Local Government Energy Audit:
Energy Audit Report

Atlantic Highlands Elementary School

140 1st Avenue

Atlantic Highlands, NJ 07716

June 20, 2018

Final Report by:

TRC Energy Services

Disclaimer

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

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

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

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

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1 EXECUTIVE SUMMARY

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

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

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

1.1 Facility Summary

Atlantic Highlands Elementary School is a 67,557 square foot, three-story building comprised of classrooms, offices, gym, cafeteria, kitchen, storage closets, hallways and a mechanical space. The regular school schedule is ten months and is occupied from 8:00 AM – 4:30 PM on weekdays. There are sports and recreational activities on the weekends. The summer school is for 20 days during the months of July and August.

The building is heated using gas-fired boilers and gas-fired rooftop units. The child study team area has a forced air furnace serving just those offices. Space cooling is provided using rooftop packaged units, window AC units and split system AC systems.

Lighting at Atlantic Highlands Elementary School consists of aging and inefficient T12 and T8 linear fixtures, compact fluorescent lamps and incandescent lamps. Exterior lighting consists of high pressure sodium fixtures controlled using timers and photocells. A thorough description of the facility and our observations are in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated six measures which together represent an opportunity for Atlantic Highlands Elementary School to reduce annual energy costs by $11,772 and annual greenhouse gas emissions by 108,754 lbs. CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 6.9 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 Atlantic Highlands Elementary School's annual energy use by 14%.

Figure 1 – Previous 12 Month Utility Costs

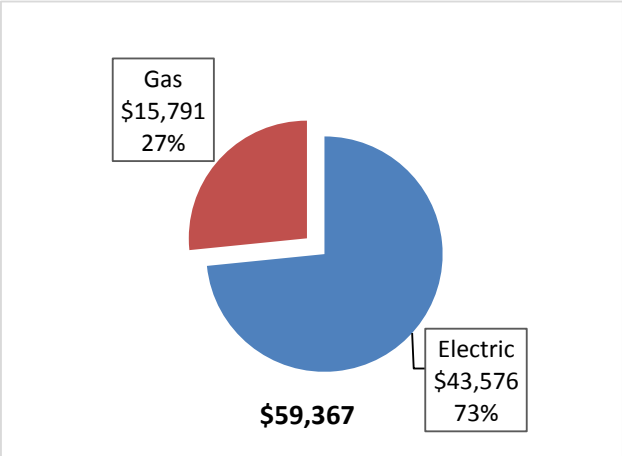
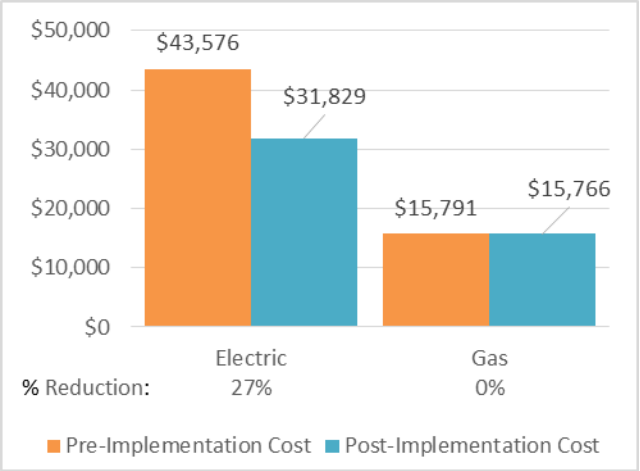


Figure 2 – Potential Post-Implementation Costs



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

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**81,740**	**24.0**	**0.0**	**$8,911.85**	**$63,982.73**	**$11,020.00**	**$52,962.73**	**5.9**	**82,312**
ECM 1	Install LED Fixtures	Yes	11,129	1.6	0.0	$1,213.33	$7,546.59	$1,700.00	$5,846.59	4.8	11,207
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	17,380	5.0	0.0	$1,894.90	$10,017.17	$1,185.00	$8,832.17	4.7	17,502
ECM 3	Retrofit Fixtures with LED Lamps	Yes	53,231	17.4	0.0	$5,803.62	$46,418.97	$8,135.00	$38,283.97	6.6	53,604
Lighting Control Measures			**9,258**	**2.6**	**0.0**	**$1,009.40**	**$24,744.00**	**$2,430.00**	**$22,314.00**	**22.1**	**9,323**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	8,030	2.3	0.0	$875.49	$17,844.00	$2,430.00	$15,414.00	17.6	8,086
	Install High/Low Lighitng Controls	No	1,228	0.3	0.0	$133.91	$6,900.00	$0.00	$6,900.00	51.5	1,237
Variable Frequency Drive (VFD) Measures			**17,977**	**4.8**	**0.0**	**$1,959.99**	**$12,668.60**	**$0.00**	**$12,668.60**	**6.5**	**18,103**
ECM 5	Install VFDs on Hot Water Pumps	Yes	17,977	4.8	0.0	$1,959.99	$12,668.60	$0.00	$12,668.60	6.5	18,103
Domestic Water Heating Upgrade			**0**	**0.0**	**6.5**	**$75.78**	**$4,427.89**	**$152.00**	**$4,275.89**	**56.4**	**764**
	Install High Efficiency Gas Water Heater	No	0	0.0	4.4	$50.64	$4,392.04	$152.00	$4,240.04	83.7	511
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	2.2	$25.14	$35.85	$0.00	$35.85	1.4	253
TOTAL OF ALL EVALUATED MEASURES			**108,976**	**31.5**	**6.5**	**$11,957.01**	**$105,823.22**	**$13,602.00**	**$92,221.22**	**7.7**	**110,502**
TOTAL OF ALL RECOMMENDED MEASURES			**107,747.49**	**31.17**	**2.16**	**$ 11,772.46**	**$ 94,531.18**	**$ 13,450.00**	**$ 81,081.18**	**6.9**	**108,754**
TOTAL OF ALL NON-RECOMMENDED MEASURES			**1,228.21**	**0.34**	**4.36**	**$ 184.55**	**$ 11,292.04**	**$ 152.00**	**$ 11,140.04**	**60.4**	**1,747**

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

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

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

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

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.

Domestic Hot Water upgrade measures generally 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.

Energy Efficient Practices

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

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Ensure Lighting Controls Are Operating Properly
- Practice Use of Thermostat Schedules and Temperature Resets
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

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

On-site Generation Measures

TRC evaluated the potential for installing on-site generation for Atlantic Highlands Elementary School. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

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

1.3 Implementation Planning

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

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

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

- SmartStart
- Direct Install

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

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

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

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

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Janet Sherlock	Business Administrator	jsherlock@ahes.k12.nj.us	(732) 291-2020
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On January 31, 2018, TRC performed an energy audit at Atlantic Highlands Elementary School located in Atlantic Highlands, New Jersey. TRC's team met with Kevin Krippa to review the facility operations and help focus our investigation on specific energy-using systems.

