Local Government Energy Audit:
Energy Audit Report

Lincoln Elementary School

Ridgefield Park Board of Education

712 Lincoln Avenue
Ridgefield Park, NJ 07660

July 16, 2018

Final Report by:
TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate saving are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

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

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

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

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1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Lincoln Elementary School.

The goal of a LGEA is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and put you in a position to implement the ECMs. The LGEA also sets you on the path to receive financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing the ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey local government in controlling energy costs and protecting our environment by offering a full spectrum of energy management options.

1.1 Facility Summary

Lincoln Elementary School is a 54,000 square feet facility comprised of various space types within two buildings, the main school building and the gymnasium building. The buildings' roofs are predominantly a medium-pitch hip type. Exterior walls are finished with brick masonry. The windows throughout the facility are double pane, single hung. Exterior doors are constructed of metal and are in good condition. The facility's interior lighting system consists mainly of T8 linear fluorescent lamps and fixtures with electronic ballasts. Lighting control is provided by manual wall switches. The cooling system consists of window air conditioning units, one air cooled chiller, and one 20-ton rooftop packaged unit serving the cafeteria. Heating is provided by two Smith non-condensing boilers.

A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated nine projects which represent an opportunity for Lincoln Elementary School to reduce annual energy costs by $12,434 and annual greenhouse gas emissions by 93,344 lbs CO_2e. The measures would pay for themselves in roughly five years. The breakdown of existing and potential utility costs is illustrated in Figure 1 and Figure 2, respectively. These projects represent an opportunity to reduce Lincoln Elementary School's annual energy use by 8%.

Figure 1 – Previous 12 Month Utility Costs

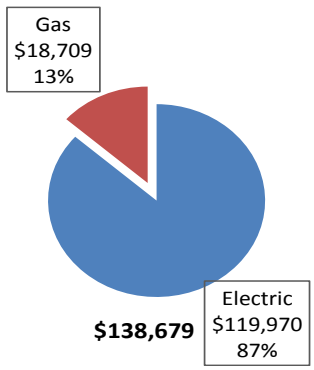
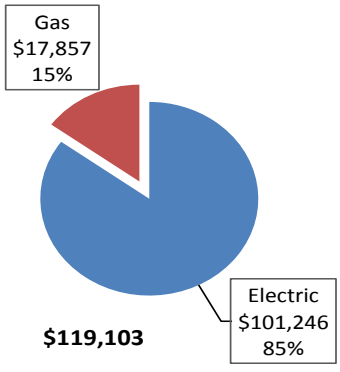


Figure 2 – Potential Post-Implementation Costs



A detailed description of Lincoln Elementary School's existing energy use can be found in Section 3.

The evaluated measures have been listed and grouped into major categories as shown in Figure 3. Brief descriptions of the categories can be found below and descriptions of the individual opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

	Energy Conservation Measure	Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**65,541**	**27.7**	**0.0**	**$9,258.65**	**$54,411.63**	**$9,220.00**	**$45,191.63**	**4.88**	**65,999**
ECM 1	Install LED Fixtures	Yes	25,765	13.4	0.0	$3,639.64	$18,348.10	$2,630.00	$15,718.10	4.32	25,945
ECM 2	Retrofit Fixtures with LED Lamps	Yes	39,776	14.3	0.0	$5,619.01	$36,063.53	$6,590.00	$29,473.53	5.25	40,054
Lighting Control Measures			**7,924**	**2.9**	**0.0**	**$1,119.32**	**$5,104.00**	**$880.00**	**$4,224.00**	**3.77**	**7,979**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	7,924	2.9	0.0	$1,119.32	$5,104.00	$880.00	$4,224.00	3.77	7,979
Motor Upgrades			**601**	**0.6**	**0.0**	**$84.87**	**$1,516.29**	**$0.00**	**$1,516.29**	**17.87**	**605**
ECM 4	Premium Efficiency Motors	Yes	601	0.6	0.0	$84.87	$1,516.29	$0.00	$1,516.29	17.87	605
Variable Frequency Drive (VFD) Measures			**5,787**	**2.3**	**0.0**	**$817.48**	**$11,816.62**	**$0.00**	**$11,816.62**	**14.45**	**5,827**
ECM 5	Install VFDs on Chilled Water Pumps	Yes	4,226	1.7	0.0	$597.01	$6,551.70	$0.00	$6,551.70	10.97	4,256
ECM 6	Install VFDs on Hot Water Pumps	Yes	1,561	0.5	0.0	$220.47	$5,264.92	$0.00	$5,264.92	23.88	1,572
Electric Unitary HVAC Measures			**525**	**0.4**	**0.0**	**$74.16**	**$1,360.95**	**$0.00**	**$1,360.95**	**18.35**	**529**
ECM 7	Install High Efficiency Electric AC	Yes	525	0.4	0.0	$74.16	$1,360.95	$0.00	$1,360.95	18.35	529
Domestic Water Heating Upgrade			**0**	**0.0**	**92.1**	**$851.78**	**$164.91**	**$0.00**	**$164.91**	**0.19**	**10,782**
ECM 8	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	92.1	$851.78	$164.91	$0.00	$164.91	0.19	10,782
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$227.70**	**$1,437.60**	**$0.00**	**$1,437.60**	**6.31**	**1,623**
ECM 9	Vending Machine Control	Yes	1,612	0.0	0.0	$227.70	$1,437.60	$0.00	$1,437.60	6.31	1,623
TOTALS			**81,989**	**33.9**	**92.1**	**$12,433.96**	**$75,812.01**	**$10,100.00**	**$65,712.01**	**5.28**	**93,344**

* - All incentives presented in this table are based on NJ Smart Start Building 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).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when conditions allow. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing old standard efficiency motors with motors of the current efficiency standard (EISA 2007). Motors will be replaced with the same size motors. This measure saves energy by reducing the power used by the motors due to improved electrical efficiency.

Variable Frequency Drives measures generally involve controlling the speed of a motor to achieve a flow or temperature rather than using a valve, damper, or no means at all. These measures save energy by slowing a motor which is an extremely efficient method of control.

Electric Unitary HVAC measures generally involve replacing old inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide cooling equivalent to older air condition systems, but use less energy. These measures save energy by reducing the power used by the air condition system due to improved electrical efficiency.

Domestic Water Heating upgrade measures generally involve replacing old inefficient domestic water heating systems with modern energy efficient systems. New domestic water heating systems can provide equivalent or greater capacity as older systems, but use less energy. These measures save energy by reducing the fuel used by the domestic water heating systems due to improved efficiency or the removal of standby losses.

Plug Load Equipment control measures generally involve installing automation that limits the power use or operation of equipment plugged into an electrical receptacle based on occupancy.

Energy Efficient Practices

TRC also identified 12 low (or no) cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems. Through these practices equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. Opportunities identified at Lincoln Elementary School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Use Fans to Reduce Cooling Load
- Clean and/or Replace HVAC Filters
- Perform Boiler Maintenance
- Perform Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

Self-Generation Measures

TRC evaluated the potential for installing self-generation sources for Lincoln Elementary School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	64	kW DC STC
Electric Generation	76,248	kWh/yr
Displaced Cost	$6,630	/yr
Installed Cost	$166,400	

For details on our evaluation and the self-generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, the equipment changes outlined for each ECM need to be selected and installed through project implementation. One of the first considerations is if there is capital available for project implementation. Another consideration is whether to pursue individual ECMs, a group of ECMs, or a comprehensive approach wherein all ECMs are pursued, potentially in conjunction with other facility projects or improvements.

