Local Government Energy Audit:
Energy Audit Report

Buzz Aldrin Middle School

Montclair Board of Education

173 Bellevue Avenue
Montclair, New Jersey 07043

January 3, 2019

Final Report by:

TRC Energy Services

Disclaimer

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

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

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

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

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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 Buzz Aldrin Middle School.

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

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey local governments and school districts in controlling their energy costs and help protect our environment by encouraging more efficient usage of energy resources statewide.

1.1 Facility Summary

Buzz Aldrin Middle School is a 58,128 square foot facility comprised of various space types within a single building. The school building is three floors. It includes classrooms, offices, gyms, locker rooms, a cafeteria, and an auditorium.

Interior lighting at Buzz Aldrin Middle School consists mostly of 1, 2, and 4-lamp T8 linear fluorescent fixtures. There are also many incandescent bulbs used in recessed cans, wall sconces, and ceiling fixtures in the auditorium. The ceiling fixtures in the front foyer and the post lighting by the main entrance also use incandescent bulbs. The exterior perimeter of the building is lit by High Intensity Discharge (HID) spotlight fixtures.

Heating is supplied by the school's two main boilers. They are Weil-McLain low-pressure steam boilers, each with a rated output of 6,100 MBh (@5 psi). Only about 25% of the building's total space is air conditioned. There are approximately 43 window air conditioning (AC) units, which are used to cool some classrooms and 11 packaged terminal air conditioning (PTAC) serving some administrative offices. A thorough description of the facility and our observations are provided in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated eight potential energy efficient upgrades. We recommend seven ECMs for implementation. The seven ECMs together represent an opportunity for Buzz Aldrin Middle School to reduce annual energy costs by roughly $39,607 and annual greenhouse gas emissions by 242,568 lbs CO_2e. We estimate that if all recommended measures are implemented, the project would pay for itself in energy savings alone in about 3.3 years. The breakdown of existing utility costs is shown in Figure 1. The potential energy savings, following project implementation, is shown in Figure 2. Together these measures represent an opportunity to reduce Buzz Aldrin Middle School's annual energy usage by about 11% overall.

We evaluated the cost and savings for replacement of the school's two main boilers. However, we chose not to include that measure among our recommended ECMs. We estimate that replacement of the main boilers with higher efficiency units could save the school an additional $2,009 per year, but energy savings alone is not sufficient to justify the high cost of that measure. Adding replacement of the boilers to the list of recommended measures would increase overall energy savings to about 15%, but the combined payback period would increase to 8.2 years. (See Figure 3 below).

Figure 1 – Previous 12 Month Utility Costs

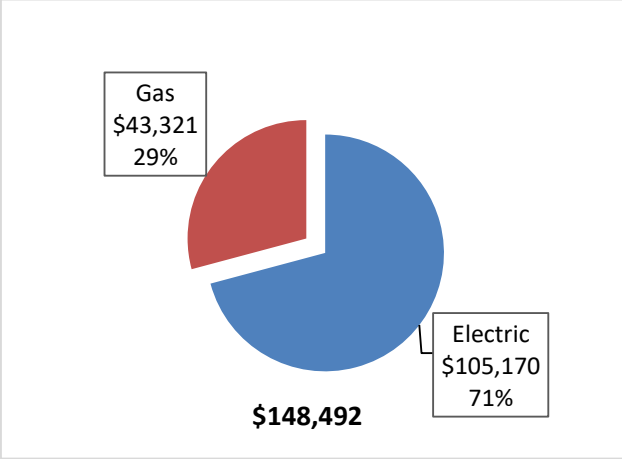
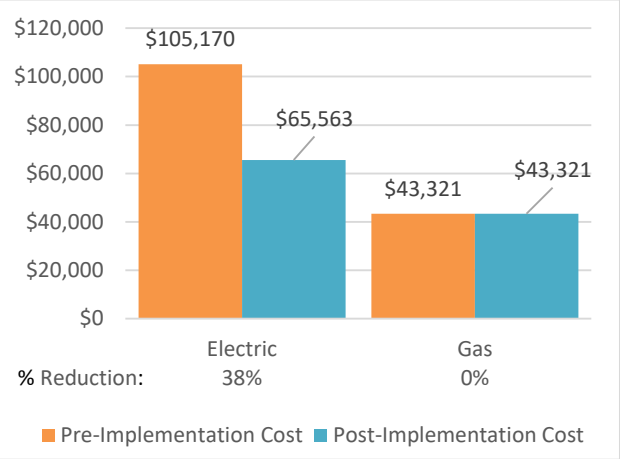


Figure 2 – Potential Post-Implementation Costs



A detailed description of Buzz Aldrin Middle School's existing energy use can be found in Section 3.

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

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**207,198**	**51.0**	**0.0**	**$34,068.52**	**$120,707.89**	**$22,415.00**	**$98,292.89**	**2.9**	**208,647**
ECM 1	Install LED Fixtures	Yes	15,380	3.3	0.0	$2,528.88	$7,211.34	$1,200.00	$6,011.34	2.4	15,488
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	417	0.1	0.0	$68.50	$392.00	$20.00	$372.00	5.4	420
ECM 3	Retrofit Fixtures with LED Lamps	Yes	190,978	47.5	0.0	$31,401.55	$112,244.11	$21,195.00	$91,049.11	2.9	192,313
ECM 4	Install LED Exit Signs	Yes	423	0.1	0.0	$69.58	$860.44	$0.00	$860.44	12.4	426
Lighting Control Measures			**32,074**	**8.6**	**0.0**	**$5,273.74**	**$35,926.00**	**$4,245.00**	**$31,681.00**	**6.0**	**32,298**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	30,452	8.5	0.0	$5,007.14	$32,326.00	$4,245.00	$28,081.00	5.6	30,665
ECM 6	Install High/Low Lighitng Controls	Yes	1,621	0.1	0.0	$266.60	$3,600.00	$0.00	$3,600.00	13.5	1,633
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**234.4**	**$2,009.23**	**$209,050.93**	**$0.00**	**$209,050.93**	**104.0**	**27,442**
	Install High Efficiency Steam Boilers	No	0	0.0	234.4	$2,009.23	$209,050.93	$0.00	$209,050.93	104.0	27,442
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$265.03**	**$460.00**	**$0.00**	**$460.00**	**1.7**	**1,623**
ECM 7	Vending Machine Control	Yes	1,612	0.0	0.0	$265.03	$460.00	$0.00	$460.00	1.7	1,623
TOTAL FOR PROPOSED MEASURES			**240,884**	**59.7**	**0.0**	**$39,607.29**	**$157,093.89**	**$26,660.00**	**$130,433.89**	**3.3**	**242,568**
TOTAL FOR ALL MEASURES			**240,884**	**59.7**	**234.4**	**$41,616.52**	**$366,144.82**	**$26,660.00**	**$339,484.82**	**8.2**	**270,010**

* - 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.

