



Local Government Energy Audit: Energy Audit Report



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Haviland Avenue School

Audubon Board of Education

240 S. Haviland Avenue
Audubon, NJ 08106

April 12, 2018

Final Report by:
TRC Energy Services

Disclaimer

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

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

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

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

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I EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBP) has sponsored this Local Government Energy Audit (LGEA) Report for Haviland Avenue School.

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

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

I.1 Facility Summary

Haviland Avenue School is a 41,702 square foot facility, part of the Audubon Board of Education. This school building has two floors that include classrooms, gym, media-centers, restrooms, cafeteria and a mechanical space. Lighting primarily consists of T8 and incandescent fixtures which are in need of replacement. The building is heated using gas-fired condensing hot water boilers and cooled using DX packaged AC units and split AC units. A thorough description of the facility and our observations are located in Section 2.

I.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated eight measures which together represent an opportunity for Haviland Avenue School to reduce annual energy costs by \$12,376 and annual greenhouse gas emissions by 79,282 lbs CO₂e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 6.6 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Haviland Avenue School’s annual energy use by 10%.

Figure 1 – Previous 12 Month Utility Costs

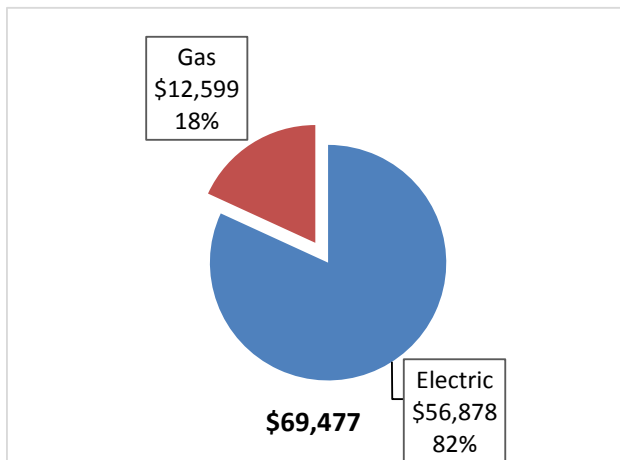
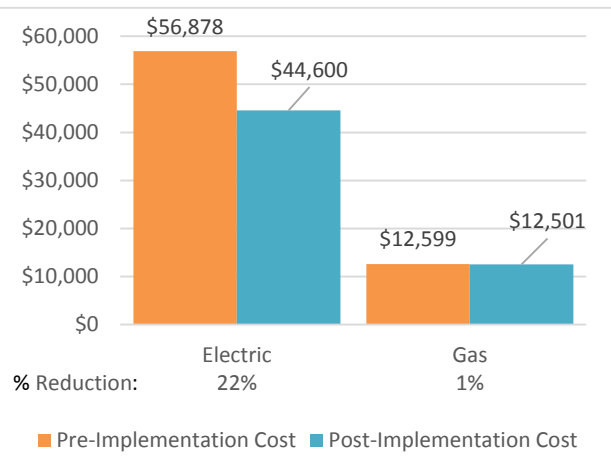


Figure 2 – Potential Post-Implementation Costs



A detailed description of Haviland Avenue 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 ₂ e Emissions Reduction (lbs)
Lighting Upgrades			40,576	11.0	0.0	\$6,433.46	\$69,929.97	\$8,520.00	\$61,409.97	9.5	40,860
ECM 1	Install LED Fixtures	Yes	4,055	0.5	0.0	\$642.90	\$3,516.09	\$900.00	\$2,616.09	4.1	4,083
ECM 2	Retrofit Fixtures with LED Lamps	Yes	33,942	10.3	0.0	\$5,381.66	\$62,864.56	\$7,620.00	\$55,244.56	10.3	34,180
ECM 3	Install LED Exit Signs	Yes	2,579	0.2	0.0	\$408.90	\$3,549.32	\$0.00	\$3,549.32	8.7	2,597
Lighting Control Measures			6,466	1.7	0.0	\$1,025.27	\$4,578.00	\$1,065.00	\$3,513.00	3.4	6,512
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	4,754	1.5	0.0	\$753.73	\$3,828.00	\$660.00	\$3,168.00	4.2	4,787
ECM 5	Install Daylight Dimming Controls	Yes	1,713	0.2	0.0	\$271.54	\$750.00	\$405.00	\$345.00	1.3	1,725
Electric Unitary HVAC Measures			25,044	24.3	0.0	\$3,970.84	\$17,017.20	\$690.00	\$16,327.20	4.1	25,219
ECM 6	Install High Efficiency Electric AC	Yes	25,044	24.3	0.0	\$3,970.84	\$17,017.20	\$690.00	\$16,327.20	4.1	25,219
Domestic Water Heating Upgrade			3,739	0.0	11.1	\$690.92	\$164.91	\$0.00	\$164.91	0.2	5,069
ECM 7	Install Low-Flow Domestic Hot Water Devices	Yes	3,739	0.0	11.1	\$690.92	\$164.91	\$0.00	\$164.91	0.2	5,069
Plug Load Equipment Control - Vending Machine			1,612	0.0	0.0	\$255.56	\$230.00	\$0.00	\$230.00	0.9	1,623
ECM 8	Vending Machine Control	Yes	1,612	0.0	0.0	\$255.56	\$230.00	\$0.00	\$230.00	0.9	1,623
TOTALS			77,437	37.1	11.1	\$12,376.05	\$91,920.08	\$10,275.00	\$81,645.08	6.6	79,282

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

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

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

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

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

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

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

Energy Efficient Practices

TRC also identified 10 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 Haviland Avenue School include:

- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean and/or Replace HVAC Filters
- 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 Haviland Avenue School. Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures. For details on our evaluation and on-site generation potential, please refer to Section 6.

I.3 Implementation Planning

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

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

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

- SmartStart
- Pay for Performance - Existing Building (P4P)
- Energy Savings Improvement Program (ESIP)

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

estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.3 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 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Bud Rutter	Director of Facilities	brutter@audubonschools.org	856-547-7596 Extn: 4172
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On December 28, 2016, TRC performed an energy audit at Haviland Avenue School located in Audubon, New Jersey. TRC's team met with Geoff Metzger to review the facility operations and help focus our investigation on specific energy-using systems.