Rebates, incentives, and financing are available from the NJBPU, NJCEP, as well as some of the state's investor-owned utilities, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any project, please review the appropriate incentive program guidelines before proceeding. This is important because in most cases you will need to submit an application for the incentives before purchasing materials and beginning installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Pay for Performance - Existing Building (P4P EB)
- Energy Savings Improvement Program (ESIP)

For facilities with capital available for implementation of selected individual measures or phasing implementation of selected measures over multiple years, incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to design the ECM(s), select the equipment and apply for the incentive(s). Program pre-approval is required for some SS incentives, so only after receiving approval may the ECM(s) be installed. The incentive values listed above in Figure 3 represent the SmartStart program and will be explained further in Section 8, as well as the other programs as mentioned below.

For facilities with capital available and an interest in a comprehensive, holistic approach to energy conservation should consider participating in the P4P EB program. This program has minimum savings requirements and the incentives are based on actual measured performance savings. The application process is more involved, and requires working with an eligible contractor, but may result in more lucrative incentives up to 50% of total project cost.

For facilities without capital available to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with external project development, design, and implementation services as well as financing for implementing ECMs. This LGEA report is the first step for participating in ESIP and should help you determine next steps. Refer to Section 8.4 for additional information on the ESIP Program.

Additional descriptions of all relevant incentive programs are located in Section 8. You may also check the following website for further information on available rebates and incentives: www.njcleanenergy.com/ci.

To ensure projects are implemented such that maximum savings and incentives are achieved, bids and specifications should be reviewed by your procurement personnel and/or consultant(s) to ensure that selected equipment coincides with LGEA recommendations, as well as applicable incentive program guidelines and requirements.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Eric Koenig	Superintendent	ekoenig@rpps.net	(201) 641-0800
Designated Representative			
Michael Daglezt	Director Buildings & Grounds		(201) 522-7660
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	(732) 855-2879

2.2 General Site Information

On October 5, 2016, TRC performed an energy audit at Lincoln Elementary School located in Ridgefield Park, New Jersey. TRC's team met with Michael Daglezt, Director of Buildings & Grounds to review the facility operations and focus the investigation on specific energy-using systems.

Lincoln Elementary School is a 54,000 square foot facility comprised of various space types within two buildings, the main school building and the gymnasium building. The buildings were constructed in 1912. The main school building is three floors and includes the basement area that houses the Ridgefield Park School District, a mechanical room, a sub-basement cafeteria, a kitchen, classrooms, offices, a library, and storage rooms. The building's roof is predominantly a medium-pitch hip type. The building base consists of a below-grade sub-basement with slab floor and a stone bloc perimeter foundation. The foundation systems include reinforced column pads. Exterior walls are finished with brick masonry. The gymnasium building's foundation consists of cast-in-place concrete perimeter wall footings with masonry foundation wall. The windows throughout the facility are metal framed double pane, single hung. They are in acceptable condition with some units showing signs of outside air infiltration. Exterior doors are constructed of metal and are in good condition.

The facility's interior lighting system consists mainly of T8 linear fluorescent lamps and fixtures with electronic ballasts. Lighting control is provided by manual wall switches. Exterior lighting consists of high intensity discharge (HID) lamps which are controlled with photocells.

The cooling system consists of window units, one air cooled chiller, one 20 ton packaged serving the cafeteria, and Airedale DX cooling and heat pump. Heating is provided by two Smith non-condensing boilers. Heating and cooling system are controlled by local thermostats.

2.3 Building Occupancy

The school building is open Monday through Friday and the typical schedule is presented in the table below.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Lincoln Elementary School	Weekday	7:30 AM - 4:30 PM
Lincoln Elementary School	Weekend	N/A

2.4 Building Envelope

The main school building is three floors and includes the basement area that houses the Ridgefield Park School District, a mechanical room, a sub-basement cafeteria, a kitchen, classrooms, offices, a library, and storage rooms. The building's roof is predominantly a medium-pitch hip type. The building base consists of a below-grade sub-basement with slab floor and a stone block perimeter foundation. The foundation systems include reinforced column pads. Exterior walls are finished with brick masonry. The gymnasium building's foundation consists of cast-in-place concrete perimeter wall footings with masonry foundation wall. The windows throughout the facility are metal framed double pane, single hung. They are in acceptable condition with some units showing signs of outside air infiltration. Exterior doors are constructed of metal and are in good condition and are in good condition. The building envelope was found to be in acceptable condition.

2.5 On-site Generation

Lincoln Elementary School does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Lighting System

The facility interior lighting system consists mainly of T8 linear fluorescent lamps and fixtures with both electronic and magnetic ballasts. The gymnasium is lit with 400-Watt Mercury Vapor lamps. The stage of the gymnasium is lit with halogen incandescent lamps. The remaining interior spaces are lit with 32-Watt T8 linear lamps and fixtures. Most of the building interior spaces use 2, and 3-lamp, 4-foot long recessed troffers. Lighting control is provided by manual wall switches. Exterior lighting consists of 250-Watt metal halide outdoor wall-mounted fixtures. They are controlled with photocells.

Significant energy saving could be achieved by replacing the existing lighting system with LED linear tubes and LED lamps fixtures. Installing occupancy sensors in select areas will yield additional energy savings.

Hot Water System

The hot water system consists of two Smith 2,974 kBtu/hr output non-condensing boilers. The boilers have a combustion efficiency of 80%. Each boiler has a 3 hp forced draft fan. The boilers are configured in a constant flow primary distribution with two 1.5 hp hot water pumps. The boilers operate in a lead/lag configuration with only operating at a time. Steam is supplied directly to air handlers and radiators located in each tenant spaces for heating. The boilers also provide hot water to the classrooms cabinet unit ventilators equipped with hot water coil for heating. Heating in spaces is controlled by local thermostats. The boilers are in good condition and well maintained.

Air Conditioning Systems (CHW)

The chilled water is produced by one Daikin air-cooled screw chiller located on the ground, behind the gymnasium building. The chiller is 17 years old, and provides 45 tons of cooling at full capacity. The chiller has three compressors that appear to be in good working condition. Based on the discussion with the operator, the chiller is only put in service when the outside temperature reaches 75°F. The chilled water for the facility is pumped to the air-handling units' chilled water coils via 1.5 hp base-mounted, end-suction pump located in the gymnasium mechanical space. The chilled water also has 5 hp return pump. The gymnasium has one indoor air handling unit.

Air-Handling System

Air handling system throughout the facility provide tempered air via duct distribution systems to the spaces for heating and cooling, hot water coil for heating and chilled water coil for cooling. The unit appears to be in good operating condition.



Air Conditioning (DX)

A 20 ton McQuay direct-expansion (DX) package located on the roof with an outside air economizer is used to condition the cafeteria. The unit provides constant air volume with a single 5 hp supply fan and a 2 hp return fan. The unit has an outside air economizer to utilize free cooling when the outside air temperature is lower than the return air temperature. The classrooms have unit ventilators that are equipped with hot water coils for space heating and DX coils for cooling. Window units and the Airedale single package vertical cabinet units are also used in some classrooms and offices.

Building Energy Management System

The facility BEMS system consists of Andover Continuum DDC system made by Schneider Electric. The system integrates into the majority of the equipment and is capable of providing trends for individual DDC points. This user interface platform provides start and stop scheduling and resets of supply air temperature based on setpoints.

