Local Government Energy Audit:
Energy Audit Report

Barack Obama

Elementary School

Asbury Park Board of Education

1300 Bangs Ave

Asbury Park, New Jersey 07712

October 11, 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 Barack Obama Elementary School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey schools in controlling energy costs and help protect our environment by reducing energy usage statewide.

1.1 Facility Summary

Barack Obama Elementary School is a 68,400 square foot facility public school. The building has three floors which includes classrooms, offices, a kitchen, a library, a gym, restrooms, storage, and mechanical spaces. Lighting at the facility consists primarily of T8 linear fluorescent fixtures. There are also a few compact fluorescent bulbs. The building exterior is lighted mostly by high pressure sodium (HPS) fixtures.

The entire facility is heated, but only limited areas are cooled. Unit ventilators (UVs) with hot water coils provide heat to most areas of the building. Two very old (1950s vintage) H.B. Smith cast iron boilers generate the heat provided to UVs. Three split systems provide cooling to about 10% of the school including the air handling units serving main offices, cafeteria, and the media center. Spot cooling is also provided to a few areas with window-mounted air conditioning (AC) units. 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 six measures which together represent an opportunity for Barack Obama Elementary School to reduce its annual energy costs by roughly $14,296 and its annual greenhouse gas emissions by 126,912 lbs CO_2e. We estimate that if all measures are implemented as recommended, the project would pay for itself from energy savings alone in about 15.9 years. The breakdown of current costs is shown in Figure 1. The estimated savings following project implementation is shown Figure 2 below. Together these measures represent an opportunity to reduce Barack Obama Elementary School's annual energy use by about 15% overall.

Figure 1 – Previous 12 Month Utility Costs

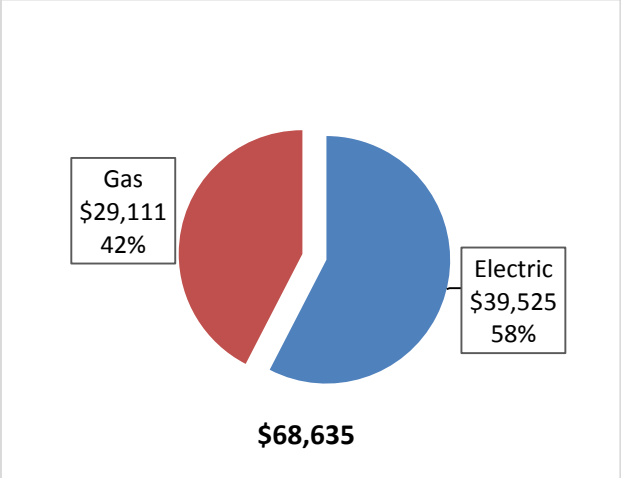
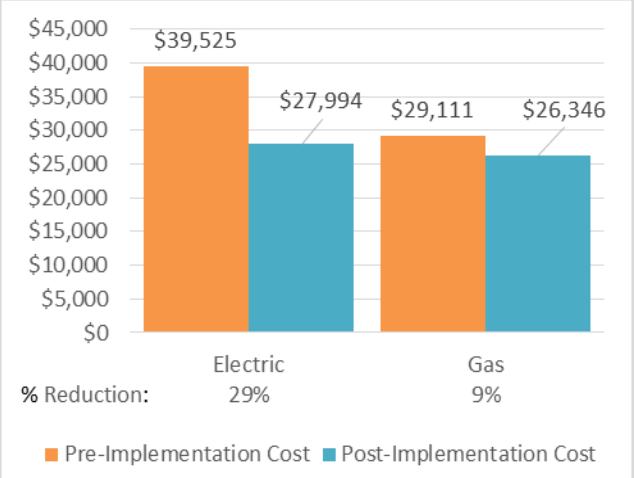


Figure 2 – Potential Post-Implementation Costs



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

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings 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			**78,256**	**20.3**	**0.0**	**$9,563.21**	**$52,085.80**	**$9,880.00**	**$42,205.80**	**4.4**	**78,803**
ECM 1	Install LED Fixtures	Yes	13,842	1.8	0.0	$1,691.51	$5,078.80	$1,300.00	$3,778.80	2.2	13,938
ECM 2	Retrofit Fixtures with LED Lamps	Yes	64,414	18.5	0.0	$7,871.69	$47,007.00	$8,580.00	$38,427.00	4.9	64,865
Lighting Control Measures			**14,491**	**4.0**	**0.0**	**$1,770.86**	**$21,990.00**	**$2,605.00**	**$19,385.00**	**10.9**	**14,592**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	14,491	4.0	0.0	$1,770.86	$21,990.00	$2,605.00	$19,385.00	10.9	14,592
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**229.2**	**$2,326.12**	**$179,481.85**	**$14,000.00**	**$165,481.85**	**71.1**	**26,833**
ECM 4	Install High Efficiency Hot Water Boilers	Yes	0	0.0	229.2	$2,326.12	$179,481.85	$14,000.00	$165,481.85	71.1	26,833
Domestic Water Heating Upgrade			**0**	**0.0**	**43.2**	**$438.76**	**$153.03**	**$0.00**	**$153.03**	**0.3**	**5,061**
ECM 5	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	43.2	$438.76	$153.03	$0.00	$153.03	0.3	5,061
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$196.97**	**$230.00**	**$0.00**	**$230.00**	**1.2**	**1,623**
ECM 6	Vending Machine Control	Yes	1,612	0.0	0.0	$196.97	$230.00	$0.00	$230.00	1.2	1,623
TOTALS			**94,359**	**24.2**	**272.4**	**$14,295.92**	**$253,940.68**	**$26,485.00**	**$227,455.68**	**15.9**	**126,912**

* - 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 measure 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 not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Gas Heating (HVAC/Process) measures generally involve replacing older inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide equivalent heating compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel demands for heating, due to improved combustion and heat transfer efficiency.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems, or measures to reduce hot water consumption. New domestic hot water heating systems and equipment can provide equivalent, or greater, performance compared to older systems and devices at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency, or by reducing water usage and standby losses.

Plug Load Equipment control measures generally involve installing automated devices that limit the power usage or operation of equipment that is plugged into an electric outlets when not in use.