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

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

Energy Efficient Practices

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

- Close Doors and Windows
- Perform Proper Boiler Maintenance
- 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 Buzz Aldrin Middle School. Based on the configuration of the site and its loads there appears to be a high potential for cost-effective installation of a rooftop solar photovoltaic (PV) array at this site.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	94	kW DC STC
Electric Generation	111,989	kWh/yr
Displaced Cost	$9,740	/yr
Installed Cost	$268,800	

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

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

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

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

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

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Emidio D'Andrea	Business Administrator/ Board Secretary	edandrea@montclair.k12.nj.us	(973) 509-4050
John Eschmann	Director of Facilities	jeschmann@montclair.k12.nj.us	(973) 509-4044
Designated Representative			
Matthew Wolchko	Project Architect	mwolchko@planetpsa.com	(973) 586-2400
TRC Energy Services			
Tom Page	Auditor	tpage@TRCsolutions.com	(732) 855-0033

2.2 General Site Information

On November 16, 2016, TRC performed an energy audit at Buzz Aldrin Middle School located in Montclair, New Jersey. TRC's team met with (former Director of Facilities) Leonard Saponara to review the facility operations and help focus our investigation on specific energy-using systems.

Buzz Aldrin Middle School is a 58,128 square foot facility comprised of various space types within a single building. The school building is three floors. It includes classrooms, offices, gyms, locker rooms, a cafeteria, and an auditorium. It is a STEM magnet school for grades 6, 7, and 8.

The original building was constructed in 1909. Additions were constructed in 1920, 1924, 1930, and 1972. A greenhouse was added in 2000. It was originally known as the Mount Hebron School. In 2016, it was renamed in honor of Apollo 11 Astronaut Buzz Aldrin, a school alumnus.

2.3 Building Occupancy

The school building is typically open Monday to Friday, 7:00 AM to 3:30 PM, from September through June. The typical schedule is presented in the table below. During a typical day, the facility is occupied by approximately 600 students and staff.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Buzz Aldrin Middle School	Weekday	7:00 AM - 3:30 PM
Buzz Aldrin Middle School	Weekend	CLOSED

2.4 Building Envelope

The building is constructed of concrete block and structural steel with a brick facade. Around the perimeter, the building has a sloped roof with slate shingles. The center of the building has flat roof covered by a rubber membrane. The building has mostly double-paned, operable windows, which are in good condition. Doors are mostly steel with double-paned glass. All door and window seals appeared tight. No sign of excessive air infiltration was noted.

Image 1: Buzz Aldrin Middle School - Front Exterior

2.5 On-Site Generation

Buzz Aldrin Middle School does not have any on-site electric generation.

2.6 Energy-Using Systems

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

Lighting System

Interior lighting at Buzz Aldrin Middle School consists mostly of 1, 2, and 4-lamp T8 linear fluorescent fixtures. There are also many incandescent bulbs used in recessed cans, wall sconces, and ceiling fixtures in the auditorium. The ceiling fixtures in the front foyer and the post lighting by the main entrance also use incandescent bulbs.

The exterior perimeter of the building is lit by High Intensity Discharge (HID) spotlight fixtures.

Image 2: Lighting Fixtures at Buzz Aldrin Middle School

The exterior lighting is controlled by timers or photocells. Interior lighting is controlled by manual switches.

Steam Heating System

Heating is supplied by the school's two main boilers. They are Weil-McLain gas-fired low-pressure steam boilers, each with a rated output of 6,100 MBh. Steam is supplied to radiators throughout the building at 5 psi. The boilers are 26 years old. They are estimated to be about 80% efficient.

The ASHRAE rated useful lifetime for this type of equipment is 25 years. Though the boilers are at the end of their rated useful life, they are not in bad condition. They are not in critical need of replacement at this time. Replacing them with a high efficiency steam boiler (~85% efficient) is a significant capital expense which would be cost effective on the basis of energy savings alone.

Image 3: HVAC at Buzz Aldrin Middle School

Air Conditioning (AC)

Only about 25% of the building's total space is air conditioned. Cooling is supplied to classrooms by approximately 43 window AC units. The main office and nurse's office are cooled by a total of 11 packaged terminal air conditioning (PTAC) units.

Some of the window AC units are old and in need of repair or replacement, but most were found in good condition. The classrooms are generally not used through the summer months, so replacement of these units with higher efficiency models cannot be justified on the basis of energy savings alone.

Domestic Hot Water Heating System

The domestic hot water is provided by a 75-gallon Bradford-White gas-fired water heater, which is located in the boiler room. It is a fairly efficient model and in good condition.

Image 4: Domestic Hot Water at Buzz Aldrin Middle School

Refrigeration

TRC counted six refrigerators at the school. There are two large Traulsen commercial refrigerators in the kitchen and one glass door refrigerator in the cafeteria for beverages. The rest are standard small to medium sized units used by school staff.

Image 5: Refrigeration Equipment at Buzz Aldrin Middle School

Building Plug Load

Plug-Load equipment at the school appeared to be fairly typical for a building of this size and type. The school has approximately 187 desktop computers and monitors, about a dozen small printers, four large copy machines, six large flat screen TVs, and about six computer servers. There are also many microwaves, toaster ovens, coffee makers, and other devices used by school staff. Also found were one clothes washer, one dryer, and three electric stoves.

The school has just two vending machines (one beverage machine and one snack machine) located in the teacher's room.




2.7 Water-Using Systems

There are approximately 15 restrooms at this facility. In our sampling of restrooms fixtures, all faucets appeared to meet current guidelines for "low-flow" water conserving devices for public restrooms. All toilets and urinals also appeared to be low-flow devices. For more on current water conservation standards, see Section 5.

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

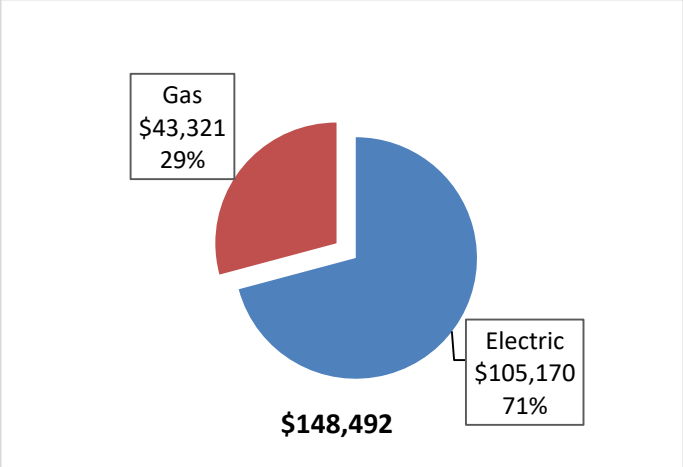
The following energy consumption and cost data is based on a recent 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Buzz Aldrin Middle School		
Fuel	**Usage**	**Cost**
Electricity	639,624 kWh	$105,170
Natural Gas	50,534 Therms	$43,321
Total		**$148,492**

The current annual energy cost for this facility is $148,492 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric rate over a recent 12-month period was found to be $0.164/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly electricity consumption and peak demand are shown in the chart below.

