Local Government Energy Audit:
Energy Audit Report

North Boulevard School

363 Boulevard

Pompton Plains, NJ 07444

Pequannock Township BOE

October 31, 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 building's energy using equipment and systems. Approximate saving are included in this report to help make decisions about reducing energy use at the building. 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 building 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 building should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 EXECUTIVE SUMMARY

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

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

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey public schools in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Building Summary

North Boulevard School is a 45,902 square-foot building comprised of various space types including classrooms, offices, a cafeteria, a media center, a gymnasium, and various storage and mechanical spaces. This is a one-story building with two separate heating systems serving the old and new section. The old section of the building includes classrooms 101 through 123. The new section of the building is from the gymnasium to classroom 129.

Lighting at North Boulevard School consists of aging and inefficient fluorescent fixtures as well as some compact fluorescent and incandescent screw-in lamps. Heating is supplied by a combination of two steam boilers serving the old section, and one hot water boiler serving the new section. A thorough description of the building and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated eight measures which together represent an opportunity for North Boulevard School to reduce annual energy costs by $10,923 and annual greenhouse gas emissions by 91,333 lbs. CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 4.8 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 North Boulevard School's annual energy use by 6%.

Figure 1 – Previous 12 Month Utility Costs

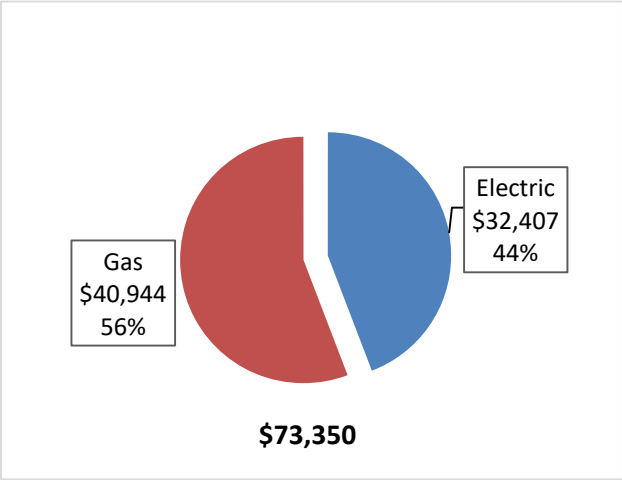
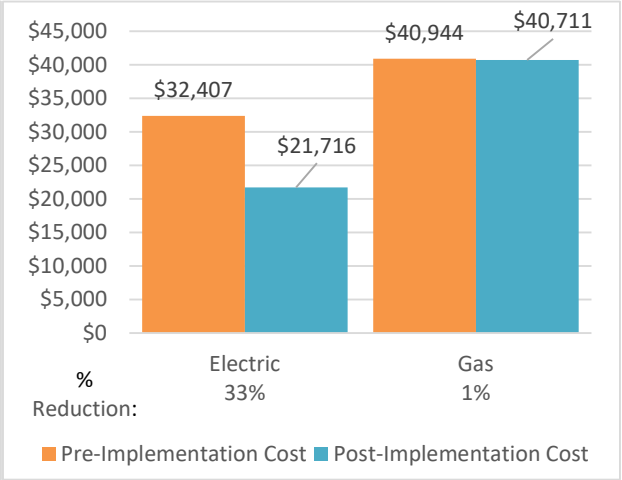


Figure 2 – Potential Post-Implementation Costs



A detailed description of North Boulevard 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			73,761	16.4	0.0	$8,995.98	$45,245.31	$8,700.00	$36,545.31	4.1	74,276
ECM 1	Install LED Fixtures	Yes	3,772	0.7	0.0	$460.07	$7,032.19	$1,800.00	$5,232.19	11.4	3,799
ECM 2	Retrofit Fixtures with LED Lamps	Yes	68,719	15.7	0.0	$8,381.11	$37,245.12	$6,900.00	$30,345.12	3.6	69,199
ECM 3	Install LED Exit Signs	Yes	1,269	0.1	0.0	$154.81	$968.00	$0.00	$968.00	6.3	1,278
Lighting Control Measures			3,328	0.6	0.0	$405.90	$7,250.00	$875.00	$6,375.00	15.7	3,351
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	3,328	0.6	0.0	$405.90	$7,250.00	$875.00	$6,375.00	15.7	3,351
Motor Upgrades			318	0.1	0.0	$38.75	$2,414.52	$0.00	$2,414.52	62.3	320
	Premium Efficiency Motors	No	318	0.1	0.0	$38.75	$2,414.52	$0.00	$2,414.52	62.3	320
Variable Frequency Drive (VFD) Measures			11,152	1.9	0.0	$1,360.07	$17,016.72	$0.00	$17,016.72	12.5	11,230
	Install VFD on Variable Air Volume (VAV) HVAC	No	2,194	0.7	0.0	$267.59	$7,993.77	$0.00	$7,993.77	29.9	2,209
ECM 5	Install VFDs on Hot Water Pumps	Yes	8,958	1.1	0.0	$1,092.48	$9,022.95	$0.00	$9,022.95	8.3	9,020
HVAC System Improvements			0	0.0	4.7	$41.89	$39.15	$0.00	$39.15	0.9	552
ECM 6	Install Pipe Insulation	Yes	0	0.0	4.7	$41.89	$39.15	$0.00	$39.15	0.9	552
Domestic Water Heating Upgrade			0	0.0	21.4	$190.52	$100.38	$0.00	$100.38	0.5	2,511
ECM 7	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	21.4	$190.52	$100.38	$0.00	$100.38	0.5	2,511
Plug Load Equipment Control - Vending Machine			1,612	0.0	0.0	$196.58	$230.00	$0.00	$230.00	1.2	1,623
ECM 8	Vending Machine Control	Yes	1,612	0.0	0.0	$196.58	$230.00	$0.00	$230.00	1.2	1,623
TOTAL FOR RECOMMENDED MEASURES			87,658	18.2	26.2	$10,923.36	$61,887.79	$9,575.00	$52,312.79	4.8	91,333
TOTAL FOR ALL MEASURES			90,170	18.3	26.2	$10,962.11	$64,302.31	$9,575.00	$54,727.31	5.0	93,863

* - 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.

Lighting Upgrades 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 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 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.