Domestic Hot Water

The domestic hot water system for the facility consists of one PVI gas-fired, non-condensing hot water heater with an input rating of 200 kBtu/hr and a nominal efficiency of 83%. The water heater has a 225 gallon storage tank. One 0.3 hp recirculation pump distributes 120°F water to the entire site. The water heater appears to be in good working condition.

Food Service & Refrigeration

The school has an electric and gas-fired kitchen that is used to prepare approximately 300 lunches per day for the students. The ovens, range tops, and griddle are all gas fired. The kitchen is cleaned and its equipment is well maintained.

The kitchen has three refrigerators which are ENERGY STAR® certified equipment. There is no walk-in refrigerator or cooler in the facility.

Plug load & Vending Machines

There are 119 computer work stations throughout the facility and are mostly desktop units with LCD monitors. There is no centralized PC power management software installed.

The facility has a one refrigerated beverage machine and one non-refrigerated vending machine located in teacher's room 113.

2.7 Water-Using Systems

There are several restrooms at this facility. A sampling of restrooms found that the 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. There are no restrooms with showers in the facility.

3 SITE ENERGY USE AND COSTS

Utility data for 3lectricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy use per square foot. These energy use indices are indicative of the relative energy effectiveness of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy use for other facilities identified as school (K-12). Specific local climate conditions, daily occupancy hours of the facility, seasonal fluctuations in occupancy, daily operating hours of energy use systems, and the behavior of the occupants with regard to operating systems that impact energy use such as turning off appliances and leaving windows open. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

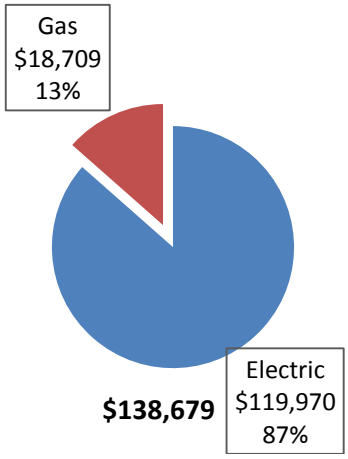
The following energy consumption and cost data is based on the last 12 month period of utility usage data that was provided for each utility. The annual consumption and cost was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Lincoln Elementary School		
Fuel	**Usage**	**Cost**
Electricity	792,926 kWh	$119,970
Natural Gas	20,227 Therms	$18,709
Total		**$138,679**

The current utility cost for this site is $138,679 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost (combined for commodity, transmission and distribution) for the past 12 months is $0.141/kWh, which is the blended rate used throughout the analyses in this report. The monthly electricity consumption and peak demand is represented graphically in the chart below.

Figure 9 - Electric Usage & Demand

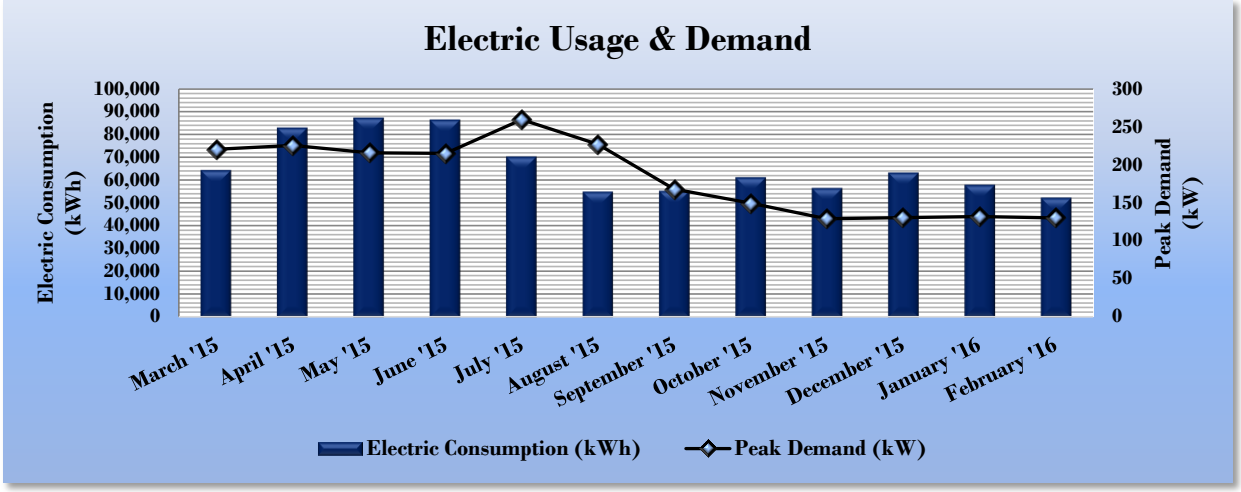


Figure 10 - Electric Usage & Demand

Electric Billing Data for Lincoln Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
4/1/15	31	64,396	221	$795	$10,107
5/1/15	30	82,907	226	$813	$14,031
6/1/15	30	87,231	216	$778	$14,442
7/1/15	30	86,486	215	$776	$13,473
8/1/15	31	70,248	260	$938	$11,905
9/1/15	31	54,980	227	$824	$8,165
10/1/15	30	55,324	168	$609	$7,962
11/1/15	31	61,215	150	$543	$8,437
12/1/15	30	56,575	129	$468	$8,518
1/1/16	31	63,315	130	$472	$8,195
2/1/16	31	57,980	132	$468	$7,707
3/1/16	29	52,269	130	$472	$7,028
Totals	**365**	**792,926**	**259.6**	**$7,957**	**$119,970**
Annual	**365**	**792,926**	**259.6**	**$7,957**	**$119,970**

3.3 Natural Gas Usage

Natural Gas is provided by PSE&G. The average gas cost for the past 12 months is $0.925/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is represented graphically in the chart below.

Figure 11 - Natural Gas Usage

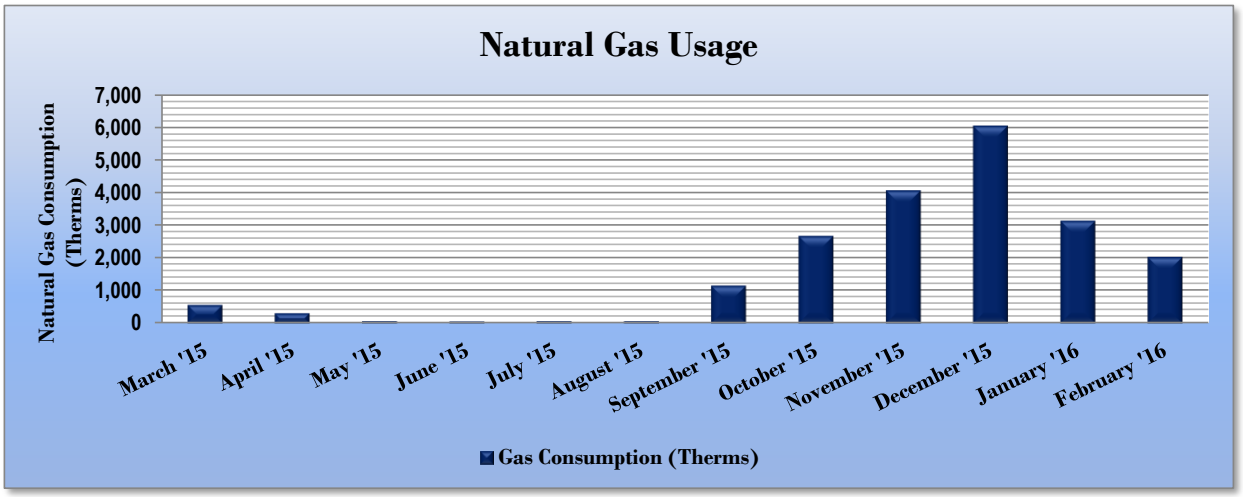


Figure 12 Natural Gas Usage

Gas Billing Data for Lincoln Elementary School				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
4/1/15	31	565	$452	No
5/1/15	30	312	$291	Yes
6/1/15	30	60	$141	Yes
7/1/15	30	55	$137	No
8/1/15	31	61	$147	No
9/1/15	31	65	$147	No
10/1/15	30	1,153	$1,729	No
11/1/15	31	2,674	$2,747	No
12/1/15	30	4,069	$3,681	Yes
1/1/16	31	6,043	$4,986	Yes
2/1/16	31	3,134	$2,919	Yes
3/1/16	29	2,035	$1,333	Yes
Totals	**365**	**20,227**	**$18,709**	6
Annual	**365**	**20,227**	**$18,709**	

