Local Government Energy Audit:
Energy Audit Report

Glenwood Avenue Elementary School

Wildwood City School District

2900 New York Avenue
Wildwood, New Jersey 08260

September 20, 2018

Final Report by:
TRC Energy Services

Disclaimer

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

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

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

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

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1 EXECUTIVE SUMMARY

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

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

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

1.1 Facility Summary

Glenwood Avenue Elementary School is a 38,500 square foot two-story elementary school building. The facility is comprised of mainly classrooms and offices and was constructed in 1953 with an addition in 1983. The facility is L-shaped with a gable roof consisting of pre-engineered metal roof framing and insulated metal panels. The roofing system was installed in 2003.

Lighting at Glenwood Avenue Elementary School consists of mainly T8 lighting in the classrooms while the T8 lighting in the hallways and bathrooms having been upgraded to LED tubes. As part of this partial upgrade the bathrooms were also fitted with occupancy sensors however, the lighting and lighting controls in the classrooms have not been upgraded. The facility is electrically heated and cooled through the wall air source heat pumps installed in 2000. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated seven measures which together represent an opportunity for Glenwood Avenue Elementary School to reduce annual energy costs by roughly $26,515 and annual greenhouse gas emissions by 135,721 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 13.5 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 Glenwood Avenue Elementary School's annual energy use by 38%.

Figure 1 – Previous 12 Month Utility Costs

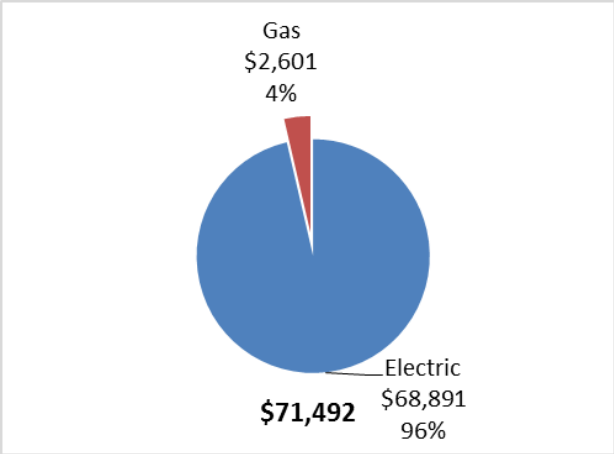
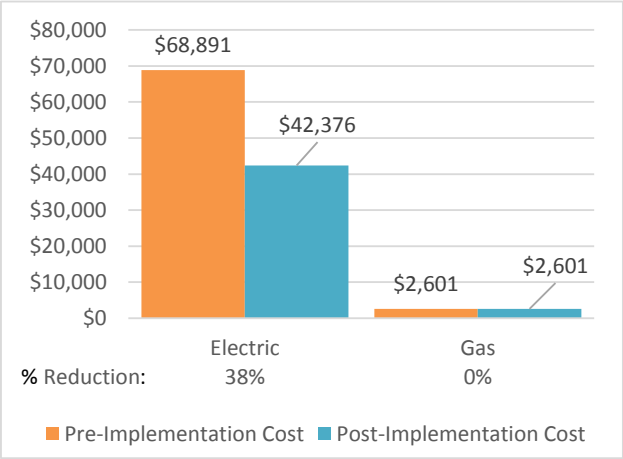


Figure 2 – Potential Post-Implementation Costs



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

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

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**94,538**	**12.4**	**0.0**	**$14,232.61**	**$54,480.15**	**$6,040.00**	**$48,440.15**	**3.4**	**95,199**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	90,808	12.1	0.0	$13,671.07	$52,383.00	$6,005.00	$46,378.00	3.4	91,443
ECM 2	Retrofit Fixtures with LED Lamps	Yes	1,796	0.2	0.0	$270.35	$376.27	$35.00	$341.27	1.3	1,808
ECM 3	Install LED Exit Signs	Yes	1,934	0.1	0.0	$291.19	$1,720.88	$0.00	$1,720.88	5.9	1,948
Lighting Control Measures			**24,379**	**3.2**	**0.0**	**$3,670.28**	**$9,180.00**	**$1,190.00**	**$7,990.00**	**2.2**	**24,550**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	24,379	3.2	0.0	$3,670.28	$9,180.00	$1,190.00	$7,990.00	2.2	24,550
Electric Unitary HVAC Measures			**41,345**	**13.7**	**0.0**	**$6,224.48**	**$304,116.96**	**$10,304.00**	**$293,812.96**	**47.2**	**41,634**
	Install High Efficiency Heat Pumps	No	41,345	13.7	0.0	$6,224.48	$304,116.96	$10,304.00	$293,812.96	47.2	41,634
Domestic Water Heating Upgrade			**13,907**	**0.0**	**0.0**	**$2,093.65**	**$6,000.00**	**$0.00**	**$6,000.00**	**2.9**	**14,004**
ECM 5	Install High Efficiency Heat Pump Water Heater	Yes	13,907	0	0	$ 2,093.65	$ 6,000.00	0	$ 6,000.00	3	14,004
Plug Load Equipment Control - Vending Machine			**1,954**	**0.0**	**0.0**	**$294.23**	**$460.00**	**$0.00**	**$460.00**	**1.6**	**1,968**
ECM 6	Vending Machine Control	Yes	1,954	0.0	0.0	$294.23	$460.00	$0.00	$460.00	1.6	1,968
TOTALS			**134,779**	**29.4**	**0.0**	**$26,515.24**	**$374,237.11**	**$17,534.00**	**$356,703.11**	**13.5**	**135,721**

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

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

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

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

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 outlet when not in use.

