



Local Government Energy Audit Report

Battle Hill Elementary School

April 19, 2019

Prepared for:

Union Township Public Schools
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Union, NJ 07083

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Disclaimer

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

TRC 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 (NJBP) 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 NJBP 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 NJBP reserves the right to extend, modify, or terminate programs without prior notice. Please review all available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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

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Table of Contents

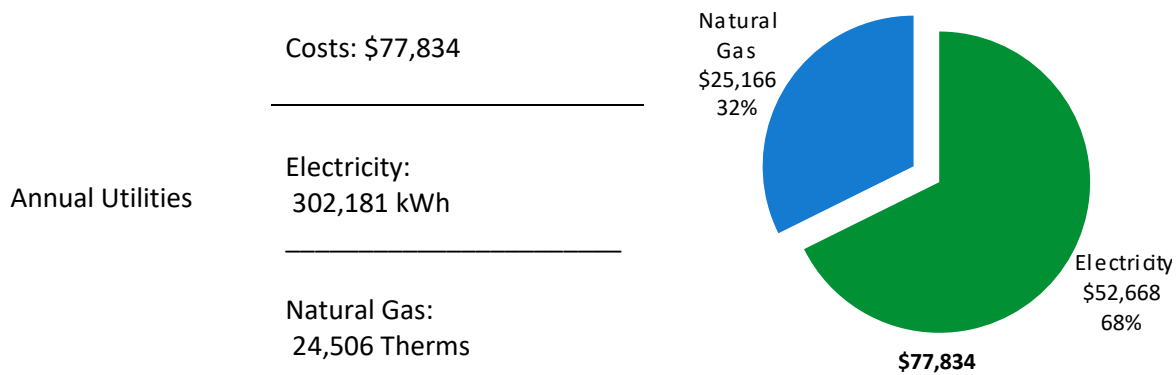
1	Executive Summary	5
1.1	Planning Your Project	8
	Pick Your Installation Approach	8
	More Options from Around the State	10
2	Existing Conditions	12
2.1	Site Overview.....	12
2.2	Building Occupancy	12
2.3	Building Envelope	13
2.4	Lighting Systems	13
2.5	Air Handling Systems	15
	Unit Ventilators	15
	Air Conditioners	15
2.6	Heating Hot Water Systems	16
2.7	Domestic Hot Water	17
2.8	Food Service Equipment and Refrigeration	18
2.9	Plug Load & Vending Machines	19
2.10	Water-Using Systems	19
3	Energy Use and Costs	20
3.1	Electricity	21
3.2	Natural Gas	22
3.3	Benchmarking.....	22
	Tracking Your Energy Performance	23
4	Energy Conservation Measures	24
4.1	Lighting	27
	ECM 1: Install LED Fixtures	27
	ECM 2: Retrofit Fixtures with LED Lamps.....	27
4.2	Lighting Controls.....	28
	ECM 3: Install Occupancy Sensor Lighting Controls	28
	ECM 4: Install High/Low Lighting Controls	28
4.3	Motors	29
	Premium Efficiency Motors.....	29
4.4	Variable Frequency Drives (VFD).....	30
	Install VFDs on Heating Water Pumps	30
4.5	Electric Unitary HVAC	31
	Install High Efficiency Air Conditioning Units	31
4.6	Domestic Water Heating	32

Install High Efficiency Gas-Fired Water Heater	32
ECM 5: Install Low-Flow DHW Devices.....	32
4.7 Food Service & Refrigeration Measures.....	33
ECM 6: Replace Refrigeration Equipment	33
ECM 7: Vending Machine Control	33
5 Energy Efficient Best Practices	34
Energy Tracking with ENERGY STAR® Portfolio Manager®	34
Motor Maintenance	34
Thermostat Schedules and Temperature Resets	34
AC System Evaporator/Condenser Coil Cleaning	34
HVAC Filter Cleaning and Replacement	35
Boiler Maintenance	35
Water Heater Maintenance	35
Plug Load Controls.....	35
Water Conservation	36
Procurement Strategies	36
6 On-site Generation	37
6.1 Solar Photovoltaic	38
6.2 Combined Heat and Power	39
7 Project Funding and Incentives.....	40
7.1 SmartStart	41
7.2 Direct Install	42
7.3 Energy Savings Improvement Program	42
7.4 SREC Registration Program.....	43
8 Energy Purchasing and Procurement Strategies	44
8.1 Retail Electric Supply Options.....	44
8.1 Retail Natural Gas Supply Options	44
Appendix A: Equipment Inventory & Recommendations	A-1
Appendix B: ENERGY STAR® Statement of Energy Performance.....	B-1
Appendix C: Glossary	C-1

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) report for Battle Hill Elementary 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 help protect our environment by reducing statewide energy consumption.

BUILDING PERFORMANCE REPORT



<p>ENERGY STAR® Benchmarking Score</p> <p style="text-align: center; font-size: 1.2em;">82 <i>(1-100 scale)</i></p>	<p>Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance and lower your energy bills even more.</p> <p>This report contains suggestions about how to improve building performance and reduce energy costs.</p>
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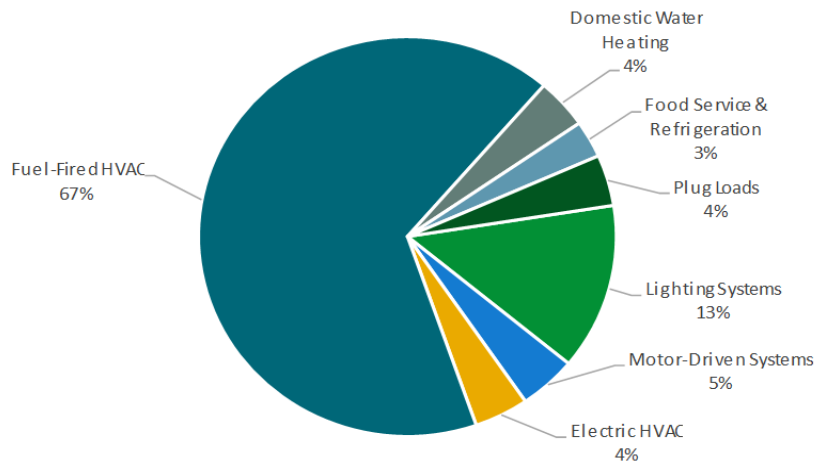


Figure 1 - Energy Use by System

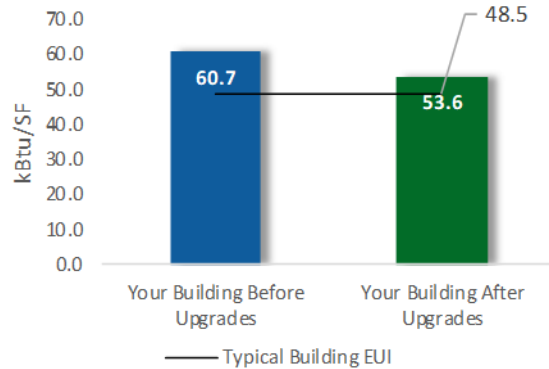
POTENTIAL IMPROVEMENTS



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.

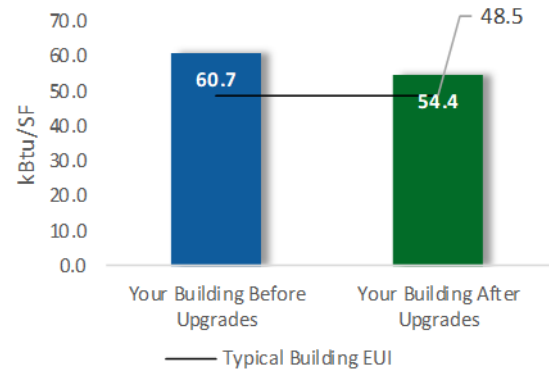
Scenario 1: Full Package (all evaluated measures)

Installation Cost	\$133,697
Potential Rebates & Incentives ¹	\$12,703
Annual Cost Savings	\$19,447
Annual Energy Savings	Electricity: 109,788 kWh Natural Gas: 303 Therms
Greenhouse Gas Emission Savings	57 Tons
Simple Payback	6.2 Years
Site Energy Savings (all utilities)	12%



Scenario 2: Cost Effective Package²

Installation Cost	\$82,324
Potential Rebates & Incentives	\$12,403
Annual Cost Savings	\$18,003
Annual Energy Savings	Electricity: 102,658 kWh Natural Gas: 107 Therms
Greenhouse Gas Emission Savings	52 Tons
Simple Payback	3.9 Years
Site Energy Savings (all utilities)	10%



