	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2, 3	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,077	0.5	2,085	0	$318	$818	$185	2.0
B1 closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
B1 bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,010	0.0	96	0	$15	$72	$10	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
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 4	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,077	0.2	735	0	$112	$444	$60	3.4
Hallway	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 4	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,077	1.1	5,004	-1	$763	$2,215	$360	2.4
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
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
Cafeteria	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2, 3	Relamp	Yes	28	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,077	0.8	3,892	-1	$593	$1,562	$350	2.0
Cafeteria	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,010	0.0	192	0	$29	$145	$20	4.3
Cafeteria	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
Kitchen	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	3,010	2	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,010	0.0	212	0	$32	$130	$24	3.3
Kitchen	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.2	834	0	$127	$489	$95	3.1
Kitchen	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,077	0.1	556	0	$85	$416	$75	4.0
Walkin cooler	1	Refrigerated Case Lighting - LED: Refrigerator lights	Wall Switch	S	17	7,446		None	No	1	Refrigerated Case Lighting - LED: Refrigerator lights	Wall Switch	17	7,446	0.0	0	0	$0	$0	$0	0.0
Walkin freezer	1	Refrigerated Case Lighting - LED: Refrigerator lights	Wall Switch	S	17	7,446		None	No	1	Refrigerated Case Lighting - LED: Refrigerator lights	Wall Switch	17	7,446	0.0	0	0	$0	$0	$0	0.0
Kitchen	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
Kitchen storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,010	0.0	164	0	$25	$55	$15	1.6
Gym	9	Compact Fluorescent: Sportlite (252W)	Wall Switch	S	252	3,010	1, 3	Fixture Replacement	Yes	9	LED - Fixtures: High-Bay	Occupancy Sensor	176	2,077	0.8	3,882	-1	$592	$7,244	$1,385	9.9
Gym	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
Gym storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,010	0.0	185	0	$28	$73	$20	1.9
Gym office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,010	0.0	185	0	$28	$73	$20	1.9
Stairs gym	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.1	328	0	$50	$110	$30	1.6
Stairs gym	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
9 class	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.5	2,502	-1	$381	$927	$215	1.9
9 closet	2	Compact Fluorescent: CFL	Wall Switch	S	52	3,010	2	Relamp	No	2	LED Lamps: LED lamp	Wall Switch	36	3,010	0.0	103	0	$16	$69	$4	4.1
Room 8	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.5	2,502	-1	$381	$927	$215	1.9
8 closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,010	0.1	371	0	$57	$146	$40	1.9
Room 7	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.1	417	0	$64	$380	$65	4.9

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 6	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
Main office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.1	417	0	$64	$380	$65	4.9
Principal	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 3	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,077	0.2	980	0	$149	$562	$115	3.0
Bathroom PO	1	LED Lamps: LED	Wall Switch	S	15	3,010		None	No	1	LED Lamps: LED	Wall Switch	15	3,010	0.0	0	0	$0	$0	$0	0.0
Nurse	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Nurse	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,010	0.0	164	0	$25	$55	$15	1.6
Nurse BR	1	Compact Fluorescent: 4-pin base	Wall Switch	S	42	3,010	2	Relamp	No	1	LED Lamps: LED lamp (4-Pin base)	Wall Switch	29	3,010	0.0	42	0	$6	$25	$1	3.8
Room 2	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
Room2 bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Room 5	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.3	1,251	0	$191	$599	$125	2.5
Room 1	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
1 bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Computer room	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
Mail room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.1	417	0	$64	$380	$65	4.9
Mail room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Room 3	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
Hallway 1st	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 4	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,077	0.6	2,939	-1	$448	$1,326	$240	2.4
Hallway 1st	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	218	0	$33	$73	$20	1.6
Hallway 1st	5	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	5	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Stair 1	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.1	437	0	$67	$146	$40	1.6
Stair 1	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
Stair 1	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,010	0.0	185	0	$28	$73	$20	1.9
Stair 1 office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Room 12	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
Room 13	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1

	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 10	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
Room 14	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
Room 11	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
teacher room	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 3	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,077	0.2	980	0	$149	$562	$115	3.0
teacher room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
IR bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Room 15	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
Room 24	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
Room 24	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Room 24	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	S	22	3,010	2	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	3,010	0.0	45	0	$7	$16	$3	1.9
24 bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Room 16	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.4	1,877	0	$286	$763	$170	2.1
16 closet	2	Compact Fluorescent: CFL	Wall Switch	S	52	3,010	2	Relamp	No	2	LED Lamps: LED lamp	Wall Switch	36	3,010	0.0	103	0	$16	$69	$4	4.1
Room 23	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2, 3	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,077	0.3	1,529	0	$233	$672	$145	2.3
23 bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Room 22	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 3	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,077	0.5	2,449	-1	$373	$1,000	$235	2.1
Room 22	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,010	0.0	192	0	$29	$145	$20	4.3
22 bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Room 17	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 3	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,077	0.6	2,939	-1	$448	$1,146	$275	1.9
17 closet	2	Compact Fluorescent: CFL	Wall Switch	S	52	3,010	2	Relamp	No	2	LED Lamps: LED lamp	Wall Switch	36	3,010	0.0	103	0	$16	$69	$4	4.1
Room 21	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2, 3	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,077	0.3	1,390	0	$212	$635	$135	2.4
Room 21	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,010	0.0	96	0	$15	$72	$10	4.3
21 bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Room 21	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	218	0	$33	$73	$20	1.6
Room 18	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.5	2,502	-1	$381	$927	$215	1.9