Energy Efficient Practices

TRC also identified nine 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 Glenwood Avenue Elementary School include:

- Reduce Air Leakage
- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls

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

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

1.3 Implementation Planning

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

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

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

- SmartStart
- Direct Install
- Energy Savings Improvement Program (ESIP)
- Demand Response Energy Aggregator

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

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

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. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Martha Jameson	Business Admin	mjamison@wwschools.org	609.522.0786
Patrick Quinlan	Facilities Supervisor	pquinlan@wwschools.org	609-374-1197
TRC Energy Services			
Ignacio Badilla	Auditor	ibadilla@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 16, 2017, TRC performed an energy audit at Glenwood Avenue Elementary School located in Wildwood, New Jersey. TRC's team met with Patrick Quinlan to review the facility operations and help focus our investigation on specific energy-using systems.

Glenwood Avenue Elementary School is a 38,500 square foot two-story elementary school building. The facility is comprised of mainly classrooms and offices and was constructed in 1953 with an addition in 1983. The facility is L-shaped with a gable roof consisting of pre-engineered metal roof framing and insulated metal panels. The roofing system was installed in 2003.

Lighting at Glenwood Avenue Elementary School consists of mainly T8 lighting in the classrooms while the T8 lighting in the hallways and bathrooms having been upgraded to LED tubes. As part of this partial upgrade the bathrooms were also fitted with occupancy sensors however, the lighting and lighting controls in the classrooms have not been upgraded. The facility is electrically heated and cooled through the wall air source heat pumps installed in 2000.

2.3 Building Occupancy

The school building is open Monday through Friday with a staff of about 50 and approximately 450 students. The typical schedule is presented in the table below. The facility is used year round with full occupancy in the winter and partial occupancy in the summer for summer school. Approximately 50% of the building is used during the summer months however the classrooms used rotate and are not consistent from one summer to another.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Glenwood Avenue Elementary	Weekday	6:30-11PM
Glenwood Avenue Elementary	Weekend	no schedule

2.4 Building Envelope

The building is constructed of concrete block and structural steel with a stone facade. The building has a gable roof of metal construction that is in good condition. The building has double pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum and in good condition except that the door seals are starting to wear and could lead to increased infiltration.

Picture 1: Building Envelope

2.5 On-Site Generation

Glenwood Avenue Elementary 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 at the facility is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some incandescent lamps in storage areas and classroom bathrooms. Most of the fixtures are 2-lamp or 3-lamp, 4-foot long troffers with diffusers.

The hallways and bathrooms in the facility were retrofit with LED tubes and the bathrooms were also fitted with occupancy sensors.

Lighting in the classrooms is controlled by wall switches and as such provide opportunities for energy savings through the installation of occupancy sensors. The exit signs are 2-lamp pin based 9-Watt compact fluorescents and they are on 24 hours per day. They also present an opportunity for energy savings.

The building's exterior lighting is minimal and consists primarily of efficient led wall mounted area lights.

Picture 2: Sample Incandescent

Picture 3: Sample T8 Fixture

Direct Expansion Air Conditioning System (DX)

The facility is heated and cooled by 18 4-ton vertical through the wall heat pumps (Marvair-Schollar II) and 10 4-ton horizontal through the wall heat pumps (Marvair EcoCool). The heat pumps are equipped with energy recovery and humidity control wheels. The units are approximately 17 years old and in fair condition. They have full load efficiencies of approximately 10.5 EER and COP's of 2.55. The units are located in the areas that they serve and with the supply for the vertical units ducted in the drop ceilings. There is also one 2-ton Sanyo mini-split heat pump that serves the offices.

Heating in the hallways is provided by electric resistance heaters. The hallways are not cooled during the summers.

The units are controlled by individual thermostats linked to a central controller. The heat pumps maintain the building space temperature setpoint around 72°F during occupied hours starting at 5:00 AM and set back to a 66°F at 10:00 PM.

Picture 4: Sample Vertical Heat Pump

Picture 5: Sample Horizontal Heat Pump

Domestic Hot Water Heating System

The school has a 91 gallon gas fired domestic water heater with an input rating of 200 kbtu/hr and a nominal efficiency of 80% that provides hot water for the original building bathrooms. A 50 kW recirculation pump distributes 120°F hot water throughout the building continuously.

The addition has a 36 kW electric 120 gallon storage hot water heater with a nominal efficiency of 90%. The system is capable of providing 140°F hot water. No natural gas is available in that section of the building.