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

HVAC System Improvements involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, 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.

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

Plug Load Equipment control measures 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 13 low cost (or no cost) energy efficient practices. A building'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 North Boulevard School include:

- Reduce Air Leakage
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Use Fans to Reduce Cooling Load
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- 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 for North Boulevard School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	56	kW DC STC
Electric Generation	42,137	kWh/yr
Displaced Cost	$3,670	/yr
Installed Cost	$145,600	

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 building upgrades or improvements.

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

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

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

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

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 for additional information on the ESIP Program.

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

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

2 BUILDING INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Kathy Bechtel	Business Administrator	kathy.bechtel@pequannock.org	973-616-6030
Designated Representative			
Peter Riffel	Grounds Supervisor	peter.riffel@pequannock.org	973-479-6860
TRC Energy Services			
Alexander Klieverik	Auditor	aklieverik@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On January 9 and 10, 2018, TRC performed an energy audit at North Boulevard School located in Pompton Plains, New Jersey. TRC's team met with Peter Riffel, Grounds Supervisor to review the building operations and help focus our investigation on specific energy-using systems.

North Boulevard School is a 45,902 square foot building comprised of various space types including classrooms, offices, a cafeteria, a media center, a gymnasium, and various storage and mechanical spaces. The building is one story and has two separate heating systems serving the old and new section. The old section of the building includes classrooms 101 through 123. The new section of the building is from the gymnasium to classroom 129.

The building was originally constructed in 1954. The new section of the building including classrooms 124 through 129 was added approximately 20 years ago.

2.3 Building Occupancy

The school building is open Monday through Friday and closed on weekends. The typical schedule is presented in the table below. The building is only used during the school year and there are no community activities or camps running through the summer. During a typical day, the building is occupied by 50 staff and 350 students.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
North Boulevard School	Weekday	6:00 AM to 8:00 PM
North Boulevard School	Weekend	Closed

2.4 Building Envelope

The building is constructed of concrete block and structural steel with a brick facade. The building has a flat roof covered with a combination of asphalt sheets and gravel. The building has double-pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum and in good condition except that the door seals have worn out which increases the level of outside air infiltration.



2.5 On-Site Generation

North Boulevard School does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

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

Lighting System

Lighting at the building is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). Most of the fixtures are 2-lamp or 3-lamp, 4-foot long troffers with diffusers. There are some fluorescent fixtures in various locations throughout the building which are either ceiling mounted, hanging, or utility fixtures without diffusers.



Lighting control in most spaces is provided by occupancy sensors. The occupancy sensors are either wall or ceiling mounted depending on the space layout. Stairwells, hallways, and classrooms and offices do not contain any occupancy sensors and are operated by a wall switch.

The building's exterior lighting consists primarily of high pressure sodium (HPS) fixtures that are controlled by a timer or photocells.

Steam Heating System

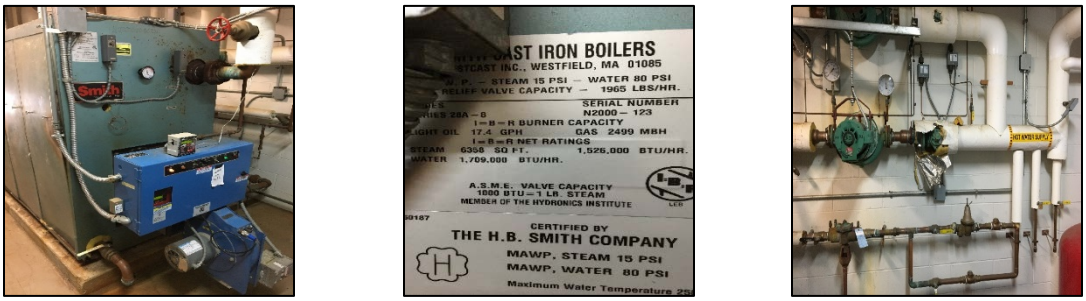
The steam system which serves the old section of the building, consists two H.B. Smith 1,526 MBH output, natural draft boilers. The boilers have a combustion efficiency of 83%. Steam is supplied to a hot water heat exchanger which produces 180°F water, and distributes to radiators and unit ventilators throughout the old section of the building via three 3 HP pumps. Condensate is returned to the feed water system via a vacuum pump system with condensate storage tank.

The boilers operate in a lead/lag configuration. Only a single boiler is required to meet the building heating demand. Boiler operation is rotated manually on a weekly basis.

The boilers are very old and at the end of their useful life.

Hot Water Heating System

The hot water system consists of H.B. Smith 1,709 MBH output, natural draft boiler. The boiler has a nominal combustion efficiency of 83%. The boiler is configured in a constant flow primary distribution with two 3 HP pumps; one of which serves as a backup. The boiler supplies hot water at 180°F when the outside air temperature is below 55°F and the setpoint is reset to 170°F when the outside air is above 55°F. The boiler serves unit ventilators throughout the new section of the building, as well as two heating-only air handler units (AHUs) located in the gymnasium.



The boiler is in good condition and well maintained.

Direct Expansion Air Conditioning System (DX)

The building is cooled via a combination of window air conditioners, a direct-expansion (DX) package roof top unit, and a split-system AC located on the roof. The rooftop packaged unit is a high-efficiency Lennox model LCH with a capacity of 5 tons and an EER rating of 12.7. The unit provides cooling to the STEM lab located on the west side of the building. The unit is controlled by a programmable thermostat located in the STEM lab. The thermostat is set to maintain cooling setpoint of 70°F every day.



A 1.5 ton Trane cooling-only split system is used to condition the teacher's lounge. The fan and evaporator are located above the drop ceiling of the teacher's lounge. The compressor and condensing unit are located on the roof directly above. The unit is manually controlled by a thermostat located in zone. The unit operates on demand to maintain a space temperature setpoint around 75°F (adjustable by staff).

There are approximately 11 window air conditioners of various sizes located in classrooms and offices throughout the building.

Domestic Hot Water Heating System

The domestic hot water heating system for the building consists of two A.O. Smith gas-fired storage water heaters with an input rating of 75 kBtuh each and a nominal thermal efficiency of 80%. Each water heater has a 74-gallon storage tank, and a 500-Watt aquastat controlled circulation pumps that distribute 110°F water to the entire site.