Haviland Avenue School is a 41,702 square foot facility, originally constructed in 1914 and renovated in 2005. This school building has two floors that include classrooms, gym, media-centers, restrooms, cafeteria and a basement mechanical space.

The existing lighting at primarily consists of T8 and incandescent fixtures which are in need of replacement. The building is heated using gas-fired condensing hot water boilers and cooling is performed using DX packaged AC units and split AC units.

2.3 Building Occupancy

The typical schedule is presented in the table below. The facility is used for regular classes for 10 months of the year. During a typical day, the facility is occupied by approximately 391 people including the full time staff and students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Haviland Avenue School	Weekday	8:40 AM - 2:40 PM
Haviland Avenue School	Weekend	No occupancy

2.4 Building Envelope

The school is constructed using brick and concrete block with a brick facade. It has poured concrete flooring. The building has a flat roof covered with white PVC membrane that is in fair condition. The buildings have new double pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed with aluminum (and glass) and were observed to be in good condition. No air leakages were observed during the audit.



Image 1: Building roof and envelope

2.5 On-Site Generation

Haviland Avenue School does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

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

Lighting System

Lighting is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). Most of the fixtures are 2-lamp or 3-lamp, 4-foot long troffers. A small area of the building and the majority of the office spaces are lit with 13-Watt or 18-Watt CFL lamps in recessed can ceiling fixtures. The gym is lit using 70-Watt halogen incandescent fixtures.

Lighting control in most spaces is provided by wall switches and a couple of restrooms have wall-mounted occupancy sensors.

Exterior lighting has a combination of metal halide, tungsten halide, and compact fluorescent lamp fixtures. These fixtures are controlled using photo cells. Exit signs were 14-Watt fluorescent fixtures.



Image 2: Typical lighting fixtures

Hot Water (or Steam) Heating System

The heating hot water system consists of two condensing hot water boilers from AERCO with an input capacity of 1,720 MBH with a combustion efficiency of 86%. The boilers have two 1 hp pumps, two 1.5 hp pumps and two 3 hp pumps operating in a lead/lag configuration for hot water circulation throughout the building. The pumps are not equipped with variable frequency drives.

Classrooms have unit ventilators with hot water coils and a supply fan and the hallways have fan coil units to distribute heat in the respective areas. Hot water is supplied at 180°F when the outside air temperature is below 50°F and the setpoint is reset to 155°F when the outside air is above 65°F. The boilers are five years old, in good condition, and well maintained.



Image 3: Hot water boiler and a sample pump at the mechanical space

Direct Expansion Air Conditioning System (DX)

The areas that have large capacity rooftop DX packaged units are the library (12.5 ton – Johnson Control), cafeteria (15 ton – Johnson Control), and both the gym and the art room (5 ton – Carrier –each). They have programmable thermostats in the respective zones to set and maintain temperatures. The building does not have outside air economizers to utilize free cooling. When the units come to the end of their useful life, it is recommended that they be replaced with higher efficiency units and economizers.

The classrooms have (13) 3.5 ton packaged AC units from Trane; the offices utilize a mix of 3-ton packaged units and 1.5-ton split AC units in their respective spaces.



Image 4: Unit ventilators and ceiling cassette units

Domestic Hot Water Heating System

Domestic hot water is provided by one Bradford White gas-fired hot water heater with an input rating of 60 kBtu/hr and a nominal efficiency of 80%. There is also a second electric water heater with an input rating of 4.5 kW. Water heaters have a storage capacity of 48 gallons and 52 gallons respectively. These are eight years old, in good condition, and well maintained.



Image 5: Domestic hot water heaters

Food Service Equipment & Refrigeration

The school has a minimally equipped kitchen where food is warmed and served for the students. Food is not prepared here. The kitchen has an all-electric convection oven, insulated food holding cabinet, a dishwasher, and a couple of commercial glass door refrigerators. The equipment have not reached the end of their useful life and hence not recommended for upgrades.



Image 6: Sample of kitchen equipment

Building Plug Load

There are 56 computer work stations throughout the facility and 14 laptops. Roughly 90% of the computers are desktop units with LCD monitors. There is no centralized PC power management software installed. Other plug loads at the school include printers, projectors, paper shredder, smart boards and kitchenette equipment like toasters, coffee machines, microwave oven and refrigerators.

The building also has one refrigerated vending machine in the teacher's lounge.



Image 7: Vending machine (teachers' lounge) and smart boards (classrooms)

2.7 Water-Using Systems

A sampling of restrooms found that the faucets are rated for 2.2 gallons per minute (gpm) or higher, the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 gpf.



Image 8: Art room sink and restroom sinks

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

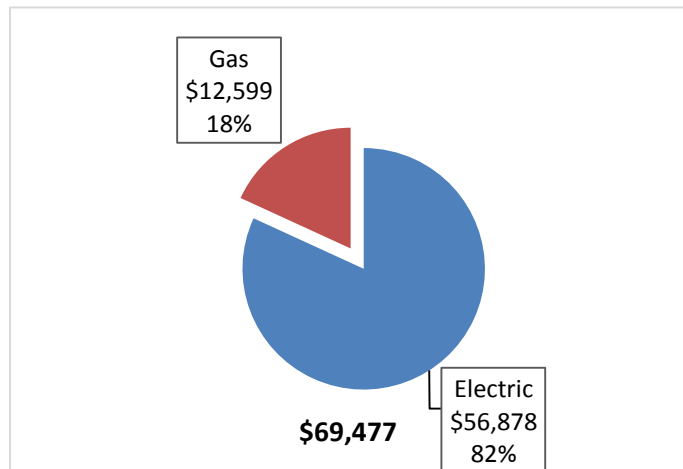
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Haviland Avenue School		
Fuel	Usage	Cost
Electricity	358,729 kWh	\$56,878
Natural Gas	14,297 Therms	\$12,599
Total		\$69,477

The current annual energy cost for this facility is \$69,477 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost over the past 12 months was \$0.159/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 third party electric supply for the school is provided by direct energy. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