Picture 6: Existing Natural Gas Heater

Picture 7: Existing Electric Resistance Heater

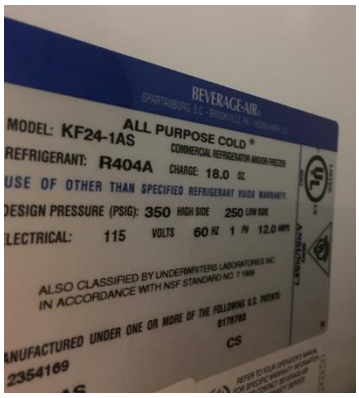
Food Service & Laundry Equipment

The school has an all-electric kitchen that is sparingly used for the students and staff. The food for the students is prepared externally and brought in. The dishwashing equipment is used however.

Refrigeration

The kitchen has some commercial refrigeration on site that is used to store food and drink items.

Picture 8: Commercial Refrigerator

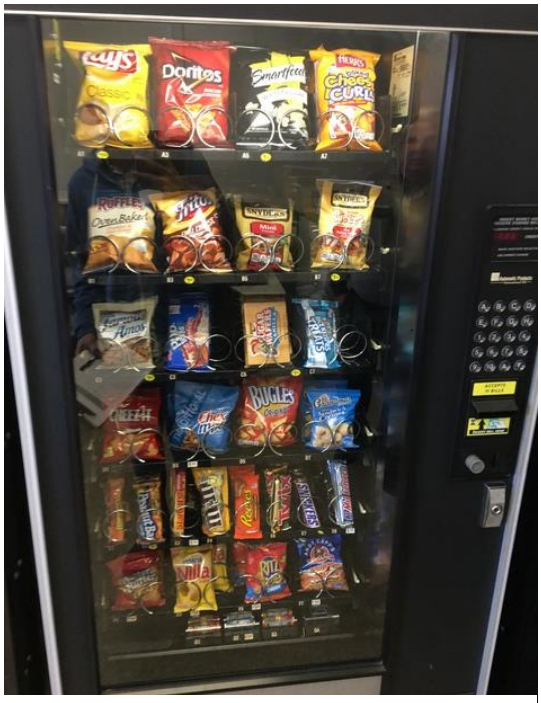


Picture 9: Freezer Nameplate

Building Plug Load

There are roughly 30 computer work stations throughout the facility along with small office appliances in the offices. There are two vending machines in the facility as well, one refrigerated beverage vending machine and one non-refrigerated snack vending machine.

Picture 10: Refrigerated Vending Machine



Picture 11: Snack Vending Machine

2.7 Water-Using Systems

There are 10 restrooms at this facility. A sampling of restrooms found that the faucets are already very efficient low flow fixtures rated for 0.5 gallons per minute (gpm). The toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 gpf. There are no showers at this facility.

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

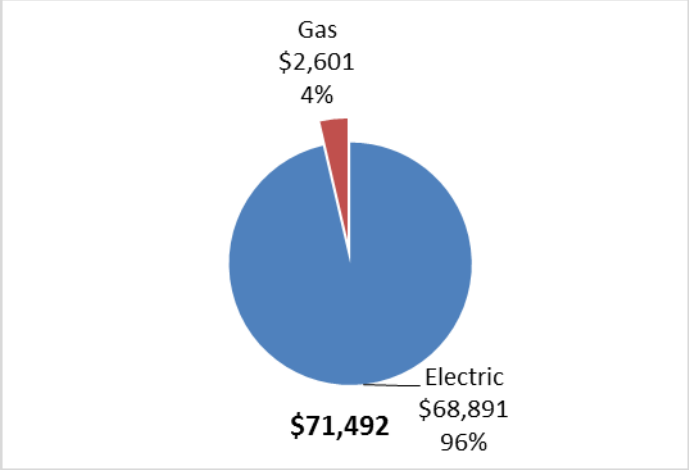
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Glenwood Avenue Elementary School		
Fuel	**Usage**	**Cost**
Electricity	457,600 kWh	$68,891
Natural Gas	1,098 Therms	$2,601
Total		**$71,492**

The current annual energy cost for this facility is $71,492 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by Atlantic City Electric. The average electric cost over the past 12 months was $0.151/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 facility is billed for demand, with summer and winter rates. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