3.4 Benchmarking

This facility was benchmarked through Portfolio Manager, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and compares its performance against a yearly baseline, national medians, or similar buildings in your portfolio. Metrics used in this comparison are the energy use intensity (EUI) and ENERGY STAR® score.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more energy than similar buildings on a square foot basis or if that building performs better than the median. EUI is presented in both 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 is the raw fuel consumed to generate the energy consumed at the site, factoring in energy production and distribution losses.

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Lincoln Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	196.6	141.4
Site Energy Use Intensity (kBtu/ft^2)	87.6	58.2

By implementing all recommended measures covered in this reporting, the Project's estimated post-implementation EUI improves as shown in the table below:

Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Lincoln Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	178.6	141.4
Site Energy Use Intensity (kBtu/ft^2)	80.7	58.2

Many buildings can also receive a 1 – 100 ENERGY STAR® score. This score compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 19.

The Portfolio Manager, Statement of Energy Performance can be found in Appendix B: ENERGY STAR® Statement of **Energy Performance**.

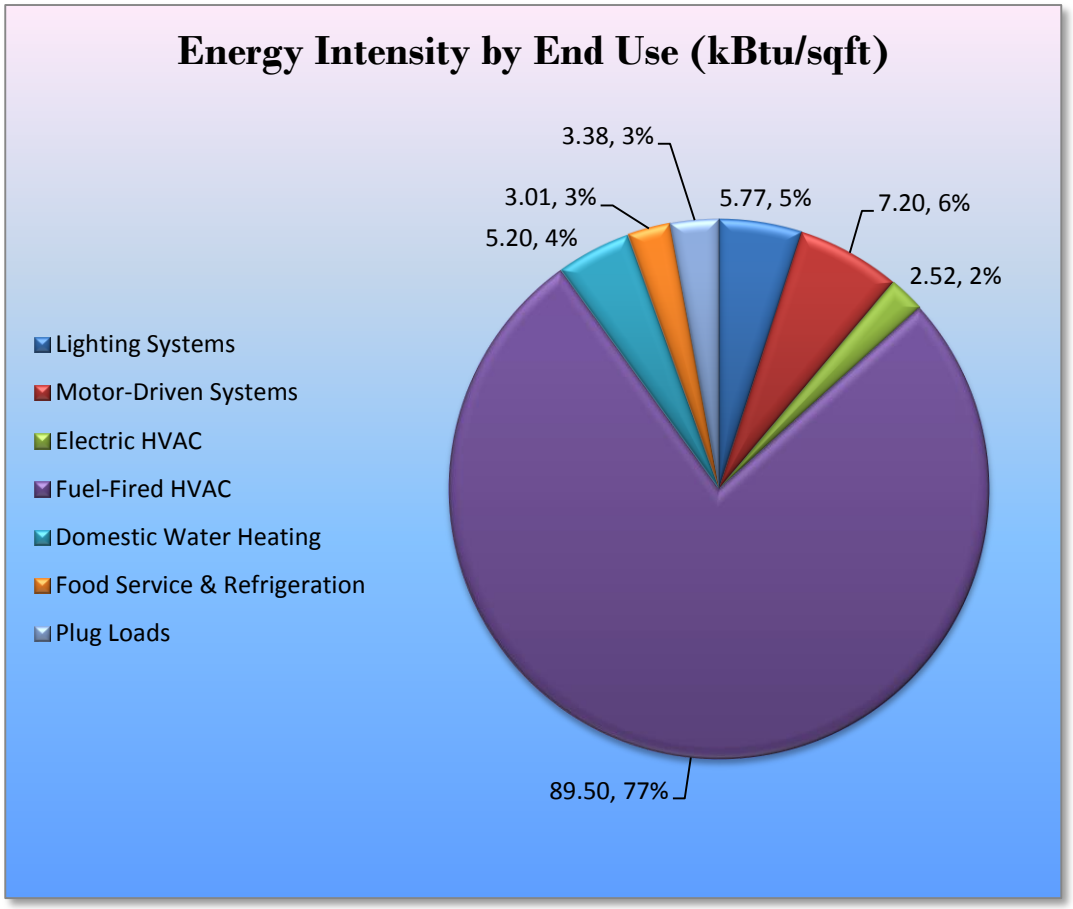
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. 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.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building and determine their proportional contribution to overall building energy usage. This visual representation of energy end uses highlights systems that may benefit most from energy efficiency projects.

Figure 15 - Energy Balance (kBtu/SF)



4 Energy Conservation Measures

Level of Analysis

The goal of this audit report is to identify potential energy projects, help prioritize specific measures for implementation, and set Lincoln Elementary School on the path to receive financial incentives. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is considered sufficient to make decisions and to prioritize energy projects. Savings are based on the New Jersey Board of Public Utilities New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016. Further analysis or investigation may be required to calculate more accurate savings to support any custom SmartStart, Pay for Performance, or Large Energy Users incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Depending on your implementation strategy, the project may be eligible for more lucrative incentives through other programs as identified in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 16 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**65,541**	**27.7**	**0.0**	**$9,258.65**	**$54,411.63**	**$9,220.00**	**$45,191.63**	**4.88**	**65,999**
ECM 1	Install LED Fixtures	25,765	13.4	0.0	$3,639.64	$18,348.10	$2,630.00	$15,718.10	4.32	25,945
ECM 2	Retrofit Fixtures with LED Lamps	39,776	14.3	0.0	$5,619.01	$36,063.53	$6,590.00	$29,473.53	5.25	40,054
Lighting Control Measures		**7,924**	**2.9**	**0.0**	**$1,119.32**	**$5,104.00**	**$880.00**	**$4,224.00**	**3.77**	**7,979**
ECM 3	Install Occupancy Sensor Lighting Controls	7,924	2.9	0.0	$1,119.32	$5,104.00	$880.00	$4,224.00	3.77	7,979
Motor Upgrades		**601**	**0.6**	**0.0**	**$84.87**	**$1,516.29**	**$0.00**	**$1,516.29**	**17.87**	**605**
ECM 4	Premium Efficiency Motors	601	0.6	0.0	$84.87	$1,516.29	$0.00	$1,516.29	17.87	605
Variable Frequency Drive (VFD) Measures		**5,787**	**2.3**	**0.0**	**$817.48**	**$11,816.62**	**$0.00**	**$11,816.62**	**14.45**	**5,827**
ECM 5	Install VFDs on Chilled Water Pumps	4,226	1.7	0.0	$597.01	$6,551.70	$0.00	$6,551.70	10.97	4,256
ECM 6	Install VFDs on Hot Water Pumps	1,561	0.5	0.0	$220.47	$5,264.92	$0.00	$5,264.92	23.88	1,572
Electric Unitary HVAC Measures		**525**	**0.4**	**0.0**	**$74.16**	**$1,360.95**	**$0.00**	**$1,360.95**	**18.35**	**529**
ECM 7	Install High Efficiency Electric AC	525	0.4	0.0	$74.16	$1,360.95	$0.00	$1,360.95	18.35	529
Domestic Water Heating Upgrade		**0**	**0.0**	**92.1**	**$851.78**	**$164.91**	**$0.00**	**$164.91**	**0.19**	**10,782**
ECM 8	Install Low-Flow Domestic Hot Water Devices	0	0.0	92.1	$851.78	$164.91	$0.00	$164.91	0.19	10,782
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$227.70**	**$1,437.60**	**$0.00**	**$1,437.60**	**6.31**	**1,623**
ECM 9	Vending Machine Control	1,612	0.0	0.0	$227.70	$1,437.60	$0.00	$1,437.60	6.31	1,623
TOTALS		**81,989**	**33.9**	**92.1**	**$12,433.96**	**$75,812.01**	**$10,100.00**	**$65,712.01**	**5.28**	**93,344**