2.7 Water-Using Systems

There are 13 restrooms at this building. A sampling of restrooms found that the faucets are rated for 2.2 gallons per minute (gpm) or lower, the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 gpf. Faucets with flow rates higher than 2.2 are located in the nurse's office, room 114B and the girl's and boy's restrooms located next to classroom 106. There are no locker rooms or showers at this building.

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

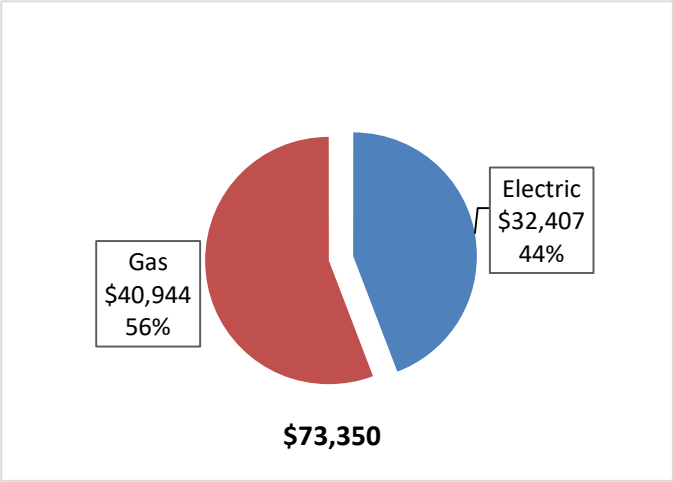
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the building was developed from this information.

Figure 7 - Utility Summary

Utility Summary for North Boulevard School		
Fuel	Usage	Cost
Electricity	265,712 kWh	$32,407
Natural Gas	46,078 Therms	$40,944
Total		$73,350

The current annual energy cost for this building is $73,350 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 $0.122/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below. The electric energy profile (pattern of consumption) indicates steady usage during the heating months which is likely driven primarily by the pumps and lighting. The air conditioners likely fill in the usage in the shoulder months when the pumps are presumably idle.

Figure 9 - Electric Usage & Demand

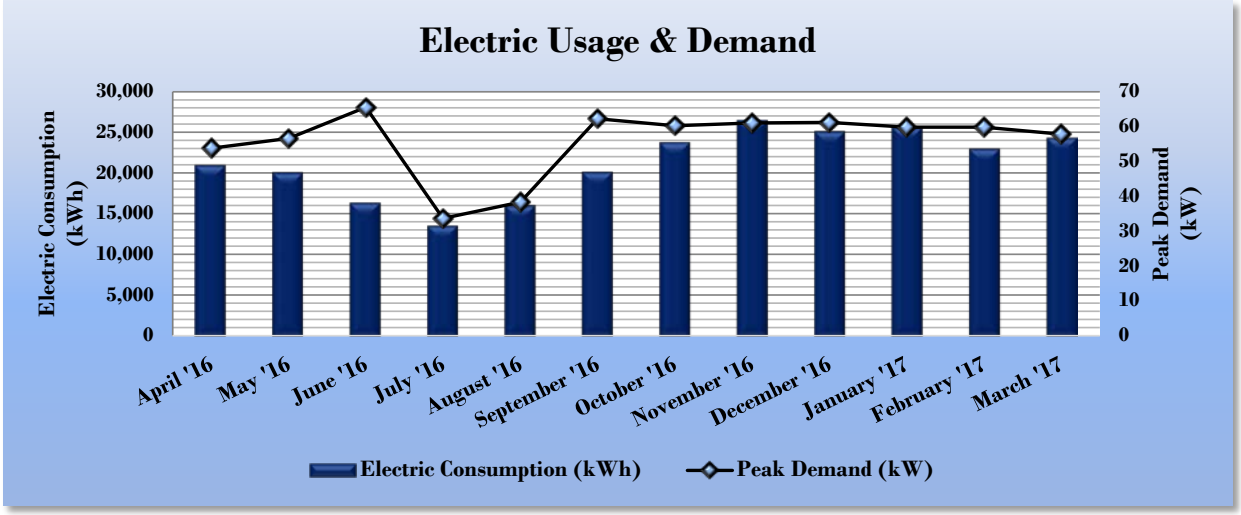


Figure 10 - Electric Usage & Demand

Electric Billing Data for North Boulevard School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
5/6/16	27	20,960	54	$302	$2,417
6/8/16	32	20,080	57	$340	$2,373
7/7/16	28	16,400	66	$394	$2,124
8/4/16	27	13,600	34	$202	$1,647
9/6/16	32	16,080	38	$230	$1,940
10/5/16	28	20,160	62	$349	$2,512
11/4/16	29	23,760	60	$338	$2,873
12/7/16	32	26,480	61	$342	$3,161
1/9/17	32	25,120	61	$356	$3,036
2/6/17	27	25,600	60	$396	$3,155
3/7/17	28	22,960	60	$396	$2,897
4/6/17	29	24,320	58	$998	$3,028
Totals	351	255,520	65.5	$4,642	$31,164
Annual	365	265,712	65.5	$4,827	$32,407

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.889/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. The usage profile is typical of a school with little in the way of DWH demand in a temperate climate zone.