2.3 Building Occupancy

The typical schedule is presented in the table below. The regular school schedule is ten months and is occupied from 8:00 AM – 4:30 PM on weekdays. There are sports and recreational activities on the weekends. The summer school is for 20 days during the months of July and August. The school serves children from Pre K to 6th grade. During a typical day the school has 47 full time staff (including administration, teachers and maintenance) and 320 students.

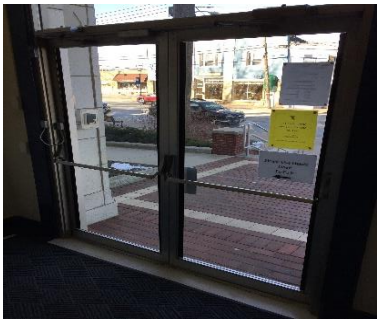
Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Atlantic Highlands BOE	Weekday	8AM - 4:30PM
Atlantic Highlands BOE	Weekend	Saturday: 9AM - 7PM Sunday:10AM - 2PM

2.4 Building Envelope

The original building was constructed in 1920. Later additions were made in 1950 and again in 2004. The building is constructed of concrete block and structural steel with a brick facade. The building has a flat rubber roof covered in TPO membrane which is in good condition. The buildings have single pane windows and aluminum framed glass doors that show signs of excessive infiltration.





2.5 On-site Generation

Atlantic Highlands Elementary School has a solar PV system setup on the rooftop. There are 156 panels and a system size of approximately 45kW.

2.6 Energy-using Systems

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

Lighting System

Lighting is provided mostly by 32-Watt linear fluorescent T8 lamps, 40-Watt fluorescent T12 lamps as well as some incandescent and compact fluorescent lamps (CFL). Most of the fixtures are 3- or 4-lamp, 4-foot long troffers.

Lighting control in some spaces is provided by occupancy sensors and by wall switches in others. The occupancy sensors are either wall or ceiling mounted depending on the space layout. Stairwells, elevator lobbies and the main lobby area do not contain any occupancy sensors and are on 24 hours per day throughout the year. The exit lights at the facility are 2-watt LED fixtures.

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

Hot Water Heating System

The heating hot water system consists of three Fulton condensing hot water boilers with an output capacity of 1260 kBtuh and a combustion efficiency of 90%. The hot water from the boilers is circulated throughout the building using two 20 HP constant speed pumps. There is a forced air furnace of output capacity of 72 kBtuh serving the Child Study offices. Hot water is supplied at 180°F when the outside air temperature is below 50°F and the setpoint is reset to 155°F when the outside air is above 65°F.

The media center, main offices, cafeteria, tech lab and gymnasiums are heated using the gas-fired rooftop units, assumed to be 80% efficient.

The boiler temperatures are controlled using the building automation system by the head custodian. The boilers, pumps, rooftop units and the furnaces were all installed in the year 2004. These are all in good condition and well maintained.

Direct Expansion Air Conditioning System (DX)

The media center (7.5 ton), main office (8.5 ton), cafeteria (20 ton) and tech lab (7.5 ton) are cooled using rooftop packaged units. The gymnasium has two packaged units of 10-ton capacity each. Temperatures in these spaces are controlled using the building automation system. All these units were installed in the year 2004. The tech closet (1 ton), child study office (3.5 ton) and the teachers' lounge (1.5 ton) are cooled using split AC units. The temperature in these spaces are controlled using programmable thermostats. There are no space cooling units in the classrooms.

The teachers' room and the nurse's office on the first floor have window AC units providing cooling to the spaces.

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of two gas-fired 76 kBtuh, 74-gallon water heaters. The systems have an efficiency of 80%. These serve the kitchen and all the restrooms at the facility. One of the water heaters is 16 years old and has been evaluated for replacement.

Food Service & Refrigeration

The school has an electric and gas-fired kitchen used to prepare lunch for the students at the facility. The kitchen staff work from 7:30 AM to 1:00 PM; September through June. Generally, the food is stored, reheated and served. The majority of the kitchen equipment was installed in 2004.

The kitchen equipment consists of milk coolers, ice-cream fridge, commercial refrigerators, walk-in refrigerator, walk-in freezer, cooking range, convection gas oven, dish washer and food warmers.

Building Plug Load

There are 76 computer work stations and 35 laptops throughout the facility. Other office plug loads include printers, a paper shredder, smart boards, wall fans and projectors. Kitchenette plug loads include microwave, refrigerators, coffee machines, water dispensers and toaster ovens. There is no centralized PC power management software installed. The server closets are cooled using dedicated split systems.

2.7 Water-using Systems

A few restrooms in spaces such as the art room, classrooms 001 and 003 may have original equipment. Other faucets are rated at 2.2 gallons per minute (gpm) or lower, the toilets are rated at 1.6 gallons per flush (gpf) and the urinals are rated at 1 gpf.

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

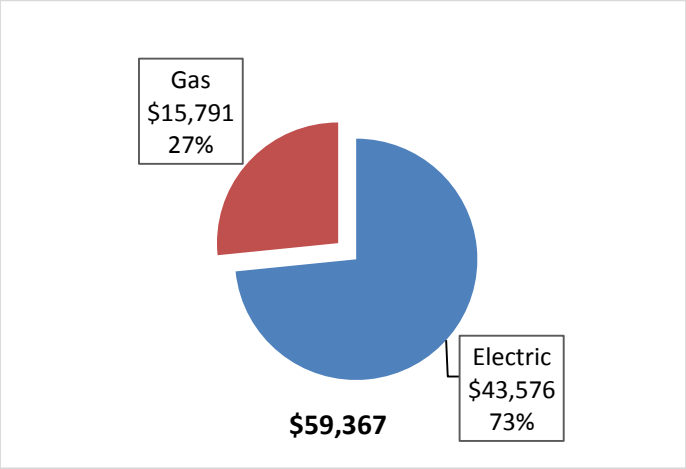
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Atlantic Highlands Elementary School		
Fuel	**Usage**	**Cost**
Electric	339,939 kWh	$43,576
Natural Gas	13,600 Therms	$15,791
Total		**$59,367**

The current annual energy cost for this facility is $59,367 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.109/kWh, which is the blended rate that includes energy supply, distribution and energy sold back to the grid from the solar PV system installed in the roof of the school. This rate is used throughout the analyses in this report to assess energy costs and savings. The third party electric service has been provided by South Jersey Energy. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