Electric usage appears to be fairly constant throughout the year, with a slight decline in the summer months due to lack of occupancy.

Figure 9 - Electric Usage & Demand

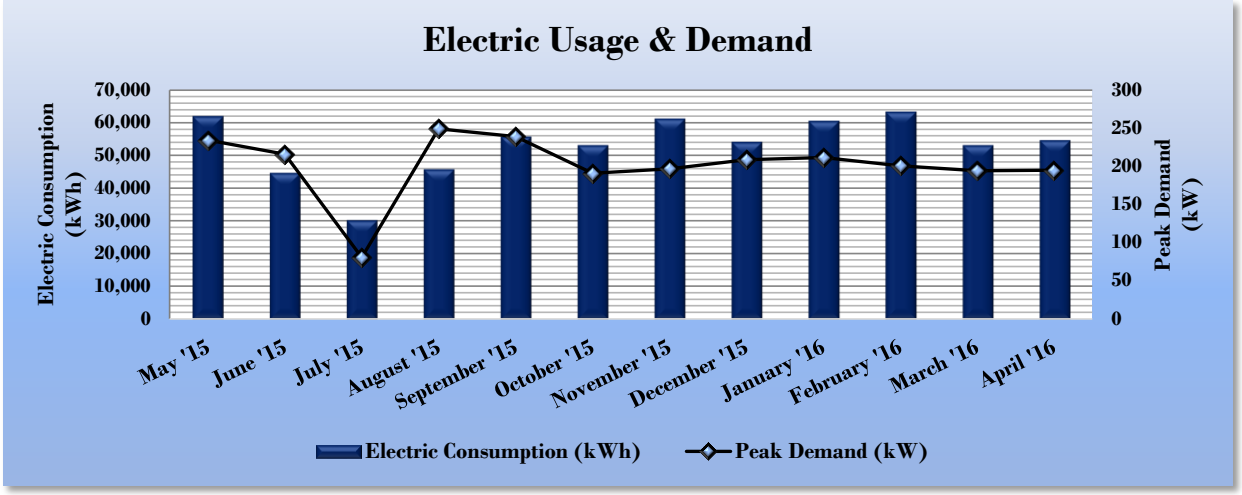


Figure 10 - Electric Usage & Demand

Electric Billing Data for Buzz Aldrin Middle School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/15/15	31	61,910	234	$4,858	$12,000
7/15/15	30	44,623	216	$4,154	$10,064
8/13/15	29	30,171	81	$2,089	$6,889
9/14/15	32	45,701	249	$4,422	$10,215
10/13/15	29	55,673	239	$2,445	$8,909
11/11/15	29	53,095	191	$2,179	$8,441
12/14/15	33	61,175	197	$2,169	$9,066
1/14/16	31	54,088	209	$1,825	$8,037
2/12/16	29	60,533	212	$1,807	$8,083
3/15/16	32	63,259	201	$1,722	$8,243
4/14/16	30	53,058	194	$1,603	$7,453
5/13/16	29	54,586	195	$1,621	$7,481
Totals	**364**	**637,872**	**249.1**	**$30,893**	**$104,882**
Annual	**365**	**639,624**	**249.1**	**$30,978**	**$105,170**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average natural gas rate for a recent 12-month period was found to be $0.857/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. Gas usage appears to be fairly typical for a facility of this size and type, which is heated by natural gas with little or no other significant gas usage during non-heating months.

Figure 11 - Natural Gas Usage

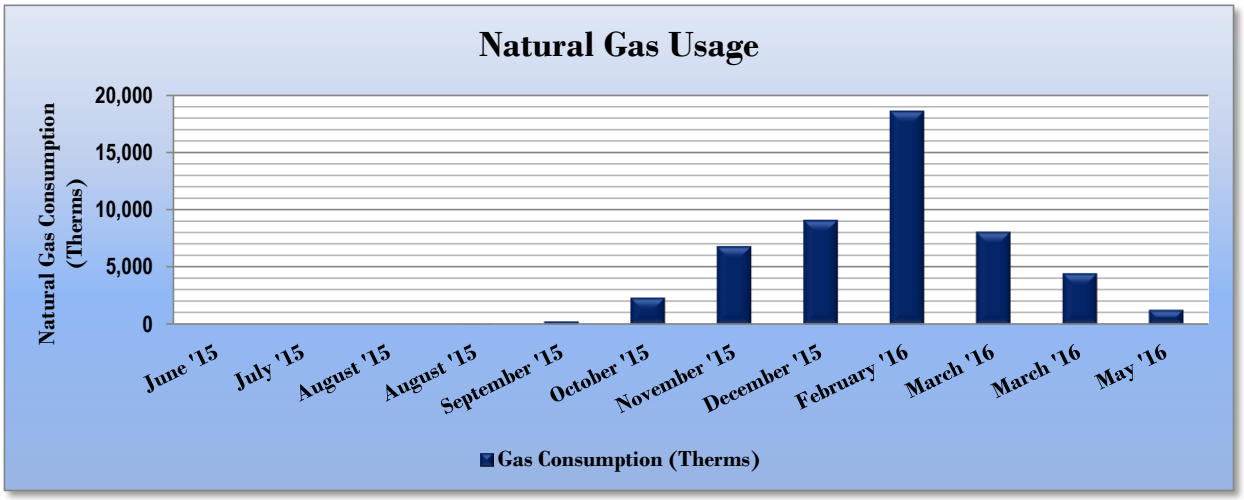


Figure 12 - Natural Gas Usage

Gas Billing Data for Buzz Aldrin Middle School				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
6/16/15	32	0	$103	No
7/20/15	34	0	$103	No
8/17/15	28	0	$103	No
9/15/15	29	22	$117	No
10/14/15	29	248	$241	No
11/12/15	29	2,325	$4,086	Yes
12/15/15	33	6,806	$6,808	No
1/15/16	31	9,120	$8,214	No
2/18/16	34	18,620	$13,495	Yes
3/17/16	28	8,083	$7,102	No
4/15/16	29	4,458	$2,513	No
5/17/16	32	1,268	$793	No
Totals	**368**	**50,949**	**$43,677**	2
Annual	**365**	**50,534**	**$43,321**	

3.4 Benchmarking

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

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

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Buzz Aldrin Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	209.2	141.4
Site Energy Use Intensity (kBtu/ft^2)	124.5	58.2

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

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

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Buzz Aldrin Middle School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	164.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	110.3	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 was estimated to have a current ENERGY STAR® score of 38, which means that it is slightly less efficient than the median value for buildings of its size, age, and type.