Energy Efficient Practices

TRC also identified five low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Barack Obama Elementary School include:

- Reduce Air Leakage
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean and/or Replace HVAC Filters
- Install Plug Load Controls
- Water Conservation

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

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Barack Obama Elementary School. Based on the configuration of the site and its electric load, there appears to be a high potential for cost-effective installation of a rooftop solar photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	91	kW DC STC
Electric Generation	108,415	kWh/yr
Displaced Cost	$9,430	/yr
Installed Cost	$260,300	

For details on our evaluation and on-site generation potential, please see Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

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

- SmartStart
- Direct Install
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Energy Savings Improvement Program (ESIP)

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated Direct Install contractor and, in most cases, they will perform the installation work.

For larger facilities with limited capital availability 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 project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) 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 commercial facilities to reduce their 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 facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Walter Sosa	Buildings and Grounds Supervisor	sosaw@asburypark.k12.nj.us	(732) 776 2663 x2851
Geoffrey Hastings	Business Administrator	hastingsg@asburypark.k12.nj.us	(732) 776 2606 x2426
TRC Energy Services			
Tom Page	Auditor	TPage@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On July 21, 2017, TRC performed an energy audit at Barack Obama Elementary School located in Asbury Park, New Jersey. TRC's team met with Walter Sosa to review the facility operations and help focus our investigation on specific energy-using systems.

Barack Obama Elementary School is a 68,400 square foot facility public school. The school building was originally constructed in 1912. The building has three floors which includes classrooms, offices, a kitchen, a library, a gym, restrooms, storage, and mechanical spaces. Lighting at the facility consists primarily of T8 linear fluorescent fixtures. There are also a few compact fluorescent bulbs. The building exterior is lighted mostly by HPS fixtures.

The entire facility is heated, but only limited areas are cooled. Unit ventilators (UVs) with hot water coils provide heat to most areas of the building. Two very old (1950s vintage) H.B. Smith cast iron boilers generate the heat provided to UVs. Three split systems provide cooling to about 10% of the school including the air handling units serving main offices, cafeteria, and the media center. Spot cooling is also provided to a few areas with window-mounted air conditioning (AC) units.

The compressors and condensers of the air conditioning system are relatively new, but the boilers are from the 1950's and should be replaced. Unfortunately, boiler replacement is complicated by the presence of asbestos which would require abatement, which will significantly increase the overall cost of the measure.

2.3 Building Occupancy

The building is open Monday through Friday; it does not have regularly scheduled weekend usage. The school provides instruction only during the regular school year. It is unoccupied during the summer. The typical operating schedule is presented in the table below. During a typical school day, the facility is occupied by approximately 436 students and staff.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Barack Obama Elementary School	Weekday	7:30 AM - 4:00 PM
Barack Obama Elementary School	Weekend	Closed

2.4 Building Envelope

Both buildings are believed to be constructed of brick with a stucco façade. The buildings have flat roofs covered with a white bitumen roof membrane. The building has a combination of single and double paned windows. Many of the windows are operable. The exterior doors are constructed of aluminum and glass.

2.5 On-Site Generation

Barack Obama Elementary School has Kato Light 45-kW gas-fired emergency generator on site. Gas usage for the equipment is negligible, because it is typically only used in case of emergency power outage, plus a few hours each year for required testing.

2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

Lighting is provided almost exclusively by 32-Watt linear T8 linear fluorescent fixtures with electronic ballasts. Most of the fixtures are 2-lamp 4-foot long troffers with diffusers, though there are also 1-lamp, 3-lamp, and 4-lamp fixtures, as well. The building also has some compact fluorescent lights. Lighting control throughout the building is provided by manually operated wall switches.

Exterior lighting is mostly provided by HPS fixtures. These fixtures illuminate the building perimeter. Exterior security lighting is controlled by time clocks or photocells.

All of the school's lighting fixtures could be cost-effectively upgraded or retrofitted with LEDs.

Hot Water Heating System

The school's hot water heating system consists of two H.B. Smith 4,032 kBtu/hr output, forced draft boilers. The boilers do not have a nameplate and no testing records were provided, so we assume they have a nominal efficiency of about 77% (including standby losses). The boilers were installed in the 1950's and are covered in asbestos insulation.

Each boiler has a 1.5-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. Historical natural gas usage indicates that only one boiler is required for a majority (if not all) of the heating season. The boilers provide hot water to heating coils in air handlers and classroom unit ventilators.

Direct Expansion Air Conditioning System (DX)

Three direct-expansion (DX) split systems provides cooling to select areas of the school. Only about 10% of the building is cooled. Chilled air is distributed by three Trane air handling units (AHU) with direct expansion and hot water coils. The AHUs condition air the main office, cafeteria, and media center. Each AHU provides a constant air volume with a single supply air fan. These DX split systems provide a total of 32.5 tons (7.5, 10, and 15 tons). All of the compressors and condensers are located on concrete pads on the ground adjacent to the building.

Spot cooling is provided by a few small window-mounted AC units. The seals around the windows in some locations is incomplete, leading to excessive infiltration. These units range in capacity from 12,000 to 18,000 Btu/hr. All cooling is manually controlled by thermostats in each zone.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of a single LAARS Mighty Therm-2 gas-fired water heater with an input rating of 362 kBtu/hr and a nominal efficiency of 85%. The water heater has a standalone 119-gallon storage tank. It is about four years old. A recirculation pump distributes domestic hot water to the entire building. The recirculation pumps operate continuously.

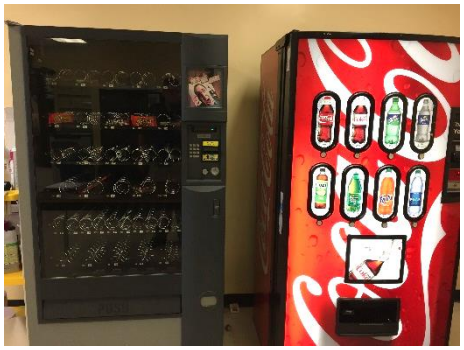
Food Service Equipment

The school has a kitchen that is used to re-heat pre-prepared food for lunches for students and staff. The kitchen has two Traulsen large commercial refrigerators and Blodgett electric convection ovens.

Building Plug Load

There are roughly 323 computer work stations throughout the school. The computers are mostly desktop units with LCD monitors. There are two servers located at the school. There is no centralized PC power management software installed.

In addition to the typical classroom and office equipment, there are also microwaves, refrigerators, and vending machines on site used by school staff.