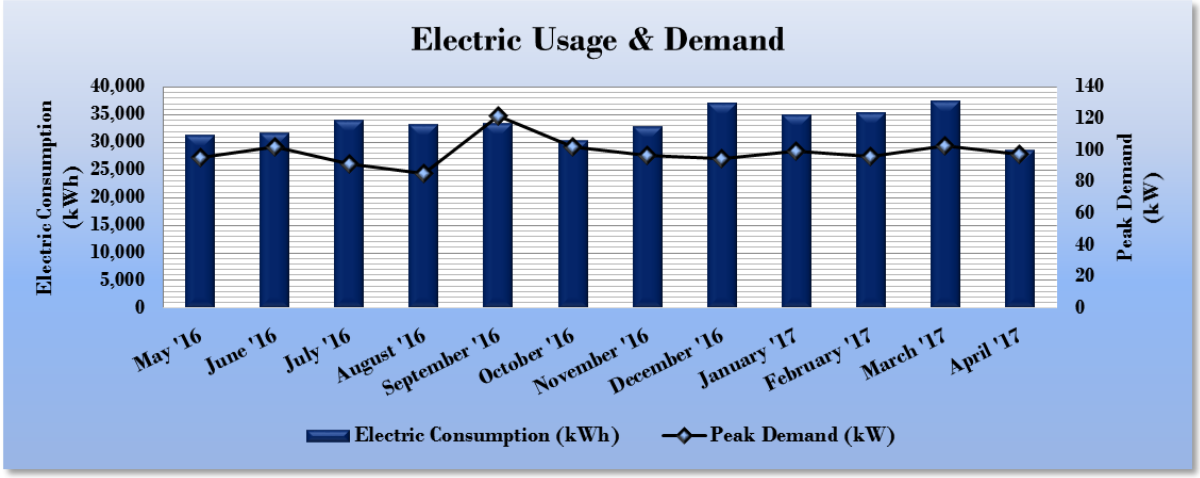


Figure 9 - Electric Usage & Demand

Electric Billing Data for Atlantic Highlands Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/1/16	30	31,290	96		$2,983
7/1/16	30	31,644	103		$3,293
8/2/16	32	34,030	92		$3,289
9/1/16	30	33,179	86		$3,323
10/3/16	32	33,370	122		$3,833
11/2/16	30	30,202	102		$3,372
12/2/16	30	32,788	97		$3,749
1/5/17	34	36,969	95		$4,289
2/2/17	28	34,857	100		$4,155
3/3/17	29	35,258	97		$3,973
4/3/17	31	37,484	103		$4,334
5/2/17	29	28,611	98		$2,982
Totals	**365**	**399,682**	**122**	**$0**	**$43,576**
Annual	**365**	**399,682**	**122**	**$0**	**$43,576**

3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.161/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Natural Gas Usage

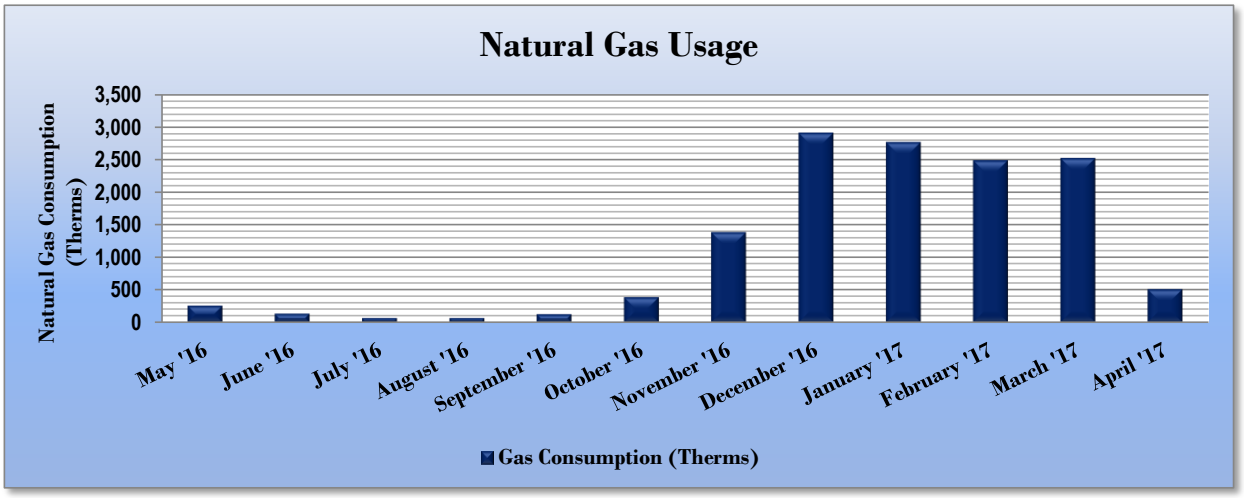


Figure 11 - Natural Gas Usage

Gas Billing Data for Atlantic Highlands Elementary School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
6/3/16	30	256	$449
7/6/16	33	134	$352
8/4/16	29	67	$298
9/1/16	28	65	$297
9/30/16	29	124	$343
11/1/16	32	388	$655
12/5/16	34	1,384	$1,494
1/5/17	31	2,907	$2,856
2/3/17	29	2,762	$3,178
3/6/17	31	2,485	$2,723
4/5/17	30	2,518	$2,607
5/4/17	29	509	$539
Totals	**365**	**13,600**	**$15,791**
Annual	**365**	**13,600**	**$15,791**

3.4 Benchmarking

This facility was benchmarked using Portfolio Manager, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy." Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Atlantic Highlands Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	84.5	141.4
Site Energy Use Intensity (kBtu/ft^2)	40.3	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 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Atlantic Highlands Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	67.4	141.4
Site Energy Use Intensity (kBtu/ft^2)	34.8	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 83.