	Existing Conditions						Proposed Conditions								Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
18 closet	2	Compact Fluorescent: CFL	Wall Switch	S	52	3,010	2	Relamp	No	2	LED Lamps: LED lamp	Wall Switch	36	3,010	0.0	103	0	$16	$69	$4	4.1
Room 19	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.5	2,502	-1	$381	$927	$215	1.9
19 closet	2	Compact Fluorescent: CFL	Wall Switch	S	52	3,010	2	Relamp	No	2	LED Lamps: LED lamp	Wall Switch	36	3,010	0.0	103	0	$16	$69	$4	4.1
Room 26	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	S	93	3,010	2, 3	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,077	0.1	626	0	$95	$434	$80	3.7
Hallway 26	14	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2, 4	Relamp	Yes	14	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	2,077	0.7	3,429	-1	$523	$1,697	$280	2.7
Stair 3	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.1	655	0	$100	$219	$60	1.6
Stair 3	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
Stair 3	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	3,010	2	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,010	0.0	185	0	$28	$73	$20	1.9
Stair 4	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.1	546	0	$83	$183	$50	1.6
Stair 4	1	Exit Signs: LED - 2 W Lamp	None		6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	$0	$0	$0	0.0
Elevator	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	3,010	0.0	109	0	$17	$37	$10	1.6
Elevator machine	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.0	109	0	$17	$37	$10	1.6
Elevator lobby	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	S	33	3,010	2	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,010	0.0	106	0	$16	$65	$12	3.3
Stair 2	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	3,010	2	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,010	0.1	655	0	$100	$219	$60	1.6
Stair 2	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
Exterior	5	Metal Halide: (1) 70W Lamp	Timeclock		95	4,380	1	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	29	4,380	0.2	1,456	0	$224	$4,830	$500	19.3
Exterior	4	Metal Halide: (1) 100W Lamp	Timeclock		128	4,380	1	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	38	4,380	0.2	1,570	0	$242	$3,864	$400	14.3
Outdoor shed	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None		62	2,508	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	2,508	0.0	83	0	$13	$37	$10	2.1
Parking lot	4	Metal Halide: (1) 100W Lamp	Photocell		128	4,380	1	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Photocell	38	4,380	0.2	1,570	0	$242	$3,864	$400	14.3

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**
Outside Gym (Ground Level)	Gym	1	Supply Fan	7.5	88.5%	No	B	3,391	5	No	91.0%	Yes	1	2.2	8,999	0	$1,387	$4,738	$600	3.0
Boiler Room	HHW Building Loop	2	Heating Hot Water Pump	3.0	86.5%	No	W	2,745	7	No	89.5%	Yes	2	0.7	6,024	0	$929	$7,768	$0	8.4
Boiler Room	HHWP Baseboard Loop	2	Heating Hot Water Pump	0.8	81.8%	No	W	2,745		No	81.8%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Feed Water	3	Boiler Feed Water Pump	1.0	80.4%	No	W	2,745		No	80.4%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boiler Feed Water Tank	2	Boiler Feed Water Pump	2.0	84.0%	No	W	2,745		No	84.0%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Boilers	2	Combustion Air Fan	2.0	85.5%	No	W	2,745	8	No	85.5%	Yes	2	1.2	3,832	0	$591	$6,987	$0	11.8
Boiler Room	Sump Pumps	2	Other	0.3	70.5%	No	W	2,745		No	70.5%	No		0.0	0	0	$0	$0	$0	0.0
Boiler Room	Chilled Water Loop	2	Chilled Water Pump	7.5	88.5%	No	W	2,035	6	No	91.0%	Yes	2	3.0	10,799	0	$1,665	$9,476	$0	5.7
Boiler Room	Building Dual Temp Loop (Secondary Loop)	2	Heating Hot Water Pump	10.0	89.5%	No	W	3,391	6	No	91.7%	Yes	2	2.1	23,588	0	$3,636	$10,303	$0	2.8
Throughout Building	Single Zones	45	Supply Fan	0.1	70.5%	No	W	3,391		No	70.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Exhaust	4	Exhaust Fan	0.5	78.2%	No	W	3,391		No	78.2%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Exhaust	14	Exhaust Fan	0.2	68.5%	No	W	3,391		No	68.5%	No		0.0	0	0	$0	$0	$0	0.0
Roof	Kitchen MUA	1	Makeup Air Fan	1.0	80.4%	No	W	3,391		No	80.4%	No		0.0	0	0	$0	$0	$0	0.0