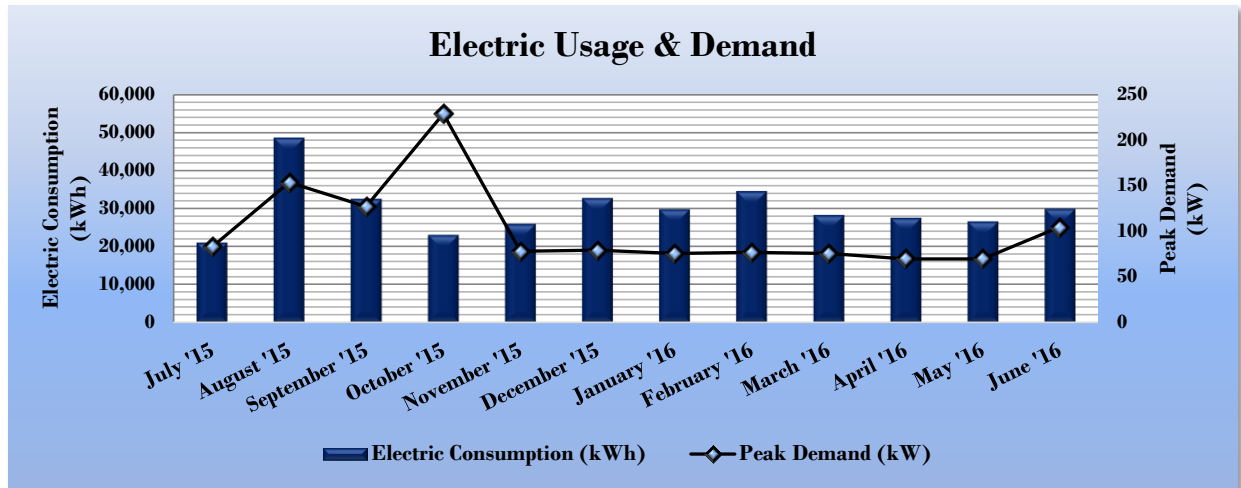


Figure 9 - Electric Usage & Demand

Electric Billing Data for Haviland Avenue School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
7/24/15	31	20,969	83	\$1,026	\$4,121
8/24/15	31	48,523	154	\$1,904	\$8,800
9/22/15	29	32,443	127	\$1,583	\$6,164
10/22/15	30	22,998	229	\$2,028	\$4,545
11/20/15	29	25,864	78	\$340	\$3,784
12/23/15	33	32,690	79	\$346	\$4,511
1/25/16	33	29,705	76	\$330	\$4,045
2/24/16	30	34,525	77	\$335	\$4,628
3/24/16	29	28,193	76	\$332	\$3,859
4/25/16	32	27,452	70	\$307	\$3,755
5/24/16	29	26,502	70	\$307	\$3,639
6/23/16	30	29,848	104	\$2,339	\$5,183
Totals	366	359,712	229.2	\$11,177	\$57,034
Annual	365	358,729	229.2	\$11,146	\$56,878

3.3 Natural Gas Usage

Natural Gas is provided by PSE&G. The average gas cost for the past 12 months is \$0.881/therm, which is the blended rate used throughout the analyses in this report. The third party gas supply is provided by Woodruff. The monthly gas consumption is shown in the chart below.

Figure 10 - Natural Gas Usage

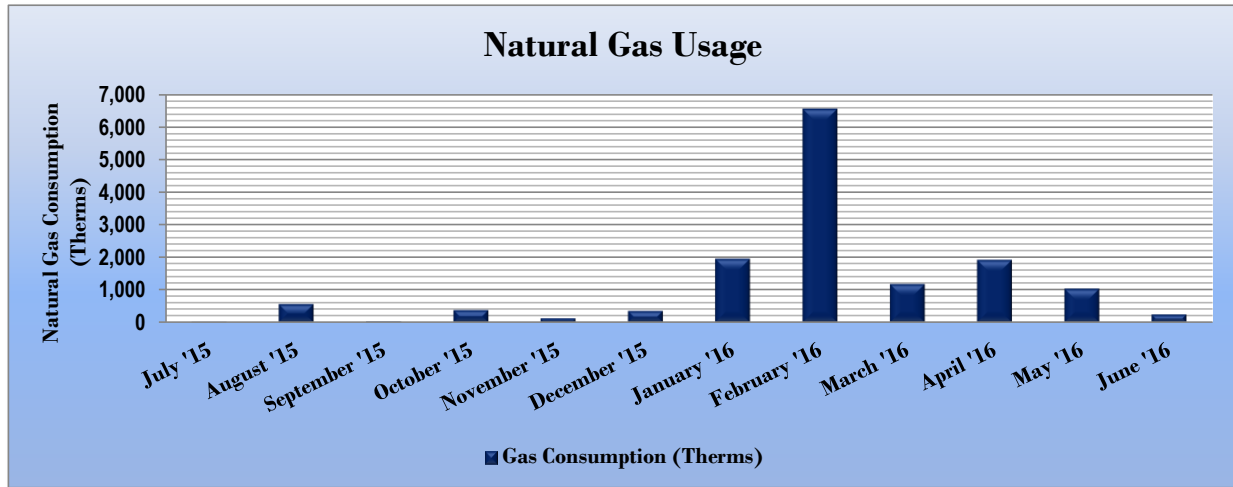


Figure 11 - Natural Gas Usage

Gas Billing Data for Haviland Avenue School				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
7/24/15	31	10	\$109	No
8/24/15	31	566	\$402	No
9/22/15	29	21	\$213	No
10/22/15	30	374	\$366	No
11/20/15	29	125	\$280	No
12/23/15	33	347	\$947	No
1/25/16	33	1,956	\$1,817	No
2/24/16	30	6,562	\$4,437	No
3/24/16	29	1,175	\$1,399	No
4/25/16	32	1,921	\$1,540	No
5/24/16	29	1,033	\$906	Yes
6/23/16	30	245	\$219	No
Totals	366	14,336	\$12,634	
Annual	365	14,297	\$12,599	

3.4 Benchmarking

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

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

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Haviland Avenue School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft ²)	128.2	141.4
Site Energy Use Intensity (kBtu/ft ²)	63.6	58.2

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

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Haviland Avenue School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft ²)	108.0	141.4
Site Energy Use Intensity (kBtu/ft ²)	57.0	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR™ score. This score is a percentile ranking from 1 to 100. It compares your building’s energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 37.