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

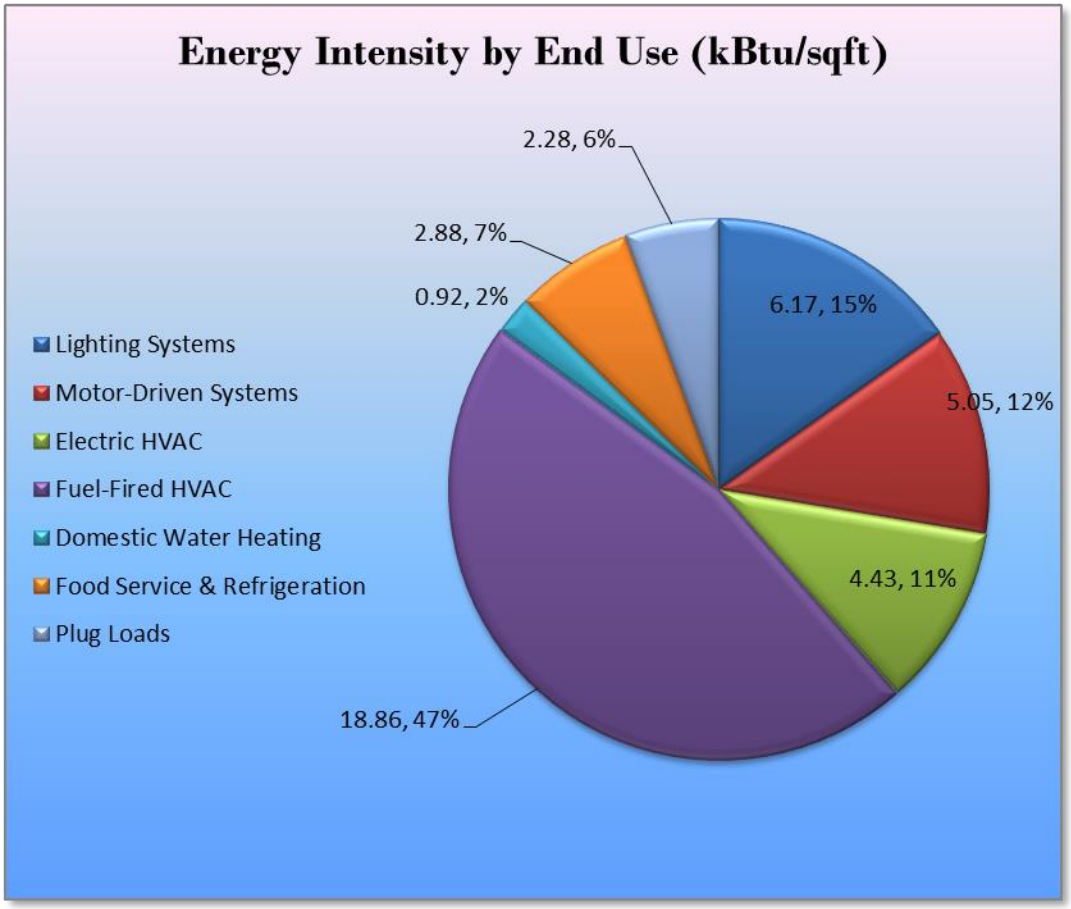
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training.

3.5 Energy End-use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 14 - Energy Balance (kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

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

4.1 Recommended ECMs

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

Figure 15 – 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		**81,740**	**24.0**	**0.0**	**$8,911.85**	**$63,982.73**	**$11,020.00**	**$52,962.73**	**5.9**	**82,312**
ECM 1	Install LED Fixtures	11,129	1.6	0.0	$1,213.33	$7,546.59	$1,700.00	$5,846.59	4.8	11,207
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	17,380	5.0	0.0	$1,894.90	$10,017.17	$1,185.00	$8,832.17	4.7	17,502
ECM 3	Retrofit Fixtures with LED Lamps	53,231	17.4	0.0	$5,803.62	$46,418.97	$8,135.00	$38,283.97	6.6	53,604
Lighting Control Measures		**9,258**	**2.6**	**0.0**	**$1,009.40**	**$24,744.00**	**$2,430.00**	**$22,314.00**	**22.1**	**9,323**
ECM 4	Install Occupancy Sensor Lighting Controls	8,030	2.3	0.0	$875.49	$17,844.00	$2,430.00	$15,414.00	17.6	8,086
Variable Frequency Drive (VFD) Measures		**17,977**	**4.8**	**0.0**	**$1,959.99**	**$12,668.60**	**$0.00**	**$12,668.60**	**6.5**	**18,103**
ECM 5	Install VFDs on Hot Water Pumps	17,977	4.8	0.0	$1,959.99	$12,668.60	$0.00	$12,668.60	6.5	18,103
Domestic Water Heating Upgrade		**0**	**0.0**	**6.5**	**$75.78**	**$4,427.89**	**$152.00**	**$4,275.89**	**56.4**	**764**
ECM 6	Install Low-Flow Domestic Hot Water Devices	0	0.0	2.2	$25.14	$35.85	$0.00	$35.85	1.4	253
TOTAL OF ALL RECOMMENDED MEASURES		**107,747.49**	**31.17**	**2.16**	**$ 11,772.46**	**$ 94,531.18**	**$ 13,450.00**	**$ 81,081.18**	**6.9**	**108,754**

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – 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		**81,740**	**24.0**	**0.0**	**$8,911.85**	**$63,982.73**	**$11,020.00**	**$52,962.73**	**5.9**	**82,312**
ECM 1	Install LED Fixtures	11,129	1.6	0.0	$1,213.33	$7,546.59	$1,700.00	$5,846.59	4.8	11,207
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	17,380	5.0	0.0	$1,894.90	$10,017.17	$1,185.00	$8,832.17	4.7	17,502
ECM 3	Retrofit Fixtures with LED Lamps	53,231	17.4	0.0	$5,803.62	$46,418.97	$8,135.00	$38,283.97	6.6	53,604

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	11,129	1.6	0.0	$1,213.33	$7,546.59	$1,700.00	$5,846.59	4.8	11,207

Measure Description

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

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of HID sources, including high pressure sodium.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

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	17,380	5.0	0.0	$1,894.90	$10,017.17	$1,185.00	$8,832.17	4.7	17,502
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T12 fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. 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 fluorescent tubes.

ECM 3: 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	53,231	17.4	0.0	$5,803.62	$46,418.97	$8,135.00	$38,283.97	6.6	53,604
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T8 linear tubes, incandescent and compact fluorescent 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 10 times longer than many incandescent lamps.

4.1.2 Lighting Control Measures

Figure 17 – 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		**9,258**	**2.6**	**0.0**	**$1,009.40**	**$24,744.00**	**$2,430.00**	**$22,314.00**	**22.1**	**9,323**
ECM 4	Install Occupancy Sensor Lighting Controls	8,030	2.3	0.0	$875.49	$17,844.00	$2,430.00	$15,414.00	17.6	8,086

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)
8,030	2.3	0.0	$875.49	$17,844.00	$2,430.00	$15,414.00	17.6	8,086

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in restrooms, storage rooms, and offices areas. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 18 below.

Figure 18 – 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		**17,977**	**4.8**	**0.0**	**$1,959.99**	**$12,668.60**	**$0.00**	**$12,668.60**	**6.5**	**18,103**
ECM 5	Install VFDs on Hot Water Pumps	17,977	4.8	0.0	$1,959.99	$12,668.60	$0.00	$12,668.60	6.5	18,103

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)
17,977	4.8	0.0	$1,959.99	$12,668.60	$0.00	$12,668.60	6.5	18,103

Measure Description

We recommend installing variable frequency drives (VFDs) to control the two 20 HP hot water pumps. This measure requires that a majority of the hot water coils be served by 2-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 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 19 below.

