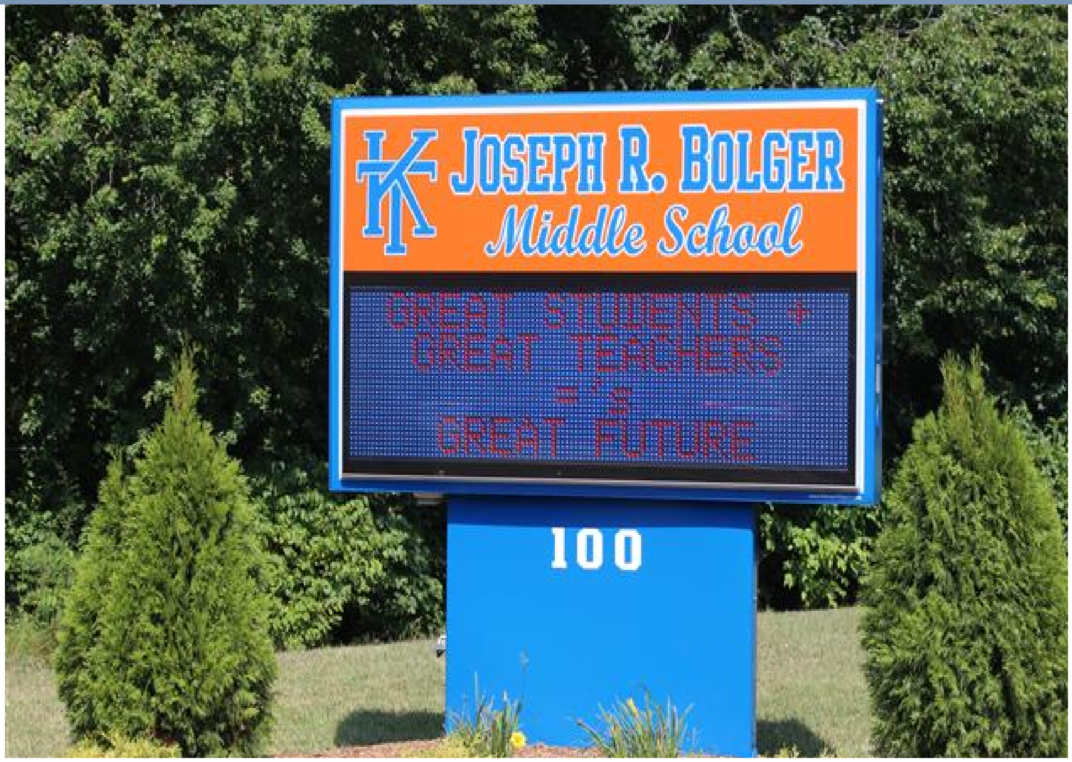
Local Government Energy Audit:

Energy Audit Report



Joseph R. Bolger Middle School

Keansburg Board of Education

100 Palmer Place
Keansburg, NJ 07734

March 29, 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 savings 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.

Table of Contents

1 Executive Summary 1

1.1 Facility Summary 1
1.2 Your Cost Reduction Opportunities 2

Energy Conservation Measures 2
Energy Efficient Practices 4
On-Site Generation Measures 5

1.3 Implementation Planning 5

2 Facility Information and Existing Conditions 7

2.1 Project Contacts 7
2.2 General Site Information 7
2.3 Building Occupancy 7
2.4 Building Envelope 8
2.5 Energy-Using Systems 8

Lighting System 8
Hot Water (or Steam) Heating System 8
Direct Expansion Air Conditioning System (DX) 9
Building Energy Management System (BEMS) 9
Domestic Hot Water Heating System 10
Food Service Equipment 10
Refrigeration 10
Building Plug Load 10

2.6 Water-Using Systems 10

3 Site Energy Use and Costs 11

3.1 Total Cost of Energy 11
3.2 Electricity Usage 12
3.3 Natural Gas Usage 13
3.4 Benchmarking 14
3.5 Energy End-Use Breakdown 15

4 Energy Conservation Measures 16

4.1 Recommended ECMs 16
4.1.1 Lighting Upgrades 17

ECM 1: Install LED Fixtures 17
ECM 2: Retrofit Fixtures with LED Lamps 17

4.1.2 Lighting Control Measures 18

ECM 3: Install Occupancy Sensor Lighting Controls 18

4.1.3 Motor Upgrades 19

ECM 4: Premium Efficiency Motors 19

4.1.4 Gas-Fired Heating System Replacements 19

ECM 5: Install High Efficiency Hot Water Boilers 19

4.1.5 HVAC System Upgrades ... 20
ECM 6: Install Pipe Insulation ... 20
4.1.6 Food Service Equipment & Refrigeration Measures ... 21
ECM 7: Food Service Equipment Replacement ... 21
4.1.7 Plug Load Equipment Control - Vending Machines ... 21
ECM 8: Vending Machine Control ... 21
5 Energy Efficient Practices ... 22
Reduce Air Leakage ... 22
Close Doors and Windows ... 22
Use Window Treatments/Coverings ... 22
Perform Proper Lighting Maintenance ... 22
Develop a Lighting Maintenance Schedule ... 22
Ensure Lighting Controls Are Operating Properly ... 23
Turn Off Unneeded Motors ... 23
Reduce Motor Short Cycling ... 23
Perform Routine Motor Maintenance ... 23
Use Fans to Reduce Cooling Load ... 23
Install Destratification Fans ... 23
Practice Proper Use of Thermostat Schedules and Temperature Resets ... 24
Ensure Economizers are Functioning Properly ... 24
Clean Evaporator/Condenser Coils on AC Systems ... 24
Clean and/or Replace HVAC Filters ... 24
Check for and Seal Duct Leakage ... 24
Perform Proper Boiler Maintenance ... 24
Perform Proper Water Heater Maintenance ... 25
Plug Load Controls ... 25
Replace Computer Monitors ... 25
Water Conservation ... 25
6 On-Site Generation Measures ... 26
6.1 Photovoltaic ... 26
7 Demand Response ... 28
8 Project Funding / Incentives ... 29
8.1 SmartStart ... 30
8.2 Pay for Performance - Existing Buildings ... 31
8.3 SREC Registration Program ... 31
8.4 Energy Savings Improvement Program ... 32
9 Energy Purchasing and Procurement Strategies ... 33
9.1 Retail Electric Supply Options ... 33
9.2 Retail Natural Gas Supply Options ... 33

Appendix A: Equipment Inventory & Recommendations

Appendix B: ENERGY STAR® Statement of Energy Performance

Table of Figures

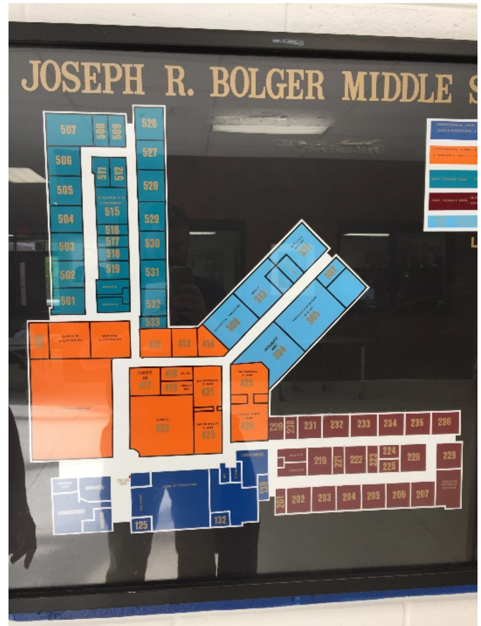
Figure 1 – Previous 12 Month Utility Costs 2
Figure 2 – Potential Post-Implementation Costs 2
Figure 3 – Summary of Energy Reduction Opportunities 3
Figure 4 – Photovoltaic Potential 5
Figure 5 – Project Contacts 7
Figure 6 - Building Schedule 7
Figure 7 - Utility Summary 11
Figure 8 - Energy Cost Breakdown 11
Figure 9 Electric Usage & Demand 12
Figure 10 - Electric Usage & Demand 12
Figure 11 -Natural Gas Usage 13
Figure 12 -Natural Gas Usage 13
Figure 13 - Energy Use Intensity Comparison – Existing Conditions 14
Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures 14
Figure 15 - Energy Balance (kBtu/SF,%) 15
Figure 16 – Summary of Recommended ECMs 16
Figure 17 – Summary of Lighting Upgrade ECMs 17
Figure 18 – Summary of Lighting Control ECMs 18
Figure 19 - Summary of Gas-Fired Heating Replacement ECMs 19
Figure 20 - Summary of HVAC System Improvement ECMs 20
Figure 21 - Summary of Food Service Equipment & Refrigeration ECMs 21
Figure 22 - Photovoltaic Screening 26
Figure 23 - ECM Incentive Program Eligibility 29

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Joseph R. Bolger Middle 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, as part of a comprehensive effort to assist New Jersey public schools and local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.