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

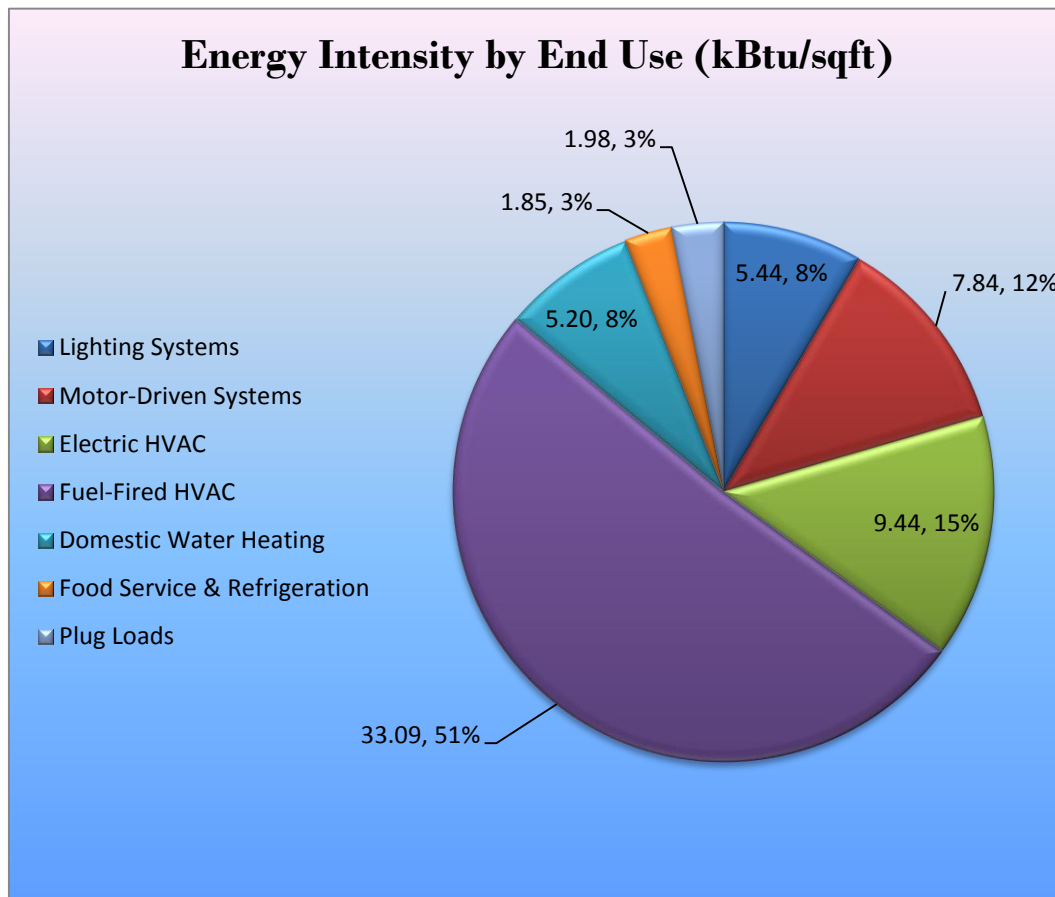
For more information on ENERGY STAR® certification go to: <https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1>

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

3.5 Energy End-Use Breakdown

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

Figure 14 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)*	Estimated Net Cost (\$)	Simple Payback Period (yrs)**	CO ₂ e Emissions Reduction (lbs)
Lighting Upgrades		40,576	11.0	0.0	\$6,433.46	\$69,929.97	\$8,520.00	\$61,409.97	9.5	40,860
ECM 1	Install LED Fixtures	4,055	0.5	0.0	\$642.90	\$3,516.09	\$900.00	\$2,616.09	4.1	4,083
ECM 2	Retrofit Fixtures with LED Lamps	33,942	10.3	0.0	\$5,381.66	\$62,864.56	\$7,620.00	\$55,244.56	10.3	34,180
ECM 3	Install LED Exit Signs	2,579	0.2	0.0	\$408.90	\$3,549.32	\$0.00	\$3,549.32	8.7	2,597
Lighting Control Measures		6,466	1.7	0.0	\$1,025.27	\$4,578.00	\$1,065.00	\$3,513.00	3.4	6,512
ECM 4	Install Occupancy Sensor Lighting Controls	4,754	1.5	0.0	\$753.73	\$3,828.00	\$660.00	\$3,168.00	4.2	4,787
ECM 5	Install Daylight Dimming Controls	1,713	0.2	0.0	\$271.54	\$750.00	\$405.00	\$345.00	1.3	1,725
Electric Unitary HVAC Measures		25,044	24.3	0.0	\$3,970.84	\$17,017.20	\$690.00	\$16,327.20	4.1	25,219
ECM 6	Install High Efficiency Electric AC	25,044	24.3	0.0	\$3,970.84	\$17,017.20	\$690.00	\$16,327.20	4.1	25,219
Domestic Water Heating Upgrade		3,739	0.0	11.1	\$690.92	\$164.91	\$0.00	\$164.91	0.2	5,069
ECM 7	Install Low-Flow Domestic Hot Water Devices	3,739	0.0	11.1	\$690.92	\$164.91	\$0.00	\$164.91	0.2	5,069
Plug Load Equipment Control - Vending Machine		1,612	0.0	0.0	\$255.56	\$230.00	\$0.00	\$230.00	0.9	1,623
ECM 8	Vending Machine Control	1,612	0.0	0.0	\$255.56	\$230.00	\$0.00	\$230.00	0.9	1,623
TOTALS		77,437	37.1	11.1	\$12,376.05	\$91,920.08	\$10,275.00	\$81,645.08	6.6	79,282

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

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

4.1.1 Lighting Upgrades

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

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
Lighting Upgrades		40,576	11.0	0.0	\$6,433.46	\$69,929.97	\$8,520.00	\$61,409.97	9.5	40,860
ECM 1	Install LED Fixtures	4,055	0.5	0.0	\$642.90	\$3,516.09	\$900.00	\$2,616.09	4.1	4,083
ECM 2	Retrofit Fixtures with LED Lamps	33,942	10.3	0.0	\$5,381.66	\$62,864.56	\$7,620.00	\$55,244.56	10.3	34,180
ECM 3	Install LED Exit Signs	2,579	0.2	0.0	\$408.90	\$3,549.32	\$0.00	\$3,549.32	8.7	2,597