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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades		81,095	24.9	-14	\$13,986	\$209,793	\$54,746	\$9,653	\$45,093	3.2	79,972
ECM 1	Install LED Fixtures	20,424	3.9	-2	\$3,540	\$53,101	\$27,047	\$2,800	\$24,247	6.8	20,342
ECM 2	Retrofit Fixtures with LED Lamps	60,671	21.0	-13	\$10,446	\$156,692	\$27,699	\$6,853	\$20,846	2.0	59,631
Lighting Control Measures		15,734	4.2	-3	\$2,709	\$21,668	\$18,512	\$2,000	\$16,512	6.1	15,458
ECM 3	Install Occupancy Sensor Lighting Controls	13,482	3.6	-3	\$2,321	\$18,567	\$15,712	\$2,000	\$13,712	5.9	13,246
ECM 4	Install High/Low Lighting Controls	2,252	0.6	0	\$388	\$3,101	\$2,800	\$0	\$2,800	7.2	2,212
Motor Upgrades		127	0.1	0	\$22	\$333	\$6,287	\$0	\$6,287	283.3	128
	Premium Efficiency Motors	127	0.1	0	\$22	\$333	\$6,287	\$0	\$6,287	283.3	128
Variable Frequency Drive (VFD) Measures		6,209	2.9	0	\$1,082	\$16,232	\$22,252	\$0	\$22,252	20.6	6,252
	Install VFDs on Heating Water Pumps	6,209	2.9	0	\$1,082	\$16,232	\$22,252	\$0	\$22,252	20.6	6,252
Electric Unitary HVAC Measures		794	0.7	0	\$138	\$2,077	\$14,154	\$0	\$14,154	102.2	800
	Install High Efficiency Air Conditioning Units	794	0.7	0	\$138	\$2,077	\$14,154	\$0	\$14,154	102.2	800
Domestic Water Heating Upgrade		0	0.0	48	\$493	\$5,938	\$8,752	\$300	\$8,451	17.1	5,625
	Install High Efficiency Gas-Fired Water Heater	0	0.0	20	\$201	\$3,015	\$8,680	\$300	\$8,380	41.7	2,291
ECM 5	Install Low-Flow DHW Devices	0	0.0	28	\$292	\$2,923	\$72	\$0	\$72	0.2	3,333
Food Service & Refrigeration Measures		5,829	0.7	0	\$1,016	\$10,226	\$8,994	\$750	\$8,244	8.1	5,870
ECM 6	Replace Refrigeration Equipment	4,218	0.5	0	\$735	\$8,821	\$8,764	\$750	\$8,014	10.9	4,247
ECM 7	Vending Machine Control	1,612	0.2	0	\$281	\$1,405	\$230	\$0	\$230	0.8	1,623
TOTALS		109,788	33.5	30	\$19,447	\$266,267	\$133,697	\$12,703	\$120,993	6.2	114,106

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

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

Figure 2 – Evaluated Energy Improvements

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 Low-Flow Domestic Hot Water Devices	x	x	
ECM 6	Replace Refrigeration Equipment		x	
ECM 7	Vending Machine Control		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 their 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 (NJBP) has sponsored this Local Government Energy Audit (LGEA) Report for Battle Hill Elementary 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 Energy Services (TRC) conducted this study as part of a comprehensive effort to assist New Jersey educational and local government facilities in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

2.1 Site Overview

On September 18, 2018, TRC performed an energy audit at Battle Hill Elementary School located in Union, NJ. TRC met with Silvano Berardulli to review the facility operations and help focus our investigation on specific energy-using systems.

Battle Hill Elementary School is a 2-story, 57,375 square foot building built in 1957. Spaces include: classrooms, gymnasium, auditorium, offices, cafeteria, corridors, stairwells, offices, a commercial kitchen and basement mechanical space.

2.2 Building Occupancy

The building is in operation 10 months out of the year. General operation is 6:30 AM to 10:00 PM Monday through Friday. The school is cleaned after hours between 6:30 PM and 10:00 PM. The building is occupied by 398 students and about 106 staff. The typical schedule is presented in the table below.

Building Name	Weekday/Weekend	Operating Schedule
Battle Hill Elementary School - General Hours of Opeartion	Weekday	6:30 AM - 10:00 PM
	Weekend	Closed
Battle Hill Elementary School - Classe'S Hours of Operation	Weekday	8:45 AM - 3:00 PM
	Weekend	Closed

Figure 4 - Building Occupancy Schedule

2.3 Building Envelope

Building walls are concrete block over structural steel with a brick facade. The roof is flat and covered with a gravel ballasted membrane that is in fair condition. The site has double glazed windows in fair condition. The exterior doors are constructed of metal or are metal framed and are in good condition.



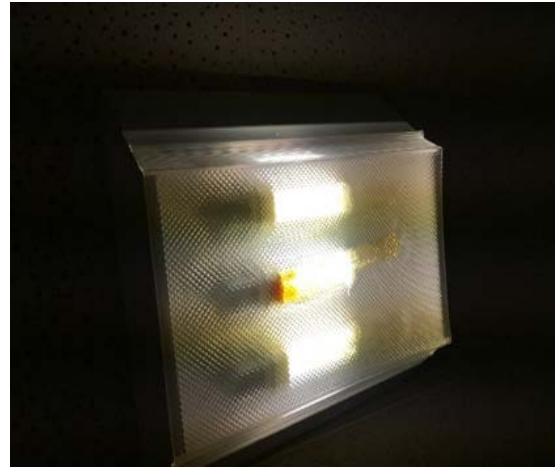
Building Envelope

2.4 Lighting Systems

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. Additionally, there are some compact fluorescent lamps (CFL), LED screw-in bulbs, LED direct fixtures and some metal halide fixtures. Typically, T8 fluorescent lamps use electronic ballasts.

The CFL wattage range from 13-Watt to 32-Watt. The LED direct fixtures in the playroom are 40-Watt and 56-Watt. The gymnasium has 250-Watt metal halide fixtures. All exit signs are LED 2-Watt fixtures. Interior lighting levels were generally sufficient. Lighting fixtures in the spaces are controlled by wall switches.

Exterior lighting in the school include 65-Watt recessed incandescent fixtures, 125-Watt LED screw-in corn bulbs, 70-Watt and 400-Watt metal halide fixtures and 13-Watt CFLs. The exterior lights are controlled by a timeclock.



Typical Interior Lighting



Exterior Wall Packs & Timer

2.5 Air Handling Systems

Unit Ventilators

Unit ventilators have supply fan motors, pneumatically controlled outside air dampers and fan coil valves that operate with a pneumatic control system. There are 39 Nestbitt unit ventilators throughout the school mostly located in the classrooms and appear to be in good working condition.



Typical Classroom Unit ventilator

Air Conditioners

The areas in the school are being cooled using window AC unit whose cooling capacities range from 8,000 Btu/hr. to 24,000 Btu/hr. The EER values of the units range from 9.8 to 10.9. Most units are within the useful life of the equipment. However, the older units have been evaluated for replacement. The newer units are ENERGY STAR® labeled.



Window ACs

2.6 Heating Hot Water Systems

The space heating in the school is provided using three condensing hot water boilers (Aerco Benchmark 2.0) with an output capacity of 1,760 MBh and a nominal efficiency of 88%. The hot water from the boilers is circulated throughout the school using two constant speed 7.5 hp pumps and five constant speed 3 hp pumps. The boilers operate in a lead/lag configuration, but the three boilers may be needed during peak heating load. The heating devices include unit ventilators in the classrooms and the gymnasium, and hydronic baseboard in other spaces. Heating hot water temperature is controlled based on the outside air temperatures. Local thermostats are used to control the temperature in spaces by a pneumatic control system. The boilers are newer, in good condition, and well maintained.



Heating Hot Water System

2.7 Domestic Hot Water

Domestic hot water for the building consists of two A. O. Smith hot water heaters with an input rating of 75 MBh and nominal efficiency of 80%. The water heaters serve the kitchen and the restrooms at the facility. The water from the heaters is distributed in the school using two circulating pumps of capacity 1/3 hp.



DHW & Circulating Pumps

2.8 Food Service Equipment and Refrigeration

The kitchen has mixed gas and electric equipment that is used to prepare lunches for students. Most cooking is done using a convection oven and gas-fired cooking range. Bulk prepared foods are held in several electric holding cabinets. Equipment are high efficiency and is in good condition.