School Map

1.1 Facility Summary

Keansburg Board of Education's Middle School is a 97,000 square-foot facility comprised of standard secondary education space types including general office space, classroom space, large instruction space, a gymnasium, athletic facilities, a cafeteria, kitchen, and a small data center. The building was constructed in 1992 and operates between fifty and seventy hours per week, and accommodates nearly 500 students and staff at capacity.

Lighting consists of moderately efficient fluorescent fixtures and lamps. The bulk of the fluorescent technology throughout the building is T8 and could be upgraded to more efficient LED technology. Lighting control was predominately wall switch and timer technology.

The Heating Ventilation and Air Conditioning (HVAC) systems were found to be in fair to good condition. The building is conditioned using a two non-condensing hot water boilers feeding a hot water loop, coupled with forced air packaged rooftop units and split systems. The ventilation is provided through a variety of rooftop terminal exhaust fans. Little fresh air is being introduced to the building via the HVAC system. The control of the HVAC is local thermostats with no umbrella building management system, which is typical for a school with these HVAC systems.

The original structure was built in 1992 and was found to be in fair condition. The structure is built on a concrete slab, with outer walls built from mainly brick and mortar, and concrete slips. The roof is rolled rubber with some stone coating

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

Side of Building

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated eight (8) measures which together represent an opportunity for Joseph R. Bolger Middle School to reduce annual energy costs by $29,806 and annual greenhouse gas emissions by 372,203 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 9.4 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Joseph R. Bolger Middle School's annual energy use by 27%.

Figure 1 – Previous 12 Month Utility Costs

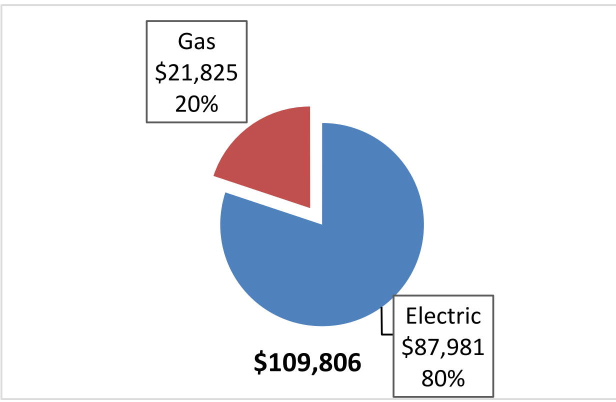
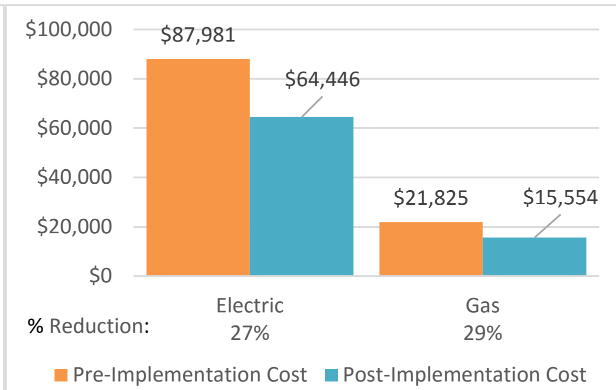


Figure 2 – Potential Post-Implementation Costs



A detailed description of Joseph R. Bolger Middle 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			223,720	36.4	0.0	$17,834.04	$150,375.72	$15,715.00	$134,660.72	7.6	225,284
ECM 1	Install LED Fixtures	Yes	51,279	8.4	0.0	$4,087.72	$86,971.52	$3,550.00	$83,421.52	20.4	51,637
ECM 2	Retrofit Fixtures with LED Lamps	Yes	172,441	28.1	0.0	$13,746.32	$63,404.20	$12,165.00	$51,239.20	3.7	173,647
Lighting Control Measures			2,354	0.4	0.0	$187.65	$1,044.00	$180.00	$864.00	4.6	2,370
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	2,354	0.4	0.0	$187.65	$1,044.00	$180.00	$864.00	4.6	2,370
Motor Upgrades			8,268	2.2	0.0	$659.10	$14,441.94	$0.00	$14,441.94	21.9	8,326
ECM 4	Premium Efficiency Motors	Yes	8,268	2.2	0.0	$659.10	$14,441.94	$0.00	$14,441.94	21.9	8,326
Gas Heating (HVAC/Process) Replacement			0	0.0	495.9	$4,861.71	$111,653.48	$12,000.00	$99,653.48	20.5	58,067
ECM 5	Install High Efficiency Hot Water Boilers	Yes	0	0.0	495.9	$4,861.71	$111,653.48	$12,000.00	$99,653.48	20.5	58,067
HVAC System Improvements			0	0.0	143.8	$1,409.45	$1,087.50	$0.00	$1,087.50	0.8	16,834
ECM 6	Install Pipe Insulation	Yes	0	0.0	143.8	$1,409.45	$1,087.50	$0.00	$1,087.50	0.8	16,834
Food Service Equipment & Refrigeration Measures			49,855	14.2	0.0	$3,974.25	$26,683.59	$1,000.00	$25,683.59	6.5	50,204
ECM 7	Food Service Equipment Replacement	Yes	49,855	14.2	0.0	$3,974.25	$26,683.59	$1,000.00	$25,683.59	6.5	50,204
Plug Load Equipment Control - Vending Machine			11,041	0.0	0.0	$880.15	$2,300.00	$0.00	$2,300.00	2.6	11,118
ECM 8	Vending Machine Control	Yes	11,041	0.0	0.0	$880.15	$2,300.00	$0.00	$2,300.00	2.6	11,118
TOTALS			295,238	53.3	639.7	$29,806.36	$307,586.23	$28,895.00	$278,691.23	9.4	372,203

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

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

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

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when 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.

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

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.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature set points, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

Food Service Equipment & Refrigeration measures generally involve improvements in the efficiency of cooking, food service, dishwashing, and food storage equipment. These measures may include more efficient convection ovens, steamers, ice machines, or refrigeration. These measures save energy by reducing the energy usage with more energy efficient equipment.

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 outlet when not in use.

Energy Efficient Practices

TRC also identified 24 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 Joseph R. Bolger Middle School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Reduce Motor Short Cycling
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Install Destratification Fans
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Ensure Economizers are Functioning Properly
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Replace Computer Monitors
- 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. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array. The analysis below includes both ground mount in the space adjacent to the middle school pictured to the left, and rooftop mounted panels.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	129	kW DC STC
Electric Generation	153,687	kWh/yr
Displaced Cost	$13,370	/yr
Installed Cost	$436,000	

Potential Ground Mount Solar Site

For details on our evaluation and on-site generation potential, please refer to 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
- Pay for Performance - Existing Building (P4P)
- 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.