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 ₂ e Emissions Reduction (lbs)
Interior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.0	0
Exterior	4,055	0.5	0.0	\$642.90	\$3,516.09	\$900.00	\$2,616.09	4.1	4,083

Measure Description

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

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

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
Interior	32,602	10.2	0.0	\$5,169.22	\$62,488.29	\$7,585.00	\$54,903.29	10.6	32,830
Exterior	1,340	0.2	0.0	\$212.44	\$376.27	\$35.00	\$341.27	1.6	1,349

Measure Description

We recommend retrofitting existing linear tube T8 fixtures technologies with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

ECM 3: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
Interior	2,579	0.2	0.0	\$408.90	\$3,549.32	\$0.00	\$3,549.32	8.7	2,597
Exterior	0	0.0	0.0	\$0.00	\$0.00	\$0.00	\$0.00	0.0	0

Measure Description

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

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
Lighting Control Measures	6,466	1.7	0.0	\$1,025.27	\$4,578.00	\$1,065.00	\$3,513.00	3.4	6,512
ECM 4 Install Occupancy Sensor Lighting Controls	4,754	1.5	0.0	\$753.73	\$3,828.00	\$660.00	\$3,168.00	4.2	4,787
ECM 5 Install Daylight Dimming Controls	1,713	0.2	0.0	\$271.54	\$750.00	\$405.00	\$345.00	1.3	1,725

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

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
4,754	1.5	0.0	\$753.73	\$3,828.00	\$660.00	\$3,168.00	4.2	4,787

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in classrooms and offices spaces. 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 5: Install Daylight Dimming 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)	CO₂e Emissions Reduction (lbs)
1,713	0.2	0.0	\$271.54	\$750.00	\$405.00	\$345.00	1.3	1,725

Measure Description

We recommend installing daylight dimming controls that use photosensors to reduce electric lighting in areas when ample daylight lighting is present. Photosensor controls are recommended for fixtures that are adjacent to windows that receive lots of sunlight. As sunlight level increase in the room, fixture lighting is decreased or turned off. This measure reduces energy use in spaces where sufficient lighting levels can be met by ambient daylight.

Optimum light levels and the method of dimming should be determined during lighting design. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

4.1.3 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 18 below.

Figure 18 - Summary of Unitary HVAC 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 ₂ e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		25,044	24.3	0.0	\$3,970.84	\$17,017.20	\$690.00	\$16,327.20	4.1	25,219
ECM 6	Install High Efficiency Electric AC	25,044	24.3	0.0	\$3,970.84	\$17,017.20	\$690.00	\$16,327.20	4.1	25,219

ECM 6: Install High Efficiency Air Conditioning Units

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 ₂ e Emissions Reduction (lbs)
25,044	24.3	0.0	\$3,970.84	\$17,017.20	\$690.00	\$16,327.20	4.1	25,219

Measure Description

We recommend replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

4.1.4 Domestic Hot Water Heating System Upgrades

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

Figure 19 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		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 ₂ e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		3,739	0.0	11.1	\$690.92	\$164.91	\$0.00	\$164.91	0.2	5,069
ECM 7	Install Low-Flow Domestic Hot Water Devices	3,739	0.0	11.1	\$690.92	\$164.91	\$0.00	\$164.91	0.2	5,069

ECM 7: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
3,739	0.0	11.1	\$690.92	\$164.91	\$0.00	\$164.91	0.2	5,069

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy. Pre-rinse spray valves (PRSVs)—often used in commercial and institutional kitchens—are designed to remove food waste from dishes prior to dishwashing. Replacing standard pre-rinse spray valves with low flow PRSVs will reduce hot water usage and save energy.

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

4.1.5 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment control are summarized in Figure 20 below.

Figure 20 - 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 ₂ e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		1,612	0.0	0.0	\$255.56	\$230.00	\$0.00	\$230.00	0.9	1,623
ECM 8	Vending Machine Control	1,612	0.0	0.0	\$255.56	\$230.00	\$0.00	\$230.00	0.9	1,623

ECM 8: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings (\$)	Estimated Install Cost (\$)	Estimated Incentive (\$)	Estimated Net Cost (\$)	Simple Payback Period (yrs)	CO ₂ e Emissions Reduction (lbs)
1,612	0.0	0.0	\$255.56	\$230.00	\$0.00	\$230.00	0.9	1,623

Measure Description

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

5 ENERGY EFFICIENT PRACTICES

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

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 Lighting Maintenance

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

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

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 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity

is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gpf and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.4 for any low-flow ECM recommendations.

6 ON-SITE GENERATION MEASURES

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

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

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

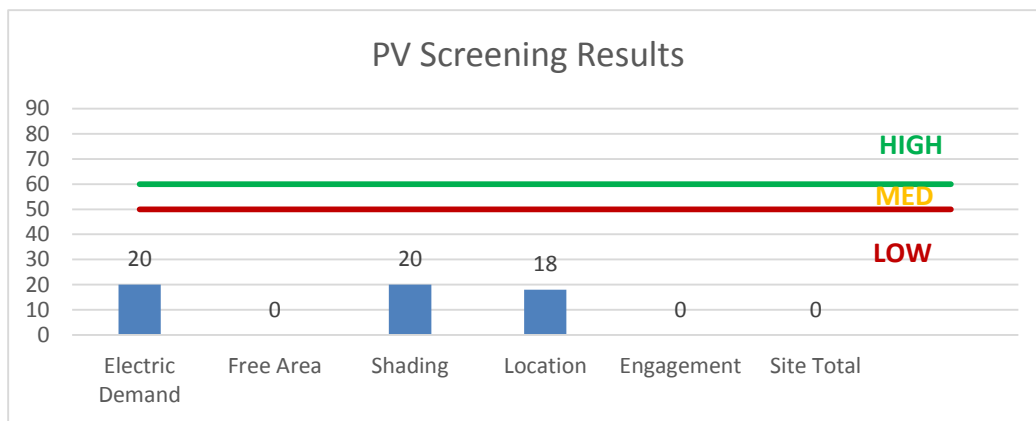
6.1 Photovoltaic

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

A preliminary screening based on the facility’s electric demand, size and location of free area, and shading elements shows that the facility has a Low potential for installing a PV array.