The dishwasher is an ENERGY STAR® high temperature, door type unit with an electric booster. Visit https://www.energystar.gov/products/commercial_food_service_equipment for the latest information on high efficiency food service equipment.

The kitchen has several stand-up refrigerators with either solid door and a couple of refrigerator chests. Most of the stand-up refrigerators are old, inefficient, and have been evaluated for replacements.

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



Stand-up refrigerator



Refrigerator chest



Convection oven and gas-fired cooking range



Dishwasher

2.9 Plug Load & Vending Machines

The utility bill analysis indicates that plug loads consume approximately 4.12% percent of total building energy use. This is higher than a typical building.

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

There are approximately 122 computer work stations throughout the facility. Other plug loads throughout the building include general café and office equipment. There are typical classroom loads such as smart boards, projectors, and fans.

There are seven residential style refrigerators throughout the building that are used to store food for the faculty onsite. These vary in condition and efficiency.

There is one refrigerated and one non-refrigerated beverage vending machines located in the teacher's lounge. Vending machines are not equipped with occupancy-based controls.

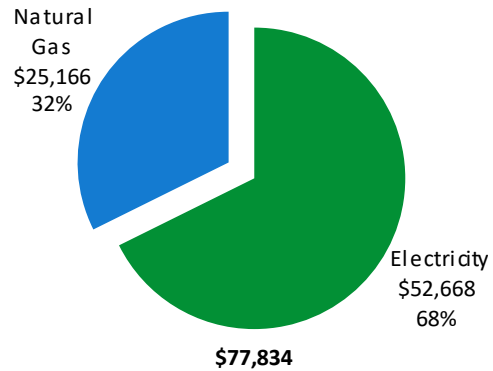
2.10 Water-Using Systems

There are several restrooms at this facility. A sampling of restrooms found that some faucets are rated for 2.2 gallons per minute (gpm) or higher, the toilets are rated at 2.2 gallons per flush (gpf), and the urinals are rated at 2 gpf.

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	302,181 kWh	\$52,668
Natural Gas	24,506 Therms	\$25,166
Total		\$77,834



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

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

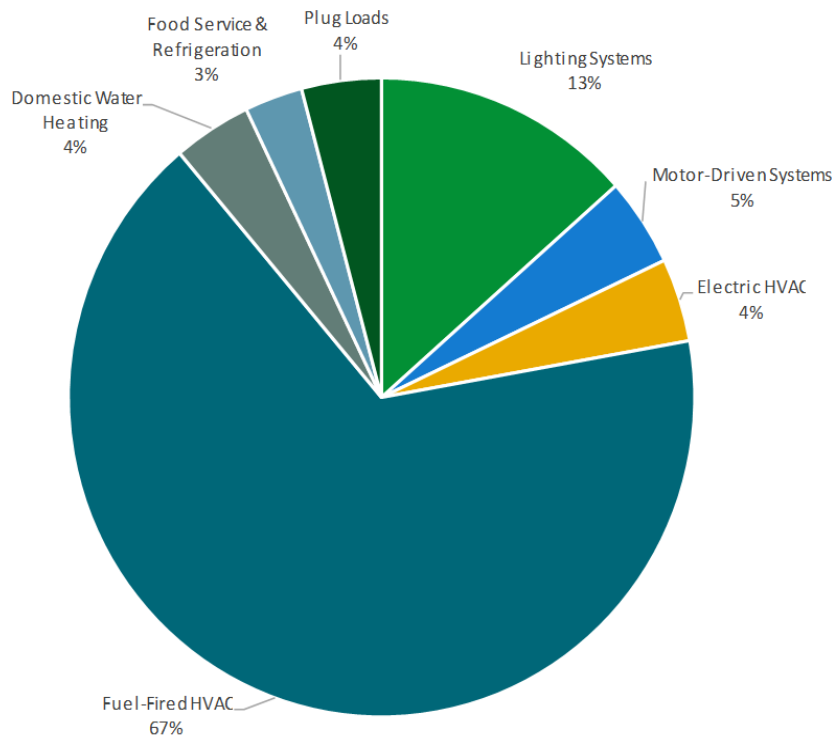
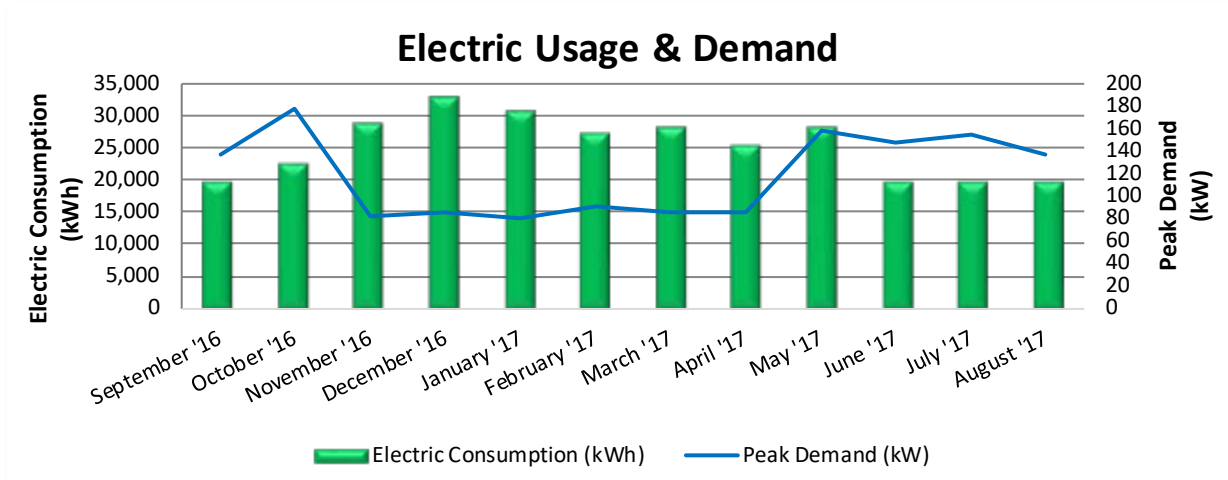


Figure 5 - Energy Balance

3.1 Electricity

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



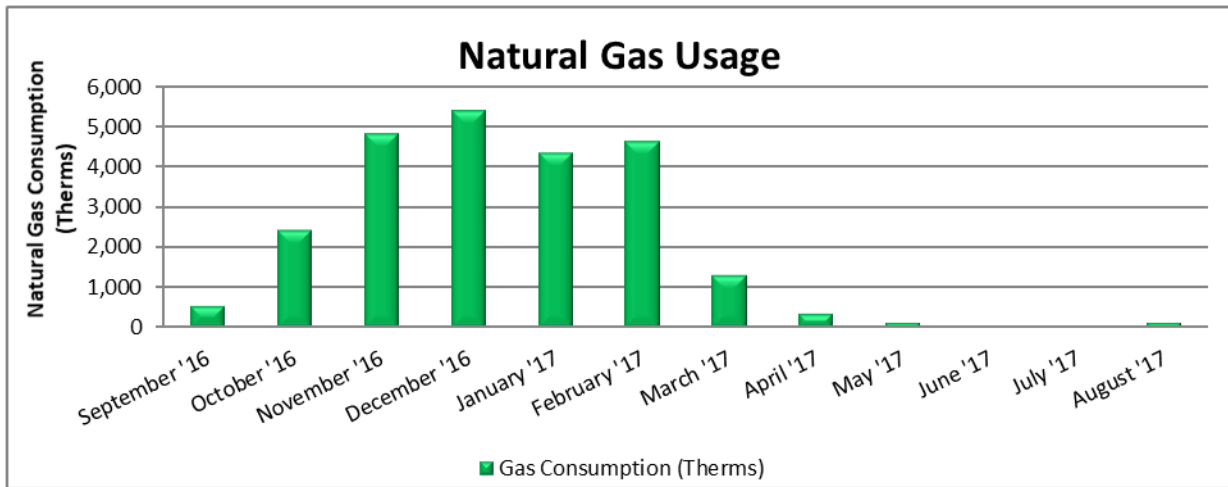
Electric Billing Data					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
9/30/16	30	19,632	137	\$817	\$3,994
10/26/16	26	22,425	178	\$526	\$3,710
11/15/16	20	28,800	83	\$369	\$4,478
12/15/16	30	32,700	86	\$385	\$5,075
1/18/17	34	30,375	81	\$361	\$4,718
2/15/17	28	27,150	90	\$404	\$4,402
3/17/17	30	28,125	86	\$389	\$4,532
4/18/17	32	25,125	85	\$396	\$4,095
5/17/17	29	28,125	158	\$714	\$5,541
6/17/17	31	19,632	147	\$817	\$3,994
8/1/17	45	19,632	155	\$817	\$3,994
8/30/17	29	19,632	137	\$817	\$3,994
Totals	364	301,353	178	\$6,814	\$52,524
Annual	365	302,181	178	\$6,833	\$52,668

Notes:

- Peak electric usage occurred in December '16.
- The average electric cost over the past 12 months was \$0.174/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 231, with natural gas supply provided by Hudson Energy, a third-party supplier.