Figure 19 - Summary of Domestic Water Heating ECMs

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)
Domestic Water Heating Upgrade			**0**	**0.0**	**6.5**	**$75.78**	**$4,427.89**	**$152.00**	**$4,275.89**	**56.4**	**764**
ECM 6	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	2.2	$25.14	$35.85	$0.00	$35.85	1.4	253

ECM 6: 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	2.2	$25.14	$35.85	$0.00	$35.85	1.4	253

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 and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy. Pre-rinse spray valves (PRSVs)—often used in commercial and institutional kitchens—are designed to remove food waste from dishes prior to dishwashing. Replacing standard pre-rinse spray valves with low flow PRSVs will reduce hot water usage and save 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.

4.2 ECMs Evaluated But Not Recommended

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

Figure 20 – Summary of Measures Evaluated, But Not Recommended

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 Control Measures		**9,258**	**2.6**	**0.0**	**$1,009.40**	**$24,744.00**	**$2,430.00**	**$22,314.00**	**22.1**	**9,323**
Install High/Low Lighitng Controls	No	1,228	0.3	0.0	$133.91	$6,900.00	$0.00	$6,900.00	51.5	1,237
Domestic Water Heating Upgrade		**0**	**0.0**	**6.5**	**$75.78**	**$4,427.89**	**$152.00**	**$4,275.89**	**56.4**	**764**
Install High Efficiency Gas Water Heater	No	0	0.0	4.4	$50.64	$4,392.04	$152.00	$4,240.04	83.7	511
TOTAL OF ALL NON-RECOMMENDED MEASURES		**1,228.21**	**0.34**	**4.36**	**$ 184.55**	**$ 11,292.04**	**$ 152.00**	**$ 11,140.04**	**60.4**	**1,747**

* - 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).

Install High Efficiency Gas Water Heater

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	4.4	$50.64	$4,392.04	$152.00	$4,240.04	83.7	511

Measure Description

We typically recommend replacing existing tank water heaters with high efficiency tank water heaters when cost effective. Improvements in combustion efficiency and reductions in heat losses have improved the overall efficiency of storage water heaters. Energy savings results from using less gas to heat water, due to higher unit efficiency, and fewer run hours to maintain the tank water temperature.

Reasons for not Recommending

Although this water heater was evaluated for replacement the payback period for this investment is longer than the useful life of the equipment. We suggest that the water heater be replaced with a high efficiency equipment when it comes to the end of its useful life.

Install High/Low 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)
1,228	0.3	0.0	$133.91	$6,900.00	$0.00	$6,900.00	51.5	1,237

Measure Description

We evaluated installing occupancy sensors to provide dual level lighting control for lighting fixtures in hallways that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are stairwells, interior corridors, parking lots, and parking garages.

Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. The lighting systems are switched to full lighting levels whenever an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period of time. Energy savings results from only providing full lighting levels when it is required.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage needs to be provided to ensure that lights turn on in each area as an occupant approaches.

Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

Reasons for not Recommending

Although this measure might save some energy, the pay back on this investment is very high and hence not recommended.

5 ENERGY EFFICIENT PRACTICES

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

Reduce Air Leakage

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

Close Doors and Windows

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

Use Window Treatments/Coverings

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

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.

Practice Use of Thermostat Schedules and Temperature Resets

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

Perform Water Heater Maintenance

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

Plug Load Controls

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

Water Conservation

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

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 0 for any low-flow ECM recommendations.

6 On-Site Generation Measures

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

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

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

6.1 Photovoltaic

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

Atlantic Highlands Elementary School has a solar PV system setup on the rooftop. There are 156 panels and a system size of approximately 45kW with very little scope for expansion of the system size.

6.2 Combined Heat and Power

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

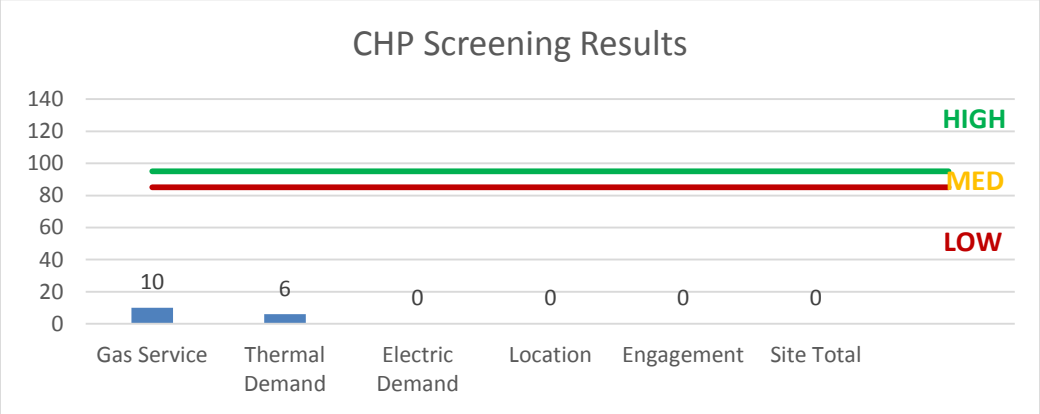
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

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

Low 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 facility 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 21 - Combined Heat and Power Screening



7 DEMAND RESPONSE

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

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

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

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

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

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

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

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and 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 22 for a list of the eligible programs identified for each recommended ECM.

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install
ECM 1	Install LED Fixtures	x		x
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x		x
ECM 3	Retrofit Fixtures with LED Lamps	x		x
ECM 4	Install Occupancy Sensor Lighting Controls	x		x
ECM 5	Install VFDs on Hot Water Pumps		x	x
ECM 6	Install Low-Flow Domestic Hot Water Devices			x

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 Direct Install

Overview

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

Incentives

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

How to Participate

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

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

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

8.3 SREC Registration Program

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

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

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

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

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

8.4 Energy Savings Improvement Program

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

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

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

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

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program 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.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