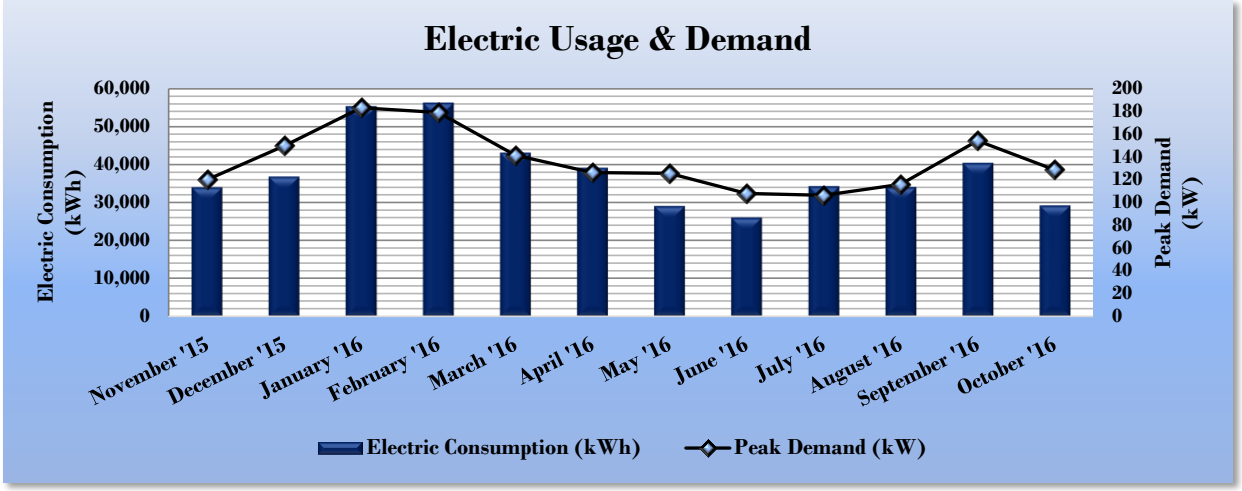


Figure 9 - Electric Usage & Demand

Electric Billing Data for Glenwood Avenue Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
12/2/15	31	34,000	120	$927	$5,020
1/4/16	33	36,800	150	$1,261	$5,700
2/1/16	28	55,360	183	$1,309	$7,894
3/1/16	29	56,240	179	$1,281	$7,968
4/1/16	31	43,120	142	$1,121	$6,289
5/3/16	32	39,120	126	$1,033	$5,739
6/2/16	30	29,040	126	$962	$4,483
7/1/16	29	26,000	108	$896	$4,189
8/2/16	30	34,240	106	$988	$5,270
9/1/16	30	34,080	116	$969	$5,186
10/4/16	33	40,400	154	$1,500	$6,477
11/2/16	29	29,200	129	$1,099	$4,674
Totals	**365**	**457,600**	**183.2**	**$13,345**	**$68,891**
Annual	**365**	**457,600**	**183.2**	**$13,345**	**$68,891**

3.3 Natural Gas Usage

Natural gas is provided by South Jersey Gas. The average gas cost for the past 12 months is $2.368/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Natural Gas Usage

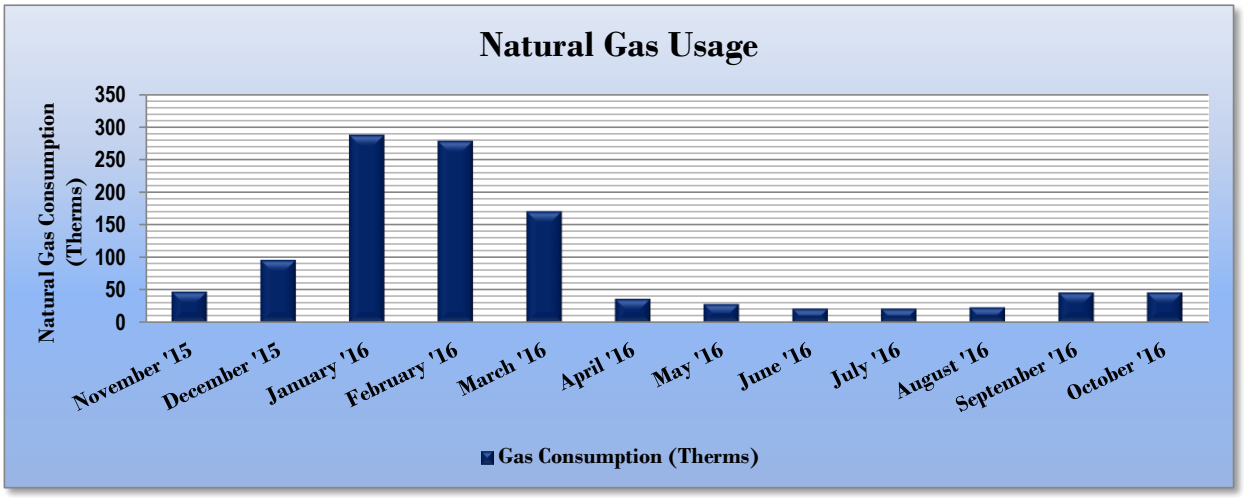


Figure 11 - Natural Gas Usage

Gas Billing Data for Glenwood Avenue Elementary School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
12/2/15	31	47	$87
1/4/16	33	96	$122
2/1/16	28	287	$1,498
3/1/16	29	278	$288
4/1/16	31	170	$190
5/3/16	32	36	$65
6/2/16	30	28	$55
7/1/16	29	21	$47
8/2/16	30	21	$50
9/1/16	30	23	$50
10/4/16	33	46	$74
11/2/16	29	46	$75
Totals	**365**	**1,098**	**$2,601**
Annual	**365**	**1,098**	**$2,601**

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		
	Glenwood Avenue Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	130.3	141.4
Site Energy Use Intensity (kBtu/ft^2)	43.4	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		
	Glenwood Avenue Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	92.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	31.5	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 43.