Larger facilities with an interest in a more comprehensive whole building approach to energy conservation should consider participating in the Pay for Performance (P4P) program. Projects eligible for this project program must meet minimum savings requirements. Final incentives are calculated based on actual measured performance achieved at the end of the project. The application process is more involved, and it requires working with a qualified P4P contractor, but the process may result in greater energy savings overall and more lucrative incentives, up to 50% of project's total cost.

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.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Dan Castles	Business Adminisrator	dcastles@keansburg.k12.nj.us	732-787-2700
Dave Cooney	Facilities	dcooney@keansburg.k12.nj.us	732-606-2055
TRC Energy Services			
Brian Dattellas	Auditor	bdattellas@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On May 18, 2017, TRC performed an energy audit at Joseph R. Bolger Middle School located in Keansburg, New Jersey. TRC's team met with Dave Cooney to review the facility operations and help focus our investigation on specific energy-using systems.

Joseph R. Bolger Middle School is a 97,000 square-foot facility comprised of standard secondary education space types including general office space, classroom space, large instruction space, a gymnasium, athletic facilities, a cafeteria, kitchen, and a small server. The building was constructed in 1992 and operates between fifty and seventy hours per week, and accommodates nearly 500 students and staff at capacity.

2.3 Building Occupancy

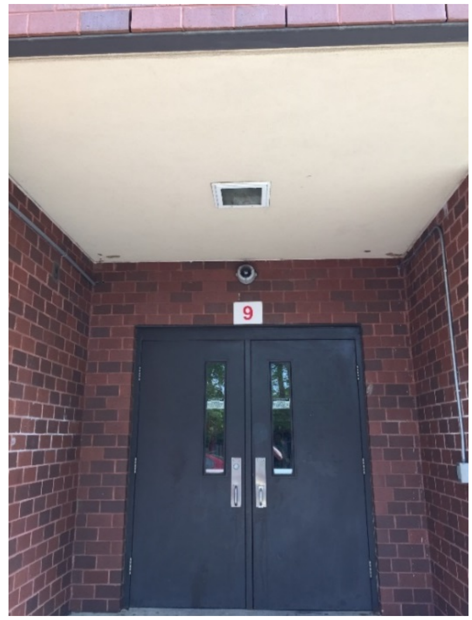
The school building is open Sunday through Saturday. The typical schedule is presented in the table below. The entire facility is used year-round by the community and camps are run throughout the summer. During a typical day, the facility is occupied by approximately 180 staff and 380 students.

Figure 6 - Building Schedule

Building Occupancy Schedule		
Building Name	Weekday/Weekend	Operating Schedule
Joseph R. Bolger Middle School	Weekday	7am-5pm
Joseph R. Bolger Middle School	Weekend	7am-5pm

2.4 Building Envelope

Both buildings are constructed of concrete block, and some structural steel with a brick facade. The buildings have flat roofs covered with black membrane and stone that is in good condition. The building has original single pane aluminum windows that appeared to be in fair to good condition. The exterior doors are constructed of aluminum and in good condition with seals found to be still intact.



Sealed Doors

2.5 Energy-Using Systems

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

Lighting System

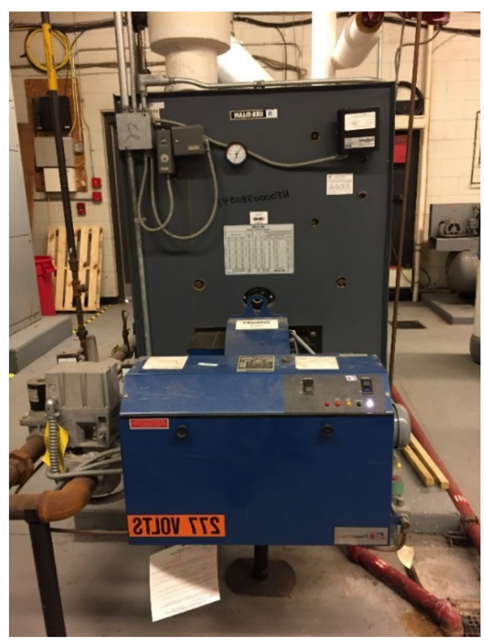
Lighting at the facility is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some compact incandescent screw-in lamps. Most of the fixtures are 3-lamp, 4-foot by 2-foot long troffers with diffusers. Mr. Dave Cooney, the facility's maintenance technician, indicated that the building has had an ongoing T8 retrofit over the past 10 years.

Lighting control in most spaces is provided by wall switches with some occupancy sensors.

Exterior lighting consists primarily of efficient metal halide (HID) fixtures and halogen fixtures that are controlled by timers and manual switch. Building mounted wall packs are present along the side of the facility. In the parking lot, pole-mounted, cobra-type metal halide fixtures service the parking lot and outdoor areas.

Hot Water (or Steam) Heating System

The heating hot water system consists of two (2) Weil McLain 3392 and 3753 rated MBh output non-condensing hot water boilers. The boilers have a rated combustion efficiency of 80% and are configured in a constant flow primary distribution with two (2) hot water pumps. The distribution system is supplied by two (2) dedicated 15 hp pump with an estimated flow rate of 400 gallons per minute (gpm). Based on site observations and conversations with site staff, hot water is supplied at 190°F when the outside air temperature is below 50°F and the set point is reset to 165°F when the outside air is above 65°F. The boilers provide hot water to a variety of terminal units throughout the space including hanging unit heaters, fan coil radiators, and base boards. Based on the efficiency of the boilers and the operation of the existing distribution system, we have recommended the replacement of the non-condensing boilers with high efficiency condensing boilers, similar to the high school. The boilers and distribution system appeared in good condition and are well maintained.



Weil McLain Boiler

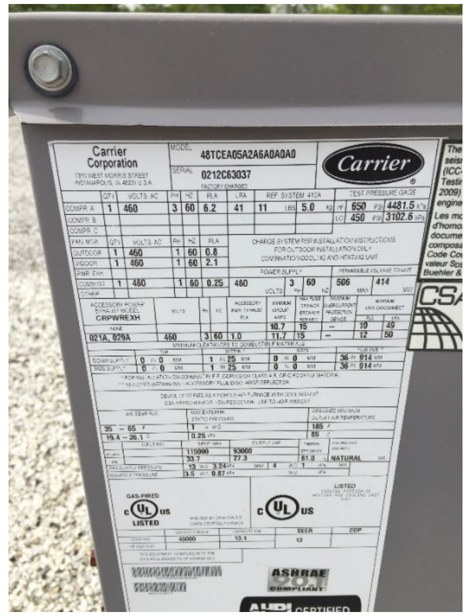
Direct Expansion Air Conditioning System (DX)

Joseph R. Bolger Middle School is approximately 95% air conditioned. The school utilizes a varied approach to conditioning the space that has been updated and modified ad hoc over the past 20 years. Joseph R. Bolger Middle School has relatively efficient cooling system. The cooling system contains three distinct types of direct expansion (DX) systems.

First, the school is cooled and air is distributed via DX packaged rooftop units that provide cooling to much of the school. These units were found to be in good condition, and based on age, operation, and condition were evaluated for replacement as part of this audit. A small number of units were recommended for replacement.

Second, there are approximately eight (8) DX split systems that provide cooling to office spaces and small assembly spaces throughout the school. Outdoor condensing units are linked with indoor cooling coils located in both terminal wall units and small air handlers.

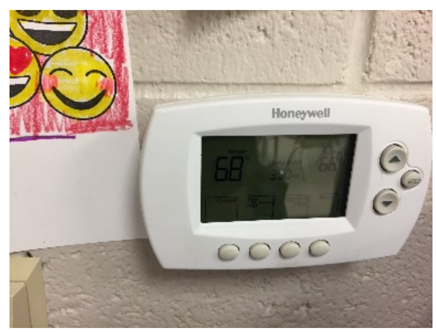
Finally, in a few offices and classroom spaces packaged DX window units are used to cool a designated space.