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

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Receiving	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.11	392	0.0	$50.31	$504.00	$75.00	8.53
Boiler room	5	Incandescent: 1 Lamp	Wall Switch	200	2,046	Relamp	No	5	LED Screw-In Lamps: 1 Lamp	Wall Switch	30	2,046	0.56	2,000	0.0	$256.37	$489.27	$25.00	1.81
Boiler room	3	Halogen Incandescent: 1 Lamp	Wall Switch	200	2,046	Relamp	No	3	LED Screw-In Lamps: 1 Lamp	Wall Switch	30	2,046	0.33	1,200	0.0	$153.82	$293.56	$15.00	1.81
Boiler room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.02	78	0.0	$9.95	$58.50	$10.00	4.87
Boiler room	2	Compact Fluorescent: 1 Lamp	Wall Switch	42	2,046	Relamp	No	2	LED Screw-In Lamps: 1 Lamp	Wall Switch	29	2,046	0.02	59	0.0	$7.60	$107.51	$0.00	14.14
Room 023	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,046	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.48	1,727	0.0	$221.38	$1,221.33	$235.00	4.46
Room 023 restroom	2	Linear Fluorescent - T12: 2' T12 (20W) - 2L	Wall Switch	50	2,046	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,432	0.05	179	0.0	$22.98	$330.00	$20.00	13.49
Room 23 closet	1	Compact Fluorescent: 2 Lamps	Occupancy Sensor	26	104	Relamp	No	1	LED Screw-In Lamps: 2 Lamps	Occupancy Sensor	18	104	0.01	1	0.0	$0.12	$107.51	$0.00	899.00
Room 024	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Occupancy Sensor	88	1,432	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	35	1,432	0.03	87	0.0	$11.19	$117.00	$10.00	9.56
Room 023 hall	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.04	155	0.0	$19.91	$117.00	$20.00	4.87
Girls' restroom	3	Linear Fluorescent - T12: 2' T12 (20W) - 2L	Wall Switch	50	2,046	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,432	0.07	269	0.0	$34.47	$437.00	$30.00	11.81
Boys' restroom	5	Linear Fluorescent - T12: 2' T12 (20W) - 2L	Wall Switch	50	2,046	Relamp & Reballast	Yes	5	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,432	0.12	448	0.0	$57.46	$805.00	$85.00	12.53
021 - Storage	1	Compact Fluorescent: 1 Lamp	Occupancy Sensor	13	520	Relamp	No	1	LED Screw-In Lamps: 1 Lamp	Occupancy Sensor	9	520	0.00	2	0.0	$0.30	$53.75	$0.00	179.80
Art room hall	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.04	155	0.0	$19.91	$117.00	$20.00	4.87
Art room	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,046	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.43	1,554	0.0	$199.24	$1,126.20	$215.00	4.57
Door 1 - stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.06	233	0.0	$29.86	$175.50	$30.00	4.87
018 - classroom	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.36	897	0.0	$114.96	$827.20	$165.00	5.76
018 - restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.03	82	0.0	$10.45	$75.20	$15.00	5.76
16 - classroom	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.36	897	0.0	$114.96	$827.20	$165.00	5.76
16 - restroom	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.36	897	0.0	$114.96	$827.20	$165.00	5.76
016,018 hallway	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.11	388	0.0	$49.77	$292.50	$50.00	4.87
015A - SAC	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,432	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.04	109	0.0	$13.93	$117.00	$20.00	6.96
015 - storage	3	Incandescent: 1 Lamp	Wall Switch	100	520	Relamp	Yes	3	LED Screw-In Lamps: 1 Lamp	Occupancy Sensor	15	364	0.18	161	0.0	$20.58	$409.56	$15.00	19.17
017 - CST suite	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.19	489	0.0	$62.71	$451.20	$90.00	5.76
017 - CST room 017A	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.19	489	0.0	$62.71	$451.20	$90.00	5.76

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
017B Conference room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.10	245	0.0	$31.35	$225.60	$45.00	5.76
001 - CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.39	978	0.0	$125.41	$902.40	$180.00	5.76
001 - RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,432	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.02	54	0.0	$6.97	$58.50	$10.00	6.96
001 hallway	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.09	311	0.0	$39.81	$234.00	$40.00	4.87
014 - Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	364	0.11	100	0.0	$12.79	$350.00	$40.00	24.24
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	520	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	520	0.01	8	0.0	$1.03	$31.90	$5.00	25.99
Hallway 003	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,432	0.38	1,374	0.0	$176.08	$2,619.00	$140.00	14.08
CR 003	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.39	978	0.0	$125.41	$902.40	$180.00	5.76
RR 003	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.03	82	0.0	$10.45	$75.20	$15.00	5.76
Speech 005	7	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	7	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.23	571	0.0	$73.16	$526.40	$105.00	5.76
10	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,432	Relamp	No	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.30	761	0.0	$97.54	$819.00	$140.00	6.96
010 closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	520	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	520	0.02	20	0.0	$2.53	$58.50	$10.00	19.17
Door 3	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,046	0.10	349	0.0	$44.79	$225.60	$45.00	4.03
6	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.04	155	0.0	$19.91	$117.00	$20.00	4.87
007 CR	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,432	Relamp	No	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.29	738	0.0	$94.59	$761.07	$160.00	6.35
007 closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	520	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	520	0.04	39	0.0	$5.06	$117.00	$20.00	19.17
007 RR	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.03	82	0.0	$10.45	$75.20	$15.00	5.76
008 CR	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,432	Relamp	No	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.29	738	0.0	$94.59	$761.07	$160.00	6.35
009 CR	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.10	245	0.0	$31.35	$225.60	$45.00	5.76
009 CR	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,432	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.19	489	0.0	$62.71	$526.50	$90.00	6.96
009 storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	520	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	364	0.08	75	0.0	$9.59	$266.40	$30.00	24.65
Cafeteria	49	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	49	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	1.59	3,995	0.0	$512.09	$3,684.80	$735.00	5.76
Cafeteria restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.03	82	0.0	$10.45	$75.20	$15.00	5.76
Kitchen	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,260	Relamp	No	11	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,260	0.36	789	0.0	$101.14	$827.20	$165.00	6.55
Kitchen	6	Compact Fluorescent: 2 Lamps	Wall Switch	26	1,260	Relamp	No	6	LED Screw-In Lamps: 2 Lamps	Wall Switch	18	1,260	0.03	68	0.0	$8.69	$645.04	$0.00	74.20