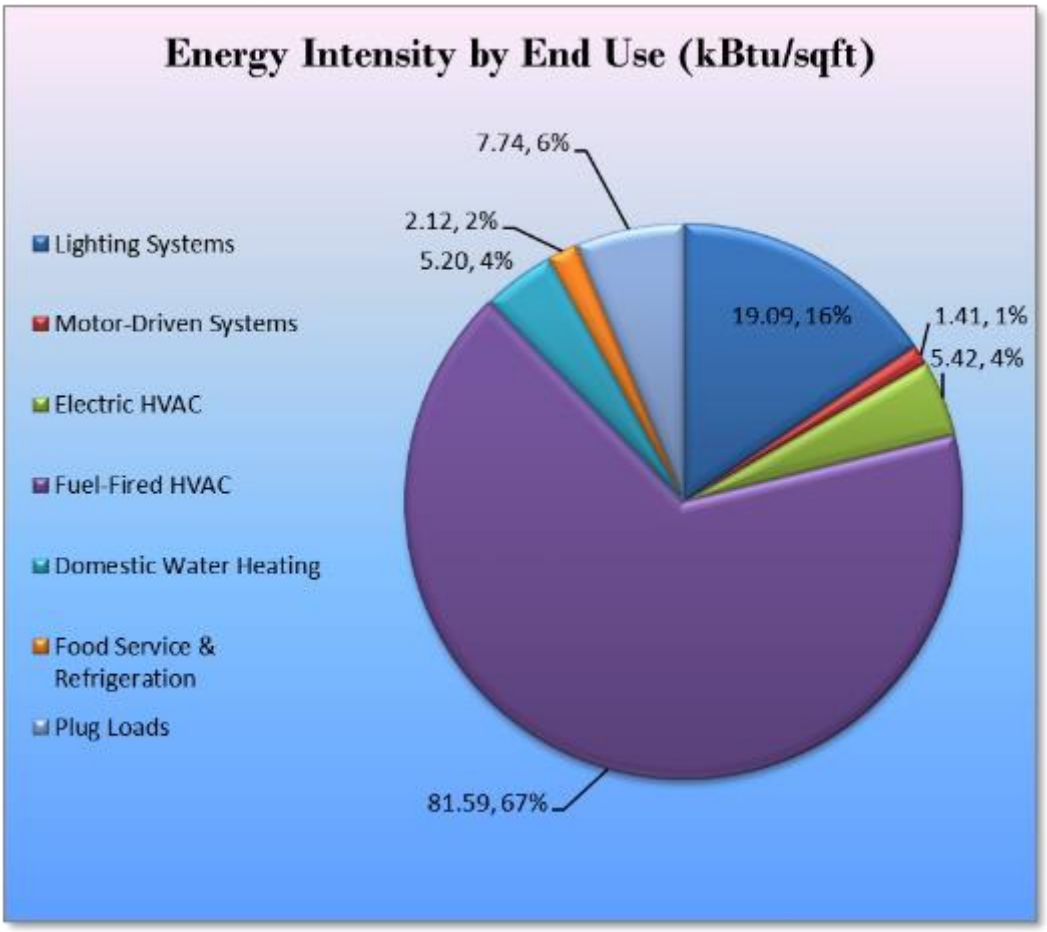
A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance. For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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

3.5 Energy End-Use Breakdown

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

Figure 15 - Energy Balance (kBtu/ft² and %)



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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 16 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**207,198**	**51.0**	**0.0**	**$34,068.52**	**$120,707.89**	**$22,415.00**	**$98,292.89**	**2.9**	**208,647**
ECM 1	Install LED Fixtures	15,380	3.3	0.0	$2,528.88	$7,211.34	$1,200.00	$6,011.34	2.4	15,488
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	417	0.1	0.0	$68.50	$392.00	$20.00	$372.00	5.4	420
ECM 3	Retrofit Fixtures with LED Lamps	190,978	47.5	0.0	$31,401.55	$112,244.11	$21,195.00	$91,049.11	2.9	192,313
ECM 4	Install LED Exit Signs	423	0.1	0.0	$69.58	$860.44	$0.00	$860.44	12.4	426
Lighting Control Measures		**32,074**	**8.6**	**0.0**	**$5,273.74**	**$35,926.00**	**$4,245.00**	**$31,681.00**	**6.0**	**32,298**
ECM 5	Install Occupancy Sensor Lighting Controls	30,452	8.5	0.0	$5,007.14	$32,326.00	$4,245.00	$28,081.00	5.6	30,665
ECM 6	Install High/Low Lighitng Controls	1,621	0.1	0.0	$266.60	$3,600.00	$0.00	$3,600.00	13.5	1,633
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$265.03**	**$460.00**	**$0.00**	**$460.00**	**1.7**	**1,623**
ECM 7	Vending Machine Control	1,612	0.0	0.0	$265.03	$460.00	$0.00	$460.00	1.7	1,623
TOTALS		**240,884**	**59.7**	**0.0**	**$39,607.29**	**$157,093.89**	**$26,660.00**	**$130,433.89**	**3.3**	**242,568**

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

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

4.1.1 Lighting Upgrades

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

Figure 17 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**207,198**	**51.0**	**0.0**	**$34,068.52**	**$120,707.89**	**$22,415.00**	**$98,292.89**	**2.9**	**208,647**
ECM 1	Install LED Fixtures	15,380	3.3	0.0	$2,528.88	$7,211.34	$1,200.00	$6,011.34	2.4	15,488
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	417	0.1	0.0	$68.50	$392.00	$20.00	$372.00	5.4	420
ECM 3	Retrofit Fixtures with LED Lamps	190,978	47.5	0.0	$31,401.55	$112,244.11	$21,195.00	$91,049.11	2.9	192,313
ECM 4	Install LED Exit Signs	423	0.1	0.0	$69.58	$860.44	$0.00	$860.44	12.4	426

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	8,701	2.4	0.0	$1,430.68	$4,341.06	$0.00	$4,341.06	3.0	8,762
Exterior	6,679	0.9	0.0	$1,098.20	$2,870.28	$1,200.00	$1,670.28	1.5	6,726

Measure Description

We recommend replacing existing fixtures with HID bulbs lamps to new high-performance LED light fixtures. Also included in this measure are upgrades to recessed can ceiling lighting. We recommend that they be upgraded with retrofit kits. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

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

ECM 2: Retrofit 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	417	0.1	0.0	$68.50	$392.00	$20.00	$372.00	5.4	420
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.

Some linear fluorescent fixtures can be upgraded to LEDs without changing the existing ballast, but for older T12 fixtures we recommend that the ballast be changed too when the fixture is upgraded.

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

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	187,125	47.0	0.0	$30,767.97	$111,964.30	$21,195.00	$90,769.30	3.0	188,433
Exterior	3,853	0.5	0.0	$633.58	$279.81	$0.00	$279.81	0.4	3,880

Measure Description

We recommend retrofitting most existing fixtures with linear fluorescent, compact fluorescent, or incandescent lamps 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 fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 4: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	423	0.1	0.0	$69.58	$860.44	$0.00	$860.44	12.4	426
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend replacing all incandescent or compact fluorescent exit signs with LED exit signs. Most of the school's exit signs already use LEDs, but a few still use older, less efficient incandescent or compact fluorescent bulbs.

LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 18 below.

Figure 18 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**32,074**	**8.6**	**0.0**	**$5,273.74**	**$35,926.00**	**$4,245.00**	**$31,681.00**	**6.0**	**32,298**
ECM 5	Install Occupancy Sensor Lighting Controls	30,452	8.5	0.0	$5,007.14	$32,326.00	$4,245.00	$28,081.00	5.6	30,665
ECM 6	Install High/Low Lighitng Controls	1,621	0.1	0.0	$266.60	$3,600.00	$0.00	$3,600.00	13.5	1,633

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 5: 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)
30,452	8.5	0.0	$5,007.14	$32,326.00	$4,245.00	$28,081.00	5.6	30,665

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in many restrooms, storage rooms, classrooms, offices areas, and other areas where occupancy often changes throughout the school day.

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.

ECM 6: 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)
1,621	0.1	0.0	$266.60	$3,600.00	$0.00	$3,600.00	13.5	1,633

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces 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 or other areas where building code requirements dictate that the space needs to be lit 24 hours per day.

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 infrared sensors. The lighting systems are quickly 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.

4.1.3 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 19 below.

Figure 19 - Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$265.03**	**$460.00**	**$0.00**	**$460.00**	**1.7**	**1,623**
ECM 7	Vending Machine Control	1,612	0.0	0.0	$265.03	$460.00	$0.00	$460.00	1.7	1,623

ECM 7: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$265.03	$460.00	$0.00	$460.00	1.7	1,623

Measure Description

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

4.2 ECM Evaluated but Not Recommended

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

Figure 20 – Summary of Measure Evaluated, but Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Gas Heating (HVAC/Process) Replacement	**0**	**0.0**	**234.4**	**$2,009.23**	**$209,050.93**	**$0.00**	**$209,050.93**	**104.0**	**27,442**
Install High Efficiency Steam Boilers	0	0.0	234.4	$2,009.23	$209,050.93	$0.00	$209,050.93	104.0	27,442
TOTALS	**0**	**0.0**	**234.4**	**$2,009.23**	**$209,050.93**	**$0.00**	**$209,050.93**	**104.0**	**27,442**

* - 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 Steam Boilers

Measure Description

We evaluated replacement of existing inefficient steam boilers with new high-efficiency steam boilers. Significant improvements have been made in combustion technology resulting in increases in overall boiler efficiency. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The existing boilers were installed in 1992. The ASHRAE rated useful lifetime for this type of equipment is 25 years. Though the boilers have reached the end of their rated useful life, they are in good condition. Replacement does not appear to be a critical need at this time.

Reasons for not Recommending

Replacing the existing boilers with high-efficiency steam boilers (~85% efficient) is a significant capital expense, potentially over $200,000. Replacement will likely become more necessary in the near future, but many similar boilers last much longer than 25 years without significant decline in efficiency in later years.

This measure was not recommended for implementation at this time because the energy it would save is not sufficient by itself to justify the large capital expense of replacement.

If the school district chooses to include this measure, it would likely increase the total energy savings for the school to about 15% but would increase the payback period for all measures combined to about 8.2 years.

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.

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.

Perform Proper Boiler Maintenance

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

Perform Proper Water Heater Maintenance

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

Plug Load Controls

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

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 gallons per minute (gpm) for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

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

6 On-Site Generation Measures

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

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

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

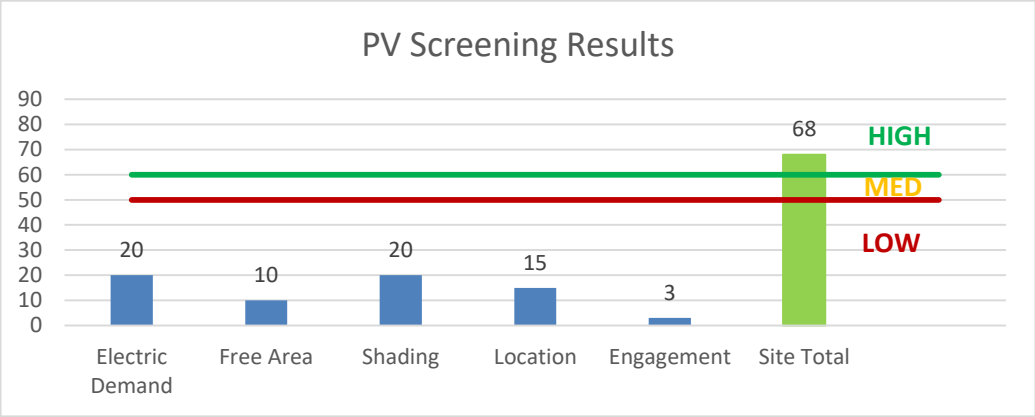
6.1 Photovoltaic

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

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a **High Potential** for installing a cost-effective rooftop PV solar array.

Estimated costs and energy savings are shown in the table below. We estimate that the building has sufficient flat, unshaded rooftop space to support a 94-kW solar array. Such an array could offset a significant portion of the school's current electric purchases.

Figure 21 - Photovoltaic Screening



Potential	High	
System Potential	94	kW DC STC
Electric Generation	111,989	kWh/yr
Displaced Cost	$9,740	/yr
Installed Cost	$268,800	

The estimated savings shown in the table above do **not** include potential SREC (Solar Renewable Energy Certificate) subsidies, which the solar project would likely be eligible to receive for up to 15 years of operation. When SREC subsidies are included, similar projects often have a payback period of 8 years or less. If Buzz Aldrin Middle School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Solar projects must register their projects in the SREC Registration Program (SRP) prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.2 for additional information.

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

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar

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

6.2 Combined Heat and Power

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

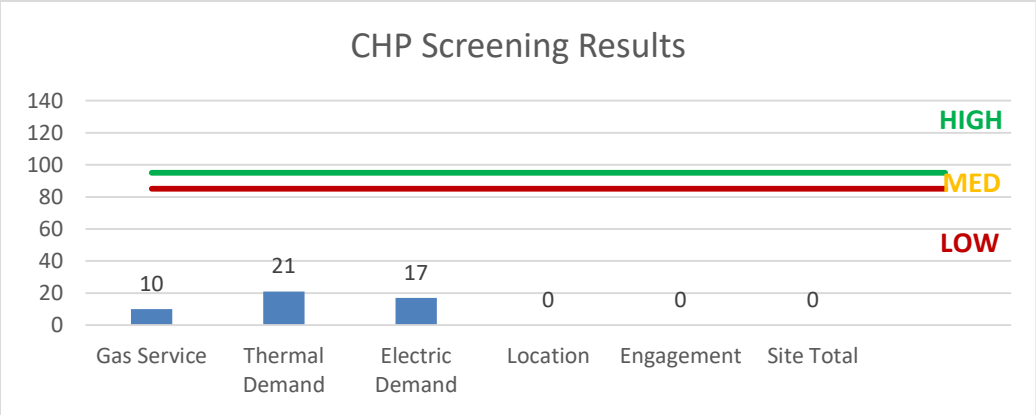
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

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

Low and infrequent thermal load 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 22 - 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.