* - All incentives presented in this table are based on NJ Smart Start Building 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).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**65,541**	**27.7**	**0.0**	**$9,258.65**	**$54,411.63**	**$9,220.00**	**$45,191.63**	**4.88**	**65,999**
ECM 1	Install LED Fixtures	25,765	13.4	0.0	$3,639.64	$18,348.10	$2,630.00	$15,718.10	4.32	25,945
ECM 2	Retrofit Fixtures with LED Lamps	39,776	14.3	0.0	$5,619.01	$36,063.53	$6,590.00	$29,473.53	5.25	40,054

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	19,787	9.9	0.0	$2,795.28	$10,143.88	$530.00	$9,613.88	3.44	19,926
Exterior	5,977	3.4	0.0	$844.36	$8,204.22	$2,100.00	$6,104.22	7.23	6,019

Measure Description

This measure evaluates replacing existing fixtures containing fluorescent, HID, and incandescent lamps with new high performance LED light fixtures. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Maintenance savings are anticipated since LED sources have burn hours which are generally more than twice that of a fluorescent source and more than ten times incandescent sources. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

During planning and design for the installation of new fixtures, we recommend a comprehensive approach that considers both the technology of the lighting sources and how they are controlled

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	39,776	14.3	0.0	$5,619.01	$36,063.53	$6,590.00	$29,473.53	5.25	40,054
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

This measure evaluates replacing linear fluorescent lamps with LED tube lamps and replacing incandescent and halogen screw-in/plug-in based lamps with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed although there is a fluorescent fixture ballast in place. Other tube lamps require that fluorescent fixture ballasts be removed or replaced with LED drivers. Screw-in/plug-in LED lamps can be used as a direct replacement for most other screw-in/plug-in lamps. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

4.1.2 Lighting Control Measures

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled. Recommended upgrades to existing lighting fixtures are summarized in Figure 18 below.

Figure 18 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**7,924**	**2.9**	**0.0**	**$1,119.32**	**$5,104.00**	**$880.00**	**$4,224.00**	**3.77**	**7,979**
ECM 3	Install Occupancy Sensor Lighting Controls	7,924	2.9	0.0	$1,119.32	$5,104.00	$880.00	$4,224.00	3.77	7,979

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
7,924	2.9	0.0	$1,119.32	$5,104.00	$880.00	$4,224.00	3.77	7,979

Measure Description

This measure evaluates installing occupancy sensors to control light fixtures that are currently manually controlled in classrooms and private offices. Sensors detect occupancy using ultrasonic and/or infrared wave technologies. Lighting control systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Occupants will also be able to manually turn off fixtures. Energy savings result from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. Ceiling-mounted or remote-mounted sensors require the use of low voltage switching relays or a wireless signal to the switch. In general, use wall switch replacement sensors for single occupant offices and other small rooms. Install ceiling-mounted or remote mounted sensors in locations without local switching, in situations where the existing wall switches are not in the line-of-sight of the main work area, and in large spaces.

Maintenance savings are anticipated due to reduced lamp operation, however, additional maintenance costs may be incurred because the occupancy sensors may require periodic adjustment; it is anticipated that the net effect on maintenance costs will be negligible.

4.1.3 Motor Upgrades

ECM 4: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
601	0.6	0.0	$84.87	$1,516.29	$0.00	$1,516.29	17.87	605

Measure Description

This measure evaluates replacing standard efficiency motors with EISA 2007 efficiency motors. The evaluation assumes existing motors will be replaced with the same size motors. It is important that the speed of each new motor match the speed of the motor it replaces as closely as possible. The base case motor efficiencies are obtained from nameplate information. Proposed case premium motor efficiencies are obtained from the New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2012). Savings are based on the difference between baseline and proposed efficiencies and the annual operating hours.

4.1.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 19 below.

Figure 19 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**5,787**	**2.3**	**0.0**	**$817.48**	**$11,816.62**	**$0.00**	**$11,816.62**	**14.45**	**5,827**
ECM 5	Install VFDs on Chilled Water Pumps	4,226	1.7	0.0	$597.01	$6,551.70	$0.00	$6,551.70	10.97	4,256
ECM 6	Install VFDs on Hot Water Pumps	1,561	0.5	0.0	$220.47	$5,264.92	$0.00	$5,264.92	23.88	1,572

ECM 5: Install VFDs on Chilled Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
4,226	1.7	0.0	$597.01	$6,551.70	$0.00	$6,551.70	10.97	4,256

Measure Description

This measure evaluates installing a variable frequency drive (VFD) to control a chilled water pump. This measure requires that a majority of the chilled water coils be served by two-way valves and that a differential pressure sensor is installed in the chilled water loop. As the chilled water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings result from reducing pump motor speed (and power) as chilled water valves close. The magnitude of energy savings is based on the amount of time at reduced loads.

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

ECM 6: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,561	0.5	0.0	$220.47	$5,264.92	$0.00	$5,264.92	23.88	1,572

Measure Description

This measure evaluates installing a variable frequency drive (VFD) to control a hot water pump. This measure requires that a majority of the hot water coils be served by two-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates 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 amount of time at reduced loads.

4.1.5 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 20 below.

Figure 20 - Summary of Unitary HVAC ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**525**	**0.4**	**0.0**	**$74.16**	**$1,360.95**	**$0.00**	**$1,360.95**	**18.35**	**529**
ECM 7	Install High Efficiency Electric AC	525	0.4	0.0	$74.16	$1,360.95	$0.00	$1,360.95	18.35	529

ECM 7: Install High Efficiency Electric AC

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
525	0.4	0.0	$74.16	$1,360.95	$0.00	$1,360.95	18.35	529

Measure Description

This measure evaluates replacing package air conditioners with high efficiency package air conditioners. There have been significant improvements in both compressor and fan motor efficiencies in the past several years. Therefore, electricity savings can be achieved by replacing old units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the old and new unit, the cooling load, and the annual operating hours.

4.1.6 Domestic Water Heating Upgrade

Our recommendations for domestic water heating system improvements are summarized in Figure 21 below.