Figure 11 - Natural Gas Usage

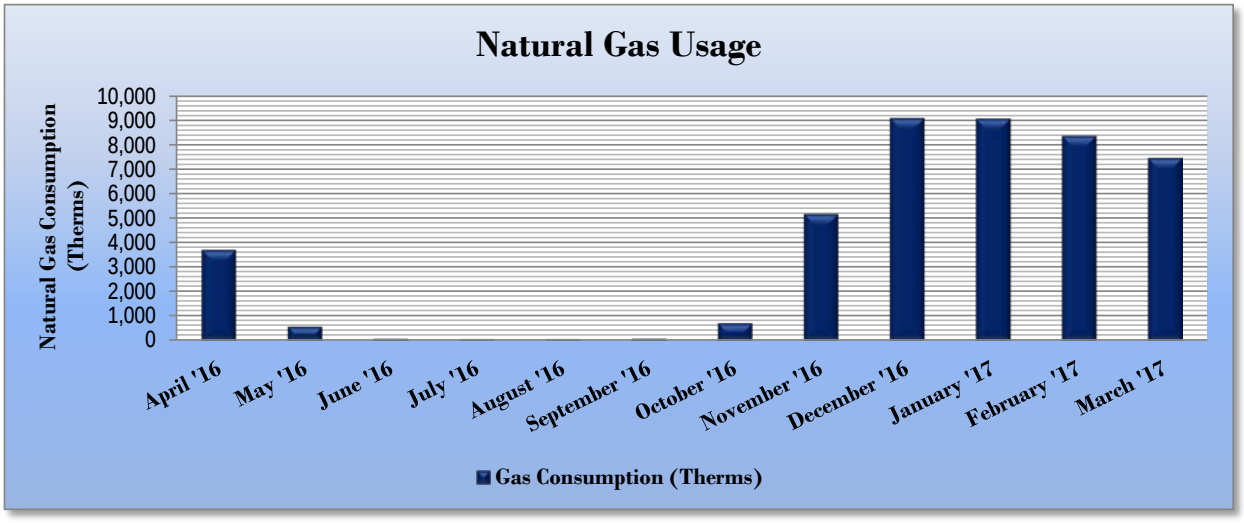


Figure 12 - Natural Gas Usage

Gas Billing Data for North Boulevard School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
4/27/16	27	3,705	$2,107
5/26/16	28	572	$417
6/27/16	31	68	$144
7/27/16	29	46	$132
8/25/16	28	41	$129
9/26/16	31	70	$145
10/25/16	28	708	$496
11/28/16	33	5,164	$4,795
12/27/16	28	9,078	$7,966
1/26/17	29	9,049	$8,260
2/27/17	31	8,352	$7,731
3/28/17	28	7,456	$7,051
Totals	351	44,311	$39,373
Annual	365	46,078	$40,944

3.4 Benchmarking

This building 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 building'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		
	North Boulevard School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	167.4	141.4
Site Energy Use Intensity (kBtu/ft^2)	120.1	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the table below:

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

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	North Boulevard School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	146.4	141.4
Site Energy Use Intensity (kBtu/ft^2)	113.0	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% of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This building has a current score of 40.

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

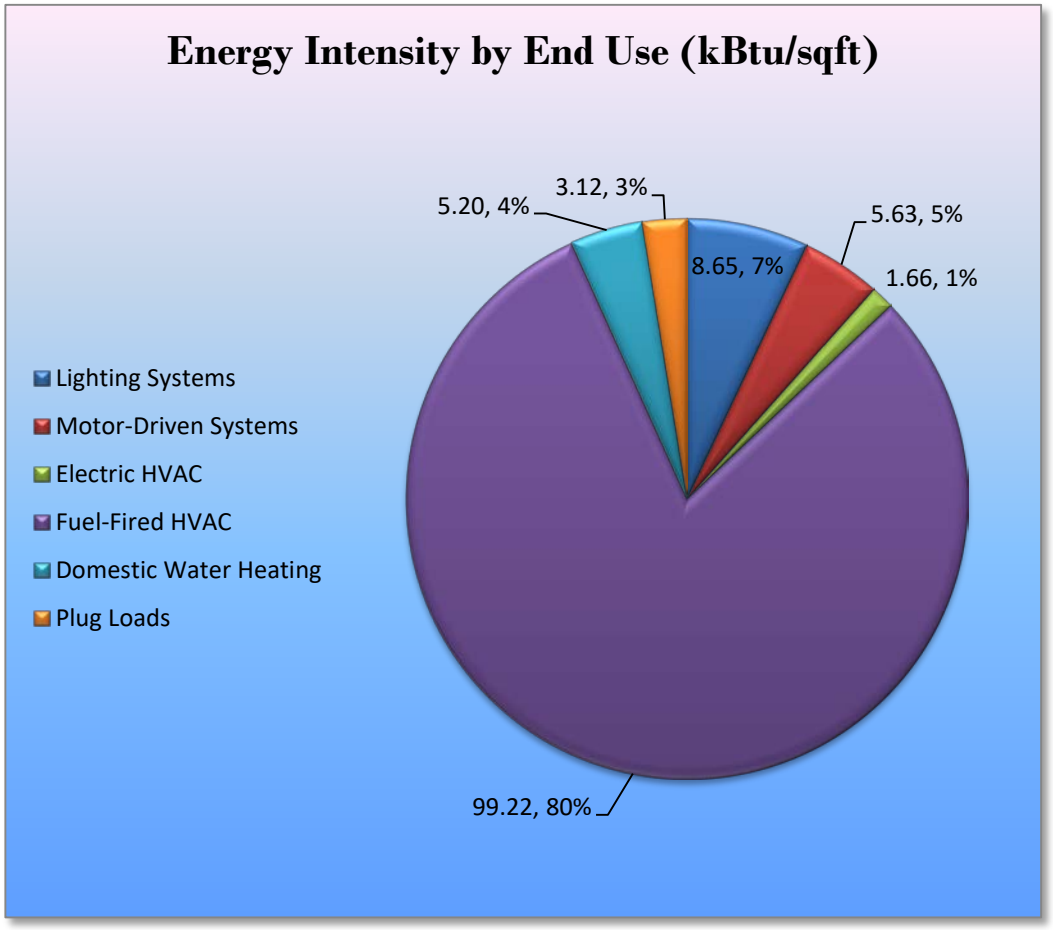
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/building-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager® account has been created online for your building 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 building. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

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



4 ENERGY CONSERVATION MEASURES

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the North Boulevard School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