In our opinion, the facility is not a good candidate for DR curtailment program.

8 PROJECT FUNDING / INCENTIVES

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

Figure 23 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	X			
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	X			
ECM 3	Retrofit Fixtures with LED Lamps	X			
ECM 4	Install LED Exit Signs				
ECM 5	Install Occupancy Sensor Lighting Controls	X			
ECM 6	Install High/Low Lighitng Controls				
ECM 7	Vending Machine Control	X			

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 SREC Registration Program

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

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

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

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

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

8.3 Energy Savings Improvement Program

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

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

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

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

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

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

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main Office	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,875	Relamp	Yes	13	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,013	0.63	3,155	0.0	$518.73	$1,776.73	$330.00	2.79
Conf. Rm.	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,013	0.08	414	0.0	$68.01	$291.50	$50.00	3.55
Office Hallway	5	Incandescent: 60W Bulbs in Recessed Cans	Wall Switch	60	2,875	LED Retrofit	Yes	5	LED - Fixtures: Downlight Recessed	Occupancy Sensor	10	2,013	0.17	882	0.0	$145.01	$618.80	$35.00	4.03
Sm. Office 1	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,875	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,013	0.10	485	0.0	$79.80	$306.27	$60.00	3.09
Sm. Office 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,875	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,013	0.10	485	0.0	$79.80	$306.27	$60.00	3.09
Break Rm.	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,875	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,013	0.10	485	0.0	$79.80	$306.27	$60.00	3.09
Server Rm.	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,013	0.08	414	0.0	$68.01	$291.50	$50.00	3.55
Conf. Rm.	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,875	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,013	0.29	1,456	0.0	$239.41	$686.80	$140.00	2.28
Sm. Office 3	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,875	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,013	0.19	971	0.0	$159.61	$496.53	$100.00	2.48
Auditorium	36	Incandescent: 100W Screw-In Globe Bulbs	Wall Switch	100	2,000	Relamp	No	36	LED Screw-In Lamps: 14W LED Screw-In Globe Bulbs	Wall Switch	14	2,000	2.03	7,121	0.0	$1,170.84	$1,119.24	$0.00	0.96
Auditorium	5	Incandescent: 100W Incandescent in Recessed Cans	Wall Switch	100	2,000	LED Retrofit	No	5	LED - Fixtures: Downlight Recessed	Wall Switch	17	2,000	0.27	955	0.0	$156.94	$287.55	$0.00	1.83
Auditorium	16	Incandescent: 200W High-Bay Recessed Cans	Wall Switch	200	2,000	LED Retrofit	No	16	LED - Fixtures: Downlight Recessed	Wall Switch	33	2,000	1.75	6,146	0.0	$1,010.49	$3,158.88	$0.00	3.13
Auditorium	6	Exit Signs: Incandescent	None	25	2,000	Fixture Replacement	No	6	LED Exit Signs: 2 W Lamp	None	2	2,000	0.09	317	0.0	$52.19	$645.33	$0.00	12.37
Lobby	14	Incandescent: 150W Screw-In Bulbs	Wall Switch	150	2,875	Relamp	No	14	LED Screw-In Lamps: 17W LED Screw-In Bulbs	Wall Switch	17	2,875	1.22	6,156	0.0	$1,012.24	$629.86	$70.00	0.55
Boiler Rm.	25	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	No	25	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,875	0.54	2,728	0.0	$448.49	$1,462.50	$250.00	2.70
Outer Boiler Rooms	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,875	0.17	873	0.0	$143.52	$468.00	$80.00	2.70
Outer Boiler Rooms	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,875	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,875	0.05	231	0.0	$38.05	$143.60	$20.00	3.25
Outer Boiler Rooms	4	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	2,875	Relamp & Reballast	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,875	0.08	417	0.0	$68.50	$392.00	$20.00	5.43
Sm. Gym	14	Incandescent: 150W Screw-In Bulbs	Wall Switch	150	2,000	Relamp	No	14	LED Screw-In Lamps: 17W LED Screw-In Bulbs	Wall Switch	17	2,000	1.22	4,283	0.0	$704.17	$649.88	$70.00	0.82
Sm. Gym	2	Exit Signs: Incandescent	None	25	2,000	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	2	2,000	0.03	106	0.0	$17.40	$215.11	$0.00	12.37
Lg. Gym	16	Incandescent: 150W Screw-In Bulbs	Wall Switch	150	2,000	Relamp	No	16	LED Screw-In Lamps: 17W LED Screw-In Bulbs	Wall Switch	17	2,000	1.39	4,894	0.0	$804.76	$742.72	$80.00	0.82
1st Flr. Hallway	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,875	0.32	1,637	0.0	$269.10	$877.50	$150.00	2.70
Front to Back Hallway	46	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	No	46	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,875	1.00	5,019	0.0	$825.23	$2,691.00	$460.00	2.70
Rm. 110	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.55	1,918	0.0	$315.40	$1,710.00	$270.00	4.57
Back Hallway	34	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	No	34	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,875	0.74	3,710	0.0	$609.95	$1,989.00	$340.00	2.70

	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
Side Hallway	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	No	21	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,875	0.45	2,291	0.0	$376.74	$1,228.50	$210.00	2.70
Rm. 115	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.96	3,376	0.0	$555.16	$2,442.67	$470.00	3.55
Rm. 116	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.96	3,376	0.0	$555.16	$2,442.67	$470.00	3.55
Rm. 117	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.96	3,376	0.0	$555.16	$2,442.67	$470.00	3.55
Teachers' Lavatory	2	Incandescent: 60W Bulbs	Wall Switch	60	1,000	Relamp	Yes	2	LED Screw-In Lamps: 9W LED Bulbs	Occupancy Sensor	9	700	0.07	124	0.0	$20.31	$147.00	$30.00	5.76
Girls' Rm.	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.11	384	0.0	$63.08	$504.00	$75.00	6.80
Stairwell	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,760	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	6,132	0.11	1,680	0.0	$276.29	$834.00	$180.00	2.37
Front Hallway	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,875	0.32	1,637	0.0	$269.10	$877.50	$150.00	2.70
Rm. 105	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.72	2,532	0.0	$416.37	$1,967.00	$370.00	3.84
Rm. 106	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.72	2,532	0.0	$416.37	$1,967.00	$370.00	3.84
Rm. 107	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.72	2,532	0.0	$416.37	$1,967.00	$370.00	3.84
Rm. 1087B	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.72	2,532	0.0	$416.37	$1,967.00	$370.00	3.84
Rm. 108	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.72	2,532	0.0	$416.37	$1,967.00	$370.00	3.84
Stairwell	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,760	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	6,132	0.11	1,680	0.0	$276.29	$834.00	$180.00	2.37
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	600	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	600	0.02	23	0.0	$3.74	$58.50	$10.00	12.95
Rm 111	19	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	19	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.91	3,208	0.0	$527.41	$2,347.53	$450.00	3.60
Rm 112	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.96	3,376	0.0	$555.16	$2,442.67	$470.00	3.55
Rm 113	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.96	3,376	0.0	$555.16	$2,442.67	$470.00	3.55
Rm 114	19	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	19	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.91	3,208	0.0	$527.41	$2,347.53	$450.00	3.60
Boys' Rm.	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.19	675	0.0	$111.03	$650.53	$115.00	4.82
Boys' Rm.	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.03	96	0.0	$15.77	$58.50	$45.00	0.86
Teachers' Lavatory	2	Incandescent: 60W Bulbs in Recessed Cans	Wall Switch	60	800	LED Retrofit	Yes	2	LED - Fixtures: Downlight Recessed	Occupancy Sensor	10	560	0.07	98	0.0	$16.14	$255.52	$20.00	14.59
Rm 201	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	No	15	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,000	0.55	1,932	0.0	$317.67	$1,427.00	$300.00	3.55
Boys' Rm.	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.05	192	0.0	$31.54	$387.00	$55.00	10.53
Rm 204 A/B	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.11	384	0.0	$63.08	$504.00	$75.00	6.80