2.7 Water-Using Systems

There are approximately 25 restrooms at this facility. A sampling of restrooms found that most of the faucets are rated as low-flow, though four were sinks found with a flow rate of 2.5 (gallons per minute) gpm or higher. The kitchen faucets are also high flow. Low-flow faucet aerators and pre-rinse spray valves would help reduce hot water energy usage.

3 SITE ENERGY USE AND COSTS

Utility data for electricity 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 usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

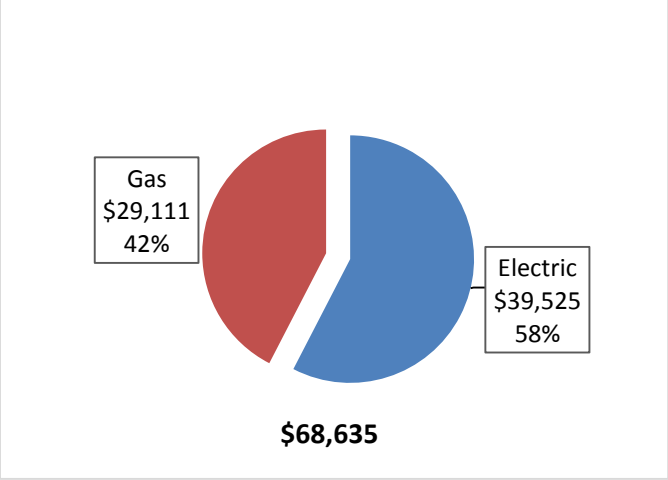
The following energy consumption and cost data is based on a recent 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Barack Obama Elementary School		
Fuel	**Usage**	**Cost**
Electricity	323,430 kWh	$39,525
Natural Gas	28,679 Therms	$29,111
Total		**$68,635**

The current annual energy cost for this facility is $68,635 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric rate over a recent 12-month period was found to be $0.122/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

It should be noted that the electric use during the summer is much higher than expected for a school that is closed.

Figure 9 - Electric Usage & Demand

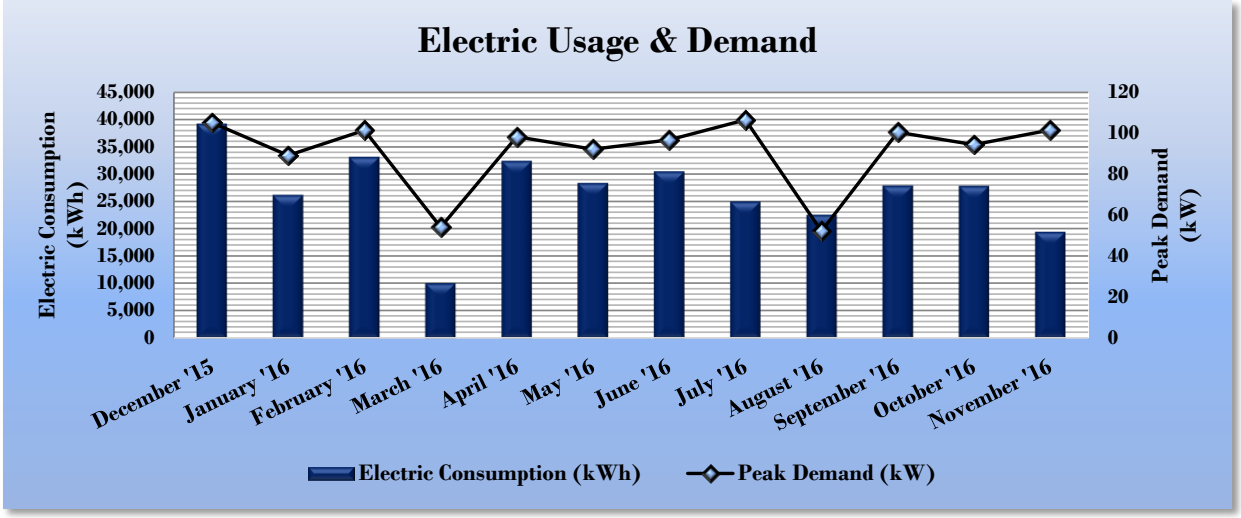


Figure 10 - Electric Usage & Demand

Electric Billing Data for Barack Obama Elementary School				
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost
12/28/15	33	39,151	105.2	$4,487
1/27/16	30	26,189	89.1	$3,126
2/24/16	28	33,136	101.4	$3,915
3/25/16	30	10,100	54.1	$853
4/25/16	31	32,405	98.2	$4,589
5/24/16	29	28,330	92.2	$3,386
6/23/16	30	30,493	96.8	$3,692
7/25/16	32	24,970	106.6	$2,953
8/24/16	30	22,578	52.2	$2,682
9/23/16	30	27,879	100.4	$3,567
10/24/16	31	27,858	94.4	$3,507
11/23/16	30	19,455	101.6	$2,660
Totals	**364**	**322,544**	**106.6**	**$39,416**
Annual	**365**	**323,430**	**106.6**	**$39,525**

3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas rate over a recent 12-month period was found to be $1.015/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 11 - Natural Gas Usage