	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
Kitchen storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	520	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	364	0.04	37	0.0	$4.79	$191.20	$15.00	36.75
Electrical machine room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	52	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	52	0.02	2	0.0	$0.25	$58.50	$10.00	191.73
Stairwell (opposite to elevator)	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.11	388	0.0	$49.77	$292.50	$50.00	4.87
Closet	1	Incandescent: 1 Lamp	Wall Switch	75	520	Relamp	Yes	1	LED Screw-In Lamps: 1 Lamp	Occupancy Sensor	11	364	0.04	40	0.0	$5.15	$169.75	$5.00	32.02
Stairwell by cafeteria	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.11	388	0.0	$49.77	$292.50	$50.00	4.87
Cafeteria hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.04	155	0.0	$19.91	$117.00	$20.00	4.87
Lobby by door 4	4	Compact Fluorescent: 1 Lamp	Wall Switch	13	2,046	Relamp	No	4	LED Screw-In Lamps: 1 Lamp	Wall Switch	9	2,046	0.01	37	0.0	$4.71	$215.01	$0.00	45.70
Tech lab	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.66	2,355	0.0	$301.85	$1,944.00	$310.00	5.41
Media center	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.98	3,532	0.0	$452.78	$2,344.80	$430.00	4.23
Media center	24	Compact Fluorescent: 2 Lamps	Wall Switch	26	2,046	Relamp	No	24	LED Screw-In Lamps: 2 Lamps	Wall Switch	18	2,046	0.12	440	0.0	$56.46	$2,580.14	$0.00	45.70
Media center restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.03	82	0.0	$10.45	$75.20	$15.00	5.76
Media center copy room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.08	294	0.0	$37.73	$266.40	$50.00	5.74
MC hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.04	155	0.0	$19.91	$117.00	$20.00	4.87
CR 110 - hallway	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,432	0.44	1,570	0.0	$201.24	$2,536.00	$160.00	11.81
CR 109	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,046	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.38	1,382	0.0	$177.11	$1,031.07	$195.00	4.72
CR 110	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,046	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.38	1,382	0.0	$177.11	$1,031.07	$195.00	4.72
CR 108	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,046	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.38	1,382	0.0	$177.11	$1,031.07	$195.00	4.72
CR 112	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,046	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.38	1,382	0.0	$177.11	$1,031.07	$195.00	4.72
Girls' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.08	294	0.0	$37.73	$445.50	$65.00	10.08
Boys' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.08	294	0.0	$37.73	$445.50	$65.00	10.08
Teachers room 107	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.11	392	0.0	$50.31	$504.00	$75.00	8.53
Teachers' room closet	1	Compact Fluorescent: 1 Lamp	Wall Switch	42	520	Relamp	Yes	1	LED Screw-In Lamps: 1 Lamp	Occupancy Sensor	29	364	0.01	13	0.0	$1.64	$169.75	$0.00	103.38
Teachers' room restroom	1	Incandescent: 2 Lamps	Occupancy Sensor	120	1,432	Relamp	No	1	LED Screw-In Lamps: 2 Lamps	Occupancy Sensor	18	1,432	0.07	168	0.0	$21.54	$107.51	$10.00	4.53
Room 114 - gym office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.12	442	0.0	$56.60	$341.60	$65.00	4.89
Room 114 - hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,432	0.16	589	0.0	$75.46	$951.00	$60.00	11.81

	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
Faculty restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,432	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.02	54	0.0	$6.97	$58.50	$10.00	6.96
Stairwell by gym	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.02	78	0.0	$9.95	$58.50	$10.00	4.87
116 hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,432	0.19	687	0.0	$88.04	$1,609.50	$70.00	17.49
116 - CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,046	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.58	2,072	0.0	$265.66	$1,411.60	$275.00	4.28
117 - CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,046	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.58	2,072	0.0	$265.66	$1,411.60	$275.00	4.28
118 - CR	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,046	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,432	0.58	2,072	0.0	$265.66	$1,411.60	$275.00	4.28
2 Stage rooms	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,260	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	882	0.05	121	0.0	$15.49	$349.00	$60.00	18.66
Nurse's office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,046	0.06	233	0.0	$29.86	$150.40	$30.00	4.03
Nurse's office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,046	0.10	349	0.0	$44.79	$225.60	$45.00	4.03
Nurse's office restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.03	82	0.0	$10.45	$75.20	$15.00	5.76
Board office	5	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	35	1,432	0.50	1,782	0.0	$228.47	$1,079.17	$135.00	4.13
Board office 105 A tech lab	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.08	294	0.0	$37.73	$266.40	$50.00	5.74
Business Administration	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.08	294	0.0	$37.73	$266.40	$50.00	5.74
Outside BA office	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,046	0.03	116	0.0	$14.93	$75.20	$15.00	4.03
Outside BA office restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,432	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.02	54	0.0	$6.97	$58.50	$10.00	6.96
Superintendent office	3	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	35	1,432	0.30	1,069	0.0	$137.08	$755.50	$95.00	4.82
Main offices	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	35	1,432	0.40	1,426	0.0	$182.78	$917.33	$115.00	4.39
Principals office	3	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	35	1,432	0.30	1,069	0.0	$137.08	$755.50	$95.00	4.82
Gym	32	Linear Fluorescent - T5: 2' T5 (14W) - 2L	Wall Switch	34	2,046	Relamp	Yes	32	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	35	1,432	0.20	715	0.0	$91.69	$8,582.40	$1,440.00	77.90
Closet opp gym	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,046	Relamp	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	2,046	0.01	32	0.0	$4.07	$31.90	$5.00	6.61
2nd floor hall - opp to elevator	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.04	155	0.0	$19.91	$117.00	$20.00	4.87
Room 215	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.65	1,631	0.0	$209.02	$1,504.00	$300.00	5.76
215A prep	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,046	0.03	116	0.0	$14.93	$75.20	$15.00	4.03
214 - CR	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.32	815	0.0	$104.51	$752.00	$150.00	5.76
2nd floor hall	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,432	0.46	1,668	0.0	$213.81	$2,694.50	$170.00	11.81

	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
206	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	35	1,432	0.40	1,426	0.0	$182.78	$917.33	$115.00	4.39
206	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,046	0.13	466	0.0	$59.72	$300.80	$60.00	4.03
207	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	35	1,432	0.40	1,426	0.0	$182.78	$917.33	$115.00	4.39
207	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,046	0.13	466	0.0	$59.72	$300.80	$60.00	4.03
205	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	35	1,432	0.40	1,426	0.0	$182.78	$917.33	$115.00	4.39
205	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,046	0.13	466	0.0	$59.72	$300.80	$60.00	4.03
Girls' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.08	294	0.0	$37.73	$445.50	$65.00	10.08
Boys' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,432	0.08	294	0.0	$37.73	$445.50	$65.00	10.08
Resource Center 204B	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.25	883	0.0	$113.20	$721.20	$125.00	5.27
CR 209	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Occupancy Sensor	176	1,432	Relamp & Reballast	No	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	35	1,432	0.37	929	0.0	$119.08	$647.33	$80.00	4.76
CR 209	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.06	163	0.0	$20.90	$150.40	$30.00	5.76
CR 209	2	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Occupancy Sensor	127	1,432	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	35	1,432	0.12	303	0.0	$38.85	$263.00	$30.00	6.00
Closet - roof hatch	1	Incandescent: 1 Lamp	Wall Switch	75	520	Relamp	No	1	LED Screw-In Lamps: 1 Lamp	Wall Switch	11	520	0.04	38	0.0	$4.89	$53.75	$5.00	9.98
CR 204 A	2	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	47	1,432	0.19	673	0.0	$86.32	$593.67	$75.00	6.01
CR 204 A	2	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Wall Switch	127	2,046	Relamp & Reballast	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	35	2,046	0.12	433	0.0	$55.50	$263.00	$30.00	4.20
Teachers room 211	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.25	883	0.0	$113.20	$721.20	$125.00	5.27
Teachers' lounge restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,432	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.03	82	0.0	$10.45	$75.20	$15.00	5.76
CR 203	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	47	1,432	0.38	1,347	0.0	$172.64	$917.33	$115.00	4.65
CR 203	4	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Wall Switch	127	2,046	Relamp & Reballast	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	35	2,046	0.24	866	0.0	$110.99	$526.00	$60.00	4.20
CR 202	4	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	47	1,432	0.38	1,347	0.0	$172.64	$917.33	$115.00	4.65
CR 202	4	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Wall Switch	127	2,046	Relamp & Reballast	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	35	2,046	0.24	866	0.0	$110.99	$526.00	$60.00	4.20
CR 201	3	Linear Fluorescent - T12: 4' T12 (40W) - 4L	Wall Switch	176	2,046	Relamp & Reballast	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	47	1,432	0.28	1,010	0.0	$129.48	$755.50	$95.00	5.10
CR 201	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,046	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,046	0.04	132	0.0	$16.89	$95.13	$20.00	4.45
CR 200	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,046	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,432	0.12	442	0.0	$56.60	$495.60	$80.00	7.34
CR 200	1	Linear Fluorescent - T12: 4' T12 (40W) - 3L	Wall Switch	127	2,046	Relamp & Reballast	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	35	2,046	0.06	216	0.0	$27.75	$131.50	$15.00	4.20