	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
Rm 204 A/B	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,400	0.03	89	0.0	$14.71	$63.20	$35.00	1.92
Rm 205	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.96	3,376	0.0	$555.16	$2,442.67	$470.00	3.55
Rm 206	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.72	2,532	0.0	$416.37	$1,967.00	$370.00	3.84
Rm 209C	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.48	1,688	0.0	$277.58	$1,221.33	$235.00	3.55
Rm 210	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.72	2,532	0.0	$416.37	$1,967.00	$370.00	3.84
2nd Flr Hallway	102	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	No	102	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,875	2.21	11,129	0.0	$1,829.86	$5,967.00	$1,020.00	2.70
2nd Flr Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,875	Relamp	No	7	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,875	0.26	1,296	0.0	$213.10	$665.93	$140.00	2.47
2nd Flr Hallway	3	Incandescent: 60W Bulbs in Recessed Cans	Wall Switch	60	2,875	LED Retrofit	No	3	LED - Fixtures: Downlight Recessed	Wall Switch	10	2,875	0.10	501	0.0	$82.36	$209.28	$0.00	2.54
2nd Flr Hallway	1	Compact Fluorescent: 26W CFL in Recessed Can	Wall Switch	34	2,875	LED Retrofit	No	1	LED - Fixtures: Downlight Recessed	Wall Switch	17	2,875	0.01	56	0.0	$9.24	$57.51	$0.00	6.22
Rm 202A	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	No	20	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,000	0.73	2,576	0.0	$423.56	$1,902.67	$400.00	3.55
Custodian	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,000	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,000	0.01	37	0.0	$6.05	$48.20	$10.00	6.31
Girls' Rm.	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.08	288	0.0	$47.31	$445.50	$65.00	8.04
Rm 203	17	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	17	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.82	2,870	0.0	$471.89	$2,157.27	$410.00	3.70
Rm 208	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	18	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.87	3,039	0.0	$499.65	$2,252.40	$430.00	3.65
Rm 207A	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.48	1,688	0.0	$277.58	$1,221.33	$235.00	3.55
Rm 207	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.96	3,376	0.0	$555.16	$2,442.67	$470.00	3.55
Rm 209A	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.72	2,532	0.0	$416.37	$1,967.00	$370.00	3.84
Rm 209B	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.48	1,688	0.0	$277.58	$1,221.33	$235.00	3.55
Rm 203A	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,000	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,400	0.49	1,726	0.0	$283.86	$1,172.40	$215.00	3.37
Rm 211	17	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	17	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.82	2,870	0.0	$471.89	$2,157.27	$410.00	3.70
Girls' Rm.	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.08	288	0.0	$47.31	$445.50	$65.00	8.04
Teachers' Lavatory	2	Incandescent: 60W Bulbs in Recessed Cans	Wall Switch	60	1,000	LED Retrofit	Yes	2	LED - Fixtures: Downlight Recessed	Occupancy Sensor	10	700	0.07	123	0.0	$20.18	$255.52	$20.00	11.67
Boys' Rm.	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.11	384	0.0	$63.08	$504.00	$75.00	6.80
Rm 212	25	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	25	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	1.20	4,221	0.0	$693.96	$3,188.33	$605.00	3.72
Rm 213	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.96	3,376	0.0	$555.16	$2,442.67	$470.00	3.55

	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
Rm 213A	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.48	1,688	0.0	$277.58	$1,221.33	$235.00	3.55
Rm 214	17	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	17	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.82	2,870	0.0	$471.89	$2,157.27	$410.00	3.70
Stairwell Exit 5	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	8,760	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	6,132	0.07	1,101	0.0	$180.96	$779.50	$200.00	3.20
Rm 215	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.72	2,532	0.0	$416.37	$1,967.00	$370.00	3.84
Rm 216	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.96	3,376	0.0	$555.16	$2,442.67	$470.00	3.55
Rm 217	25	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	25	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	1.20	4,221	0.0	$693.96	$3,188.33	$605.00	3.72
Stairwell Exit 8	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	8,760	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	6,132	0.07	1,101	0.0	$180.96	$779.50	$200.00	3.20
Stairwell 5 Exit 9	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	8,760	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	6,132	0.09	1,321	0.0	$217.16	$815.40	$240.00	2.65
Corridor 8	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	No	22	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,875	0.48	2,400	0.0	$394.68	$1,287.00	$220.00	2.70
Rm 109	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.96	3,376	0.0	$555.16	$2,442.67	$470.00	3.55
Rm 101	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.72	2,532	0.0	$416.37	$1,967.00	$370.00	3.84
Rm 102	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.48	1,688	0.0	$277.58	$1,221.33	$235.00	3.55
Stairwell 2	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	8,760	Relamp	Yes	5	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	6,132	0.07	1,101	0.0	$180.96	$779.50	$200.00	3.20
Ground Flr Hallway	117	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,875	Relamp	No	117	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,875	2.53	12,765	0.0	$2,098.96	$6,844.50	$1,170.00	2.70
Cafeteria	25	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	No	25	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,000	0.92	3,220	0.0	$529.45	$2,378.33	$500.00	3.55
Kitchen	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	No	10	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,000	0.37	1,288	0.0	$211.78	$951.33	$200.00	3.55
Mop Sink	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.02	38	0.0	$6.24	$58.50	$10.00	7.77
Men's Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.02	38	0.0	$6.24	$58.50	$10.00	7.77
Women's Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.02	38	0.0	$6.24	$58.50	$10.00	7.77
Teachers' Rm	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	22	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.60	2,110	0.0	$346.94	$2,097.00	$325.00	5.11
Rm 25	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.57	2,014	0.0	$331.17	$2,038.50	$315.00	5.20
Rm 24	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.57	2,014	0.0	$331.17	$2,038.50	$315.00	5.20
Rm 23	25	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	25	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.68	2,398	0.0	$394.25	$2,272.50	$355.00	4.86
Rm 20 A/B	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.55	1,918	0.0	$315.40	$1,980.00	$305.00	5.31
Rm 20 A/B	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,000	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,400	0.10	338	0.0	$55.52	$190.27	$75.00	2.08