In order to be cost-effective, a solar PV array needs certain minimum criteria, such as flat or south-facing rooftop or other unshaded space on which to place the PV panels. In our opinion, the facility does appear not meet these minimum criteria for cost-effective PV installation.

Figure 21 - Photovoltaic Screening



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

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.

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the 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/

7 DEMAND RESPONSE

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

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

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

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

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

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

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

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey’s Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 22 for a list of the eligible programs identified for each recommended ECM.

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	x	x
ECM 2	Retrofit Fixtures with LED Lamps	x	x
ECM 3	Install LED Exit Signs		x
ECM 4	Install Occupancy Sensor Lighting Controls	x	x
ECM 5	Install Daylight Dimming Controls	x	x
ECM 6	Install High Efficiency Electric AC	x	x
ECM 7	Install Low-Flow Domestic Hot Water Devices		x
ECM 8	Vending Machine Control		x

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

Overview

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

Incentives

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

How to Participate

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

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

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

8.3 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.

8.4 Demand Response Energy Aggregator

The first step toward participation in a Demand Response (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 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 the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

See Section 7 for additional information.

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

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	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
Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.19	639	0.0	\$101.27	\$526.50	\$90.00	4.31
Custodial Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	104	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	104	0.02	4	0.0	\$0.63	\$58.50	\$10.00	77.50
Stairwell	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.09	665	0.0	\$105.42	\$234.00	\$40.00	1.84
CR130	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,870	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,309	0.37	1,211	0.0	\$191.95	\$792.80	\$155.00	3.32
Bathroom CR 130	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	546	0.03	35	0.0	\$5.53	\$179.20	\$20.00	28.78
Boys restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.11	150	0.0	\$23.72	\$350.00	\$60.00	12.22
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.06	499	0.0	\$79.06	\$175.50	\$30.00	1.84
Girls' restroom	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	4	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	546	0.10	140	0.0	\$22.13	\$368.80	\$20.00	15.76
Custodial Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	52	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	52	0.02	2	0.0	\$0.31	\$58.50	\$10.00	155.01
Cafeteria	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,870	Relamp	No	13	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,870	0.48	1,566	0.0	\$248.23	\$1,236.73	\$260.00	3.93
Cafeteria	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,870	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,870	0.10	319	0.0	\$50.63	\$225.60	\$45.00	3.57
Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	20	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	20	0.09	3	0.0	\$0.48	\$234.00	\$40.00	403.02
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,380	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,380	0.06	499	0.0	\$79.06	\$175.50	\$30.00	1.84
Faculty lounge	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,870	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,870	0.15	482	0.0	\$76.38	\$380.53	\$80.00	3.93
Staff restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	780	Relamp	Yes	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	546	0.04	56	0.0	\$8.90	\$191.20	\$35.00	17.56
Stairwell	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.02	71	0.0	\$11.25	\$58.50	\$10.00	4.31
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.22	710	0.0	\$112.52	\$585.00	\$100.00	4.31
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	52	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	52	0.02	2	0.0	\$0.31	\$58.50	\$10.00	155.01
Classroom 224	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,870	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,309	0.29	947	0.0	\$150.16	\$686.80	\$140.00	3.64
Classroom 225	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,870	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,309	0.29	947	0.0	\$150.16	\$686.80	\$140.00	3.64
Staff restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.03	37	0.0	\$5.93	\$174.50	\$30.00	24.36
Classroom 230	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.11	359	0.0	\$56.87	\$350.00	\$60.00	5.10
Hallway	2	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	161	0.0	\$25.56	\$215.11	\$0.00	8.42
Stairwell	1	Exit Signs: Incandescent	None	14	4,380	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	4,380	0.01	40	0.0	\$6.39	\$107.56	\$0.00	16.83
Cafeteria	2	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	161	0.0	\$25.56	\$215.11	\$0.00	8.42

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	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
Stairwell	1	Exit Signs: Incandescent	None	14	4,380	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	4,380	0.01	40	0.0	\$6.39	\$107.56	\$0.00	16.83
Hallway	3	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	3	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	242	0.0	\$38.33	\$322.67	\$0.00	8.42
Classroom 225	1	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	81	0.0	\$12.78	\$107.56	\$0.00	8.42
Media center 230	2	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	161	0.0	\$25.56	\$215.11	\$0.00	8.42
Media center 230	13	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	176	1,870	Relamp	No	13	LED - Linear Tubes: (6) 4' Lamps	Wall Switch	87	1,870	0.76	2,488	0.0	\$394.50	\$1,744.90	\$390.00	3.43
Media center 230	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	16	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.35	1,135	0.0	\$180.03	\$936.00	\$160.00	4.31
Mechanical Room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.11	355	0.0	\$56.26	\$292.50	\$50.00	4.31
Elevator Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.02	71	0.0	\$11.25	\$58.50	\$10.00	4.31
Boiler Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.13	426	0.0	\$67.51	\$351.00	\$60.00	4.31
Media center 230	25	Compact Fluorescent: Ceiling mount - 2 lamp	Wall Switch	18	1,870	Relamp	No	25	LED Screw-In Lamps: Ceiling mount - 2 lamps	Wall Switch	7	1,870	0.18	591	0.0	\$93.77	\$2,687.65	\$250.00	26.00
Entrance	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.06	213	0.0	\$33.76	\$175.50	\$30.00	4.31
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.04	142	0.0	\$22.50	\$117.00	\$20.00	4.31
Coach office	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,870	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.00	9	0.0	\$1.36	\$58.50	\$10.00	35.56
Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	52	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	52	0.06	6	0.0	\$0.94	\$175.50	\$30.00	155.01
Boys' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.08	112	0.0	\$17.79	\$291.50	\$50.00	13.57
Hallway	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.11	355	0.0	\$56.26	\$292.50	\$50.00	4.31
Classroom 114	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,870	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,309	0.48	1,578	0.0	\$250.27	\$1,067.33	\$220.00	3.39
Classroom 113	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,870	Relamp	Yes	5	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,309	0.24	789	0.0	\$125.14	\$591.67	\$120.00	3.77
Classroom 112	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,870	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,309	0.19	631	0.0	\$100.11	\$496.53	\$100.00	3.96
Girls' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.08	112	0.0	\$17.79	\$291.50	\$50.00	13.57
SAC guidance room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.05	179	0.0	\$28.44	\$233.00	\$40.00	6.79
Art room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.04	142	0.0	\$22.50	\$117.00	\$20.00	4.31
Computer lab 111	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.22	717	0.0	\$113.75	\$584.00	\$100.00	4.26
Stairwell	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.04	142	0.0	\$22.50	\$117.00	\$20.00	4.31