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		73,761	16.4	0.0	$8,995.98	$45,245.31	$8,700.00	$36,545.31	4.1	74,276
ECM 1	Install LED Fixtures	3,772	0.7	0.0	$460.07	$7,032.19	$1,800.00	$5,232.19	11.4	3,799
ECM 2	Retrofit Fixtures with LED Lamps	68,719	15.7	0.0	$8,381.11	$37,245.12	$6,900.00	$30,345.12	3.6	69,199
ECM 3	Install LED Exit Signs	1,269	0.1	0.0	$154.81	$968.00	$0.00	$968.00	6.3	1,278
Lighting Control Measures		3,328	0.6	0.0	$405.90	$7,250.00	$875.00	$6,375.00	15.7	3,351
ECM 4	Install Occupancy Sensor Lighting Controls	3,328	0.6	0.0	$405.90	$7,250.00	$875.00	$6,375.00	15.7	3,351
Variable Frequency Drive (VFD) Measures		8,958	1.1	0.0	$1,092.48	$9,022.95	$0.00	$9,022.95	8.3	9,020
ECM 5	Install VFDs on Hot Water Pumps	8,958	1.1	0.0	$1,092.48	$9,022.95	$0.00	$9,022.95	8.3	9,020
HVAC System Improvements		0	0.0	4.7	$41.89	$39.15	$0.00	$39.15	0.9	552
ECM 6	Install Pipe Insulation	0	0.0	4.7	$41.89	$39.15	$0.00	$39.15	0.9	552
Domestic Water Heating Upgrade		0	0.0	21.4	$190.52	$100.38	$0.00	$100.38	0.5	2,511
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	21.4	$190.52	$100.38	$0.00	$100.38	0.5	2,511
Plug Load Equipment Control - Vending Machine		1,612	0.0	0.0	$196.58	$230.00	$0.00	$230.00	1.2	1,623
ECM 8	Vending Machine Control	1,612	0.0	0.0	$196.58	$230.00	$0.00	$230.00	1.2	1,623
TOTALS		87,658	18.2	26.2	$10,923.36	$61,887.79	$9,575.00	$52,312.79	4.8	91,333

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

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

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		73,761	16.4	0.0	$8,995.98	$45,245.31	$8,700.00	$36,545.31	4.1	74,276
ECM 1	Install LED Fixtures	3,772	0.7	0.0	$460.07	$7,032.19	$1,800.00	$5,232.19	11.4	3,799
ECM 2	Retrofit Fixtures with LED Lamps	68,719	15.7	0.0	$8,381.11	$37,245.12	$6,900.00	$30,345.12	3.6	69,199
ECM 3	Install LED Exit Signs	1,269	0.1	0.0	$154.81	$968.00	$0.00	$968.00	6.3	1,278

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	3,772	0.7	0.0	$460.07	$7,032.19	$1,800.00	$5,232.19	11.4	3,799

Measure Description

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

Additional savings from lighting maintenance can be anticipated since LEDs have longer lifetimes than other lighting technologies.

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	67,646	15.5	0.0	$8,250.21	$36,922.61	$6,870.00	$30,052.61	3.6	68,119
Exterior	1,073	0.2	0.0	$130.89	$322.52	$30.00	$292.52	2.2	1,081

Measure Description

We recommend retrofitting existing incandescent, fluorescent, 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 tubes and more than ten times longer than many incandescent lamps.

ECM 3: Install LED Exit Signs

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	1,269	0.1	0.0	$154.81	$968.00	$0.00	$968.00	6.3	1,278
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend replacing all incandescent or compact fluorescent Exit signs with LED Exit signs. LED Exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

4.1.2 Lighting Control Measures

Our recommendation for upgrades to existing lighting controls is summarized in Figure 18 below.

Figure 18 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		3,328	0.6	0.0	$405.90	$7,250.00	$875.00	$6,375.00	15.7	3,351
ECM 4	Install Occupancy Sensor Lighting Controls	3,328	0.6	0.0	$405.90	$7,250.00	$875.00	$6,375.00	15.7	3,351

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 4: 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)
3,328	0.6	0.0	$405.90	$7,250.00	$875.00	$6,375.00	15.7	3,351

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in restrooms, classrooms, offices areas, and the gymnasium. 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 Variable Frequency Drive Measures

Our recommendation for variable frequency drive (VFD) measures is summarized in Figure 19 below.

Figure 19 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		8,958	1.1	0.0	$1,092.48	$9,022.95	$0.00	$9,022.95	8.3	9,020
ECM 5	Install VFDs on Hot Water Pumps	8,958	1.1	0.0	$1,092.48	$9,022.95	$0.00	$9,022.95	8.3	9,020

ECM 5: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
8,958	1.1	0.0	$1,092.48	$9,022.95	$0.00	$9,022.95	8.3	9,020

Measure Description

We recommend installing a variable frequency drives (VFD) to control heating hot water pumps. This measure requires that a majority of the hot water coils be served by two-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.4 HVAC System Upgrades

Our recommendation for HVAC system improvement is 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	4.7	$41.89	$39.15	$0.00	$39.15	0.9	552
ECM 6	Install Pipe Insulation	0	0.0	4.7	$41.89	$39.15	$0.00	$39.15	0.9	552

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	4.7	$41.89	$39.15	$0.00	$39.15	0.9	552

Measure Description

We recommend installing insulation on large diameter steam valves located in the boiler room. Distribution system losses are dependent on heating 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. The system efficiency can be significantly reduced 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.

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

4.1.5 Domestic Hot Water Heating System Upgrades

Our recommendation for domestic water heating system improvements is summarized in Figure 21 below.

Figure 21 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		0	0.0	21.4	$190.52	$100.38	$0.00	$100.38	0.5	2,511
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	21.4	$190.52	$100.38	$0.00	$100.38	0.5	2,511

ECM 7: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	21.4	$190.52	$100.38	$0.00	$100.38	0.5	2,511

Measure Description

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

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

4.1.6 Plug Load Equipment Control - Vending Machines

Our recommendation for plug load equipment control – vending machines is summarized in Figure 21 below.

Figure 22 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		1,612	0.0	0.0	$196.58	$230.00	$0.00	$230.00	1.2	1,623
ECM 8	Vending Machine Control	1,612	0.0	0.0	$196.58	$230.00	$0.00	$230.00	1.2	1,623

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)
1,612	0.0	0.0	$196.58	$230.00	$0.00	$230.00	1.2	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. We recommend installing 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.

4.2 ECMs Evaluated but Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the building. Reasons for exclusion can be found in each measure description section.

Figure 23 – Summary of Measures Evaluated, But Not Recommended

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)
Motor Upgrades	318	0.1	0.0	$38.75	$2,414.52	$0.00	$2,414.52	62.3	320
Premium Efficiency Motors	318	0.1	0.0	$38.75	$2,414.52	$0.00	$2,414.52	62.3	320
Variable Frequency Drive (VFD) Measures	2,194	0.7	0.0	$267.59	$7,993.77	$0.00	$7,993.77	29.9	2,209
Install VFD on Variable Air Volume (VAV) HVAC	2,194	0.7	0.0	$267.59	$7,993.77	$0.00	$7,993.77	29.9	2,209
TOTALS	2,512	0.8	0.0	$306.34	$10,408.29	$0.00	$10,408.29	34.0	2,529

* - 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).