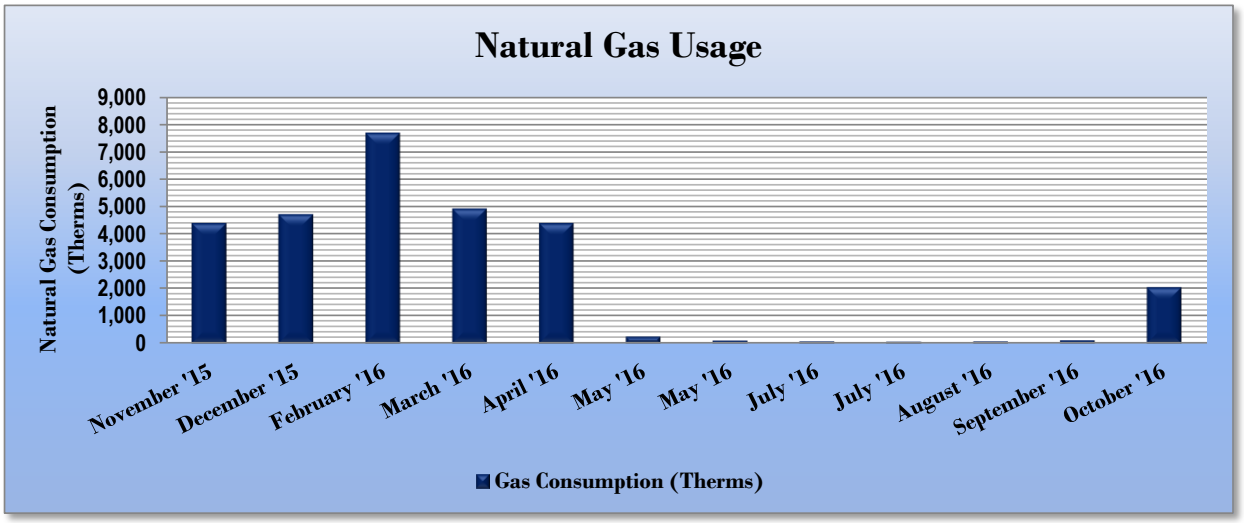


Figure 12 - Natural Gas Usage

Gas Billing Data for Barack Obama Elementary School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
12/14/15	33	4,386	$3,999
1/15/16	32	4,708	$4,256
2/17/16	33	7,679	$6,628
3/17/16	29	4,911	$4,418
4/18/16	32	4,385	$3,998
5/16/16	28	244	$692
6/15/16	30	100	$577
7/18/16	33	70	$553
8/15/16	28	56	$541
9/13/16	29	63	$547
10/13/16	30	111	$637
11/11/16	29	2,046	$2,346
Totals	**366**	**28,758**	**$29,190**
Annual	**365**	**28,679**	**$29,111**

3.4 Benchmarking

This facility was benchmarked using 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 then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

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 or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy." Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Barack Obama Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	94.7	141.4
Site Energy Use Intensity (kBtu/ft^2)	58.1	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, 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		
	Barack Obama Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	72.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	46.6	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It 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 78.

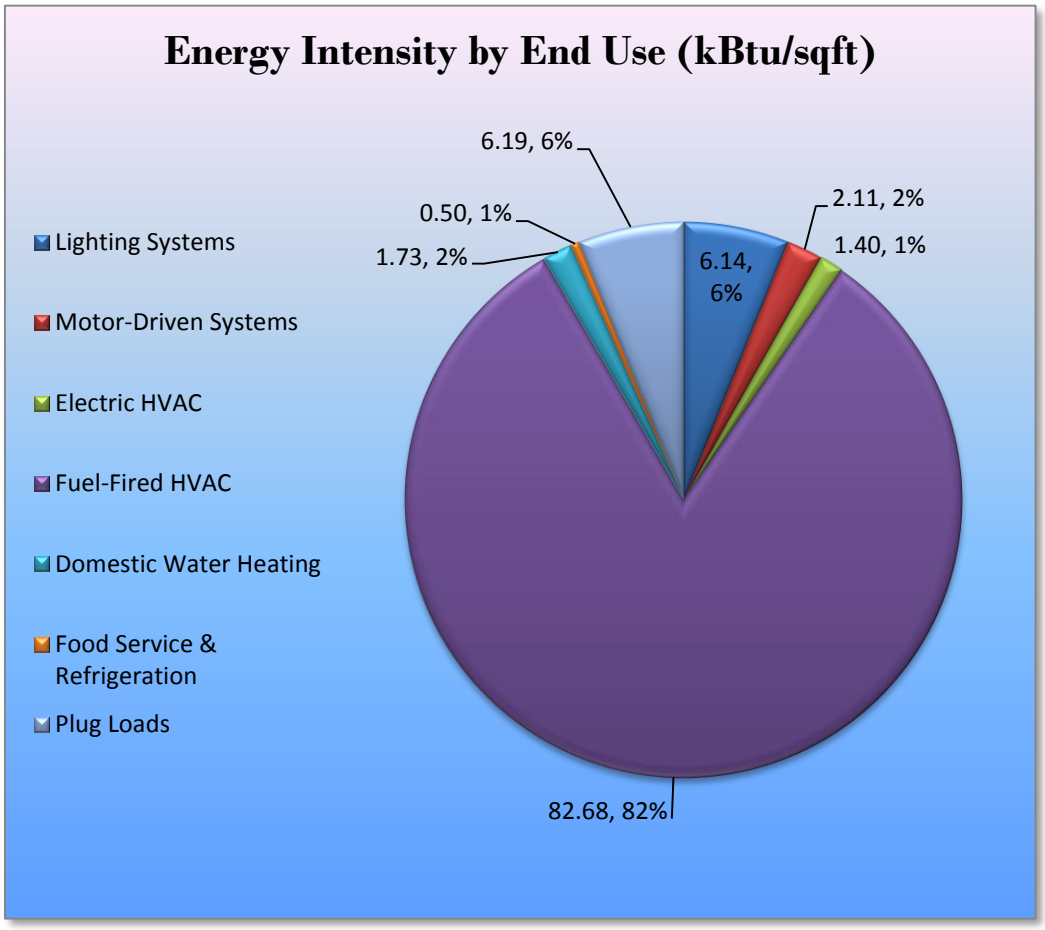
A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance. For more information on ENERGY STAR® certification go to:https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 15 - Energy Balance (% and kBtu/SF)



4 Energy Conservation Measures

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Barack Obama Elementary School regarding financial incentives for which they may qualify to implement the recommended measures. 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 usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016 approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described 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		**78,256**	**20.3**	**0.0**	**$9,563.21**	**$52,085.80**	**$9,880.00**	**$42,205.80**	**4.4**	**78,803**
ECM 1	Install LED Fixtures	13,842	1.8	0.0	$1,691.51	$5,078.80	$1,300.00	$3,778.80	2.2	13,938
ECM 2	Retrofit Fixtures with LED Lamps	64,414	18.5	0.0	$7,871.69	$47,007.00	$8,580.00	$38,427.00	4.9	64,865
Lighting Control Measures		**14,491**	**4.0**	**0.0**	**$1,770.86**	**$21,990.00**	**$2,605.00**	**$19,385.00**	**10.9**	**14,592**
ECM 3	Install Occupancy Sensor Lighting Controls	14,491	4.0	0.0	$1,770.86	$21,990.00	$2,605.00	$19,385.00	10.9	14,592
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**229.2**	**$2,326.12**	**$179,481.85**	**$14,000.00**	**$165,481.85**	**71.1**	**26,833**
ECM 4	Install High Efficiency Hot Water Boilers	0	0.0	229.2	$2,326.12	$179,481.85	$14,000.00	$165,481.85	71.1	26,833
Domestic Water Heating Upgrade		**0**	**0.0**	**43.2**	**$438.76**	**$153.03**	**$0.00**	**$153.03**	**0.3**	**5,061**
ECM 5	Install Low-Flow Domestic Hot Water Devices	0	0.0	43.2	$438.76	$153.03	$0.00	$153.03	0.3	5,061
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$196.97**	**$230.00**	**$0.00**	**$230.00**	**1.2**	**1,623**
ECM 6	Vending Machine Control	1,612	0.0	0.0	$196.97	$230.00	$0.00	$230.00	1.2	1,623
TOTALS		**94,359**	**24.2**	**272.4**	**$14,295.92**	**$253,940.68**	**$26,485.00**	**$227,455.68**	**15.9**	**126,912**