Electric HVAC Inventory & Recommendations

		Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis							
Location	**Area(s)/System(s) Served**	**System Quantity**	**System Type**	**Cooling Capacity per Unit (Tons)**	**Heating Capacity per Unit (MBh)**	**Remaining Useful Life**	**ECM #**	**Install High Efficiency System?**	**System Quantity**	**System Type**	**Cooling Capacity per Unit (Tons)**	**Heating Capacity per Unit (MBh)**	**Cooling Mode Efficiency (SEER/EER)**	**Heating Mode Efficiency (COP)**	**Total Peak kW Savings**	**Total Annual kWh Savings**	**Total Annual MMBtu Savings**	**Total Annual Energy Cost Savings**	**Total Installation Cost**	**Total Incentives**	**Simple Payback w/ Incentives in Years**
Outside Gym (Ground Level)	Gym	1	Packaged AC	30.00		B	9	Yes	1	Packaged AC	30.00		9.50		2.4	2,907	0	$448	$66,479	$0	148.4
Outside (Ground Level)	Server Room	1	Split-System AC	3.00		W		No							0.0	0	0	$0	$0	$0	0.0
Roof	Mail Room	1	Split-System AC	1.50		W		No							0.0	0	0	$0	$0	$0	0.0
Windows	Rooms	2	Window AC	1.00		W		No							0.0	0	0	$0	$0	$0	0.0

Electric Chiller Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Remaining Useful Life	ECM #	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Whole Building	2	Air-Cooled Reciprocating Chiller	100.00	B	10	Yes	2	Air-Cooled Centrifugal Chiller	Variable	100.00	1.24	0.74	67.7	46,514	0	$7,170	$170,637	$18,000	21.3

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	Whole Building	1	Forced Draft Steam Boiler	######	W		No						0.0	0	0	$0	$0	$0	0.0
Outside Gym (Ground Level)	Gym	1	Furnace	470.00	B	11	Yes	1	Furnace	470.00	95.00%	AFUE	0.0	0	39	$327	$10,649	$400	31.4
Roof	Kitchen MUA	1	Furnace	117.50	B		No						0.0	0	0	$0	$0	$0	0.0

DHW Inventory & Recommendations

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

Low-Flow Device Recommendations

	Recommendation Inputs					Energy Impact & Financial Analysis						
Location	ECM #	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	12	9	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	26	$215	$65	$0	0.3

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions				Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	ECM #	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Cooler (35F to 55F)	13	Yes	No	No	0.0	308	0	$47	$303	$0	6.4
Kitchen	1	Medium Temp Freezer (0F to 30F)	13, 14	Yes	Yes	Yes	0.1	2,292	0	$353	$2,799	$125	7.6

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	ECM #	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	4	Refrigerator Chest	Yes		No	0.0	0	0	$0	$0	$0	0.0

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	ECM #	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Griddle (4 Feet Width)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Kitchen	1	Gas Convection Oven (Full Size)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Kitchen	1	Gas Steamer	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Kitchen	4	Electric Steamer	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Yes		No	0.0	0	0	FALSE	$0	$0	#DIV/0!

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Throughout Building	69	Desktop Computers	150.0	Yes
Throughout Building	3	Laptops	45.0	Yes
Throughout Building	32	Printers (Small)	20.0	Yes
Throughout Building	2	Printers (Medium)	60.0	Yes
Throughout Building	5	Photocopiers	600.0	Yes
Throughout Building	25	Projectors	200.0	Yes
Throughout Building	5	Microwave	1,000.0	Yes
Throughout Building	1	Mini Fridge	153.0	Yes
Throughout Building	4	Refrigerators	172.0	Yes
Throughout Building	3	Coffee Machine	900.0	Yes
Throughout Building	2	Ceiling Fan	120.0	Yes
Throughout Building	1	CRT TV	120.0	No

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

EUI is presented in terms of *site energy* and *source energy*. Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

LEARN MORE AT energystar.gov

ENERGY STAR® Statement of Energy Performance

43

ENERGY STAR® Score[1]

Benjamin Franklin Elementary School (13)

Primary Property Type: K-12 School
Gross Floor Area (ft²): 61,180
Built: 1914

For Year Ending: October 31, 2017
Date Generated: March 12, 2019

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Benjamin Franklin Elementary School (13) 248 Ripley Place Elizabeth, New Jersey 07206	Elizabeth Board of Education 500 North Broad Street Elizabeth, NJ 07208 908-436-5180	Luis Couto 500 North Broad Street Elizabeth, NJ 07208 908-436-5180 coutolu@epsnj.org

Property ID: 6688942

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
69.1 kBtu/ft²

Source EUI
123.2 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	1,768,464 (42%)
Natural Gas (kBtu)	2,461,429 (58%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	64.5
National Median Source EUI (kBtu/ft²)	114.9
% Diff from National Median Source EUI	7%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	310

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 gases:* 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 $1/8^{th}$ 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.