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)
318	0.1	0.0	$38.75	$2,414.52	$0.00	$2,414.52	62.3	320

Measure Description

We evaluated 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 (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

Reasons for not Recommending

Due to the long payback period, we are not currently recommending replacement of standard efficiency motors with *NEMA Premium™* efficiency motors.

Install VFD on Constant Volume (CV) HVAC

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)
2,194	0.7	0.0	$267.59	$7,993.77	$0.00	$7,993.77	29.9	2,209

Measure Description

We recommend installing variable frequency drives (VFDs) to control supply fan motor speeds to convert a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one. Zone thermostats will cause the VFD to modulate fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings results from reducing fan speed (and power) when there is a reduced load required for the zone. The magnitude of energy savings is based on the estimated amount of time that fan motors operate at partial load.

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

Reasons for not Recommending

Due to the long payback period, we are not currently recommending installation of variable frequency drives (VFDs).

5 ENERGY EFFICIENT PRACTICES

In addition to the quantifiable savings estimated in Section 4, a building's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your building. 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.

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 setpoints and sensitivity are appropriately configured.

Use Fans to Reduce Cooling Load

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

Clean 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 building's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Perform 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 gpf and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.5 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a building, 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 building. 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.

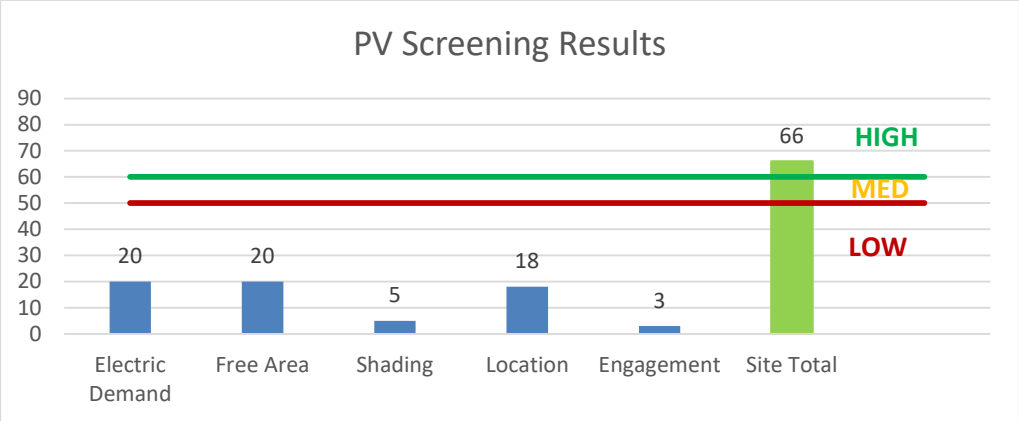
6.1 Photovoltaic

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 building'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 building's electric demand, size and location of free area, and shading elements shows that the building has a High potential for installing a PV array.

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the main building/ground next to the building/over the main parking lot may be feasible. If North Boulevard School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 24 - Photovoltaic Screening



Potential	High	
System Potential	56	kW DC STC
Electric Generation	42,137	kWh/yr
Displaced Cost	$3,670	/yr
Installed Cost	$145,600	

Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (SRP) prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.4 for additional information.

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

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

6.2 Combined Heat and Power

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

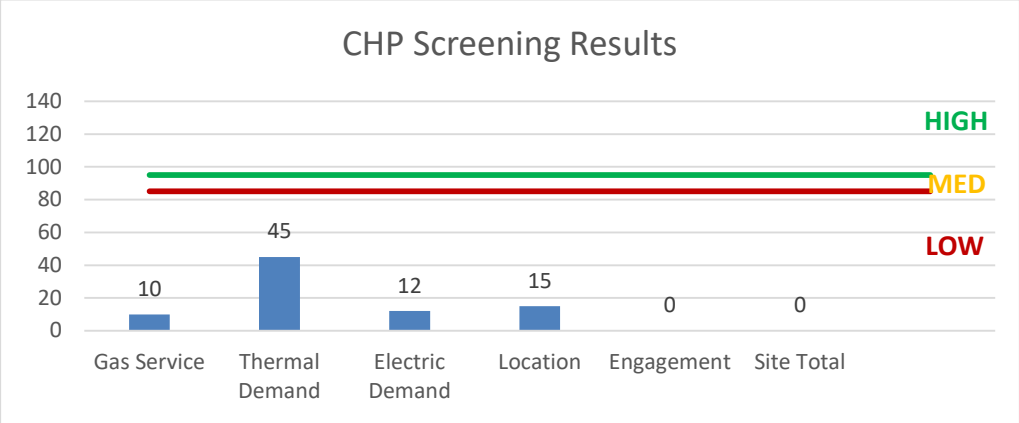
CHP systems are typically used to produce a portion of the electric power used onsite by a building, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the building's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the building has a Low potential for installing a cost-effective CHP system.

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

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

Figure 25 - Combined Heat and Power Screening



7 DEMAND RESPONSE

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

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their building 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 building 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 building's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a building'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 25 for a list of the eligible programs identified for each recommended ECM.

Figure 26 - 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 LED Exit Signs			X			
ECM 4	Install Occupancy Sensor Lighting Controls	X		X			
ECM 5	Install VFDs on Hot Water Pumps			X			
ECM 6	Install Pipe Insulation						
ECM 7	Install Low-Flow Domestic Hot Water Devices			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 building 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 building. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

Since your building is an existing building, only the retrofit incentives have been applied in this report. Custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

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

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

8.2 Direct Install

Overview

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

Incentives

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

How to Participate

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

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

8.3 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

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

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

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

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

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize 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.