Typical Rooftop Unit

Building Energy Management System (BEMS)

Joseph R. Bolger Middle School has no centralized building or energy management system. This is largely due to the age of the building, as well as the lack of interaction between the hot water heating, DX cooling, and airside systems currently in place at the middle school. Most control is handled manually for all energy systems at the school. Lighting is generally controlled by wall switch, with some occupancy based sensors. The heating and cooling systems are controlled by local thermostats and some manual fan coil controls. The current system may not be a cost-effective candidate for a building wide management system based on the conditions mentioned above.



Typical Thermostat

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one (1) American gas-fired domestic hot water heater with an input rating of 100 MBh and a nominal efficiency of 87%. The water heater has a 100-gallon storage tank. Two (2) Baldor ½ horsepower recirculation pumps distribute 120°F water to the entire site except for wash equipment in the kitchen.

DHW Heater and Tank

Food Service Equipment

The school has an electric and gas kitchen that is used to prepare approximately 450 lunches per day for the students and staff. Most of the cooking is done using a convection oven, griddle, fryer and hot holding equipment. Most of the equipment in the kitchen was found in good condition due to upkeep and maintenance by cafeteria staff.

Refrigeration

The kitchen has a walk-in refrigerator that is used to store food prepared for school lunches. The refrigerator has a single five (5) ton air cooled scroll compressor. The walk-in space temperature is maintained at 34°F. The kitchen also has one (1) walk-in commercial size freezer with an eight (8) ton air cooled compressor. The refrigeration equipment was found to be operating effectively and in good condition due to upkeep and maintenance by cafeteria staff.

Building Plug Load

There are approximately 267 computer work stations throughout the facility. 85% of the computers are desktop units with LCD monitors. There is no centralized PC power management software installed.

The facility has a large number of refrigerated and non-refrigerated beverage vending machines (estimated to be 10 machines in total).

Interior of Walk-in Cooler

2.6 Water-Using Systems

There are 11 restrooms at this facility. A sampling of restrooms found that faucets are rated for 1.5 gpm or higher, the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2.0 gpf.

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

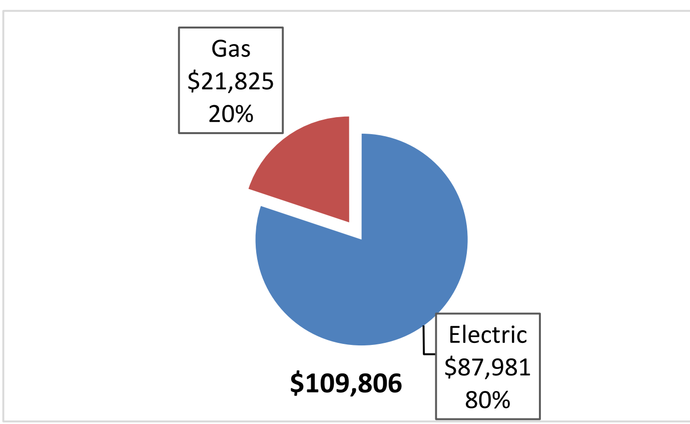
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Joseph R. Bolger Middle School		
Fuel	Usage	Cost
Electricity	1,103,680 kWh	$87,981
Natural Gas	22,263 Therms	$21,825
Total		$109,806

The current annual energy cost for this facility is $109,806 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.080/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.

Figure 9 Electric Usage & Demand

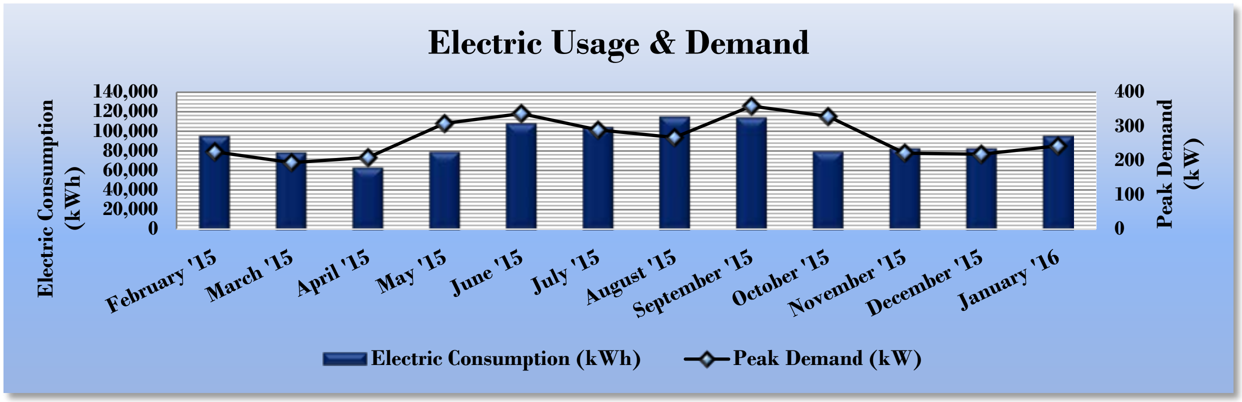


Figure 10 - Electric Usage & Demand

Electric Billing Data for Joseph R. Bolger Middle School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
3/2/15	29	96,000	226	$2,137	$7,670
4/1/15	30	79,040	194	$2,559	$6,315
5/1/15	30	63,680	209	$2,327	$5,088
5/29/15	28	79,680	309	$3,330	$6,348
6/30/15	32	108,480	337	$3,989	$8,642
7/30/15	30	104,640	290	$3,639	$8,336
8/31/15	32	115,200	268	$3,701	$9,178
9/30/15	30	114,560	359	$4,088	$9,127
10/30/15	30	80,000	329	$3,312	$6,373
12/1/15	32	83,200	222	$2,772	$6,628
12/31/15	30	83,200	219	$2,754	$6,628
2/1/16	32	96,000	243	$3,126	$7,648
Totals	365	1,103,680	359	$37,734	$87,981
Annual	365	1,103,680	359	$37,734	$87,981

3.3 Natural Gas Usage

Natural gas is provided by New Jersey Natural Gas. The average gas cost for the past 12 months is $0.980/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

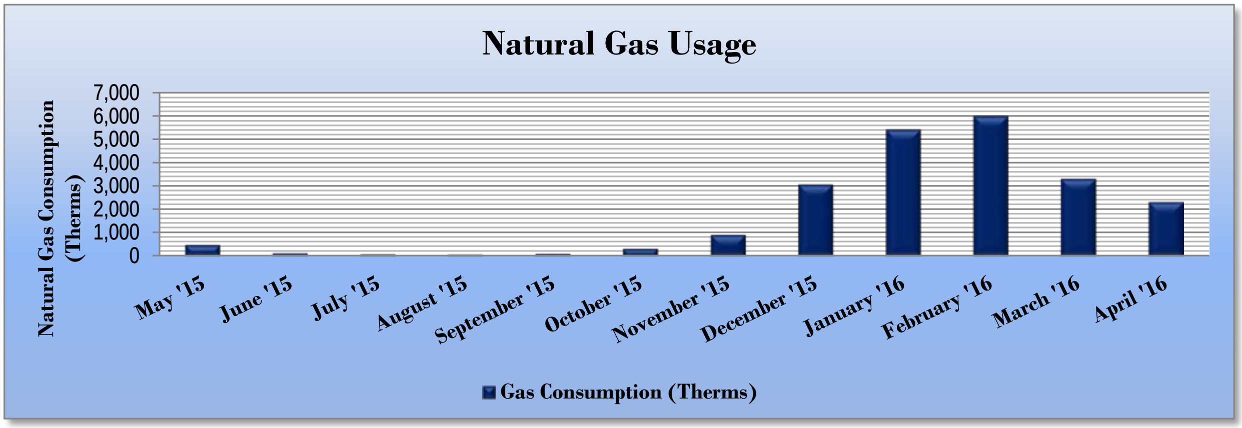


Figure 12 -Natural Gas Usage

Gas Billing Data for Joseph R. Bolger Middle School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
5/30/15	31	484	$737
6/30/15	30	128	$440
7/29/15	31	75	$397
8/30/15	29	64	$389
9/28/15	31	97	$414
10/30/15	31	323	$592
11/30/15	30	917	$1,063
12/31/15	31	3,074	$2,791
1/30/16	31	5,438	$4,679
2/28/16	28	6,018	$5,142
3/28/16	31	3,325	$2,992
4/25/16	31	2,320	$2,189
Totals	365	22,263	$21,825
Annual	365	22,263	$21,825