* - 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

Our recommendations for 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		**78,256**	**20.3**	**0.0**	**$9,563.21**	**$52,085.80**	**$9,880.00**	**$42,205.80**	**4.4**	**78,803**
ECM 1	Install LED Fixtures	13,842	1.8	0.0	$1,691.51	$5,078.80	$1,300.00	$3,778.80	2.2	13,938
ECM 2	Retrofit Fixtures with LED Lamps	64,414	18.5	0.0	$7,871.69	$47,007.00	$8,580.00	$38,427.00	4.9	64,865

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.

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	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	13,842	1.8	0.0	$1,691.51	$5,078.80	$1,300.00	$3,778.80	2.2	13,938

Measure Description

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

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

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	64,374	18.4	0.0	$7,866.77	$46,980.25	$8,580.00	$38,400.25	4.9	64,824
Exterior	40	0.0	0.0	$4.92	$26.75	$0.00	$26.75	5.4	41

Measure Description

We recommend retrofitting existing fluorescent lighting technologies with LED lamps. Many LED tube lamps are available which are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures 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		**14,491**	**4.0**	**0.0**	**$1,770.86**	**$21,990.00**	**$2,605.00**	**$19,385.00**	**10.9**	**14,592**
ECM 3	Install Occupancy Sensor Lighting Controls	14,491	4.0	0.0	$1,770.86	$21,990.00	$2,605.00	$19,385.00	10.9	14,592

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.

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)
14,491	4.0	0.0	$1,770.86	$21,990.00	$2,605.00	$19,385.00	10.9	14,592

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all classrooms and most offices areas. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results 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. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Gas-Fired Heating System Replacements

Our recommendations for gas-fired heating system replacements are summarized in Figure 19 below.

Figure 19 - Summary of Gas-Fired Heating Replacement 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)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**229.2**	**$2,326.12**	**$179,481.85**	**$14,000.00**	**$165,481.85**	**71.1**	**26,833**
ECM 4	Install High Efficiency Hot Water Boilers	0	0.0	229.2	$2,326.12	$179,481.85	$14,000.00	$165,481.85	71.1	26,833

ECM 4: Install High Efficiency Hot Water Boilers

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	229.2	$2,326.12	$179,481.85	$14,000.00	$165,481.85	71.1	26,833

Measure Description

We recommend replacing the school's very old and inefficient hot water boilers with high efficiency modular hot water boilers. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. Additionally, the existing boiler plant capacity appears to be more than twice the size required to serve the school. A modular replacement solutions allows for redundancy and possibly downsizing the total installed capacity, resulting in reduction of both operation and installation costs. We have assumed a modest capacity reduction is possible.

Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers that can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F.

The simple payback period (SPP) for this ECM is long, though the actual benefits from this measure may be understated. We try to be conservative in our cost estimates for large upgrade measures, such as this one. For the sake of this analysis, we assumed that the modular boiler upgrades would be non-condensing boilers and that the total capacity of the new boilers would be the same as the total existing capacity. The estimated SPP could be greatly improved, if higher efficiency condensing boilers (>90% efficient) could be installed instead of the 85% efficient non-condensing models assumed here. Also, the payback would be greatly improved if the total installed heating capacity for the building was reduced. Based on the billing data provided, it appears that downsizing the installed system may be possible. We recommend that the school investigate its options for installing condensing hydronic boilers and downsizing the total installed capacity, in order to maximize the efficiency of the new boiler system.

Please note: The estimated cost for this measure (Figure 19) does **not** include the cost for abatement of the asbestos in the boiler room area, which would have to done at the same time that the boilers are

replaced. We estimate that asbestos abatement of the boiler room area might add an additional $40,000 to the cost of the project.

4.1.4 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 20 below.

Figure 20 - 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**	**43.2**	**$438.76**	**$153.03**	**$0.00**	**$153.03**	**0.3**	**5,061**
ECM 5	Install Low-Flow Domestic Hot Water Devices	0	0.0	43.2	$438.76	$153.03	$0.00	$153.03	0.3	5,061

ECM 5: 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	43.2	$438.76	$153.03	$0.00	$153.03	0.3	5,061

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators can reduce hot water usage, relative to standard aerators, which saves energy.

Pre-rinse spray valves (PRSVs)—often used in commercial and institutional kitchens—are designed to remove food waste from dishes prior to dishwashing. Installing low-flow rated pre-rinse spray valves on kitchen faucets will reduce hot water usage and save energy.

Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.5 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 21 below.

Figure 21-Summary of Plug Load Equipment 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)
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$196.97**	**$230.00**	**$0.00**	**$230.00**	**1.2**	**1,623**
ECM 6	Vending Machine Control	1,612	0.0	0.0	$196.97	$230.00	$0.00	$230.00	1.2	1,623

ECM 6: 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	$196.97	$230.00	$0.00	$230.00	1.2	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor controls to reduce the energy use. These controls power down vending machines when the vending machine area has been vacant for some time, then power up at regular intervals, as needed, to turn machine lights on or keep the product cool. Energy savings are a dependent on vending machine and activity level in the area surrounding the machines.

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 many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M 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.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

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.

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 "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 gallons per flush (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 4.1.4 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) 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.