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

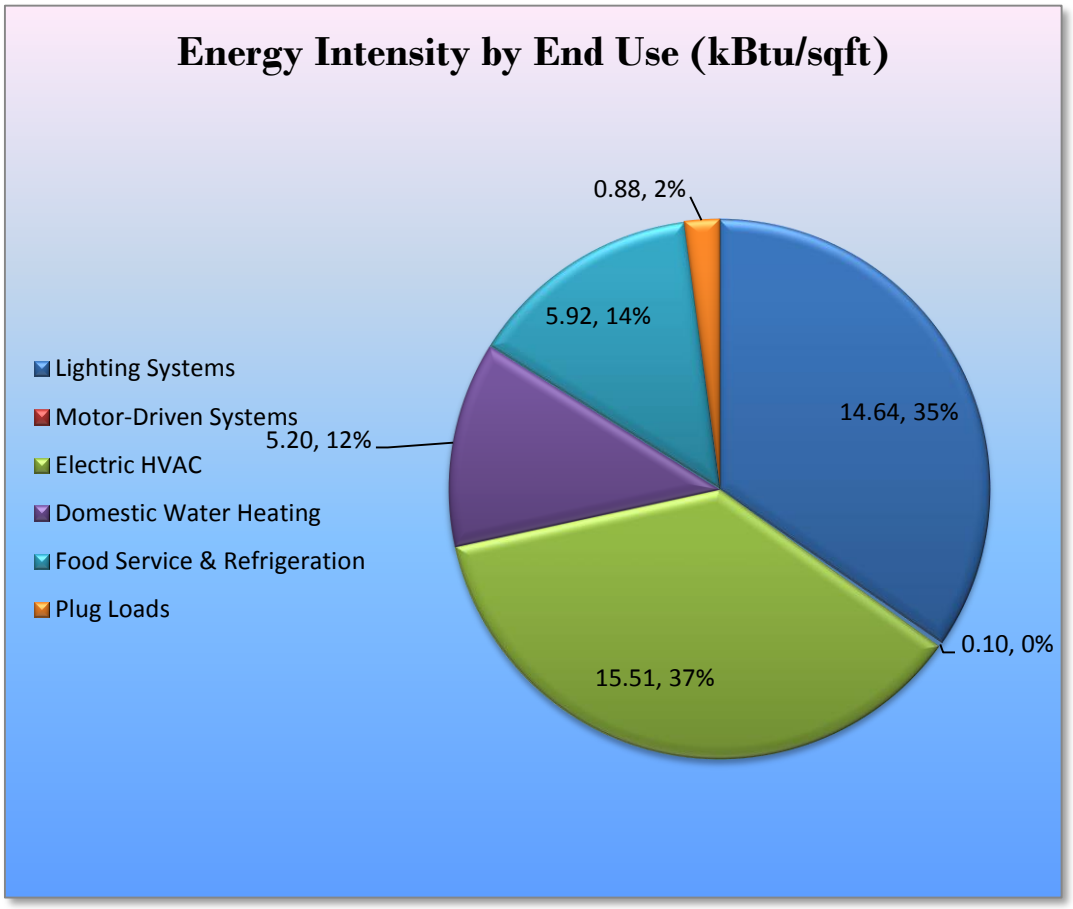
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**94,538**	**12.4**	**0.0**	**$14,232.61**	**$54,480.15**	**$6,040.00**	**$48,440.15**	**3.4**	**95,199**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	90,808	12.1	0.0	$13,671.07	$52,383.00	$6,005.00	$46,378.00	3.4	91,443
ECM 2	Retrofit Fixtures with LED Lamps	1,796	0.2	0.0	$270.35	$376.27	$35.00	$341.27	1.3	1,808
ECM 3	Install LED Exit Signs	1,934	0.1	0.0	$291.19	$1,720.88	$0.00	$1,720.88	5.9	1,948
Lighting Control Measures		**24,379**	**3.2**	**0.0**	**$3,670.28**	**$9,180.00**	**$1,190.00**	**$7,990.00**	**2.2**	**24,550**
ECM 4	Install Occupancy Sensor Lighting Controls	24,379	3.2	0.0	$3,670.28	$9,180.00	$1,190.00	$7,990.00	2.2	24,550
Domestic Water Heating Upgrade		**13,907**	**0.0**	**0.0**	**$2,093.65**	**$6,000.00**	**$0.00**	**$6,000.00**	**2.9**	**14,004**
ECM 5	Install High Efficiency Heat Pump Water Heater	13,907	0.0	0.0	$2,093.65	$6,000.00	$0.00	$6,000.00	2.9	14,004
Plug Load Equipment Control - Vending Machine		**1,954**	**0.0**	**0.0**	**$294.23**	**$460.00**	**$0.00**	**$460.00**	**1.6**	**1,968**
ECM 6	Vending Machine Control	1,954	0.0	0.0	$294.23	$460.00	$0.00	$460.00	1.6	1,968
TOTALS		**134,779**	**15.7**	**0.0**	**$20,290.76**	**$70,120.15**	**$7,230.00**	**$62,890.15**	**3.1**	**135,721**

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

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

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**94,538**	**12.4**	**0.0**	**$14,232.61**	**$54,480.15**	**$6,040.00**	**$48,440.15**	**3.4**	**95,199**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	90,808	12.1	0.0	$13,671.07	$52,383.00	$6,005.00	$46,378.00	3.4	91,443
ECM 2	Retrofit Fixtures with LED Lamps	1,796	0.2	0.0	$270.35	$376.27	$35.00	$341.27	1.3	1,808
ECM 3	Install LED Exit Signs	1,934	0.1	0.0	$291.19	$1,720.88	$0.00	$1,720.88	5.9	1,948