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		
	Joseph R. Bolger Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	146.0	141.4
Site Energy Use Intensity (kBtu/ft^2)	61.8	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		
	Joseph R. Bolger Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	106.5	141.4
Site Energy Use Intensity (kBtu/ft^2)	44.8	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. Your building currently has a score of 66.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

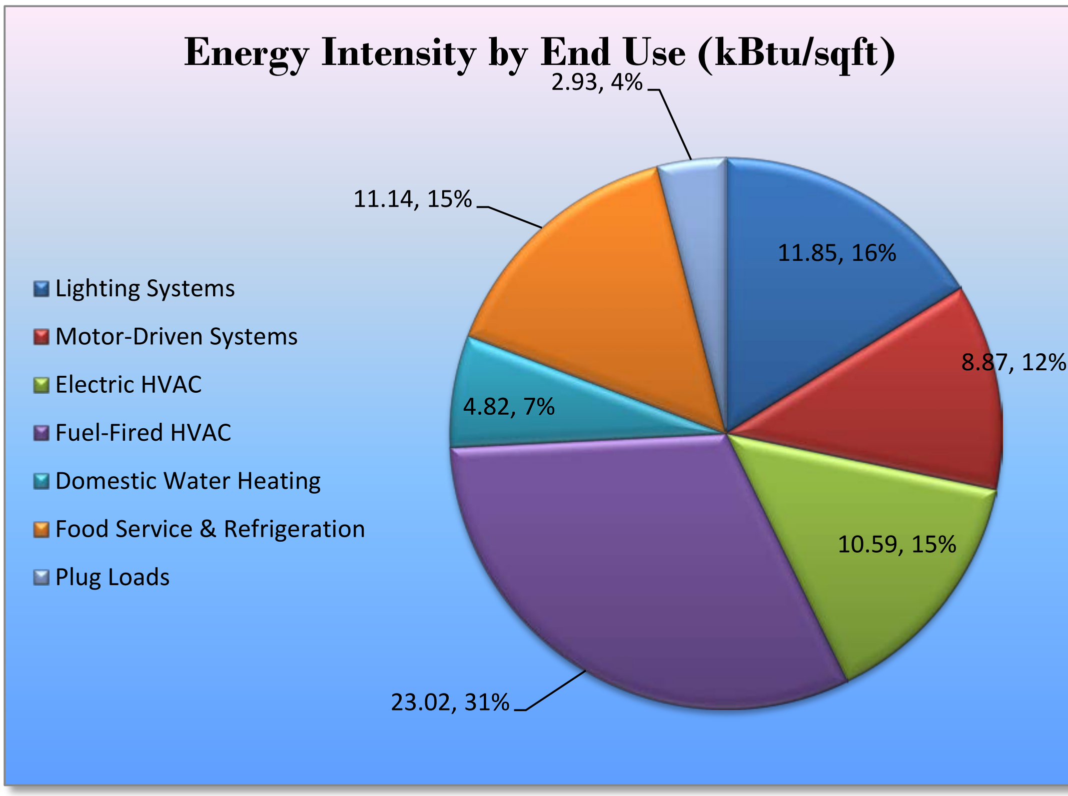
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 (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 Joseph R. Bolger Middle 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.

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		223,720	36.4	0.0	$17,834.04	$150,375.72	$15,715.00	$134,660.72	7.6	225,284
ECM 1	Install LED Fixtures	51,279	8.4	0.0	$4,087.72	$86,971.52	$3,550.00	$83,421.52	20.4	51,637
ECM 2	Retrofit Fixtures with LED Lamps	172,441	28.1	0.0	$13,746.32	$63,404.20	$12,165.00	$51,239.20	3.7	173,647
Lighting Control Measures		2,354	0.4	0.0	$187.65	$1,044.00	$180.00	$864.00	4.6	2,370
ECM 3	Install Occupancy Sensor Lighting Controls	2,354	0.4	0.0	$187.65	$1,044.00	$180.00	$864.00	4.6	2,370
Motor Upgrades		8,268	2.2	0.0	$659.10	$14,441.94	$0.00	$14,441.94	21.9	8,326
ECM 4	Premium Efficiency Motors	8,268	2.2	0.0	$659.10	$14,441.94	$0.00	$14,441.94	21.9	8,326
Gas Heating (HVAC/Process) Replacement		0	0.0	495.9	$4,861.71	$111,653.48	$12,000.00	$99,653.48	20.5	58,067
ECM 5	Install High Efficiency Hot Water Boilers	0	0.0	495.9	$4,861.71	$111,653.48	$12,000.00	$99,653.48	20.5	58,067
HVAC System Improvements		0	0.0	143.8	$1,409.45	$1,087.50	$0.00	$1,087.50	0.8	16,834
ECM 6	Install Pipe Insulation	0	0.0	143.8	$1,409.45	$1,087.50	$0.00	$1,087.50	0.8	16,834
Food Service Equipment & Refrigeration Measures		49,855	14.2	0.0	$3,974.25	$26,683.59	$1,000.00	$25,683.59	6.5	50,204
ECM 7	Food Service Equipment Replacement	49,855	14.2	0.0	$3,974.25	$26,683.59	$1,000.00	$25,683.59	6.5	50,204
Plug Load Equipment Control - Vending Machine		11,041	0.0	0.0	$880.15	$2,300.00	$0.00	$2,300.00	2.6	11,118
ECM 8	Vending Machine Control	11,041	0.0	0.0	$880.15	$2,300.00	$0.00	$2,300.00	2.6	11,118
TOTALS		295,238	53.3	639.7	$29,806.36	$307,586.23	$28,895.00	$278,691.23	9.4	372,203

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

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

4.1.1 Lighting Upgrades

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

Figure 17 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		223,720	36.4	0.0	$17,834.04	$150,375.72	$15,715.00	$134,660.72	7.6	225,284
ECM 1	Install LED Fixtures	51,279	8.4	0.0	$4,087.72	$86,971.52	$3,550.00	$83,421.52	20.4	51,637
ECM 2	Retrofit Fixtures with LED Lamps	172,441	28.1	0.0	$13,746.32	$63,404.20	$12,165.00	$51,239.20	3.7	173,647

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	27,934	4.5	0.0	$2,226.75	$37,973.48	$1,550.00	$36,423.48	16.4	28,129
Exterior	23,345	3.8	0.0	$1,860.97	$48,998.04	$2,000.00	$46,998.04	25.3	23,508

Measure Description

We recommend replacing existing fixtures containing fluorescent and incandescent 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.

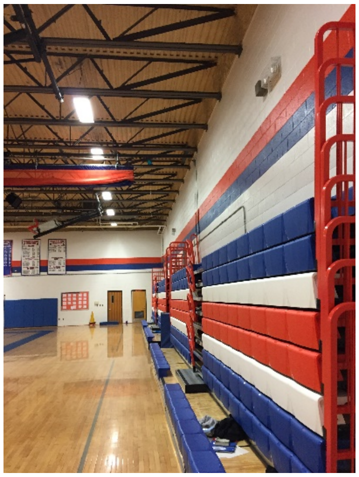
Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tube and more than 10 times longer than many incandescent lamps.