	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
Back Stariwell	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,046	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,046	0.13	466	0.0	$59.72	$351.00	$60.00	4.87
Wall packs	14	High-Pressure Sodium: (1) 150W Lamp	Wall Switch	188	4,380	Fixture Replacement	No	14	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	45	4,380	1.31	10,084	0.0	$1,292.65	$5,469.48	$1,400.00	3.15
Decorative entrance fixture	6	High-Pressure Sodium: (1) 70W Lamp	Wall Switch	95	2,046	Fixture Replacement	No	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Decorative Fixture	Wall Switch	21	2,046	0.29	1,045	0.0	$133.92	$2,077.11	$300.00	13.27

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Boiler - all school	1	Heating Hot Water Pump	20.0	93.0%	No	1,288	No	93.0%	Yes	1	2.42	8,989	0.0	$1,152.22	$6,334.30	$0.00	5.50
Boiler room	Boiler - all school	1	Heating Hot Water Pump	20.0	93.0%	No	1,288	No	93.0%	Yes	1	2.42	8,989	0.0	$1,152.22	$6,334.30	$0.00	5.50
Roof	Media center - PAC	1	Supply Fan	3.0	89.5%	No	1,288	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Main office	1	Supply Fan	3.0	89.5%	Yes	1,288	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	4	Supply Fan	3.0	89.5%	No	1,288	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Tech lab	2	Supply Fan	3.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gym	2	Supply Fan	3.0	89.5%	No	2,745	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Offices	VAV boxes with reheat	5	Supply Fan	0.3	60.0%	Yes	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Exhaust fans	14	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Unit vents	34	Supply Fan	0.3	60.0%	No	2,745	No	60.0%	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	Media center - unit 3	1	Packaged AC	7.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Main Office - unit 5	1	Packaged AC	8.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	1	Packaged AC	20.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Tech lab	1	Packaged AC	7.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Tech closet	Tech closet	1	Split-System AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gym	2	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Teachers' lounge	Teachers' lounge	1	Split-System AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Grounds	Child Study offices	1	Split-System AC	3.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Teachers' room 107	Teachers' room 107	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Nurse's office	Nurse's office	1	Window AC	0.75		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	All school	3	Condensing Hot Water Boiler	1,260.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Child Study team	1	Furnace	72.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Media center - unit 3	1	Furnace	192.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Main Office - unit 5	1	Furnace	192.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	1	Furnace	208.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Tech lab	1	Furnace	192.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gym	2	Furnace	192.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Kitchen and restrooms	1	Storage Tank Water Heater (> 50 Gal)	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	93.00%	Et	0.00	0	4.4	$50.64	$4,392.04	$152.00	83.73
Boiler room	Kitchen and restrooms	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
Art room, CR 001, 003	5	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	2.2	$25.14	$35.85	$0.00	1.43

Walk-In Cooler/Freezer Inventory & Recommendations

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

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Refrigerator Chest	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Freezer Chest	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	4	Insulated Food Holding Cabinet (1/2 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Gas Convection Oven (Half Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Single Tank Conveyor (Low Temp)	Electric	N/A	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Atlantic Highlands BOE	76	Computer	145.0	Yes
Atlantic Highlands BOE	35	Laptop	75.0	Yes
Atlantic Highlands BOE	10	Printer - Small	20.0	Yes
Atlantic Highlands BOE	10	Printer - Medium	60.0	Yes
Atlantic Highlands BOE	3	Printer - Big	200.0	Yes
Atlantic Highlands BOE	2	Paper shredder	150.0	Yes
Atlantic Highlands BOE	31	Projector	200.0	Yes
Atlantic Highlands BOE	7	Microwave	900.0	Yes
Atlantic Highlands BOE	2	Refrigerator - small	20.0	No
Atlantic Highlands BOE	2	Refrigerator - medium	60.0	Yes
Atlantic Highlands BOE	2	Refrigerator - large	218.0	Yes
Atlantic Highlands BOE	3	Coffee machine	400.0	Yes
Atlantic Highlands BOE	2	Toaster oven	1,200.0	No
Atlantic Highlands BOE	1	Television LCD	100.0	Yes
Atlantic Highlands BOE	2	Water dispenser	500.0	Yes
Atlantic Highlands BOE	44	Wall fan	60.0	Yes
Atlantic Highlands BOE	30	Smart Board	5.0	Yes

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Atlantic Highlands Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 67,557
Built: 1920

For Year Ending: April 30, 2017
Date Generated: February 09, 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
Atlantic Highlands Elementary School 140 First Avenue Atlantic Highlands, New Jersey 07716	Atlantic Highlands Elementary School 140 1st Avenue Atlantic Highlands, NJ 07716 732-291-2020	Janet Sherlock 140 1st Avenue Atlantic Highlands, NJ 07716 732-291-2020 jsherlock@ahes.k12.nj.us

Property ID: 6204176

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
40.3 kBtu/ft²

Source EUI
84.3 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	1,363,406 (50%)
Electric - Solar (kBtu)	195,360 (7%)
Electric - Grid (kBtu)	1,163,370 (43%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	57.7
National Median Source EUI (kBtu/ft²)	120.8
% Diff from National Median Source EUI	-30%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	223

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)