Gas Billing Data			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
10/1/16	30	568	\$971
11/1/16	31	2,447	\$3,182
12/1/16	30	4,859	\$6,053
12/31/16	30	5,435	\$4,339
1/31/17	31	4,375	\$3,538
3/1/17	29	4,666	\$3,833
3/30/17	29	1,336	\$1,246
4/29/17	30	357	\$529
6/1/17	33	125	\$360
6/30/17	29	72	\$345
8/1/17	32	68	\$326
8/31/17	30	132	\$373
Totals	364	24,439	\$25,097
Annual	365	24,506	\$25,166

Notes:

- The average gas cost for the past 12 months is \$1.027/therm, which is the blended rate used throughout the analysis.

3.3 Benchmarking

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

performance. It assesses the building’s physical assets, operations, and occupant behavior, which is compiled into a quick and easy-to-understand score.

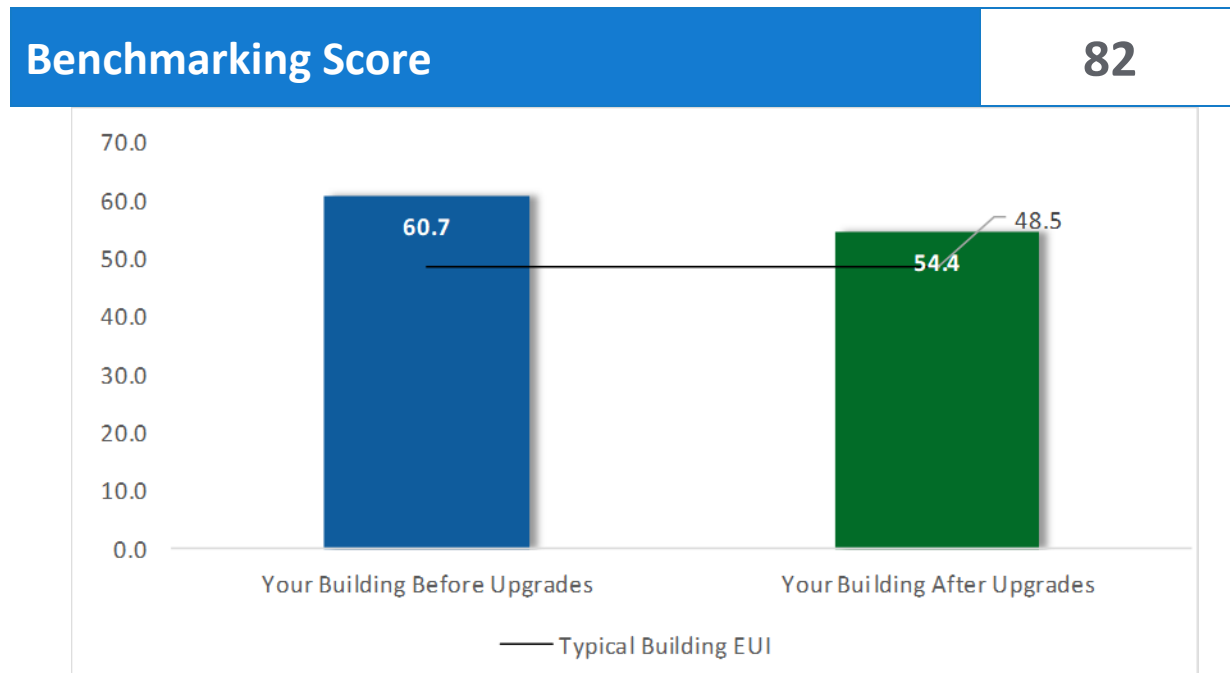


Figure 6 - Energy Use Intensity Comparison

Congratulations, your building performs better than the national average. This report has suggestions about how to keep your building running efficiently, further improve performance, and lower your energy bills even more. 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 website³.

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.

Appendix A: Equipment Inventory & Recommendations provides a detailed list of the locations and recommended upgrades for each energy conservation measure.

#	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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades		81,095	24.9	-14	\$13,986	\$54,746	\$9,653	\$45,093	3.2	79,972
ECM 1	Install LED Fixtures	20,424	3.9	-2	\$3,540	\$27,047	\$2,800	\$24,247	6.8	20,342
ECM 2	Retrofit Fixtures with LED Lamps	60,671	21.0	-13	\$10,446	\$27,699	\$6,853	\$20,846	2.0	59,631
Lighting Control Measures		15,734	4.2	-3	\$2,709	\$18,512	\$2,000	\$16,512	6.1	15,458
ECM 3	Install Occupancy Sensor Lighting Controls	13,482	3.6	-3	\$2,321	\$15,712	\$2,000	\$13,712	5.9	13,246
ECM 4	Install High/Low Lighting Controls	2,252	0.6	0	\$388	\$2,800	\$0	\$2,800	7.2	2,212
Motor Upgrades		127	0.1	0	\$22	\$6,287	\$0	\$6,287	283.3	128
	Premium Efficiency Motors	127	0.1	0	\$22	\$6,287	\$0	\$6,287	283.3	128
Variable Frequency Drive (VFD) Measures		6,209	2.9	0	\$1,082	\$22,252	\$0	\$22,252	20.6	6,252
	Install VFDs on Heating Water Pumps	6,209	2.9	0	\$1,082	\$22,252	\$0	\$22,252	20.6	6,252
Electric Unitary HVAC Measures		794	0.7	0	\$138	\$14,154	\$0	\$14,154	102.2	800
	Install High Efficiency Air Conditioning Units	794	0.7	0	\$138	\$14,154	\$0	\$14,154	102.2	800
Domestic Water Heating Upgrade		0	0.0	48	\$493	\$8,752	\$300	\$8,451	17.1	5,625
	Install High Efficiency Gas-Fired Water Heater	0	0.0	20	\$201	\$8,680	\$300	\$8,380	41.7	2,291
ECM 5	Install Low-Flow DHW Devices	0	0.0	28	\$292	\$72	\$0	\$72	0.2	3,333
Food Service & Refrigeration Measures		5,829	0.7	0	\$1,016	\$8,994	\$750	\$8,244	8.1	5,870
ECM 6	Replace Refrigeration Equipment	4,218	0.5	0	\$735	\$8,764	\$750	\$8,014	10.9	4,247
ECM 7	Vending Machine Control	1,612	0.2	0	\$281	\$230	\$0	\$230	0.8	1,623
TOTALS		109,788	33.5	30	\$19,447	\$133,697	\$12,703	\$120,993	6.2	114,106

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

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

Figure 7 – All Evaluated ECMs

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Lighting Upgrades		81,095	24.9	-14	\$13,986	\$54,746	\$9,653	\$45,093	3.2	79,972
ECM 1	Install LED Fixtures	20,424	3.9	-2	\$3,540	\$27,047	\$2,800	\$24,247	6.8	20,342
ECM 2	Retrofit Fixtures with LED Lamps	60,671	21.0	-13	\$10,446	\$27,699	\$6,853	\$20,846	2.0	59,631
Lighting Control Measures		15,734	4.2	-3	\$2,709	\$18,512	\$2,000	\$16,512	6.1	15,458
ECM 3	Install Occupancy Sensor Lighting Controls	13,482	3.6	-3	\$2,321	\$15,712	\$2,000	\$13,712	5.9	13,246
ECM 4	Install High/Low Lighting Controls	2,252	0.6	0	\$388	\$2,800	\$0	\$2,800	7.2	2,212
Domestic Water Heating Upgrade		0	0.0	28	\$292	\$72	\$0	\$72	0.2	3,333
ECM 5	Install Low-Flow DHW Devices	0	0.0	28	\$292	\$72	\$0	\$72	0.2	3,333
Food Service & Refrigeration Measures		5,829	0.7	0	\$1,016	\$8,994	\$750	\$8,244	8.1	5,870
ECM 6	Replace Refrigeration Equipment	4,218	0.5	0	\$735	\$8,764	\$750	\$8,014	10.9	4,247
ECM 7	Vending Machine Control	1,612	0.2	0	\$281	\$230	\$0	\$230	0.8	1,623
TOTALS		102,658	29.8	11	\$18,003	\$82,324	\$12,403	\$69,921	3.9	104,634

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

** - 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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades		81,095	24.9	-14	\$13,986	\$54,746	\$9,653	\$45,093	3.2	79,972
ECM 1	Install LED Fixtures	20,424	3.9	-2	\$3,540	\$27,047	\$2,800	\$24,247	6.8	20,342
ECM 2	Retrofit Fixtures with LED Lamps	60,671	21.0	-13	\$10,446	\$27,699	\$6,853	\$20,846	2.0	59,631

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 exterior fixtures and gym fixtures containing metal halide lamps with new LED high bay 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, exterior fixtures

ECM 2: Retrofit Fixtures with LED Lamps

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

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

Affected building areas: all areas with fluorescent fixtures with T8 tubes, CFLs and incandescent lamps.