8.4 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects 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. SRECs are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

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

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

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

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 building's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your building is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your building 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 building is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your building 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
Boiler Room 1	6	Compact Fluorescent: Screw-In (13W) - 1L	Wall Switch	13	3,080	None	No	6	Compact Fluorescent: Screw-In (13W) - 1L	Wall Switch	13	3,080	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 108	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.30	1,145	0.0	$139.71	$819.00	$140.00	4.86
CR 111	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.30	1,145	0.0	$139.71	$819.00	$140.00	4.86
CR 106	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.30	1,145	0.0	$139.71	$819.00	$140.00	4.86
CR 106	1	Incandescent: Screw-In (60W) - 1L	Wall Switch	60	3,080	Relamp	No	1	LED Screw-In Lamps: LED: Screw-In (9.5W) - 1L	Wall Switch	10	3,080	0.03	179	0.0	$21.82	$53.75	$5.00	2.23
CR 106 RR	1	Incandescent: Screw-In (60W) - 1L	Wall Switch	60	3,080	None	No	1	Incandescent: Screw-In (60W) - 1L	Wall Switch	60	3,080	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 109	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.30	1,145	0.0	$139.71	$819.00	$140.00	4.86
CR 109	1	Incandescent: Screw-In (60W) - 1L	Wall Switch	60	3,080	Relamp	No	1	LED Screw-In Lamps: LED: Screw-In (9.5W) - 1L	Wall Switch	10	3,080	0.03	179	0.0	$21.82	$53.75	$5.00	2.23
Girls RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.03	148	0.0	$18.01	$328.50	$10.00	17.68
Girls RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	8,760	0.02	332	0.0	$40.55	$58.50	$10.00	1.20
Boys RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.03	148	0.0	$18.01	$328.50	$10.00	17.68
Boys RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	8,760	0.02	332	0.0	$40.55	$58.50	$10.00	1.20
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.04	164	0.0	$19.96	$117.00	$20.00	4.86
Custodian Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.04	164	0.0	$19.96	$117.00	$20.00	4.86
CR 115	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.19	736	0.0	$89.81	$451.20	$90.00	4.02
CR 117	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
Music Room 110	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
Music Room Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.04	164	0.0	$19.96	$117.00	$20.00	4.86
Art Room 112	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
Art Room Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.04	164	0.0	$19.96	$117.00	$20.00	4.86
CR 114A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.04	164	0.0	$19.96	$117.00	$20.00	4.86
CR 119	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.29	1,105	0.0	$134.72	$676.80	$135.00	4.02
Media Center 114	36	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.78	2,946	0.0	$359.24	$2,106.00	$360.00	4.86
Media Center 114	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
114 B	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.06	245	0.0	$29.94	$150.40	$30.00	4.02

	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
114 C	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,156	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.07	278	0.0	$33.87	$190.27	$40.00	4.44
Boys RR (Media Center)	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.03	148	0.0	$18.01	$328.50	$10.00	17.68
Boys RR (Media Center)	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	8,760	0.02	332	0.0	$40.55	$58.50	$10.00	1.20
Girls RR (Media Center)	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.03	148	0.0	$18.01	$328.50	$10.00	17.68
Girls RR (Media Center)	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	8,760	0.02	332	0.0	$40.55	$58.50	$10.00	1.20
CR 116	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	2,156	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.44	1,666	0.0	$203.21	$1,141.60	$240.00	4.44
CR 118	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.04	164	0.0	$19.96	$117.00	$20.00	4.86
Custodian Closet	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.06	245	0.0	$29.94	$175.50	$30.00	4.86
CR 121	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
CR 120	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
CR 122	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
CR 123	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
Cafeteria / APR	24	Linear Fluorescent - T5HO: 4' T5HO (54W) - 2L	Wall Switch	117	3,080	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	1.52	8,220	0.0	$1,002.56	$1,844.00	$310.00	1.53
Cafeteria / APR	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Nurse's Office	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.33	1,772	0.0	$216.17	$1,242.00	$190.00	4.87
Nurse's Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	None	62	8,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	None	29	8,760	0.02	332	0.0	$40.55	$58.50	$10.00	1.20
Nurse's Office RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.02	82	0.0	$9.98	$58.50	$10.00	4.86
Teacher's Lounge	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.19	736	0.0	$89.81	$526.50	$90.00	4.86
Teacher's Lounge RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.02	82	0.0	$9.98	$58.50	$10.00	4.86
Teacher's Lounge RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.02	82	0.0	$9.98	$58.50	$10.00	4.86
CR 105	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.16	886	0.0	$108.08	$891.00	$130.00	7.04
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.04	164	0.0	$19.96	$117.00	$20.00	4.86
CR 104	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.30	1,145	0.0	$139.71	$819.00	$140.00	4.86
CR 104 RR	1	Compact Fluorescent: Screw-In (13W) - 1L	Wall Switch	13	3,080	None	No	1	Compact Fluorescent: Screw-In (13W) - 1L	Wall Switch	13	3,080	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
CR 103	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.43	1,636	0.0	$199.58	$1,170.00	$200.00	4.86
CR 103 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.02	82	0.0	$9.98	$58.50	$10.00	4.86
CR 103 Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.02	82	0.0	$9.98	$58.50	$10.00	4.86
CR 102	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.30	1,145	0.0	$139.71	$819.00	$140.00	4.86
CR 102 RR	1	Compact Fluorescent: Screw-In (13W) - 1L	Occupancy Sensor	13	2,156	None	No	1	Compact Fluorescent: Screw-In (13W) - 1L	Occupancy Sensor	13	2,156	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 101	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.55	2,954	0.0	$360.28	$1,710.00	$270.00	4.00
CR 101	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 101 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.02	82	0.0	$9.98	$58.50	$10.00	4.86
CR 101 Exterior entry area	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.02	117	0.0	$14.26	$58.50	$10.00	3.40
Boiler Room 2 (New Section)	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.10	368	0.0	$44.91	$225.60	$45.00	4.02
Janitor Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.02	82	0.0	$9.98	$58.50	$10.00	4.86
Storage Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.04	164	0.0	$19.96	$117.00	$20.00	4.86
Boys RR	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,080	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,156	0.09	464	0.0	$56.63	$485.40	$65.00	7.42
Boys RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.05	295	0.0	$36.03	$117.00	$20.00	2.69
Faculty RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.02	82	0.0	$9.98	$58.50	$10.00	4.86
Girls RR	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,080	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	2,156	0.09	464	0.0	$56.63	$485.40	$65.00	7.42
Girls RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.05	295	0.0	$36.03	$117.00	$20.00	2.69
Storage Room (roof access)	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,156	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.06	245	0.0	$29.94	$175.50	$30.00	4.86
CR 124	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
CR 126	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
CR 125	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
CR 127	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
CR 129	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
CR 128	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	2,156	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.39	1,473	0.0	$179.62	$902.40	$180.00	4.02
Gym Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.05	295	0.0	$36.03	$387.00	$20.00	10.19