Figure 21 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**92.1**	**$851.78**	**$164.91**	**$0.00**	**$164.91**	**0.19**	**10,782**
ECM 8	Install Low-Flow Domestic Hot Water Devices	0	0.0	92.1	$851.78	$164.91	$0.00	$164.91	0.19	10,782

ECM 8: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	92.1	$851.78	$164.91	$0.00	$164.91	0.19	10,782

Measure Description

This measure evaluates the savings from installing low-flow domestic water devices to reduce overall water flow in general and hot water flow in particular. Low-flow showerheads and faucet aerators reduce the water flow, relative to standard showerheads and aerators, from the fixture. Pre-rinse spray valves often used in commercial and institutional kitchens are designed to remove food waste from dishes prior to dishwashing. Replacing standard pre-rinse spray valves with low flow valves will reduce water use.

All of the low-flow devices reduce the overall water flow from the fixture which generally reduces the amount of hot water used resulting in energy and water savings.

4.1.7 Plug Load Equipment Control - Vending Machine

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	*Annual Natural Gas Savings (MMBtu)*	*Annual N/A Savings (MMBtu)*	*Annual N/A Savings (MMBtu)*	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**$227.70**	**$1,437.60**	**$0.00**	**$1,437.60**	**6.31**	**1,623**
ECM 9	Vending Machine Control	1,612	0.0	0.0	0.0	0.0	0.0	$227.70	$1,437.60	$0.00	$1,437.60	6.31	1,623

ECM 9: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$227.70	$1,437.60	$0.00	$1,437.60	6.31	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. We recommend installing occupancy sensor based controls to reduce the energy use. These controls power down the machine when the surrounding area is vacant, then monitor the surrounding temperature and power up the cooling system at regular intervals to keep the product cool. Savings are a function of the activity level around the vending machine.

5 Energy Efficient Practices

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of low (or no) cost efficiency strategies. By employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

Perform Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20%-60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6–12 months.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Use Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Perform Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Water Heater Maintenance

At least once a year, 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. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any 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 any 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 over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Assessing and Reducing Plug and Process Loads in Office Buildings," or "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. 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. The EPA WaterSense ratings for urinals is 0.5 gpf and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.6 for any low-flow ECM recommendations.

6 SELF-GENERATION MEASURES

Self-generation measures include both renewable (e.g., solar, wind) and non-renewable (e.g., microturbines) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at 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.

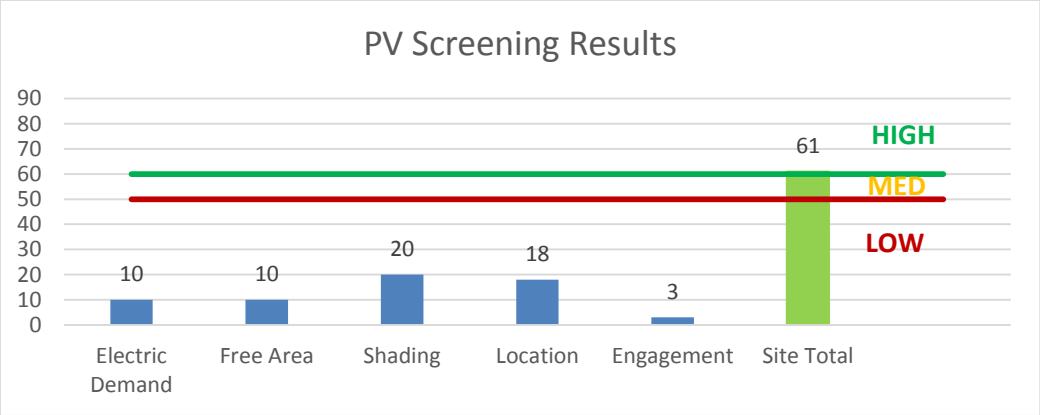
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a 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 for PV at the site. A PV array located on the roof of the main building/ground next to the building/over the main parking lot may be feasible. If Lincoln Elementary School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 22 - Photovoltaic Screening



Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SREC Registration Program prior to the start of construction in order 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. Refer to Section 8.3 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://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

In non-industrial settings, combined heat and power (CHP) is the on-site generation of electricity and recovery of heat which is put to beneficial use. Common prime movers in CHP applications include reciprocating engines, microturbines, fuel cells, and (at large facilities) gas turbines. Electricity is typically interconnected to the sites local distribution system. Heat is recovered from the exhaust stream and the ancillary cooling system and interconnected to the existing hot water (or steam) distribution system.

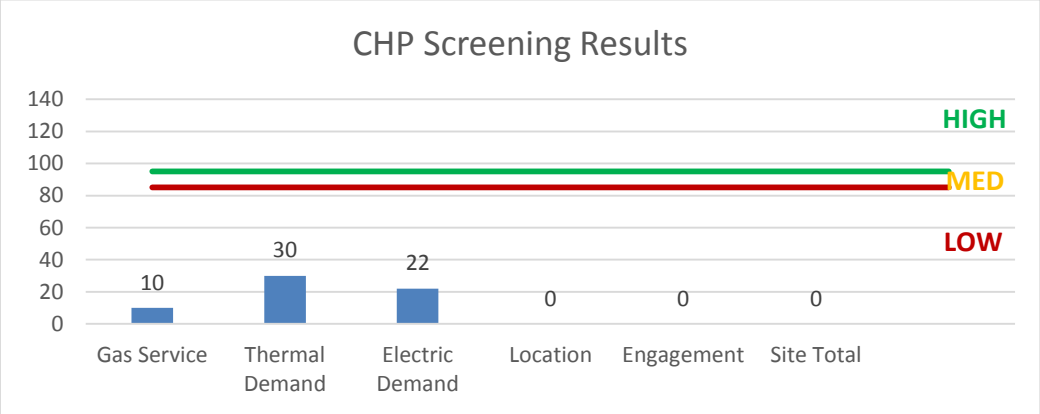
CHP systems are typically used to produce a portion of the electricity needed by a facility, with the balance of electric needs satisfied by purchase from the grid. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use 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 a low potential for installing a cost-effective CHP system.

Low or infrequent thermal load, and lack of space near the existing thermal generation are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in NJ specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

Figure 23 - Combined Heat and Power Screening



7 DEMAND RESPONSE

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage 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 DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and others, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's 1999 Electricity Restructuring Law which requires all customers of investor-owned electric and gas utilities to pay this charge on their monthly energy bills. As a contributor to the fund, you were able to participate in the LGEA program and are also eligible to utilize the equipment incentive programs. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 24 for a list of the eligible programs identified for each recommended ECM.

Figure 24 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Pay For Performance Existing Buildings
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	Premium Efficiency Motors			x
ECM 5	Install VFDs on Chilled Water Pumps			x
ECM 6	Install VFDs on Hot Water Pumps			x
ECM 7	Install High Efficiency Electric AC			x
ECM 8	Install Low-Flow Domestic Hot Water Devices			x
ECM 9	Vending Machine Control			x

SmartStart is generally well suited for implementation of individual or small sets of measures, with the flexibility to install projects at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities to bundle measures and simplify participation, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities and requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption; applicants can use in-house staff or preferred contractor.

Generally, the incentive values provided throughout the report assume the SS program is utilized because it provides a consistent comparison of available incentives.

Brief descriptions of all relevant alternative financing and incentive programs are located in the sections below. You may also check the following website for further information, including most current program availability, requirements, and incentive levels: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program is comprised of New Construction and Retrofit components that offer incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives for various energy efficiency equipment based on national/market trends, new technologies or changes in efficiency baselines.