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	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
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.15	497	0.0	\$78.76	\$409.50	\$70.00	4.31
Classroom 210	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.25	807	0.0	\$127.97	\$642.50	\$110.00	4.16
Classroom 209	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09
Staff bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	780	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	780	0.03	44	0.0	\$7.04	\$75.20	\$15.00	8.55
Nurse	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,870	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,870	0.06	213	0.0	\$33.76	\$150.40	\$30.00	3.57
Classroom 206	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09
Classroom 211	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09
Principal office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.11	359	0.0	\$56.87	\$350.00	\$60.00	5.10
Principal office	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,870	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,870	0.01	34	0.0	\$5.46	\$48.20	\$10.00	7.00
Classroom 214	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09
Classroom 218	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09
Classroom 217	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.11	359	0.0	\$56.87	\$350.00	\$60.00	5.10
Classroom 216	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09
Classroom 215	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,870	Relamp	No	3	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,870	0.10	319	0.0	\$50.63	\$225.60	\$45.00	3.57
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,870	Relamp	No	10	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,870	0.32	1,064	0.0	\$168.78	\$752.00	\$150.00	3.57
Storage	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	104	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	104	0.02	4	0.0	\$0.63	\$58.50	\$10.00	77.50
Classroom 202	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.25	807	0.0	\$127.97	\$642.50	\$110.00	4.16
Classroom 201	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.25	807	0.0	\$127.97	\$642.50	\$110.00	4.16
Classroom 200	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.33	1,076	0.0	\$170.62	\$818.00	\$140.00	3.97
Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,870	0.06	213	0.0	\$33.76	\$175.50	\$30.00	4.31
Girls' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	780	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	780	0.04	59	0.0	\$9.39	\$117.00	\$20.00	10.33
Hallway	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,870	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,870	0.04	138	0.0	\$21.82	\$192.80	\$40.00	7.00
Classroom 103	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09
Classroom 102	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09

Location	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 101	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,870	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,309	0.27	897	0.0	\$142.18	\$701.00	\$120.00	4.09
Boys' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	780	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	780	0.04	59	0.0	\$9.39	\$117.00	\$20.00	10.33
Hallway	5	Exit Signs: Fluorescent	None	14	8,760	Fixture Replacement	No	5	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	403	0.0	\$63.89	\$537.78	\$0.00	8.42
Classroom 114	1	Exit Signs: Fluorescent	None	14	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	81	0.0	\$12.78	\$107.56	\$0.00	8.42
Art room	1	Exit Signs: Fluorescent	None	14	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	81	0.0	\$12.78	\$107.56	\$0.00	8.42
Hallway	1	Exit Signs: Fluorescent	None	14	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	81	0.0	\$12.78	\$107.56	\$0.00	8.42
Stairwell	1	Exit Signs: Fluorescent	None	14	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	81	0.0	\$12.78	\$107.56	\$0.00	8.42
Hallway	3	Exit Signs: Fluorescent	None	14	8,760	Fixture Replacement	No	3	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	242	0.0	\$38.33	\$322.67	\$0.00	8.42
Classroom 215	1	Exit Signs: Fluorescent	None	14	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	81	0.0	\$12.78	\$107.56	\$0.00	8.42
Hallway	7	Exit Signs: Fluorescent	None	14	8,760	Fixture Replacement	No	7	LED Exit Signs: 2 W Lamp	None	6	8,760	0.04	564	0.0	\$89.45	\$752.89	\$0.00	8.42
Entrance	1	Exit Signs: Fluorescent	None	14	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	81	0.0	\$12.78	\$107.56	\$0.00	8.42
Gym	15	Halogen Incandescent: Wall mount fixtures	Wall Switch	70	1,870	Relamp	No	15	LED Screw-In Lamps: Wall mount fixtures - 1 lamp	Wall Switch	36	1,870	0.33	1,097	0.0	\$173.89	\$34,371.54	\$2,700.00	182.13
Exterior	3	Metal Halide: (1) 70W Lamp	Wall Switch	95	4,380	Fixture Replacement	Yes	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	36	2,190	0.15	1,164	0.0	\$184.48	\$1,422.03	\$435.00	5.35
Exterior	5	Metal Halide: (1) 150W Lamp	Wall Switch	190	4,380	Fixture Replacement	Yes	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	83	2,190	0.49	3,740	0.0	\$592.99	\$2,203.39	\$725.00	2.49
Exterior	7	Compact Fluorescent: Wall mount fixtures	Wall Switch	52	4,380	Relamp	No	7	LED Screw-In Lamps: Wall mount fixtures - 2 lamp	Wall Switch	14	4,380	0.17	1,340	0.0	\$212.44	\$376.27	\$35.00	1.61
Exterior	1	Halogen Incandescent: Tungsten Halide - 1 lamp	Wall Switch	250	4,380	Fixture Replacement	Yes	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	157	2,190	0.11	864	0.0	\$136.97	\$640.68	\$145.00	3.62