4.2 Lighting Controls

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Lighting Control Measures		15,734	4.2	-3	\$2,709	\$18,512	\$2,000	\$16,512	6.1	15,458
ECM 3	Install Occupancy Sensor Lighting Controls	13,482	3.6	-3	\$2,321	\$15,712	\$2,000	\$13,712	5.9	13,246
ECM 4	Install High/Low Lighting Controls	2,252	0.6	0	\$388	\$2,800	\$0	\$2,800	7.2	2,212

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 that lighting controls use dual technology sensors, which reduce the possibility of lights turning off unexpectedly.

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

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

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

Affected building areas: Offices, conference rooms, classrooms, gymnasium, library, restrooms, and storage rooms

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.

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 Motors

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Motor Upgrades		127	0.1	0	\$22	\$6,287	\$0	\$6,287	283.3	128
	Premium Efficiency Motors	127	0.1	0	\$22	\$6,287	\$0	\$6,287	283.3	128

Premium Efficiency Motors

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

Affected motors:

Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Additional Motor Description
Boiler room	Heating system	2	Heating Hot Water Pump	7.5	
Boiler room	Heating system	5	Heating Hot Water Pump	3.0	

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

4.4 Variable Frequency Drives (VFD)

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		6,209	2.9	0	\$1,082	\$22,252	\$0	\$22,252	20.6	6,252
	Install VFDs on Heating Water Pumps	6,209	2.9	0	\$1,082	\$22,252	\$0	\$22,252	20.6	6,252

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. The savings and cost associated with the new motor are presented with the Premium Efficiency Motor measures. If the proposed VFD measure is not selected for implementation the motor replacement should be reevaluated.

Install VFDs on Heating Water Pumps

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

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

Affected pumps: Hot water pumps serving the boilers – (2) 7.5hp and (5) 3hp

4.5 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 ₂ e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		794	0.7	0	\$138	\$14,154	\$0	\$14,154	102.2	800
	Install High Efficiency Air Conditioning Units	794	0.7	0	\$138	\$14,154	\$0	\$14,154	102.2	800

Install High Efficiency Air Conditioning Units

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

Replacing the window 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 units are eventually replaced, consider purchasing equipment that exceeds the minimum efficiency required by building codes.

4.6 Domestic Water Heating

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		0	0.0	48	\$493	\$8,752	\$300	\$8,451	17.1	5,625
	Install High Efficiency Gas-Fired Water Heater	0	0.0	20	\$201	\$8,680	\$300	\$8,380	41.7	2,291
ECM 5	Install Low-Flow DHW Devices	0	0.0	28	\$292	\$72	\$0	\$72	0.2	3,333

Install High Efficiency Gas-Fired Water Heater

We have evaluated replacing the existing tank water heater with a high efficiency tank water heater. Energy savings result from the increased efficiency of the unit, which uses less gas to heat water, and fewer operating hours to maintain the tank water temperature.

ECM 5: Install Low-Flow DHW Devices

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

Device	Flow Rate
Faucet aerators (lavatory)	0.5 gpm

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

4.7 Food Service & Refrigeration Measures

#	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Food Service & Refrigeration Measures		5,829	0.7	0	\$1,016	\$8,994	\$750	\$8,244	8.1	5,870
ECM 6	Replace Refrigeration Equipment	4,218	0.5	0	\$735	\$8,764	\$750	\$8,014	10.9	4,247
ECM 7	Vending Machine Control	1,612	0.2	0	\$281	\$230	\$0	\$230	0.8	1,623

ECM 6: Replace Refrigeration Equipment

Replace existing commercial refrigerators and freezers with new ENERGY STAR® rated equipment. The energy savings associated with this measure come from reduced energy usage, due to more efficient technology, and reduced run times.

ECM 7: Vending Machine Control

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

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 emissions⁴. Your account has already been established. Now you can continue to keep tabs on your energy performance every month.

Motor Maintenance

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

Thermostat Schedules and Temperature Resets



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

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.

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

HVAC Filter Cleaning and Replacement

Air filters should be checked regularly (often monthly) and cleaned or replaced when appropriate. Air filters reduce indoor air pollution, increase occupant comfort, and help keep equipment operating efficiently. If the building has a building management system, consider installing a differential pressure switch across filters to send an alarm about premature fouling or overdue filter replacement. Over time, filters become less and less effective as particulate buildup increases. Dirty filters also restrict air flow through the air conditioning or heat pump system, which increases the load on the distribution fans.

Boiler Maintenance

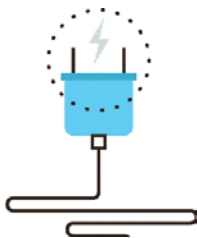
Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to keeping the heating system running efficiently and preventing expensive repairs. Annual tune-ups should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is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

Water Heater Maintenance

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

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

Plug Load Controls



Reducing plug loads is a common way to decrease your electrical use. Limiting the energy use of plug loads can include increasing occupant awareness, removing under-used equipment, installing hardware controls, and using software controls. Consider enabling the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips⁵. Your local utility may offer incentives or rebates for this equipment.

⁵ For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings" <http://www.nrel.gov/docs/fy13osti/54175.pdf>, or "Plug Load Best Practices Guide" <http://www.advancedbuildings.net/plug-load-best-practices-guide-offices>.

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™ website⁶ or download a copy of EPA's "WaterSense™ at Work: Best Management Practices for Commercial and Institutional Facilities"⁷ to get ideas for creating a water management plan and best practices for a wide range of water using systems.

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

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

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

Procurement Strategies

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

⁶ <https://www.epa.gov/watersense>.

⁷ <https://www.epa.gov/watersense/watersense-work-0>.

6 ON-SITE GENERATION

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

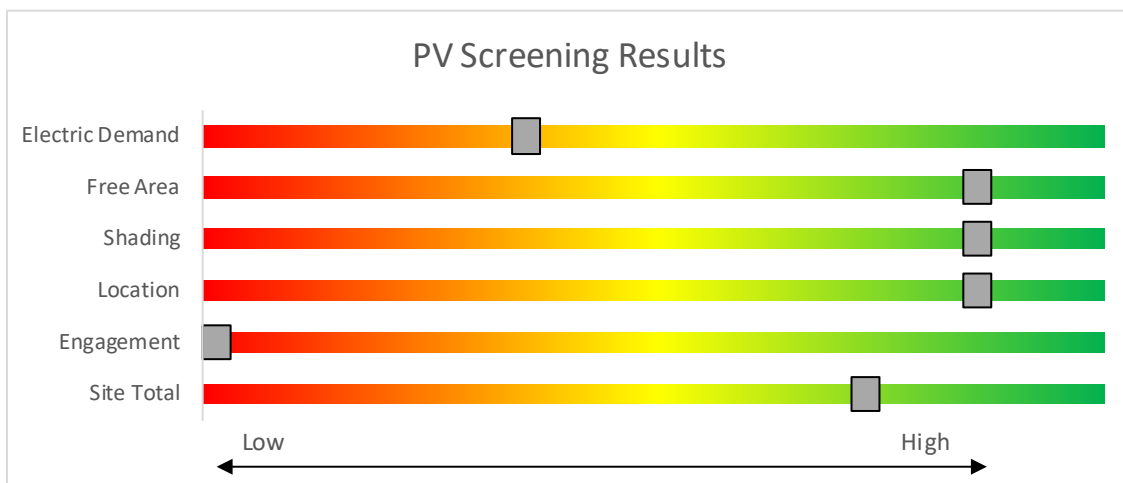


Figure 9 - Photovoltaic Screening

Solar Renewable Energy Credit (SREC) Registration Program

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 **low** 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.