Prescriptive Equipment Incentives 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

All customer sizes and types may be served by this program. This program provides an effective mechanism for securing incentives for individual projects that may be completed at once or over several years.

Incentives

The prescriptive path provides fixed incentives for specific energy efficiency measures whereas the custom measure path provides incentives for unique or specialized technologies that are not addressed through prescriptive offerings.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, 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

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB.

8.2 Pay for Performance - Existing Buildings

Overview

The Pay for Performance–Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program 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. P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing ESIP also utilize the P4P program.

Incentives

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

How to Participate

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors) or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

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

8.3 SREC Registration Program

The SREC 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 in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

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

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

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

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

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. 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. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. 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 can be leveraged to help further reduce the total project cost of eligible measures.

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 utilized 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. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program description and application can be found at: www.njcleanenergy.com/ESIP.

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize the incentive programs to help further reduce costs when compiling the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e., non-utility) energy supplier.

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 is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. 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 is typically dependent upon whether a customer seeks 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 is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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
Gymnasium Exterior Perimeter Light	6	Metal Halide: (1) 250W Lamp	Daylight Dimming	275	990	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	25	990	0.98	1,708	0.0	$241.25	$2,344.06	$600.00	7.23
West Wing	4	Metal Halide: Wall Pack 275W	Daylight Dimming	275	990	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	25	990	0.66	1,139	0.0	$160.83	$1,562.71	$400.00	7.23
North wing	5	Metal Halide: Wall Pack 275W	Daylight Dimming	275	990	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	25	990	0.82	1,423	0.0	$201.04	$1,953.39	$500.00	7.23
East wing	2	Metal Halide: Wall Pack 275W	Daylight Dimming	275	990	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	25	990	0.33	569	0.0	$80.42	$781.35	$200.00	7.23
South wing	2	Metal Halide: Wall Pack 275W	Daylight Dimming	275	990	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	25	990	0.33	569	0.0	$80.42	$781.35	$200.00	7.23
Gymnasium East Wing	2	Metal Halide: Wall Pack 275W	Daylight Dimming	275	990	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	25	990	0.33	569	0.0	$80.42	$781.35	$200.00	7.23
Classroom 7	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.41	1,266	0.0	$178.84	$868.00	$170.00	3.90
Bathroom	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	924	0.05	118	0.0	$16.68	$242.40	$20.00	13.33
Basement Main Hallway	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	17	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.37	1,135	0.0	$160.40	$994.50	$170.00	5.14
Room 5	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.86	2,326	0.0	$328.63	$1,695.20	$335.00	4.14
Room 5	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,540	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,540	0.01	31	0.0	$4.38	$35.90	$5.00	7.06
Room 8	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.25	665	0.0	$93.89	$567.20	$110.00	4.87
Room 4	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,078	0.16	443	0.0	$62.60	$467.00	$80.00	6.18
Room 9 (Mechanical Room)	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.22	501	0.0	$70.77	$585.00	$100.00	6.85
Data Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,100	0.04	83	0.0	$11.79	$117.00	$20.00	8.22
Room 10 (Office)	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.25	760	0.0	$107.31	$567.20	$110.00	4.26
Men's Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,320	0.02	44	0.0	$6.22	$63.20	$0.00	10.16
Women's Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,320	0.02	44	0.0	$6.22	$63.20	$0.00	10.16
Room 13	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,078	0.14	369	0.0	$52.16	$408.50	$70.00	6.49
Room 1	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.49	1,329	0.0	$187.79	$1,018.40	$200.00	4.36
Superintendent Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.21	633	0.0	$89.42	$492.00	$95.00	4.44
Closet	1	Compact Fluorescent: Circle CFL 23W	Wall Switch	23	1,320	Fixture Replacement	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	7	1,320	0.01	24	0.0	$3.43	$63.65	$0.00	18.55
Room 14	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,540	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,078	0.38	1,040	0.0	$146.91	$877.07	$180.00	4.74
Closet	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,100	0.06	125	0.0	$17.69	$175.50	$30.00	8.22
Room (Hallway)	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.06	200	0.0	$28.31	$175.50	$30.00	5.14

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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 15	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,540	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,078	0.48	1,300	0.0	$183.63	$1,067.33	$220.00	4.61
Sub-basement- Cafeteria	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,540	Relamp	No	13	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,540	0.48	1,289	0.0	$182.13	$1,236.73	$260.00	5.36
Elevator Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,100	0.04	83	0.0	$11.79	$117.00	$20.00	8.22
Stairway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$18.87	$117.00	$20.00	5.14
Gym Entrance Hallway	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	3	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.06	176	0.0	$24.88	$189.60	$0.00	7.62
Gymnasium	6	Mercury Vapor: (1) 400W Lamp	Wall Switch	455	1,320	Fixture Replacement	No	6	LED - Fixtures: Downlight Pendant	Wall Switch	75	1,320	1.49	3,461	0.0	$488.93	$3,651.48	$30.00	7.41
Stage	88	Halogen Incandescent: PAR30 150W	Wall Switch	150	1,100	Fixture Replacement	No	88	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	15	1,100	7.79	15,028	0.0	$2,122.97	$5,601.29	$440.00	2.43
Stage	12	Halogen Incandescent: PAR30 90W (Flood Light)	Wall Switch	90	1,100	Fixture Replacement	No	12	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	9	1,100	0.64	1,230	0.0	$173.70	$763.81	$60.00	4.05
North Gym Entrance	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.04	117	0.0	$16.58	$126.40	$0.00	7.62
Gym Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,100	0.04	83	0.0	$11.79	$117.00	$20.00	8.22
Stairway Door 3	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$18.87	$117.00	$20.00	5.14
1st Floor North Wing Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.22	668	0.0	$94.35	$585.00	$100.00	5.14
Room 102	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.33	886	0.0	$125.19	$717.60	$140.00	4.61
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,540	0.02	51	0.0	$7.26	$63.20	$0.00	8.71
Room 103	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.33	886	0.0	$125.19	$717.60	$140.00	4.61
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,540	0.02	51	0.0	$7.26	$63.20	$0.00	8.71
Room 104	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.33	886	0.0	$125.19	$717.60	$140.00	4.61
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,540	0.02	51	0.0	$7.26	$63.20	$0.00	8.71
Room 105	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.33	886	0.0	$125.19	$717.60	$140.00	4.61
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,320	0.02	44	0.0	$6.22	$63.20	$0.00	10.16
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,320	0.02	44	0.0	$6.22	$63.20	$0.00	10.16
Room 107	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.33	886	0.0	$125.19	$717.60	$140.00	4.61
Main Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.17	534	0.0	$75.48	$468.00	$80.00	5.14
Main Hallway	12	Linear Fluorescent - T8: 2' T8 (17W) - 4L	Wall Switch	63	1,980	Relamp	No	12	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	1,980	0.23	792	0.0	$111.94	$918.40	$240.00	6.06
Front Entrance	8	Linear Fluorescent - T8: 2' T8 (17W) - 4L	Wall Switch	63	1,980	Relamp	No	8	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	1,980	0.15	528	0.0	$74.63	$612.27	$160.00	6.06