	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
Men's Rm	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.14	480	0.0	$78.85	$562.50	$85.00	6.06
Women's Rm	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.14	480	0.0	$78.85	$562.50	$85.00	6.06
Teachers' Lavatory	2	Incandescent: 60W Bulbs	Wall Switch	60	1,000	Relamp	Yes	2	LED Screw-In Lamps: 9W LED Bulbs	Occupancy Sensor	9	700	0.07	124	0.0	$20.31	$147.00	$30.00	5.76
Girls' Locker Rm.	19	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,000	Relamp	Yes	19	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,400	0.27	955	0.0	$157.00	$1,492.10	$200.00	8.23
Girls' Locker Rm.	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.05	192	0.0	$31.54	$117.00	$55.00	1.97
Girls' Showers	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.17	607	0.0	$99.84	$468.00	$80.00	3.89
Boys' Locker Rm.	19	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,000	Relamp	Yes	19	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,400	0.27	955	0.0	$157.00	$1,492.10	$200.00	8.23
Boys' Locker Rm.	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.05	192	0.0	$31.54	$117.00	$55.00	1.97
Boys' Showers	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,000	0.17	607	0.0	$99.84	$468.00	$80.00	3.89
Rm 18	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.49	1,726	0.0	$283.86	$1,593.00	$250.00	4.73
Elevator	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	8,760	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	8,760	0.02	353	0.0	$57.97	$71.80	$10.00	1.07
SGI 3	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.36	1,247	0.0	$205.01	$1,300.50	$200.00	5.37
SGI 2	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.25	863	0.0	$141.93	$796.50	$125.00	4.73
Rm 16	30	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,000	Relamp	Yes	30	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,400	0.43	1,508	0.0	$247.90	$1,887.00	$255.00	6.58
Research Area A	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,000	Relamp	Yes	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,400	0.11	402	0.0	$66.11	$557.20	$75.00	7.29
Research Area A	2	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,000	Relamp	Yes	2	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,400	0.02	74	0.0	$12.14	$63.80	$45.00	1.55
Rm 17	24	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,000	Relamp	Yes	24	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,400	0.34	1,206	0.0	$198.32	$1,671.60	$225.00	7.29
Rm 17	4	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	2,000	Relamp	Yes	4	LED - Linear Tubes: (1) 2' Lamp	Occupancy Sensor	9	1,400	0.04	148	0.0	$24.28	$127.60	$55.00	2.99
SGI 1-B	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.27	959	0.0	$157.70	$855.00	$135.00	4.57
SGI 1-A	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,000	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,400	0.27	959	0.0	$157.70	$855.00	$135.00	4.57
Custodial Storage Area	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	840	0.16	345	0.0	$56.77	$621.00	$95.00	9.27
Custodial Storage Area	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,200	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	840	0.09	181	0.0	$29.75	$485.40	$65.00	14.13
Whole School	32	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	32	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Building Exterior	9	Incandescent: 100W Incandescent (Globe Lights)	None	100	4,380	Relamp	No	9	LED Screw-In Lamps: 14W LED Screw-In Globe Bulbs	None	15	4,380	0.50	3,853	0.0	$633.58	$279.81	$0.00	0.44

	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
Building Exterior	3	High-Pressure Sodium: (1) 100W Lamp	None	138	4,380	LED Retrofit	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	20	4,380	0.23	1,783	0.0	$293.19	$717.57	$300.00	1.42
Building Exterior	9	Metal Halide: (1) 100W Lamp	None	128	4,380	LED Retrofit	No	9	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	20	4,380	0.64	4,896	0.0	$805.02	$2,152.71	$900.00	1.56

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Gym	4	Exhaust Fan	1.0	75.0%	No	2,745	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Rm	Pneumatic Controls	1	Air Compressor	5.0	87.5%	No	4,957	No	87.5%	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
BAMS	Classrooms	4	Window AC	0.42		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Classrooms	8	Window AC	0.83		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Rm 215	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Classrooms	2	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Rm 204	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Classrooms	3	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Classrooms	2	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Classrooms	6	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Rm 208	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Main Office	9	Packaged Terminal AC	1.17		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Nurse's Office	2	Packaged Terminal AC	1.17		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Classrooms	5	Window AC	0.42		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Rm 214	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	SGI-2, Rm 201	2	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
BAMS	Classrooms	7	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Rm	BAMS	2	Natural Draft Steam Boiler	6,100.00	Yes	2	Natural Draft Steam Boiler	6,100.00	85.00%	Et	0.00	0	234.4	$2,009.23	$209,050.93	$0.00	104.05

DHW Inventory & Recommendations

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

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Cond	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	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Teachers' Rm	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Break Rm	1	Stand-Up Refrigerator, Solid Door (≤15 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rm 110	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cafeteria	1	Stand-Up Freezer, Glass Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Electric Convection Oven (Full Size)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	3	Insulated Food Holding Cabinet (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
BAMS	187	Computers & Monitors	229.0	Yes
BAMS	6	TVs (Lg. Flat Screens)	200.0	Yes
BAMS	7	Microwave Ovens	800.0	No
BAMS	5	Coffee Makers	900.0	No
BAMS	2	Toaster Oven	1,000.0	No
BAMS	4	Lg. Copy Machines	494.0	No
BAMS	3	Electric Range	400.0	No
BAMS	6	Server	450.0	No
BAMS	12	Sm Printers	80.0	Yes
BAMS	1	Washer & Dryer	5,300.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Teachers' Rm	1	Refrigerated	Yes	0.00	1,612	0.0	$265.03	$230.00	$0.00	0.87
Teachers' Rm	1	Non-Refrigerated	No	0.00	0	0.0	$0.00	$230.00	$0.00	0.00

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Mount Hebron (Buzz Aldrin) Middle School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 126,568
Built: 1909

For Year Ending: April 30, 2016
Date Generated: December 25, 2017

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Mount Hebron (Buzz Aldrin) Middle School 173 Bellevue Avenue Montclair, New Jersey 07043	Montclair Board of Education 22 Valley Road Montclair, NJ 07042 (973) 509-4050	Steve DiGeronimo 22 Valley Road Montclair, NJ 07042 (973) 509-4050 bfleischer@montclair.k12.nj.us

Property ID: 5724942

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
59.7 kBtu/ft²

Source EUI
98.8 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	2,186,053 (29%)
Natural Gas (kBtu)	5,367,632 (71%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	54
National Median Source EUI (kBtu/ft²)	89.3
% Diff from National Median Source EUI	11%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	528

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)