Motor Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
		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
Elevator Room	Elevator	1	Other	20.0	91.0%	No	3,391	No	91.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Accessibility elevators	Gym	2	Other	1.0	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Boiler Room	Hot water heater	2	Heating Hot Water Pump	1.0	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Boiler Room	Boiler	2	Water Supply Pump	1.5	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Boiler Room	Boiler - Circulation pump	2	Heating Hot Water Pump	3.0	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Fan coil units	Classroom	16	Other	0.8	59.0%	No	2,745	No	59.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Accessibility Elevator	Accessibility Elevator	1	Other	3.0	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Rooftop	Exhaust fans	10	Exhaust Fan	0.3	59.0%	No	2,745	No	59.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Classrooms	Unit vents	25	Supply Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Electric HVAC Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions		Proposed Conditions										Energy Impact & Financial Analysis						
		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
Condensers on the roof	Room 200,101,102,202,103,201	6	Packaged AC	3.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Condensers on the roof	Room 215, 216, 206, 207,209,211,214	7	Packaged AC	3.50		Yes	1	Packaged AC	3.50		14.00		No	22.38	23,052	0.0	\$3,654.97	\$7,941.36	\$322.00	2.08
Rooftop	Library	1	Packaged AC	12.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Rooftop	Cafeteria	1	Packaged AC	15.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Rooftop	Gym, Art room	2	Packaged AC	5.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Nurse, Room 217, SGIT	Nurse, Room 217, SGIT	3	Packaged Terminal AC	1.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Condensers on the roof	SGIT 2nd floor	1	Split-System AC	1.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Condensers on the roof	Principal's office	1	Split-System AC	1.50		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Condensers on the roof	Room 114	1	Packaged AC	4.00		Yes	1	Packaged AC	4.00		14.00		No	1.93	1,992	0.0	\$315.87	\$9,075.84	\$368.00	27.57
Condensers on the roof	Room 112	1	Packaged AC	3.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Condensers on the roof	Room 113	2	Packaged AC	3.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Condensers on the roof	Room 210	1	Packaged AC	3.00		No							No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Fuel Heating Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis							
		System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years		
Boiler Room	Haviland Avenue School	2	Condensing Hot Water Boiler	1,720.00	No								0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

DHW Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
		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
Elevator Room	Restroom and kitchen	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Boiler Room	Restroom and kitchen	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Low-Flow Device Recommendations

Location	Recommendation Inputs				Energy Impact & Financial Analysis							
	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years	
Boys' restroom	4	Faucet Aerator (Lavatory)	2.20	1.00	0.00	1,221	0.0	\$193.57	\$28.68	\$0.00	0.15	
Girls' restroom	6	Faucet Aerator (Lavatory)	2.20	1.00	0.00	1,831	0.0	\$290.35	\$43.02	\$0.00	0.15	
Art room	1	Faucet Aerator (Kitchen)	2.50	2.20	0.00	76	0.0	\$12.10	\$7.17	\$0.00	0.59	
Faculty restroom	1	Faucet Aerator (Lavatory)	2.20	1.00	0.00	305	0.0	\$48.39	\$7.17	\$0.00	0.15	
Nurse room	1	Faucet Aerator (Lavatory)	2.20	1.00	0.00	305	0.0	\$48.39	\$7.17	\$0.00	0.15	
Classroom 130	1	Faucet Aerator (Kitchen)	2.20	2.20	0.00	0	0.0	\$0.00	\$7.17	\$0.00	0.00	
Classroom 130	1	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	1.2	\$10.90	\$7.17	\$0.00	0.66	
Boys' restroom	3	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	3.7	\$32.70	\$21.51	\$0.00	0.66	
Girls' restroom	3	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	3.7	\$32.70	\$21.51	\$0.00	0.66	
Staff restroom	2	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	2.5	\$21.80	\$14.34	\$0.00	0.66	

Commercial Refrigerator/Freezer Inventory & Recommendations

Location	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
	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
Cafeteria	1	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Cafeteria	1	Stand-Up Refrigerator, Glass Door (31 - 50 cu. ft.)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Cooking Equipment Inventory & Recommendations

Location	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
	Quantity	Equipment Type	High Efficiency Equipment?	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
Faculty lunchroom	1	Electric Combination Oven/Steam Cooker (<15 Pans)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Cafeteria	1	Electric Convection Oven (Half Size)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00
Cafeteria	1	Insulated Food Holding Cabinet (1/2 Size)	No	No	0.00	0	0.0	\$0.00	\$0.00	\$0.00	0.00

Dishwasher Inventory & Recommendations

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

Plug Load Inventory

Existing Conditions				
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Haviland Avenue School	56	Computer	75.0	Yes
Haviland Avenue School	14	Laptop	40.0	Yes
Haviland Avenue School	5	Printer - Small	20.0	Yes
Haviland Avenue School	10	Printer - Medium	40.0	Yes
Haviland Avenue School	1	Printer - Big	200.0	Yes
Haviland Avenue School	1	Paper Shredder	360.0	No
Haviland Avenue School	25	Projector	200.0	Yes
Haviland Avenue School	4	Microwave	900.0	No
Haviland Avenue School	1	Refrigerator - Small	26.0	No
Haviland Avenue School	1	Refrigerator - Medium	40.0	No
Haviland Avenue School	1	Refrigerator - Large	200.0	No
Haviland Avenue School	5	Coffee Machine	400.0	Yes
Haviland Avenue School	1	Toaster Oven	1,200.0	No
Haviland Avenue School	6	Television - CRT/DLP	120.0	No
Haviland Avenue School	2	Space heater	1,500.0	No
Haviland Avenue School	23	Smart board	5.0	Yes
Haviland Avenue School	1	Ceramic kiln	11,520.0	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
Faculty lunch room	1	Refrigerated	Yes	0.00	1,612	0.0	\$255.56	\$230.00	\$0.00	0.90

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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**ENERGY STAR®
Score¹**

Haviland Avenue School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 41,702
Built: 1914

For Year Ending: May 31, 2016
Date Generated: May 24, 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
Haviland Avenue School 240 S Haviland Avenue Audubon, New Jersey 08106	_____ () - _____	_____ () - _____ _____
Property ID: 5897990		

Energy Consumption and Energy Use Intensity (EUI)			
Site EUI	Annual Energy by Fuel		National Median Comparison
64.5 kBtu/ft²	Natural Gas (kBtu)	1,442,869 (54%)	National Median Site EUI (kBtu/ft²) 58
	Electric - Grid (kBtu)	1,247,524 (46%)	National Median Source EUI (kBtu/ft²) 117.1
			% Diff from National Median Source EUI 11%
Source EUI			Annual Emissions
130.3 kBtu/ft²			Greenhouse Gas Emissions (Metric Tons CO2e/year) 220

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)**