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: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	90,808	12.1	0.0	$13,671.07	$52,383.00	$6,005.00	$46,378.00	3.4	91,443
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	1,796	0.2	0.0	$270.35	$376.27	$35.00	$341.27	1.3	1,808
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

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

ECM 3: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	1,934	0.1	0.0	$291.19	$1,720.88	$0.00	$1,720.88	5.9	1,948
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

4.1.2 Lighting Control Measures

Our recommendtions for lighting control measures are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**24,379**	**3.2**	**0.0**	**$3,670.28**	**$9,180.00**	**$1,190.00**	**$7,990.00**	**2.2**	**24,550**
ECM 4	Install Occupancy Sensor Lighting Controls	24,379	3.2	0.0	$3,670.28	$9,180.00	$1,190.00	$7,990.00	2.2	24,550

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

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
24,379	3.2	0.0	$3,670.28	$9,180.00	$1,190.00	$7,990.00	2.2	24,550

Measure Description

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

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

4.1.3 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 18 below.

Figure 18 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**13,907**	**0.0**	**0.0**	**$2,093.65**	**$6,000.00**	**$0.00**	**$6,000.00**	**2.9**	**14,004**
ECM 6	Install High Efficiency Gas Water Heater	13,907	0.0	0.0	$2,093.65	$6,000.00	$0.00	$6,000.00	2.9	14,004

ECM 5: Install High Efficiency Heat Pump Water Heater

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
13,907	0.0	0.0	$2,093.65	$6,000.00	$0.00	$6,000.00	2.9	14,004

Measure Description

We recommend replacing the existing tank water heater with a high efficiency heat pump tank water heater. Heat pump water heaters move heat from one place to another and can therefore be two to three times more efficient than the electric resistance water heater that is currently in place.

4.1.4 Plug Load Equipment Control - Vending Machines

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

Figure 19-Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**1,954**	**0.0**	**0.0**	**$294.23**	**$460.00**	**$0.00**	**$460.00**	**1.6**	**1,968**
ECM 6	Vending Machine Control	1,954	0.0	0.0	$294.23	$460.00	$0.00	$460.00	1.6	1,968

ECM 6: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,954	0.0	0.0	$294.23	$460.00	$0.00	$460.00	1.6	1,968

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 dependent on vending machine and activity level in the area surrounding the machines.

4.1 ECMs Evaluated But Not Recommended

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

Figure 20 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**41,345**	**13.7**	**0.0**	**$6,224.48**	**$304,116.96**	**$10,304.00**	**$293,812.96**	**47.2**	**41,634**
Install High Efficiency Heat Pumps	41,345	13.7	0.0	$6,224.48	$304,116.96	$10,304.00	$293,812.96	47.2	41,634
TOTALS	**41,345**	**13.7**	**0.0**	**$6,224.48**	**$304,116.96**	**$10,304.00**	**$293,812.96**	**47.2**	**41,634**

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

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

Install High Efficiency Heat Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
41,345	13.7	0.0	$6,224.48	$304,116.96	$10,304.00	$293,812.96	47.2	41,634

Measure Description

We recommend replacing standard efficiency heat pumps with high efficiency heat pumps. 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 and a higher HPSF rating indicates more efficient heating mode. 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 heating and cooling loads, and the estimated annual operating hours.

Reasons for not Recommending

The existing systems have energy recovery wheels and are in good condition for their age. They were efficient systems when they were installed and the savings that would be generated by replacing them would not justify the cost of replacement at this time.

5 ENERGY EFFICIENT PRACTICES

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

Reduce Air Leakage

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

Close Doors and Windows

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

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.

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 Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

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.

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.

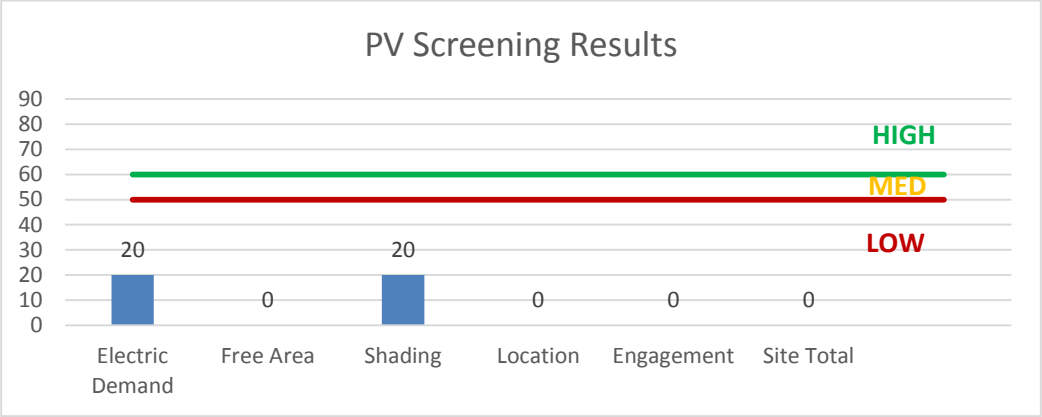
6.1 Photovoltaic

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. It may be possible to mount solar panels on the roof however, the roof is now 15 years old and may present difficulties with mounting.