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	172,441	28.1	0.0	$13,746.32	$63,404.20	$12,165.00	$51,239.20	3.7	173,647
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description



Gym Lighting

We recommend retrofitting existing incandescent, halogen, HID or other lighting technologies with LED lamps. Many LED tube lamps 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 tube and more than 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

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		2,354	0.4	0.0	$187.65	$1,044.00	$180.00	$864.00	4.6	2,370
ECM 3	Install Occupancy Sensor Lighting Controls	2,354	0.4	0.0	$187.65	$1,044.00	$180.00	$864.00	4.6	2,370

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)
2,354	0.4	0.0	$187.65	$1,044.00	$180.00	$864.00	4.6	2,370

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms. 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 Motor Upgrades

ECM 4: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
8,268	2.2	0.0	$659.10	$14,441.94	$0.00	$14,441.94	21.9	8,326

Measure Description

We recommend replacing standard efficiency motors with NEMA Premium® efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2012). Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

4.1.4 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	495.9	$4,861.71	$111,653.48	$12,000.00	$99,653.48	20.5	58,067
ECM 5	Install High Efficiency Hot Water Boilers	0	0.0	495.9	$4,861.71	$111,653.48	$12,000.00	$99,653.48	20.5	58,067

ECM 5: 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	495.9	$4,861.71	$111,653.48	$12,000.00	$99,653.48	20.5	58,067

Measure Description

We recommend replacing older inefficient hot water boilers with high efficiency condensing hot water boilers. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. 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. Therefore, condensing hydronic boilers were only evaluated when the return water temperature is less than 130°F during most of the operating hours. As a result, condensing hydronic boilers are recommended for this site.

4.1.5 HVAC System Upgrades

Our recommendation for HVAC system improvement are summarized in Figure 20 below.

Figure 20 - Summary of HVAC System Improvement 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)
HVAC System Improvements		0	0.0	143.8	$1,409.45	$1,087.50	$0.00	$1,087.50	0.8	16,834
ECM 6	Install Pipe Insulation	0	0.0	143.8	$1,409.45	$1,087.50	$0.00	$1,087.50	0.8	16,834

ECM 6: Install Pipe Insulation

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	143.8	$1,409.45	$1,087.50	$0.00	$1,087.50	0.8	16,834

Measure Description

We recommend installing insulation on heating system piping. Distribution system losses are dependent on heating water system temperature, the size of the distribution system, and the level of insulation of the piping. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced.

This measure saves energy by reducing heat losses from the heating distribution system.

4.1.6 Food Service Equipment & Refrigeration Measures

Food service and refrigeration measures recommendations are summarized in Figure 21 below.

Figure 21 - Summary of Food Service Equipment & Refrigeration 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)
	Food Service Equipment & Refrigeration Measures	49,855	14.2	0.0	$3,974.25	$26,683.59	$1,000.00	$25,683.59	6.5	50,204
ECM 7	Food Service Equipment Replacement	49,855	14.2	0.0	$3,974.25	$26,683.59	$1,000.00	$25,683.59	6.5	50,204

ECM 7: Food Service Equipment Replacement

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)
49,855	14.2	0.0	$3,974.25	$26,683.59	$1,000.00	$25,683.59	6.5	50,204

We recommend replacement existing food service equipment with new high efficiency equipment. Buildings that use a lot of food service equipment are often among the most energy intensive commercial buildings. Energy usage in commercial kitchens is primarily used for cooking and refrigeration. There have been many energy efficiency improvements for cooking, dishwashing, and refrigerated food storage. For more information on improved energy efficiency for food service and storage see the Food Service Technology Center website at: www.fishnick.com.

4.1.7 Plug Load Equipment Control - Vending Machines

ECM 8: 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)
11,041	0.0	0.0	$880.15	$2,300.00	$0.00	$2,300.00	2.6	11,118

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. If the district is not already doing so, 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.

Close Doors and Windows

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

Use Window Treatments/Coverings

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

Perform Proper Lighting Maintenance

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

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

Turn Off Unneeded Motors

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Reducing run hours for these motors can result in significant energy savings. Whenever possible, use automatic devices such as twist timers or occupancy sensors to ensure that motors are turned off when not needed.

Reduce Motor Short Cycling

Frequent stopping and starting of motors subject rotors and other parts to substantial stress. This can result in component wear, reducing efficiency, and increasing maintenance costs. Adjust the load on the motor to limit the amount of unnecessary stopping and starting to improve motor performance.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Use Fans to Reduce Cooling Load

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

Install Destratification Fans

Allowing air to thermally stratify in spaces with high ceilings results in additional energy consumption by requiring the heating system to heat a volume of space much larger than the actual occupied space. Additional inefficiencies also occur because there are higher temperatures at the ceiling level than at the floor level. Higher temperatures at the ceiling accelerate heat loss through the roof, requiring additional energy consumption by the heating equipment in order to compensate for the accelerated heat transfer.

Destratification fans are specially designed to deliver a columnar, laminar flow of air balancing the air temperature from floor to ceiling. In addition to fuel savings, the use of destratification fans will reduce the recovery time necessary to warm the space after nightly temperature setbacks and will increase the comfort level of the occupants.

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 set points and increase cooling set points). Cooling load can be reduced further by increasing the facility's occupied set point temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

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.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5 to 25 percent of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Perform Proper Boiler Maintenance

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

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

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

Replace Computer Monitors

Replacing old computer monitors or displays with efficient monitors will reduce energy use. ENERGY STAR® rated monitors have specific requirements for on mode power consumption as well as idle and sleep mode power. According to the ENERGY STAR® website monitors that have earned the ENERGY STAR® label are 25% more efficient than standard monitors.

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).

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.

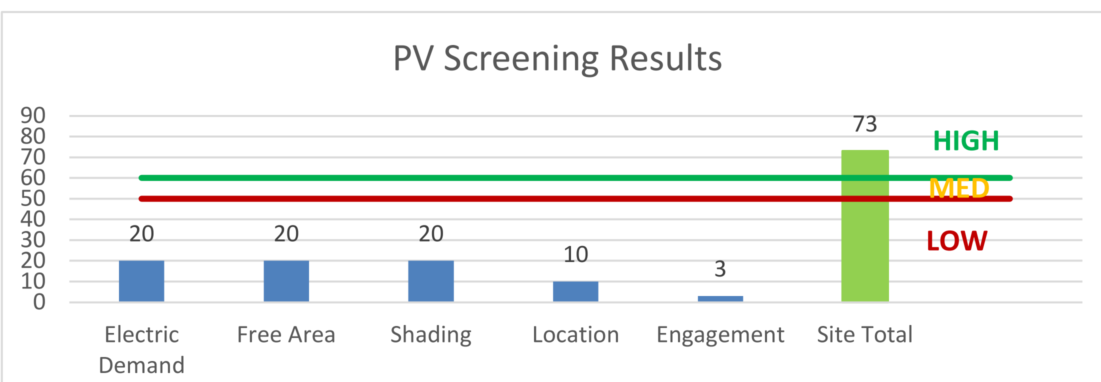
6.1 Photovoltaic

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. A PV array located on the roof of the main building/ground next to the building as proposed by site staff may be feasible. If Joseph R. Bolger Middle School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 22 - Photovoltaic Screening



Potential	High	
System Potential	129	kW DC STC
Electric Generation	153,687	kWh/yr
Displaced Cost	$13,370	/yr
Installed Cost	$436,000	

Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about 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

7 Demand Response

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

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

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

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

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

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

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

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and 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	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	X			X		
ECM 2	Retrofit Fixtures with LED Lamps	X			X		
ECM 3	Install Occupancy Sensor Lighting Controls	X			X		
ECM 4	Premium Efficiency Motors		X		X		
ECM 5	Install High Efficiency Hot Water Boilers	X			X		
ECM 6	Install Pipe Insulation		X		X		
ECM 7	Food Service Equipment Replacement	X			X		
ECM 8	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 SmartStart custom program provides incentives for new and innovative technologies, or process improvements not defined through one of the prescriptive incentives listed above.