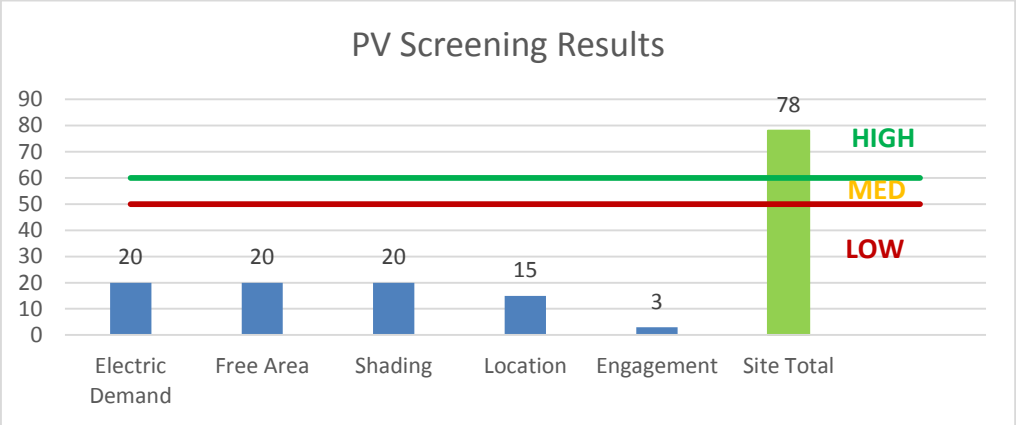
6.1 Photovoltaic

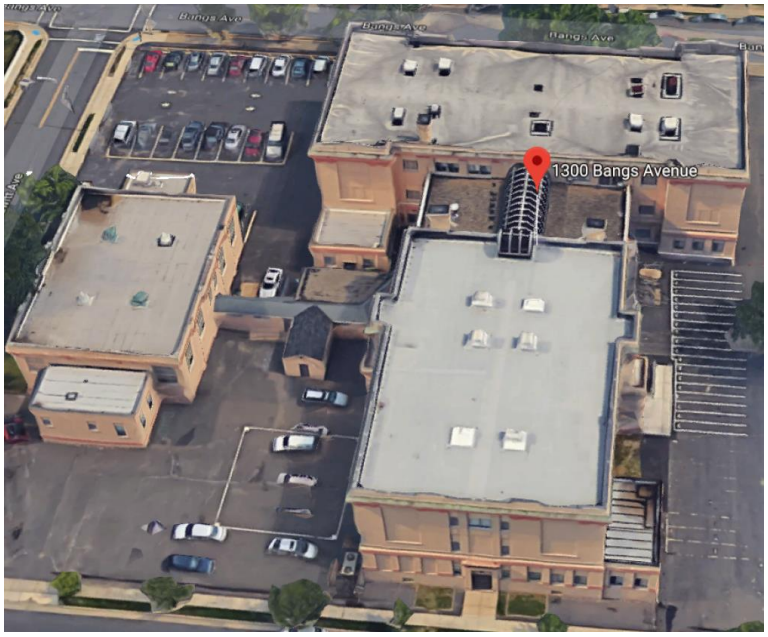
Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical 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. It appears that installing a solar PV array on the roof of the school might be feasible and cost effective. If Barack Obama Elementary School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted by a qualified solar installer.

Figure 22 - Photovoltaic Screening





Potential	High	
System Potential	91	kW DC STC
Electric Generation	108,415	kWh/yr
Displaced Cost	$13,250	/yr
Installed Cost	$260,300	

The aerial image of the school's rooftops shown above indicates that the school may have adequate unshaded space available to make a solar installation cost effective. We estimate that the school has about 10,000 ft2 available that could be developed for solar power generation. An area that size could hold up 91-kW of DC solar electric generating capacity. An array that size could reduce the school's annual electric purchases by about 33%. With the electric savings and SREC income generated by such a project the solar array could pay for itself in about 8 years.

Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (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 developed new solar projects 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

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. 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 and infrequent thermal load 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.

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.

This facility is a poor candidate for Demand Response.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 23 for a list of the eligible programs identified for each recommended ECM.

Figure 23 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	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	Install High Efficiency Hot Water Boilers	x		x	
ECM 5	Install Low-Flow Domestic Hot Water Devices			x	
ECM 6	Vending Machine Control			x	

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, 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. It 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. LEUP applicants can use in-house staff or a preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

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

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

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 Direct Install

Overview

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

Incentives

The program pays up to **70%** of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

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

Since Direct Install offers a free assessment of eligible measures, Direct Install is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

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

8.3 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects 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 SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar 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 descriptions 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 NJCEP incentive programs to help further reduce costs when developing 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
Main Office	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.15	555	0.0	$67.85	$409.50	$70.00	5.00
Conference Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.11	401	0.0	$48.99	$350.00	$60.00	5.92
Men's Room	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,090	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,090	0.01	32	0.0	$3.97	$31.90	$5.00	6.78
Women's Room	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,090	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,090	0.01	32	0.0	$3.97	$31.90	$5.00	6.78
Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,090	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,090	0.01	42	0.0	$5.14	$35.90	$5.00	6.01
Office Room 131	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.05	200	0.0	$24.50	$233.00	$20.00	8.70
Closet	1	Compact Fluorescent: 14W CFL	Wall Switch	14	500	Relamp	No	1	LED Screw-In Lamps: 5W LED plug-in lamp	Wall Switch	5	500	0.01	5	0.0	$0.63	$26.25	$0.00	41.51
Principal's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.16	601	0.0	$73.49	$416.80	$60.00	4.86
Front Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.30	1,102	0.0	$134.73	$1,453.50	$215.00	9.19
Classroom 125	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.45	1,654	0.0	$202.09	$1,097.20	$200.00	4.44
Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.02	79	0.0	$9.69	$58.50	$10.00	5.00
Classroom 124-1	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.16	601	0.0	$73.49	$621.00	$95.00	7.16
Classroom 121	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.62	2,255	0.0	$275.58	$1,668.00	$295.00	4.98
Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.02	79	0.0	$9.69	$58.50	$10.00	5.00
4x Foyer/Stairwell	28	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,300	Relamp	No	28	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,300	0.61	2,444	0.0	$298.66	$1,638.00	$280.00	4.55
Classroom 128	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.49	1,804	0.0	$220.46	$1,172.40	$215.00	4.34
Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.02	79	0.0	$9.69	$58.50	$10.00	5.00
Office Room 157	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.05	200	0.0	$24.50	$233.00	$20.00	8.70
Office Room 156	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.05	200	0.0	$24.50	$233.00	$20.00	8.70
Office Room 155	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.05	200	0.0	$24.50	$233.00	$20.00	8.70
Office Room 154	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.05	200	0.0	$24.50	$233.00	$20.00	8.70
Nurse's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,090	0.13	476	0.0	$58.16	$300.80	$60.00	4.14
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,045	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,045	0.02	42	0.0	$5.14	$71.80	$10.00	12.02
Dental Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.16	601	0.0	$73.49	$570.80	$95.00	6.47
Exam Room 145	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.08	301	0.0	$36.74	$420.40	$65.00	9.67