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



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

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

7 DEMAND RESPONSE

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

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

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

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

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

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

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

8 PROJECT FUNDING / INCENTIVES

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

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x		x			
ECM 2	Retrofit Fixtures with LED Lamps	x		x			
ECM 3	Install LED Exit Signs	x		x			
ECM 4	Install Occupancy Sensor Lighting Controls	x		x			
ECM 5	Install High Efficiency Heat Pump Water Heater		x	x			
ECM 6	Vending Machine Control	x		x			

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the SmartStart custom program provides incentives for new and innovative technologies, or process improvements not defined through one of the prescriptive incentives listed above.

Although your facility is an existing building, and only the prescriptive incentives have been applied in the calculations, the SmartStart custom measure path is recommended for ECM 5 (Install High Efficiency Heat Pump Water Heater). These incentives are calculated utilizing a number of factors, including project cost, energy savings and comparison to existing conditions or a defined standard. To qualify, the proposed measure(s) must be at least 2% more efficient than current energy code or recognized industry standard and save at least 75,000 kWh or 1,500 therms annually.

SmartStart custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives in the SmartStart program (inclusive of prescriptive and custom) are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

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

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

8.2 Direct Install

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

Incentives

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

How to Participate

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

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

8.3 Energy Savings Improvement Program

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

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

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

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

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

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical room	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp & Reballast	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	0.11	814	0.0	$122.55	$585.00	$50.00	4.37
Hallways	11	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	None	No	11	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Entrance	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	4,290	None	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	4,290	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
104	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.53	4,012	0.0	$603.95	$1,979.50	$230.00	2.90
Girls	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	None	No	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
105	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.57	4,320	0.0	$650.41	$2,111.00	$245.00	2.87
offices	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.19	1,448	0.0	$218.07	$917.33	$115.00	3.68
principal	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.19	1,448	0.0	$218.07	$917.33	$115.00	3.68
Detention	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	4,290	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.03	206	0.0	$30.97	$387.00	$45.00	11.04
guidance	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.05	411	0.0	$61.94	$504.00	$55.00	7.25
101	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.72	5,432	0.0	$817.75	$2,697.50	$335.00	2.89
102	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.72	5,432	0.0	$817.75	$2,697.50	$335.00	2.89
101 bath	1	Incandescent: 2 lamp	Wall Switch	120	4,290	Relamp	No	1	LED Screw-In Lamps: led	Wall Switch	16	4,290	0.07	513	0.0	$77.24	$107.51	$10.00	1.26
102 bath	1	Incandescent: 2 lamp	Wall Switch	120	4,290	Relamp	No	1	LED Screw-In Lamps: led	Wall Switch	16	4,290	0.07	513	0.0	$77.24	$107.51	$10.00	1.26
stairs	2	LED - Linear Tubes: (1) 4' Lamp	None	15	4,290	None	No	2	LED - Linear Tubes: (1) 4' Lamp	None	15	4,290	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
stairs	1	LED - Linear Tubes: (1) 2' Lamp	None	9	4,290	None	No	1	LED - Linear Tubes: (1) 2' Lamp	None	9	4,290	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
220	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.14	1,086	0.0	$163.55	$755.50	$95.00	4.04
221	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.58	4,345	0.0	$654.20	$2,212.00	$275.00	2.96
223	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.58	4,345	0.0	$654.20	$2,212.00	$275.00	2.96
222	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.58	4,345	0.0	$654.20	$2,212.00	$275.00	2.96
Teachers rm	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.49	3,703	0.0	$557.49	$1,848.00	$215.00	2.93
Bathroom	5	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	None	No	5	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
storage	1	Incandescent: 1 lamp	Wall Switch	60	4,290	Relamp	No	1	LED Screw-In Lamps: led	Wall Switch	8	4,290	0.03	257	0.0	$38.62	$53.75	$5.00	1.26
girls	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	None	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
girls	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	None	No	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallways	7	LED - Linear Tubes: (2) 4' Lamps	None	29	4,290	None	No	7	LED - Linear Tubes: (2) 4' Lamps	None	29	4,290	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
storage d	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	0.04	326	0.0	$49.02	$234.00	$20.00	4.37
storage e	1	Incandescent: 1 lamp	Wall Switch	60	4,290	Relamp	No	1	LED Screw-In Lamps: led	Wall Switch	8	4,290	0.03	257	0.0	$38.62	$53.75	$5.00	1.26
boys	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	None	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
boys	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	None	No	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
storagec	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,290	0.04	276	0.0	$41.59	$161.83	$20.00	3.41
storage (roofaccess)	1	Incandescent: 1 lamp	Wall Switch	60	4,290	Relamp	No	1	LED Screw-In Lamps: led	Wall Switch	8	4,290	0.03	257	0.0	$38.62	$53.75	$5.00	1.26
Hallways	14	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,290	None	No	14	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,290	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
storage f	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	None	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
225	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.38	2,897	0.0	$436.13	$1,564.67	$195.00	3.14
224	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.38	2,897	0.0	$436.13	$1,564.67	$195.00	3.14
227	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.19	1,448	0.0	$218.07	$917.33	$115.00	3.68
228	35	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp & Reballast	Yes	35	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.96	7,200	0.0	$1,084.02	$4,365.00	$385.00	3.67
offices	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.10	724	0.0	$109.03	$593.67	$75.00	4.76
226	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.33	2,469	0.0	$371.66	$1,322.00	$155.00	3.14
229	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.41	3,086	0.0	$464.58	$1,585.00	$185.00	3.01
230	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.41	3,086	0.0	$464.58	$1,585.00	$185.00	3.01
grils	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	None	No	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
232	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.66	4,937	0.0	$743.32	$2,374.00	$275.00	2.82
231	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.41	3,086	0.0	$464.58	$1,585.00	$185.00	3.01
stairs 2	7	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,290	None	No	7	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,290	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
115	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.49	3,703	0.0	$557.49	$1,848.00	$215.00	2.93
boys	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	None	No	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
119	27	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	27	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	1.30	9,777	0.0	$1,471.94	$4,639.50	$575.00	2.76
kitchen	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	No	7	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	4,290	0.26	1,934	0.0	$291.15	$1,132.83	$140.00	3.41