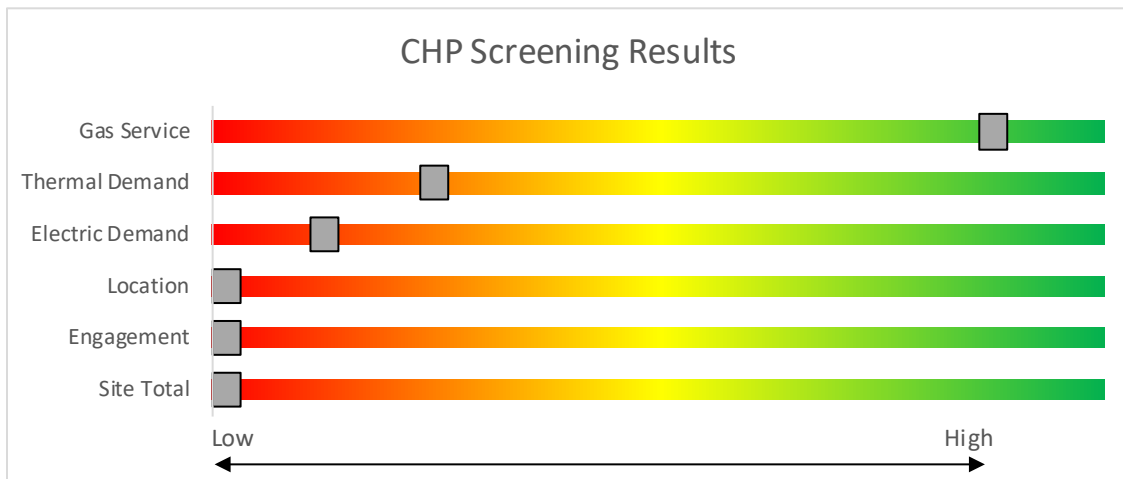


Figure 10 - Combined Heat and Power Screening

7 PROJECT FUNDING AND INCENTIVES

Ready to improve your building’s performance? New Jersey’s Clean Energy Programs can help. Pick the program that works best for you. Incentive programs that may apply to this facility are identified in the Executive Summary. This section provides an overview of currently available in New Jersey’s Clean Energy Programs.

	SmartStart <i>Flexibility to install at your own pace</i>	Direct Install <i>Turnkey installation</i>	Pay for Performance <i>Whole building upgrades</i>
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.
<p>Take the next step by visiting www.njcleanenergy.com for program details, applications, and to contact a qualified contractor.</p>			

7.1 SmartStart



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

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

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting

Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Incentives

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

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

How to Participate

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

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

7.2 Direct Install



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

installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives, and controls.

Incentives

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

How to Participate

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

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

7.3 Energy Savings Improvement Program

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

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

How to Participate

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

- (1) Use an energy services company or "ESCO".
- (2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
- (3) Use a hybrid approach of the two options described above where the ESCO is used for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the energy savings plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by

the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

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

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

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

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

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

8 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

8.1 Retail Electric Supply Options

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

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

A list of licensed third-party electric suppliers is available at the NJBPU website⁸.

8.1 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 website⁹.

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

Location	Existing Conditions						Proposed Conditions							Energy Impact & Financial Analysis							
	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	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,040	2	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,040	0.2	264	0	\$45	\$256	\$70	4.1
Electrical closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	520	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.0	19	0	\$3	\$37	\$10	8.2
Custodian office	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.2	935	0	\$161	\$562	\$115	2.8
Custodian office restroom	1	Compact Fluorescent: 4 pin circle	Wall Switch	S	28	2,530	2	Relamp	No	1	LED Screw-In Lamps: 4 pin Circle	Wall Switch	20	2,530	0.0	23	0	\$4	\$27	\$0	6.8
Main hallway	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 4	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,746	0.6	2,454	-1	\$422	\$1,567	\$210	3.2
Main hallway	1	Compact Fluorescent: Screw-in 1 Lamp	Wall Switch	S	23	2,530	2, 4	Relamp	Yes	1	LED Screw-In Lamps: Screw-in 1 lamp	High/Low Control	16	1,746	0.0	33	0	\$6	\$17	\$1	2.8
Main hallway	5	Exit Signs: LED - 2 W Lamp	None	S	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
Main hallway	12	Compact Fluorescent: 4 pin circle	Wall Switch	S	28	2,530	2, 4	Relamp	Yes	12	LED Screw-In Lamps: 4 pin Circle	High/Low Control	20	1,746	0.1	483	0	\$83	\$726	\$0	8.7
1st floor hallway	1	Incandescent: Screw-in 1 Lamp	Wall Switch	S	65	2,530	2, 4	Relamp	Yes	1	LED Screw-In Lamps: Screw-in 1 Lamp	High/Low Control	10	1,746	0.0	162	0	\$28	\$17	\$1	0.6
1st floor hallway	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 4	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,746	0.6	2,220	0	\$382	\$1,894	\$190	4.5
1st floor hallway	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	S	114	2,530	2, 4	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	1,746	0.8	3,088	-1	\$532	\$1,095	\$300	1.5
1st floor hallway	5	Exit Signs: LED - 2 W Lamp	None	S	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
Stairwell 11	1	Exit Signs: LED - 2 W Lamp	None	S	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
Stairwell 11	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,530	0.1	551	0	\$95	\$219	\$60	1.7
Room 25	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Room 23	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,636	0	\$282	\$781	\$175	2.2
Room 24	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.2	935	0	\$161	\$562	\$115	2.8
Room 22	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Storage room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	520	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	359	0.1	48	0	\$8	\$189	\$20	20.4
Room 21	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Room 20	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Girls restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,920	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,325	0.1	177	0	\$31	\$189	\$20	5.5
Sink closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	520	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.0	19	0	\$3	\$37	\$10	8.2
Boys restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,920	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,325	0.1	177	0	\$31	\$189	\$20	5.5
Stairwell B	1	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0