Although your facility is an existing building, and only the prescriptive incentives have been applied in the calculations, the SmartStart custom measure path is recommended for ECM 4 (Install VFDs on Well Pumps). These incentives are calculated utilizing a number of factors, including project cost, energy savings and comparison to existing conditions or a defined standard. To qualify, the proposed measure(s) must be at least 2% more efficient than current energy code or recognized industry standard, and save at least 75,000 kWh or 1,500 therms annually.

SmartStart 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 in the SmartStart program (inclusive of prescriptive and custom) 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 prescriptive program you will need to submit an application for the specific equipment installed or 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. Please note that SmartStart custom application requirements are different from the prescriptive applications and will most likely require additional effort to complete.

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

8.2 Pay for Performance - Existing Buildings

Overview

The Pay for Performance – Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

Incentives

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

How to Participate

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

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

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

8.3 SREC Registration Program

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

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

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows 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
Parking Lot	22	Metal Halide: (1) 150W Lamp	Wall Switch	190	3,500	Fixture Replacement	No	22	LED - Fixtures: Architectural Flood/Spot Luminaire	Wall Switch	45	3,500	2.09	12,840	0.0	$1,023.53	$26,948.92	$1,100.00	25.25
Mechanical Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,500	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	-0.06	-370	0.0	-$29.52	$601.60	$120.00	-16.31
Hallway Art	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.39	2,391	0.0	$190.59	$902.40	$180.00	3.79
Salt Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,500	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.10	596	0.0	$47.49	$601.60	$120.00	10.14
Girls Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,450	0.08	504	0.0	$40.14	$266.40	$50.00	5.39
Girls Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,500	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,450	0.00	10	0.0	$0.82	$191.20	$35.00	190.91
Boys Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,450	0.08	504	0.0	$40.14	$266.40	$50.00	5.39
Boys Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,500	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,450	0.00	10	0.0	$0.82	$191.20	$35.00	190.91
305	28	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	28	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.91	5,579	0.0	$444.71	$2,105.60	$420.00	3.79
305	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,500	Relamp	No	10	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.46	2,838	0.0	$226.20	$752.00	$150.00	2.66
305	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.03	199	0.0	$15.88	$75.20	$15.00	3.79
305	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.49	2,989	0.0	$238.24	$1,128.00	$225.00	3.79
305	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.03	199	0.0	$15.88	$75.20	$15.00	3.79
Band Room	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	18	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.58	3,586	0.0	$285.88	$1,353.60	$270.00	3.79
Band Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,500	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.09	568	0.0	$45.24	$150.40	$30.00	2.66
Band Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.13	797	0.0	$63.53	$300.80	$60.00	3.79
Custodial Closets	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.18	1,135	0.0	$90.48	$300.80	$60.00	2.66
Music	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.49	2,989	0.0	$238.24	$1,128.00	$225.00	3.79
Music	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.06	398	0.0	$31.76	$150.40	$30.00	3.79
Music	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.16	996	0.0	$79.41	$376.00	$75.00	3.79
Hallway	22	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	22	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.71	4,383	0.0	$349.41	$1,654.40	$330.00	3.79
425	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	18	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.58	3,586	0.0	$285.88	$1,353.60	$270.00	3.79
421	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.49	2,989	0.0	$238.24	$1,128.00	$225.00	3.79
421	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.06	398	0.0	$31.76	$150.40	$30.00	3.79
421	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.49	2,989	0.0	$238.24	$1,128.00	$225.00	3.79

	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
429	25	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	25	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.81	4,981	0.0	$397.06	$1,880.00	$375.00	3.79
429	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.06	398	0.0	$31.76	$150.40	$30.00	3.79
5th and 6th Hallway	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.49	2,989	0.0	$238.24	$1,128.00	$225.00	3.79
5th and 6th Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.13	797	0.0	$63.53	$300.80	$60.00	3.79
229	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.19	1,195	0.0	$95.29	$451.20	$90.00	3.79
230	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.13	797	0.0	$63.53	$300.80	$60.00	3.79
231	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
219	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
232	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
221	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
233	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
222	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
223	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.16	996	0.0	$79.41	$376.00	$75.00	3.79
234	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
224	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.13	797	0.0	$63.53	$300.80	$60.00	3.79
235	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
226	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	10	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.32	1,992	0.0	$158.82	$752.00	$150.00	3.79
236	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
Exit Signs	55	Exit Signs: Fluorescent	Wall Switch	8	8,760	None	No	55	Exit Signs: Fluorescent	Wall Switch	8	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Emergency	55	Halogen Incandescent: Emergency Lighting Packs	Wall Switch	75	200	None	No	55	Halogen Incandescent: Emergency Lighting Packs	Wall Switch	75	200	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Wallpack OD	18	Metal Halide: (1) 150W Lamp	Wall Switch	190	3,500	Fixture Replacement	No	18	LED - Fixtures: Architectural Flood/Spot Luminaire	Wall Switch	45	3,500	1.71	10,505	0.0	$837.44	$22,049.12	$900.00	25.25
Entrances	4	Metal Halide: (1) 150W Lamp	Wall Switch	190	3,500	Fixture Replacement	No	4	LED - Fixtures: Architectural Flood/Spot Luminaire	Wall Switch	45	3,500	0.38	2,335	0.0	$186.10	$4,899.80	$200.00	25.25
Hallway 4th	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.13	797	0.0	$63.53	$300.80	$60.00	3.79
228	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
Hallway 5th and 6th	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.49	2,989	0.0	$238.24	$1,128.00	$225.00	3.79

	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
227	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,500	Relamp	No	2	LED - Linear Tubes: (1) U-Lamp	Wall Switch	17	3,500	0.02	133	0.0	$10.59	$79.46	$0.00	7.50
207	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
206	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
205	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
225	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.13	797	0.0	$63.53	$300.80	$60.00	3.79
204	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
203	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
202	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
207	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.13	797	0.0	$63.53	$300.80	$60.00	3.79
Faculty Lounge	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	10	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.32	1,992	0.0	$158.82	$752.00	$150.00	3.79
Hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.13	797	0.0	$63.53	$300.80	$60.00	3.79
138	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.13	797	0.0	$63.53	$300.80	$60.00	3.79
216	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,500	Relamp	No	1	LED - Linear Tubes: (1) U-Lamp	Wall Switch	17	3,500	0.01	62	0.0	$4.97	$39.73	$0.00	7.99
Boys Restroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,450	0.62	3,776	0.0	$301.04	$1,244.00	$245.00	3.32
Boys Restroom	5	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,500	Relamp	Yes	5	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	2,450	0.03	185	0.0	$14.76	$498.67	$120.00	25.66
Girls Restroom	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,450	0.62	3,776	0.0	$301.04	$1,244.00	$245.00	3.32
Girls Restroom	5	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,500	Relamp	Yes	5	LED - Linear Tubes: (4) 2' Lamps	Occupancy Sensor	34	2,450	0.03	185	0.0	$14.76	$498.67	$120.00	25.66
Café	25	Metal Halide: (1) 250W Lamp	Wall Switch	295	3,500	Fixture Replacement	No	25	LED - Fixtures: Architectural Flood/Spot Luminaire	Wall Switch	45	3,500	4.10	25,156	0.0	$2,005.36	$30,623.78	$1,250.00	14.65
Café	2	Halogen Incandescent: Quartz	Wall Switch	100	3,500	Fixture Replacement	No	2	LED - Fixtures: Architectural Flood/Spot Luminaire	Wall Switch	45	3,500	0.07	443	0.0	$35.29	$2,449.90	$100.00	66.58
Kitchen	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	20	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.65	3,985	0.0	$317.65	$1,504.00	$300.00	3.79
Hallway Front Enterance	25	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	25	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.81	4,981	0.0	$397.06	$1,880.00	$375.00	3.79
Stage	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,500	Relamp	No	16	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.19	1,191	0.0	$94.97	$1,203.20	$240.00	10.14
Stage Entrance	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.06	398	0.0	$31.76	$150.40	$30.00	3.79
Nurse	11	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,500	Relamp	No	11	LED - Linear Tubes: (1) U-Lamp	Wall Switch	17	3,500	0.12	731	0.0	$58.24	$437.06	$0.00	7.50
Nurse	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.06	398	0.0	$31.76	$150.40	$30.00	3.79