	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
Gym	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.72	3,900	0.0	$475.62	$4,727.00	$825.00	8.20
Gym	4	Exit Signs: Incandescent	None	20	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.04	564	0.0	$68.80	$430.22	$0.00	6.25
Old Section Hallway	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	22	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.48	2,571	0.0	$313.62	$1,287.00	$220.00	3.40
Old Section Hallway	5	Exit Signs: Incandescent	None	20	8,760	Fixture Replacement	No	5	LED Exit Signs: 2 W Lamp	None	6	8,760	0.05	705	0.0	$86.01	$537.78	$0.00	6.25
Hallway from Main entry to CR 101	14	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	No	14	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,080	0.51	2,777	0.0	$338.68	$1,331.87	$280.00	3.11
Hallway from Main entry to CR 101	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Display Cabinets (2)	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	3,080	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	3,080	0.02	124	0.0	$15.12	$71.80	$10.00	4.09
Hallway (106, 108, 109, 111)	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	No	5	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,080	0.18	992	0.0	$120.96	$475.67	$100.00	3.11
Hallway (106, 108, 109, 111)	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Media Center Hallway	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.30	1,636	0.0	$199.58	$819.00	$140.00	3.40
Media Center Hallway	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Far End Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.17	935	0.0	$114.05	$468.00	$80.00	3.40
Far End Hallway	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior Building	15	High-Pressure Sodium: (1) 70W Lamp	Wall Switch	95	3,080	Fixture Replacement	No	18	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	20	3,080	0.70	3,772	0.0	$460.07	$7,032.19	$1,800.00	11.37
Exterior Building	6	Incandescent: Screw-In (60W) - 1L	Wall Switch	60	3,080	Relamp	No	6	LED Screw-In Lamps: LED: Screw-In (9.5W) - 1L	Wall Switch	10	3,080	0.20	1,073	0.0	$130.89	$322.52	$30.00	2.23
Exterior Pole Lighting	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	40	3,080	None	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	40	3,080	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Roof	Whole Building	20	Exhaust Fan	0.3	65.0%	No	2,745	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Media Center	1	Supply Fan	1.0	84.0%	No	2,745	No	84.0%	Yes	1	0.14	439	0.0	$53.52	$2,536.07	$0.00	47.39
Roof	Media Center	1	Exhaust Fan	0.3	70.0%	No	2,745	No	70.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Whole Building	Unit Ventilators	52	Supply Fan	0.3	65.0%	No	2,745	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room 1	Vacuum System	2	Process Pump	0.5	75.0%	No	2,745	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room 1	From Heat Exchanger to Building	3	Heating Hot Water Pump	3.0	87.5%	No	2,745	Yes	89.5%	Yes	3	1.22	9,275	0.0	$1,131.23	$11,437.47	$0.00	10.11
Gym Ceiling	Gym	2	Supply Fan	2.0	84.0%	No	2,745	No	84.0%	Yes	2	0.58	1,755	0.0	$214.07	$5,457.71	$0.00	25.49
Gym Ceiling	Gym	2	Return Fan	1.5	84.0%	No	2,745	No	84.0%	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
Roof	Teacher's Lounge	1	Split-System AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	STEM Lab	1	Split-System AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Whole Building	Classrooms	11	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room 1	Old Section from CR 122 to 101	1	Natural Draft Steam Boiler	1,526.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room 1	Old Section from CR 122 to 101	1	Natural Draft Steam Boiler	1,526.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room 2	New Section from Gym to 129	1	Non-Condensing Hot Water Boiler	1,709.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Boiler Room1	3 Steam Valves (Large)	6	4.00	0.00	0	3.5	$30.66	$26.10	$0.00	0.85
Boiler Room1	2 Steam Valves (Small)	3	3.00	0.00	0	1.3	$11.23	$13.05	$0.00	1.16

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room 1	Old Section	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room 2	New Section	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Nurse's Office	1	Faucet Aerator (Lavatory)	3.00	1.00	0.00	0	2.1	$18.32	$7.17	$0.00	0.39
Girls RR	6	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	9.3	$82.44	$43.02	$0.00	0.52
Boys RR	6	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	9.3	$82.44	$43.02	$0.00	0.52
114 B	1	Faucet Aerator (Kitchen)	3.00	2.20	0.00	0	0.8	$7.33	$7.17	$0.00	0.98

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Whole Building	42	Desktops	150.0	Yes
Whole Building	26	Projectors	150.0	Yes
Whole Building	26	Smartboards	100.0	Yes
Whole Building	283	Laptops	45.0	Yes
Whole Building	2	Minifridge	152.0	Yes
Whole Building	3	Microwave	1,000.0	No
Whole Building	4	Tube TV	120.0	No
Whole Building	5	Desk Printer	40.0	Yes
Whole Building	2	Photocopier	600.0	Yes
Whole Building	60	Tablets	20.0	Yes
Whole Building	1	Refrigerator	172.0	Yes
Whole Building	1	LCD TV	150.0	Yes
Gym	9	Fans	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
Storage Room	1	Refrigerated	Yes	0.00	1,612	0.0	$196.58	$230.00	$0.00	1.17

Appendix B: ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

North Boulevard Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 45,902
Built: 1954

For Year Ending: February 28, 2017
Date Generated: March 20, 2018

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
North Boulevard Elementary School 363 Boulevard Pompton Plains, New Jersey 07444	Pequannock Township Board of Education 538 Newark Pompton Turnpike Pompton Plains, NJ 07444 973-616-6030	Kateryna Bechtel 538 Newark Pompton Turnpike Pompton Plains, NJ 07444 973-616-6030 Ext. 7201 kathy.bechtel@pequannock.org

Property ID: 6254788

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
111.7 kBtu/ft²

Source EUI
157.1 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	4,252,221 (83%)
Electric - Grid (kBtu)	875,116 (17%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	103.3
National Median Source EUI (kBtu/ft²)	145.3
% Diff from National Median Source EUI	8%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	323

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)