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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 107	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53
Closet	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,100	0.02	37	0.0	$5.18	$63.20	$0.00	12.20
Room 101	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.02	67	0.0	$9.44	$58.50	$10.00	5.14
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.02	59	0.0	$8.29	$63.20	$0.00	7.62
Teacher Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.12	380	0.0	$53.65	$341.60	$65.00	5.16
Bathroom	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.04	117	0.0	$16.58	$126.40	$0.00	7.62
Room 114	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.49	1,329	0.0	$187.79	$1,018.40	$200.00	4.36
Room 114	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,078	0.03	69	0.0	$9.73	$179.20	$20.00	16.36
Room 115	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.49	1,329	0.0	$187.79	$1,018.40	$200.00	4.36
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,100	0.04	83	0.0	$11.79	$117.00	$20.00	8.22
Room 116	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.29	775	0.0	$109.54	$642.40	$125.00	4.72
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$18.87	$117.00	$20.00	5.14
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.02	59	0.0	$8.29	$63.20	$0.00	7.62
2nd Floor Stairway Door 3	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.04	117	0.0	$16.58	$126.40	$0.00	7.62
3rd Floor Stairway Door 3	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,760	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,760	0.04	113	0.0	$16.01	$95.13	$20.00	4.69
2nd Floor North Wing Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.22	668	0.0	$94.35	$585.00	$100.00	5.14
Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.02	67	0.0	$9.44	$58.50	$10.00	5.14
Room 205	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53
Room 204	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53
Room 203	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53
Room 202	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53
Main Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	13	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.28	868	0.0	$122.66	$760.50	$130.00	5.14
Room 201	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53
Room 207	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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
Closet	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	770	0.11	211	0.0	$29.81	$350.00	$60.00	9.73
Library	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.70	1,883	0.0	$266.03	$1,394.40	$275.00	4.21
Closet	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,100	0.04	73	0.0	$10.36	$126.40	$0.00	12.20
Room 209	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.16	506	0.0	$71.54	$416.80	$80.00	4.71
Room 210 (Computer Room)	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,078	0.33	886	0.0	$125.19	$818.00	$140.00	5.42
Room 210B	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.08	222	0.0	$31.30	$266.40	$50.00	6.91
Room 212	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,100	0.02	42	0.0	$5.90	$58.50	$10.00	8.22
Room 211	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.16	443	0.0	$62.60	$416.80	$80.00	5.38
Room 214	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53
Room 214	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,540	0.02	51	0.0	$7.26	$63.20	$0.00	8.71
Room 215	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.37	997	0.0	$140.84	$792.80	$155.00	4.53
Room 215	9	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,078	0.23	620	0.0	$87.59	$684.80	$20.00	7.59
South Wing Stairway	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,760	0.08	235	0.0	$33.17	$252.80	$0.00	7.62
South Wing Stairway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$18.87	$117.00	$20.00	5.14
Room 100	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.29	775	0.0	$109.54	$642.40	$125.00	4.72
Room 100	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,540	0.04	117	0.0	$16.51	$117.00	$20.00	5.87
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,540	0.02	51	0.0	$7.26	$63.20	$0.00	8.71
Room 110	1	Compact Fluorescent: 32W CFL	Wall Switch	32	1,540	Fixture Replacement	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	7	1,540	0.02	44	0.0	$6.25	$63.65	$0.00	10.18
Room 109	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,078	0.08	222	0.0	$31.30	$291.50	$50.00	7.72
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,100	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,100	0.04	83	0.0	$11.79	$117.00	$20.00	8.22
Main Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.25	760	0.0	$107.31	$567.20	$110.00	4.26
Principal Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.25	760	0.0	$107.31	$567.20	$110.00	4.26
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,320	0.02	44	0.0	$6.22	$63.20	$0.00	10.16
Room 112	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,540	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,078	0.25	665	0.0	$93.89	$567.20	$110.00	4.87

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	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
Bathroom	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,540	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,540	0.02	51	0.0	$7.26	$63.20	$0.00	8.71

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?	Annual Operating Hours	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
Mechanical Room	Boiler	2	Other	3.0	80.0%	No	650	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	DHW	1	Other	0.3	75.0%	No	1,540	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	Boiler	1	Heating Hot Water Pump	1.5	65.0%	No	1,040	Yes	86.5%	Yes	1	0.55	1,081	0.0	$152.67	$3,390.61	$0.00	22.21
Mechanical Room	Boiler	1	Heating Hot Water Pump	1.5	65.0%	No	1,040	Yes	86.5%	Yes	1	0.55	1,081	0.0	$152.67	$3,390.61	$0.00	22.21
Mechanical Room	Boiler	1	Water Supply Pump	0.2	59.8%	No	1,320	No	59.8%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Elevator Room	Elevator Room	1	Other	25.0	88.0%	No	1,760	No	88.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gymnasium Storage	Chiller	1	Chilled Water Pump	5.0	86.0%	No	840	No	86.0%	Yes	1	0.87	2,113	0.0	$298.51	$3,275.85	$0.00	10.97
Gymnasium Storage	Chiller	1	Chilled Water Pump	5.0	86.0%	No	840	No	86.0%	Yes	1	0.87	2,113	0.0	$298.51	$3,275.85	$0.00	10.97
School	School	35	Other	2.0	82.0%	No	780	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
School	School	35	Other	2.0	82.0%	No	780	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	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)	Install Dual Enthalpy Economizer?	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 14	Room 14	1	Window AC	1.25		Yes	1	Window AC	1.25		12.00		No	0.42	525	0.0	$74.16	$1,360.95	$0.00	18.35
Room 15	Room 15	1	Window AC	1.08		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Office	Main Office	1	Window AC	0.66		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Cafeteria	1	Packaged AC	20.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 209	Room 209	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 211	Room 211	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Rear Gymnasium	School	1	Air-Cooled Screw Chiller	45.00	No							0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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)	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
Room 9 (Mechanical Room)	School	2	Non-Condensing Hot Water Boiler	2,974.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	School	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	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
School	21	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	86.6	$800.92	$150.57	$0.00	0.19
Kitchen	2	Faucet Aerator (Kitchen)	3.00	2.20	0.00	0	5.5	$50.85	$14.34	$0.00	0.28

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	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
Cafeteria	2	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cafeteria	1	Refrigerator Chest	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	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
Cafeteria	1	Gas Rack Oven (Single)	Yes	No	0.00	0	0.0	$0.00	$4,838.75	$1,000.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
School	119	Desktop with LCD Monitors	191.0	Yes
School	2	Water Fountain	270.0	Yes
School	11	Copy Machine	900.0	Yes
School	9	Microwave	800.0	No
School	12	Small Printer	350.0	Yes
School	4	Small refrigeartor	150.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	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
Room 113 Teacher Room	1	Refrigerated	Yes	0.00	1,612	0.0	$227.70	$718.80	$0.00	3.16
Room 113 Teacher Room	1	Non-Refrigerated	No	0.00	0	0.0	$0.00	$718.80	$0.00	0.00

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Lincoln Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 54,000
Built: 1912

For Year Ending: March 31, 2016
Date Generated: May 29, 2017

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Lincoln Elementary School 712 Lincoln Avenue Ridgefield Park, New Jersey 07660	Ridgefield Park Board of Education 712 Lincoln Avenue Ridgefield Park, NJ 07660 (201) 641-0801	Eric Koenig 712 Lincoln Avenue Ridgefield Park, NJ 07660 (201) 641-0801 EKoenig@rpps.net

Property ID: 5776864

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
89.3 kBtu/ft²

Source EUI
199.3 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	2,727,236 (56%)
Natural Gas (kBtu)	2,096,088 (44%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	66.5
National Median Source EUI (kBtu/ft²)	148.4
% Diff from National Median Source EUI	34%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	424

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)