		Existing Conditions						Proposed Conditions						Energy Impact & Financial Analysis							
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Stairwell B	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,530	0.1	551	0	\$95	\$219	\$60	1.7
Room 19	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.7	2,688	-1	\$463	\$1,110	\$265	1.8
Room 19 restroom	1	Compact Fluorescent: 4 pin - 3 lamps	Wall Switch	S	39	1,920	2	Relamp	No	1	LED Screw-In Lamps: 4 pin - 3 lamps	Wall Switch	27	1,920	0.0	25	0	\$4	\$82	\$0	19.2
Storage rooms	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	520	2, 3	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	359	0.2	144	0	\$25	\$335	\$60	11.1
Room 18	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.2	935	0	\$161	\$562	\$115	2.8
Restroom	1	Compact Fluorescent: 4 pin - 3 lamps	Wall Switch	S	39	1,920	2	Relamp	No	1	LED Screw-In Lamps: 4 pin - 3 lamps	Wall Switch	27	1,920	0.0	25	0	\$4	\$82	\$0	19.2
Room 16	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.3	1,052	0	\$181	\$599	\$125	2.6
Room 15	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.3	1,052	0	\$181	\$599	\$125	2.6
Room 17	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.2	935	0	\$161	\$562	\$115	2.8
Room 14	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.3	1,052	0	\$181	\$599	\$125	2.6
Room 17A	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.2	818	0	\$141	\$526	\$105	3.0
Custodian closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	520	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.0	19	0	\$3	\$37	\$10	8.2
Cafeteria	36	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	1.1	4,207	-1	\$724	\$2,125	\$465	2.3
Cafeteria	3	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Room 13	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,636	0	\$282	\$781	\$175	2.2
Room 13 restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,920	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.0	70	0	\$12	\$37	\$10	2.2
Storage room 5	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	520	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	359	0.2	120	0	\$21	\$299	\$50	12.0
Women's restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,920	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.0	70	0	\$12	\$37	\$10	2.2
Men's restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,920	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.0	70	0	\$12	\$37	\$10	2.2
Sink closet	1	Compact Fluorescent: 4 pin - 3 lamps	Wall Switch	S	39	520	2	Relamp	No	1	LED Screw-In Lamps: 4 pin - 3 lamps	Wall Switch	27	520	0.0	7	0	\$1	\$82	\$0	70.8
Nurse office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,530	0.1	367	0	\$63	\$146	\$40	1.7
Nurse office	1	Compact Fluorescent: Screw-in 1 Lamp	Wall Switch	S	23	2,530	2	Relamp	No	1	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	16	2,530	0.0	19	0	\$3	\$17	\$1	4.9
Main office	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.2	935	0	\$161	\$562	\$115	2.8
Principal office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.1	467	0	\$80	\$262	\$60	2.5
Room 1	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.6	2,337	0	\$402	\$1,000	\$235	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
Room 1 restroom	1	Compact Fluorescent: 4 pin circle	Wall Switch	S	28	1,920	2	Relamp	No	1	LED Screw-In Lamps: 4 pin Circle	Wall Switch	20	1,920	0.0	18	0	\$3	\$27	\$0	8.9
Room 1 closet	1	Compact Fluorescent: 4 pin - 3 lamps	Wall Switch	S	39	520	2	Relamp	No	1	LED Screw-In Lamps: 4 pin - 3 lamps	Wall Switch	27	520	0.0	7	0	\$1	\$82	\$0	70.8
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	520	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.0	38	0	\$6	\$73	\$20	8.2
Music room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.2	818	0	\$141	\$526	\$105	3.0
Music room	1	Compact Fluorescent: 4 pin circle	Wall Switch	S	28	2,530	2, 3	Relamp	Yes	1	LED Screw-In Lamps: 4 pin Circle	Occupancy Sensor	20	1,746	0.0	40	0	\$7	\$27	\$0	3.9
Music room	1	Exit Signs: LED - 2 W Lamp	None	S	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
Handicap restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	920	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	920	0.0	67	0	\$11	\$73	\$20	4.6
Room 2	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,636	0	\$282	\$781	\$175	2.2
Teachers room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Room 3	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,636	0	\$282	\$781	\$175	2.2
Room 12	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.2	935	0	\$161	\$562	\$115	2.8
Room 4	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,636	0	\$282	\$781	\$175	2.2
Room 11	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,636	0	\$282	\$781	\$175	2.2
Boys restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,920	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,325	0.1	177	0	\$31	\$189	\$20	5.5
Girls restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,920	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,325	0.1	177	0	\$31	\$189	\$20	5.5
Sink closet	1	Compact Fluorescent: 4 pin - 3 lamps	Wall Switch	S	39	520	2	Relamp	No	1	LED Screw-In Lamps: 4 pin - 3 lamps	Wall Switch	27	520	0.0	7	0	\$1	\$82	\$0	70.8
Room 5	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,636	0	\$282	\$781	\$175	2.2
Room 10	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	28	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.8	3,272	-1	\$563	\$1,562	\$350	2.2
Room 6	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,636	0	\$282	\$781	\$175	2.2
Room 8	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,636	0	\$282	\$781	\$175	2.2
Second floor hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 4	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,746	0.3	1,285	0	\$221	\$802	\$110	3.1
Second floor hallway	2	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Boys restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,920	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,325	0.1	177	0	\$31	\$189	\$20	5.5
Sink closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	520	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.0	19	0	\$3	\$37	\$10	8.2
Girls restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	1,920	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,325	0.1	177	0	\$31	\$189	\$20	5.5

Location	Existing Conditions						Proposed Conditions						Energy Impact & Financial Analysis								
	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 26	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Room 27	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Room 30	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.2	935	0	\$161	\$562	\$115	2.8
Room 28	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Room 31	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Room 29	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Room 32	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.4	1,402	0	\$241	\$708	\$155	2.3
Gym	16	Metal Halide: (1) 250W Lamp	Wall Switch	S	295	2,530	1, 3	Fixture Replacement	Yes	16	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Occupancy Sensor	89	1,746	2.7	10,417	-2	\$1,793	\$18,975	\$2,160	9.4
Gym	4	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Gym	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,530	0.0	92	0	\$16	\$37	\$10	1.7
Play room	2	LED - Fixtures: Ambient 2x2 Fixture	Wall Switch	S	40	2,530	3	None	Yes	2	LED - Fixtures: Ambient 2x2 Fixture	Occupancy Sensor	40	1,746	0.0	69	0	\$12	\$0	\$0	0.0
Play room	3	LED - Fixtures: Ambient - 4' - Direct Fixture	Wall Switch	S	56	2,530	3	None	Yes	3	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	56	1,746	0.0	145	0	\$25	\$270	\$35	9.4
Storage room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	520	2, 3	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	359	0.2	120	0	\$21	\$299	\$50	12.0
Gym office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2, 3	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,746	0.1	234	0	\$40	\$189	\$40	3.7
Kitchen	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,530	0.6	2,204	0	\$379	\$876	\$240	1.7
Kitchen storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,530	0.0	184	0	\$32	\$73	\$20	1.7
Kitchen hood	4	Compact Fluorescent: Screw-in 1 Lamp	Wall Switch	S	32	2,530	2	Relamp	No	4	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	22	2,530	0.0	107	0	\$18	\$69	\$4	3.5
Auditorium	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2	Relamp	No	28	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,530	0.7	2,571	-1	\$443	\$1,022	\$280	1.7
Auditorium	4	Exit Signs: LED - 2 W Lamp	None	S	6	8,760		None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.0	0	0	\$0	\$0	\$0	0.0
Auditorium stage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	S	62	2,530	2	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,530	0.1	367	0	\$63	\$146	\$40	1.7
Auditorium stage	1	Exit Signs: LED - 2 W Lamp	None	S	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
Auditorium stage	120	Incandescent: Screw-in 1 Lamp	Wall Switch	S	65	52	2	Relamp	No	120	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	10	52	4.8	379	0	\$65	\$2,067	\$120	29.8
Front recessed	6	Incandescent: Screw-in 1 Lamp	Wall Switch	S	65	2,530	2	Relamp	No	6	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	10	2,530	0.2	839	0	\$146	\$103	\$6	0.7
Front entrance	2	LED Screw-In Lamps: Corn bulb - 1 lamp	Timeclock	S	125	3,640		None	No	2	LED Screw-In Lamps: Corn bulb - 1 lamp	Timeclock	125	3,640	0.0	0	0	\$0	\$0	\$0	0.0
Wall pack	4	LED Screw-In Lamps: Corn bulb - 1 lamp	Timeclock	S	125	3,640		None	No	4	LED Screw-In Lamps: Corn bulb - 1 lamp	Timeclock	125	3,640	0.0	0	0	\$0	\$0	\$0	0.0

Existing Conditions							Proposed Conditions							Energy Impact & Financial Analysis							
Location	Fixture Quantity	Fixture Description	Control System	Light Level	Watts per Fixture	Annual Operating Hours	ECM #	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Wall pack	9	Metal Halide: (1) 400W Lamp	Timeclock	S	458	3,640	1	Fixture Replacement	No	9	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	137	3,640	1.4	10,503	0	\$1,831	\$8,694	\$900	4.3
Recessed	1	Compact Fluorescent: 4 pin - 2 lamps	Wall Switch	S	26	2,530	2	Relamp	No	1	LED Screw-In Lamps: 4 pin - 2 lamps	Wall Switch	18	2,530	0.0	20	0	\$3	\$54	\$0	15.8
Recessed	3	Metal Halide: (1) 70W Lamp	Timeclock	S	95	3,640	1	Fixture Replacement	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Timeclock	29	3,640	0.1	726	0	\$127	\$2,898	\$300	20.5

Motor Inventory & Recommendations

		Existing Conditions							Proposed Conditions					Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Remaining Useful Life	Annual Operating Hours	ECM #	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Gym	2	Exhaust Fan	0.3	60.0%	No		2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Roof	Hallway	5	Exhaust Fan	0.3	60.0%	No		2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Roof	Restroom	2	Exhaust Fan	0.3	60.0%	No		2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Roof	Kitchen	2	Exhaust Fan	0.3	60.0%	No		2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Roof	Hallway	2	Exhaust Fan	0.5	60.0%	No		2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Roof	Restroom	4	Exhaust Fan	0.2	60.0%	No		2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Boiler room	Heating system	2	Heating Hot Water Pump	7.5	91.0%	No	W	660	NR, NR	Yes	91.0%	Yes	2	1.4	3,043	0	\$530	\$9,476	\$0	17.9
Boiler room	DHW - Booster pump	2	Process Pump	0.3	60.0%	No		2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Boiler room	Heating system	5	Heating Hot Water Pump	3.0	87.5%	No	W	660	NR, NR	Yes	89.5%	Yes	5	1.6	3,292	0	\$574	\$19,062	\$0	33.2
Boiler room	Compressed air	1	Air Compressor	0.5	60.0%	No		2,190		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Cafeteria	Cafeteria	2	Ventilation Fan	0.1	60.0%	No		2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
Auditorium	Auditorium	4	Ventilation Fan	0.1	60.0%	No		2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0
School	Unit vent	39	Supply Fan	0.2	60.0%	No	B	2,745		No	60.0%	No		0.0	0	0	\$0	\$0	\$0	0.0