	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
Exam Room 147	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.05	200	0.0	$24.50	$387.00	$20.00	14.98
Small Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.02	79	0.0	$9.69	$58.50	$10.00	5.00
Office Room 139	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.08	301	0.0	$36.74	$291.50	$50.00	6.57
Office Room 142	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.05	200	0.0	$24.50	$233.00	$20.00	8.70
Office Room 140	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.05	200	0.0	$24.50	$233.00	$20.00	8.70
Office Room 141	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.08	301	0.0	$36.74	$291.50	$50.00	6.57
Office Room 153	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.05	200	0.0	$24.50	$233.00	$20.00	8.70
Women's Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,090	0.06	238	0.0	$29.08	$150.40	$30.00	4.14
Men's Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,090	0.03	119	0.0	$14.54	$75.20	$15.00	4.14
Server Room 158	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.04	38	0.0	$4.64	$117.00	$20.00	20.92
Classroom 123	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.21	752	0.0	$91.86	$646.00	$110.00	5.83
Front Hallway	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	7	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Back Hallway	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym	48	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	48	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	1.31	4,811	0.0	$587.91	$4,428.00	$690.00	6.36
Boys Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.06	238	0.0	$29.08	$175.50	$30.00	5.00
Girls Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.04	159	0.0	$19.39	$117.00	$20.00	5.00
Janitor's Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.04	38	0.0	$4.64	$117.00	$20.00	20.92
Kitchen	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,672	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,672	0.17	508	0.0	$62.03	$468.00	$80.00	6.25
Kitchen	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Back Hallway	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.33	1,203	0.0	$146.98	$1,512.00	$120.00	9.47
Library	30	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	30	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.82	3,007	0.0	$367.44	$2,565.00	$405.00	5.88
Library Classroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.41	1,503	0.0	$183.72	$1,417.50	$220.00	6.52
Computer Room	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.49	1,804	0.0	$220.46	$1,593.00	$250.00	6.09
Library Classroom 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.11	401	0.0	$48.99	$504.00	$75.00	8.76

	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
Storage Room 168	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,045	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,045	0.09	159	0.0	$19.39	$234.00	$40.00	10.01
Library Break Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.14	501	0.0	$61.24	$562.50	$85.00	7.80
Classroom 171	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.66	2,405	0.0	$293.95	$1,743.20	$310.00	4.88
Classroom 163	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.44	1,604	0.0	$195.97	$1,476.00	$230.00	6.36
Elevator Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.02	79	0.0	$9.69	$58.50	$10.00	5.00
Boys Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.06	238	0.0	$29.08	$175.50	$30.00	5.00
Girls Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.06	238	0.0	$29.08	$175.50	$30.00	5.00
Boiler Room	13	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,045	Relamp	No	13	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,045	0.15	273	0.0	$33.41	$466.70	$65.00	12.02
Boiler Room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
janitor room 162	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,090	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,090	0.01	42	0.0	$5.14	$35.90	$5.00	6.01
Classroom 234	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.38	1,403	0.0	$171.47	$1,359.00	$210.00	6.70
Classroom 234 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,045	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,045	0.02	40	0.0	$4.85	$58.50	$10.00	10.01
Classroom 231	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.38	1,403	0.0	$171.47	$1,359.00	$210.00	6.70
Classroom 231 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,045	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,045	0.02	40	0.0	$4.85	$58.50	$10.00	10.01
Classroom 236	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.36	1,303	0.0	$159.22	$1,300.50	$200.00	6.91
Classroom 236 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,045	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,045	0.02	40	0.0	$4.85	$58.50	$10.00	10.01
Classroom 229	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.36	1,303	0.0	$159.22	$1,300.50	$200.00	6.91
Classroom 229 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,045	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,045	0.02	40	0.0	$4.85	$58.50	$10.00	10.01
Faculty Room 225	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.22	802	0.0	$97.98	$738.00	$115.00	6.36
2x Faculty Restrooms	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	1,045	Relamp	No	2	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,045	0.02	32	0.0	$3.97	$63.80	$10.00	13.57
Classroom 234	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.38	1,403	0.0	$171.47	$1,359.00	$210.00	6.70
Storage 224	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.02	19	0.0	$2.32	$58.50	$10.00	20.92
2nd Floor Hallways	23	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	23	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.63	2,305	0.0	$281.71	$2,695.50	$405.00	8.13
2nd Floor Hallways	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	8	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Auditorium	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	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
Auditorium	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,045	Relamp	No	18	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,045	0.66	1,211	0.0	$148.03	$1,712.40	$360.00	9.14
Stage	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,045	Relamp	No	13	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,045	0.28	516	0.0	$63.00	$760.50	$130.00	10.01
Auditorium Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.02	19	0.0	$2.32	$58.50	$10.00	20.92
Classroom 212	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.49	1,804	0.0	$220.46	$1,172.40	$215.00	4.34
Girls Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.06	238	0.0	$29.08	$175.50	$30.00	5.00
Classroom 213	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.49	1,804	0.0	$220.46	$1,172.40	$215.00	4.34
Classroom 214	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.33	1,203	0.0	$146.98	$972.00	$155.00	5.56
Classroom 214 Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.02	19	0.0	$2.32	$58.50	$10.00	20.92
Small Classroom 216	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.08	301	0.0	$36.74	$291.50	$50.00	6.57
Small Classroom 217	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.08	301	0.0	$36.74	$291.50	$50.00	6.57
Small Classroom 218	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.08	301	0.0	$36.74	$291.50	$50.00	6.57
Classroom 219	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.49	1,804	0.0	$220.46	$1,172.40	$215.00	4.34
Boys Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.04	159	0.0	$19.39	$117.00	$20.00	5.00
Classroom 220	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.49	1,804	0.0	$220.46	$1,172.40	$215.00	4.34
Classroom 319	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.49	1,804	0.0	$220.46	$1,172.40	$215.00	4.34
Classroom 320	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.49	1,804	0.0	$220.46	$1,172.40	$215.00	4.34
Boys Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.04	159	0.0	$19.39	$117.00	$20.00	5.00
Classroom 312	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.49	1,804	0.0	$220.46	$1,172.40	$215.00	4.34
Storage 316	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	500	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	500	0.06	57	0.0	$6.96	$175.50	$30.00	20.92
Classroom 315	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.12	451	0.0	$55.12	$495.60	$80.00	7.54
Classroom 309	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.12	451	0.0	$55.12	$495.60	$80.00	7.54
Classroom 313	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.12	451	0.0	$55.12	$495.60	$80.00	7.54
Classroom 317	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.12	451	0.0	$55.12	$495.60	$80.00	7.54
Computer Class 323	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.37	1,353	0.0	$165.35	$946.80	$170.00	4.70
Classroom 325	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.33	1,203	0.0	$146.98	$972.00	$155.00	5.56