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
kitchen	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp & Reballast	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	0.11	814	0.0	$122.55	$585.00	$50.00	4.37
114	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.41	3,086	0.0	$464.58	$1,585.00	$185.00	3.01
112	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.41	3,086	0.0	$464.58	$1,585.00	$185.00	3.01
Hallways	10	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,290	None	No	10	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,290	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
110	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.41	3,086	0.0	$464.58	$1,585.00	$185.00	3.01
109	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.41	3,086	0.0	$464.58	$1,585.00	$185.00	3.01
111	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.53	4,012	0.0	$603.95	$1,979.50	$230.00	2.90
closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	0.02	163	0.0	$24.51	$117.00	$10.00	4.37
108	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp & Reballast	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,003	0.08	617	0.0	$92.92	$621.00	$65.00	5.98
108	7	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	4,290	Relamp & Reballast	Yes	7	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	3,003	0.34	2,535	0.0	$381.61	$1,402.83	$175.00	3.22
bathroom	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	None	No	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
conference	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.12	926	0.0	$139.37	$664.50	$80.00	4.19
girls	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	None	No	3	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	3,003	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
elevator	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	4,290	0.03	244	0.0	$36.77	$131.50	$15.00	3.17
106	13	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,290	Relamp & Reballast	Yes	13	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,003	0.53	4,012	0.0	$603.95	$1,979.50	$230.00	2.90
storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,290	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,290	0.04	326	0.0	$49.02	$234.00	$20.00	4.37
exits	16	Exit Signs: Fluorescent	None	18	8,760	Fixture Replacement	No	16	LED Exit Signs: 2 W Lamp	None	6	8,760	0.13	1,934	0.0	$291.19	$1,720.88	$0.00	5.91
exterior	9	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	30	4,290	None	No	9	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	30	4,290	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
roof	bathrooms	3	Exhaust Fan	0.3	75.0%	No	2,745	No	75.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classrooms	Classrooms	18	Through-The-Wall HP	4.00	48.00	Yes	18	Through-The-Wall HP	4.00	48.00	12.50	3.50	No	8.82	26,579	0.0	$4,001.45	$195,503.76	$6,624.00	47.20
Classrooms	Classrooms	10	Through-The-Wall HP	4.00	48.00	Yes	10	Through-The-Wall HP	4.00	48.00	12.50	3.50	No	4.90	14,766	0.0	$2,223.03	$108,613.20	$3,680.00	47.20
exterior	offices	1	Split-System Air-Source HP	2.00	24.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
maintenance office	bathrooms	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
kitchen area	kitchen	1	Storage Tank Water Heater (> 50 Gal)	Yes	1	Heat Pump Water Heater	Electric	200.00%	COP	0.00	13,907	0.0	$2,093.65	$6,000.00	$0.00	2.87

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
kitchen	1	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
kitchen	1	Electric Steamer	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
kitchen	2	Electric Combination Oven/Steam Cooker (<15 Pans)	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?
classrooms	28	computers	200.0	no
copier	2	copier	350.0	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
hallway	1	Refrigerated	Yes	0.00	1,612	0.0	$242.66	$230.00	$0.00	0.95
hallway	1	Non-Refrigerated	Yes	0.00	343	0.0	$51.57	$230.00	$0.00	4.46

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® Score[1]

Glenwood Avenue Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 38,500
Built: 1953

For Year Ending: October 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
Glenwood Avenue Elementary School 2900 New York Avenue Wildwood, New Jersey 08260	_____ , (___)___-_____	Ignacio Badilla 1430 Broadway 10th Floor New York, NY 10018 2015721187 ibadilla@trcsolutions.com

Property ID: 5851039

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
43.4 kBtu/ft²

Source EUI
130.3 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	1,561,222 (93%)
Natural Gas (kBtu)	109,733 (7%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	40.9
National Median Source EUI (kBtu/ft²)	122.9
% Diff from National Median Source EUI	6%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	185

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)