	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
Nurse	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.06	398	0.0	$31.76	$150.40	$30.00	3.79
Guidance Office	43	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,500	Relamp	No	43	LED - Linear Tubes: (1) U-Lamp	Wall Switch	17	3,500	0.47	2,856	0.0	$227.65	$1,708.49	$0.00	7.50
Guidance Office	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	7	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.23	1,395	0.0	$111.18	$526.40	$105.00	3.79
Gym	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.13	797	0.0	$63.53	$300.80	$60.00	3.79
Gym	21	Linear Fluorescent - T5HO: 4' T5HO (54W) - 4L	Wall Switch	234	3,500	Relamp	No	21	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	2.62	16,102	0.0	$1,283.59	$1,579.20	$315.00	0.98
Gym	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,500	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.09	568	0.0	$45.24	$150.40	$30.00	2.66
Gym St	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,500	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.18	1,135	0.0	$90.48	$300.80	$60.00	2.66
Boys Locker	11	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,500	Relamp	No	11	LED - Linear Tubes: (1) U-Lamp	Wall Switch	17	3,500	0.12	731	0.0	$58.24	$437.06	$0.00	7.50
Boys Locker	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,500	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.28	1,703	0.0	$135.72	$451.20	$90.00	2.66
Boys Locker	2	U-Bend Fluorescent - T12: 4' T8 (32W) - 2L	Wall Switch	40	3,500	Relamp	No	2	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	3,500	0.01	48	0.0	$3.85	$153.07	$40.00	29.37
Attic	56	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	56	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	1.82	11,157	0.0	$889.42	$4,211.20	$840.00	3.79
Library	41	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	41	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	1.33	8,169	0.0	$651.18	$3,083.20	$615.00	3.79
Library	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.06	398	0.0	$31.76	$150.40	$30.00	3.79
Lib Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.19	1,195	0.0	$95.29	$451.20	$90.00	3.79
417	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	16	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.52	3,188	0.0	$254.12	$1,203.20	$240.00	3.79
Hallway Lib	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	7	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.23	1,395	0.0	$111.18	$526.40	$105.00	3.79
413	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	7	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.23	1,395	0.0	$111.18	$526.40	$105.00	3.79
419	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.10	598	0.0	$47.65	$225.60	$45.00	3.79
Custodial Closets	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.42	2,554	0.0	$203.58	$676.80	$135.00	2.66
hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	7	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.23	1,395	0.0	$111.18	$526.40	$105.00	3.79
412	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
533	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	5	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.16	996	0.0	$79.41	$376.00	$75.00	3.79
532	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,500	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.29	1,793	0.0	$142.94	$676.80	$135.00	3.79
Custody	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,500	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,500	0.05	284	0.0	$22.62	$75.20	$15.00	2.66
Boys Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	3,500	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,450	0.01	91	0.0	$7.24	$191.20	$35.00	21.59

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	DHW	1	Heating Hot Water Pump	0.5	81.0%	No	2,745	No	81.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	DHW	1	Heating Hot Water Pump	0.5	81.0%	No	2,745	No	81.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	HW	1	Heating Hot Water Pump	15.0	88.0%	Yes	3,391	No	88.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	HW	1	Heating Hot Water Pump	15.0	88.0%	Yes	3,391	No	88.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Exhaust	5	Exhaust Fan	5.0	80.0%	No	2,745	Yes	89.5%	No		1.37	5,094	0.0	$406.11	$4,605.30	$0.00	11.34
Roof	Exhaust	11	Exhaust Fan	2.0	80.0%	Yes	2,745	Yes	86.5%	No		0.86	3,174	0.0	$253.00	$9,836.64	$0.00	38.88
Roof	Exhaust	6	Exhaust Fan	7.5	89.0%	No	3,391	No	89.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Exhaust	4	Exhaust Fan	10.0	91.0%	No	3,391	No	91.0%	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
305	305	4	Window AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
207	207	2	Split-System AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1178	1	Packaged AC	12.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1173	1	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1783	1	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1786	1	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1786	1	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1789	1	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1793	1	Electric Resistance Heat		300.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1794	4	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1796	1	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1799	1	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1816	1	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1793	1	Packaged Terminal HP	5.00	250.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1792	1	Packaged Terminal HP	5.00	250.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1798	1	Packaged AC	7.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1803	8	Split-System AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1804	4	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	1812-16	4	Packaged AC	5.00		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
Mechanical Room	Middle School	1	Non-Condensing Hot Water Boiler	3,392.00	Yes	1	Condensing Hot Water Boiler	3,000.00	93.00%	Ec	0.00	0	202.8	$1,988.48	$55,826.74	$6,000.00	25.06
Mechanical Room	Middle School	1	Non-Condensing Hot Water Boiler	3,753.00	Yes	1	Condensing Hot Water Boiler	3,000.00	93.00%	Ec	0.00	0	293.1	$2,873.23	$55,826.74	$6,000.00	17.34

Pipe Insulation Recommendations

		Recommendation Inputs		Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room / Various	HW Boiler Loop	250	4.00	0.00	0	143.8	$1,409.45	$1,087.50	$0.00	0.77

DHW Inventory & Recommendations

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

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Café Kitchen	1	Cooler (35F to 55F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Café Kitchen	1	Medium Temp Freezer (0F to 30F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Café / Kitchen	1	Electric Combination Oven/Steam Cooker (15 - 28 Pans)	No	Yes	14.24	49,855	0.0	$3,974.25	$26,683.59	$1,000.00	6.46
Café / Kitchen	1	Gas Convection Oven (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Café / Kitchen	1	Gas Griddle (4 Feet Width)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Café / Kitchen	1	Gas Fryer	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Café / Kitchen	1	Insulated Food Holding Cabinet (3/4 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Café / Kitchen	1	Multi-Tank Conveyor (High Temp)	Natural Gas	N/A	Yes	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?
Green Wing	17	Projector Ceiling	75.0	No
Green Wing	3	Printer Large	400.0	No
Green Wing	3	Printer Small	200.0	No
Orange Wing	12	Projector Ceiling	75.0	No
Orange Wing	2	Printer Large	400.0	No
Orange Wing	6	Printer Small	200.0	No
Blue Wing	2	Projector Ceiling	75.0	No
Blue Wing	2	Printer Large	400.0	Yes
Blue Wing	4	Printer Small	200.0	Yes
Light Blue Wing	12	Projector Ceiling	75.0	No
Light Blue Wing	1	Printer Large	400.0	No
Light Blue Wing	3	Printer Small	200.0	No
Red Wing	11	Projector Ceiling	75.0	No
Red Wing	2	Printer Large	400.0	No
Red Wing	2	Printer Small	200.0	No
Total PC	267	PC / Desktop	100.0	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
Various	6	Refrigerated	Yes	0.00	9,671	0.0	$770.94	$1,380.00	$0.00	1.79
Various	4	Non-Refrigerated	Yes	0.00	1,370	0.0	$109.22	$920.00	$0.00	8.42

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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66

ENERGY STAR® Score[1]

Joseph R. Bolger Middle School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 97,000
Built: 1992

For Year Ending: January 31, 2016
Date Generated: September 21, 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
Joseph R. Bolger Middle School 100 Palmer Place Keansburg, New Jersey 07734	________________ , (___)___-_____	Dave Cooney 100 Palmer Place Keansburg, NJ 07734 732-606-2055 alalonde@trcsolutions.com

Property ID: 6049080

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
58.1 kBtu/ft²

Source EUI
141.9 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	1,881,920 (33%)
Electric - Grid (kBtu)	3,754,838 (67%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	68
National Median Source EUI (kBtu/ft²)	166
% Diff from National Median Source EUI	-14%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	516

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)