Electric HVAC Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions				Proposed Conditions									Energy Impact & Financial Analysis					
		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
Room 17 A	Room 17 A	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Cafeteria	Cafeteria	2	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Room 13	Room 13	2	Window AC	1.50		B	NR	Yes	2	Window AC	1.50		12.00	0.2	183	0	\$32	\$3,266	\$0	102.2
Main Office	Main Office	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Principal Office	Principal Office	1	Window AC	1.50		B	NR	Yes	1	Window AC	1.50		12.00	0.1	92	0	\$16	\$1,633	\$0	102.2
Room 1	Room 1	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Music room	Music room	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Room 2	Room 2	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Teachers lounge	Teachers lounge	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Room 3	Room 3	1	Window AC	1.50		B	NR	Yes	1	Window AC	1.50		12.00	0.1	92	0	\$16	\$1,633	\$0	102.2
Room 12	Room 12	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Room 4	Room 4	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Room 11	Room 11	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Custodian office	Custodian office	1	Window AC	0.42				No						0.0	0	0	\$0	\$0	\$0	0.0
Room 25	Room 25	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Room 23	Room 23	1	Window AC	2.00				No						0.0	0	0	\$0	\$0	\$0	0.0
Room 24	Room 24	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0
Room 22	Room 22	1	Window AC	2.00		B	NR	Yes	1	Window AC	2.00		12.00	0.1	122	0	\$21	\$2,178	\$0	102.2
Room 21	Room 21	1	Window AC	2.00				No						0.0	0	0	\$0	\$0	\$0	0.0
Room 20	Room 20	1	Window AC	1.50				No						0.0	0	0	\$0	\$0	\$0	0.0

		Existing Conditions					Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 19	Room 19	2	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 18	Room 18	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 16	Room 16	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 15	Room 15	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 17	Room 17	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 14	Room 14	1	Window AC	2.00		B	NR	Yes	1	Window AC	2.00		12.00		0.1	122	0	\$21	\$2,178	\$0	102.2
Room 5	Room 5	1	Window AC	1.50		B	NR	Yes	1	Window AC	1.50		12.00		0.1	92	0	\$16	\$1,633	\$0	102.2
Room 10 - library	Room 10 - library	2	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 6	Room 6	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 7	Room 7	1	Window AC	1.50		B	NR	Yes	1	Window AC	1.50		12.00		0.1	92	0	\$16	\$1,633	\$0	102.2
Room 8	Room 8	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 26	Room 26	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 27	Room 27	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 30	Room 30	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 28	Room 28	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 31	Room 31	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 29	Room 29	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Room 32	Room 32	2	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Play room	Play room	1	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0
Auditorium	Auditorium	2	Window AC	1.50				No							0.0	0	0	\$0	\$0	\$0	0.0

Fuel Heating Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Remaining Useful Life	ECM #	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	All school	3	Condensing Hot Water Boiler	#####	W		No						0.0	0	0	\$0	\$0	\$0	0.0

DHW Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
		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	School	2	Storage Tank Water Heater (> 50 Gal)	B	NR	Yes	2	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	Et	0.0	0	20	\$201	\$8,680	\$300	41.7

Low-Flow Device Recommendations

Location	Recommendation Inputs					Energy Impact & Financial Analysis						
	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
Restroom	5	10	Faucet Aerator (Lavatory)	2.20	0.50	0.0	0	28	\$292	\$72	\$0	0.2

Commercial Refrigerator/Freezer Inventory & Recommendations

Location	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
	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
Closet	1	Refrigerator Chest	No	5	Yes	0.1	1,020	0	\$178	\$1,554	\$0	8.7
Cafeteria	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	No	5	Yes	0.2	1,841	0	\$321	\$2,441	\$300	6.7
Cafeteria	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	No	5	Yes	0.0	50	0	\$9	\$1,509	\$300	138.5
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	5	Yes	0.1	891	0	\$155	\$1,962	\$75	12.1
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	5	Yes	0.0	415	0	\$72	\$1,299	\$75	16.9
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes		No	0.0	0	0	\$0	\$0	\$0	0.0
Kitchen	1	Refrigerator Chest	Yes		No	0.0	0	0	\$0	\$0	\$0	0.0

Cooking Equipment Inventory & Recommendations

Location	Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis						
	Quantity	Equipment Type	High Efficiency Equipment?	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	Electric Convection Oven (Half Size)	Yes		No	0.0	0	0	\$0	\$0	\$0	0.0
Kitchen	1	Electric Convection Oven (Half Size)	No		No	0.0	0	0	\$0	\$0	\$0	0.0
Kitchen	1	Insulated Food Holding Cabinet (1/2 Size)	Yes		No	0.0	0	0	\$0	\$0	\$0	0.0

Dishwasher Inventory & Recommendations

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

Plug Load Inventory


Location	Existing Conditions			
	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Battle Hill ES	122	Desktop computers	145.0	Yes
Battle Hill ES	3	Copy machine	200.0	Yes
Battle Hill ES	32	Printer	60.0	Yes
Battle Hill ES	7	Small refrigerators	70.0	Yes
Battle Hill ES	5	Refrigerators	220.0	Yes
Battle Hill ES	6	Microwaves	1,000.0	Yes
Battle Hill ES	3	Coffee machine	400.0	Yes

Vending Machine Inventory & Recommendations

Location	Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis						
	Quantity	Vending Machine Type	ECM #	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Teachers lounge	1	Refrigerated	6	Yes	0.2	1,612	0	\$281	\$230	\$0	0.8

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

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



ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

82

ENERGY STAR®
Score¹

Battle Hill

Primary Property Type: K-12 School
Gross Floor Area (ft²): 57,375
Built: 1957

For Year Ending: September 30, 2017
Date Generated: November 26, 2018

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 Battle Hill 2600 Killian Place Union, New Jersey 07083	Property Owner _____	Primary Contact _____	
Property ID: 6455062			
Energy Consumption and Energy Use Intensity (EUI)			
Site EUI	Annual Energy by Fuel		National Median Comparison
59.2 kBtu/ft ²	Natural Gas (kBtu)	2,441,649 (72%)	National Median Site EUI (kBtu/ft ²)
	Electric - Grid (kBtu)	957,161 (28%)	National Median Source EUI (kBtu/ft ²)
			% Diff from National Median Source EUI
			-32%
Source EUI			Annual Emissions
91.4 kBtu/ft ²			Greenhouse Gas Emissions (Metric Tons CO ₂ e/year)
			227

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 return on investment. The blended rate is calculated by dividing the amount of your bill by the total kilowatt-hours consumed. For example, if your bill is \$22,217.22, and you consumed 266,400 kilowatt-hours, your blended rate is 8.3 cents per kilowatt-hour.
BTU	British thermal unit. A BTU is the amount of heat required to increase the temperature of a pint of water (which weighs exactly 16 ounces) by one-degree Fahrenheit. Commonly used characterized heat transfer and measure natural gas consumption.
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.
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 energy management systems.
Generation	The process of generating electric power from sources of primary energy (e.g., natural gas, the sun, oil).
HVAC	Heating, ventilation, and air conditioning.
kW	Kilowatt. Equal to 1,000 Watts.
Load	The total amount of energy a building system is consuming 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.
MMBtu	One million British thermal units.
PSIG	Pounds per square inch.
Plug Load	Refers to the amount of energy used in a space by products that are powered by means of an ordinary AC plug.
Simple Payback	The amount of time needed to recoup the funds expended in an investment, or to reach the break-even point.
Temperature Setpoint	The temperature at which a temperature regulating device (thermostat, for example) has been set.
Therm	A unit of heat energy equal to 100,000 Btus
Turnkey	Provision of a complete product or service that is ready for immediate use
Watt (W)	Unit of power commonly used to measure electricity use.