	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
Classroom 325 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,045	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,045	0.02	40	0.0	$4.85	$58.50	$10.00	10.01
Faculty Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.04	159	0.0	$19.39	$117.00	$20.00	5.00
Faculty Office Restrooms	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	1,045	Relamp	No	2	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,045	0.02	32	0.0	$3.97	$63.80	$10.00	13.57
Classroom 335	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.53	1,954	0.0	$238.84	$1,517.60	$265.00	5.24
Classroom 335 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,045	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,045	0.03	59	0.0	$7.27	$75.20	$15.00	8.28
Classroom 327	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.53	1,954	0.0	$238.84	$1,517.60	$265.00	5.24
Classroom 327 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,045	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,045	0.03	59	0.0	$7.27	$75.20	$15.00	8.28
Classroom 329	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.53	1,954	0.0	$238.84	$1,517.60	$265.00	5.24
Classroom 329 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,045	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,045	0.03	59	0.0	$7.27	$75.20	$15.00	8.28
Classroom 333	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.53	1,954	0.0	$238.84	$1,517.60	$265.00	5.24
Classroom 333 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,045	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,045	0.03	59	0.0	$7.27	$75.20	$15.00	8.28
3rd Floor Hallway	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.46	1,704	0.0	$208.22	$1,534.50	$240.00	6.22
Classroom 340	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.33	1,203	0.0	$146.98	$972.00	$155.00	5.56
Classroom 340 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,045	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,045	0.02	40	0.0	$4.85	$58.50	$10.00	10.01
Exterior Perimeter 1	12	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	295	4,380	Fixture Replacement	No	12	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	75	4,380	1.73	13,298	0.0	$1,625.03	$4,688.12	$1,200.00	2.15
Exterior Perimeter 2	1	High-Pressure Sodium: (1) 100W Lamp	Wall Switch	138	4,380	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	30	4,380	0.07	544	0.0	$66.48	$390.68	$100.00	4.37
Exterior Perimeter 3	1	Compact Fluorescent: 23W CFL	Wall Switch	23	4,380	Relamp	No	1	LED Screw-In Lamps: 17W LED Lamp	Wall Switch	15	4,380	0.01	40	0.0	$4.92	$26.75	$0.00	5.43

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
Boiler Rm	AHU 1 - Health & Main Offices	1	Supply Fan	2.0	84.0%	No	2,090	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Rm	AHU 2 - Inner & CST Offices	1	Supply Fan	2.0	84.0%	No	2,090	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Rm	AHU 3 - Gym / Cafeteria	1	Supply Fan	3.0	86.5%	No	2,090	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Media Center	AHU 4 - Media Center	1	Supply Fan	3.0	86.5%	No	2,090	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym	AHU 5 - Gym Girls Room	1	Supply Fan	1.5	84.0%	No	2,090	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	AHU 6 - Kitchen	1	Supply Fan	1.5	84.0%	No	2,090	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Rm	HW Circ Pump	1	Heating Hot Water Pump	1.5	78.5%	No	2,190	No	78.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Rm	HW Circ Pump	1	Heating Hot Water Pump	1.5	78.5%	No	0	No	78.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Rm	Boiler Draft Fans	1	Combustion Air Fan	1.5	82.5%	No	1,095	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Rm	Boiler Draft Fans	1	Combustion Air Fan	1.5	82.5%	No	0	No	82.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Vairous Exhust Fans	7	Exhaust Fan	0.5	80.0%	No	8,760	No	80.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	Class Room Evaprators	37	Supply Fan	0.3	80.0%	No	2,090	No	80.0%	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
Parking Lot	School	1	Split-System AC	7.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Parking Lot	School	1	Split-System AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Parking Lot	School	1	Split-System AC	15.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BOES	BOES	1	Window AC	0.75		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BOES	BOES	2	Window AC	1.00		No							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
Boiler Rm	Building	2	Non-Condensing Hot Water Boiler	4,032.00	Yes	8	Non-Condensing Hot Water Boiler	1,000.00	85.00%	Et	0.00	0	229.2	$2,326.12	$179,481.85	$14,000.00	71.14

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
Boiler Rm	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
Restrooms	4	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	6.2	$62.78	$28.68	$0.00	0.46
Kitchen	1	Pre-Rinse Spray Valve	5.00	1.15	0.00	0	37.0	$375.98	$124.35	$0.00	0.33

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
Kitchen	2	Electric Convection Oven (Half Size)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Various	323	Desktop Computers	120.0	Yes
Various	323	Computer Monitors	28.0	Yes
Various	4	Sm. Printers	13.0	Yes
Various	3	Lg. Copiers	380.0	Yes
Various	7	Sm. Microwaves	800.0	No
Various	4	Refrigerator	750.0	Yes
BOES	2	Server Rack	360.0	Yes
Kitchen	5	Lg. Refrigerator (# of doors)	750.0	No

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
BOES	1	Refrigerated	Yes	0.00	1,612	0.0	$196.97	$230.00	$0.00	1.17

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Barack Obama Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 68,400
Built: 1900

For Year Ending: October 31, 2016
Date Generated: October 13, 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
Barack Obama Elementary School 1300 Bangs Avenue Asbury Park, New Jersey 07712	Asbury Park Board of Education 910 4th Avenue Asbury Park, NJ 07712 (732) 776-2606 x 2426	Geoffrey Hastings 910 4th Avenue Asbury Park, NJ 07712 (732) 776-2606 x 2426 hastingsg@asburypark.k12.nj.us

Property ID: 6060566

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
58.5 kBtu/ft²

Source EUI
95.1 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	2,896,357 (72%)
Electric - Grid (kBtu)	1,102,248 (28%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	78.3
National Median Source EUI (kBtu/ft²)	127.3
% Diff from National Median Source EUI	-25%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	276

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)