Local Government Energy Audit:
Energy Audit Report

Hilldale Elementary School

123 Konner Avenue

Pine Brook, NJ 07058

Montville Township BOE

February 12, 2018

Final Report by:

TRC Energy Services

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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 Hilldale 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 local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Hilldale Elementary School is a 37,055 square foot facility comprised of various space types such as classrooms, gymnasium/cafeteria, libraries and a mechanical space. The building has single story and serves students from kindergarten through fifth grade. This is a ten (10) month school and the building schedule on a regular day is from 8:00 AM to 3:00PM.

Heating in the building is supplied by three (3) condensing boilers and space cooling is provided by packaged units and split units. Lighting at Hilldale Elementary School consists of aged and inefficient T8 and T12 linear tubes for majority spaces. Smaller spaces such as boiler room and main office are lit using compact fluorescents and incandescent bulbs. 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 five (5) measures which together represent an opportunity for Hilldale Elementary School to reduce annual energy costs by roughly $11,755 and annual greenhouse gas emissions by 98,906 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 8.2 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 Hilldale Elementary School's annual energy use by 17%.

Figure 1 – Previous 12 Month Utility Costs

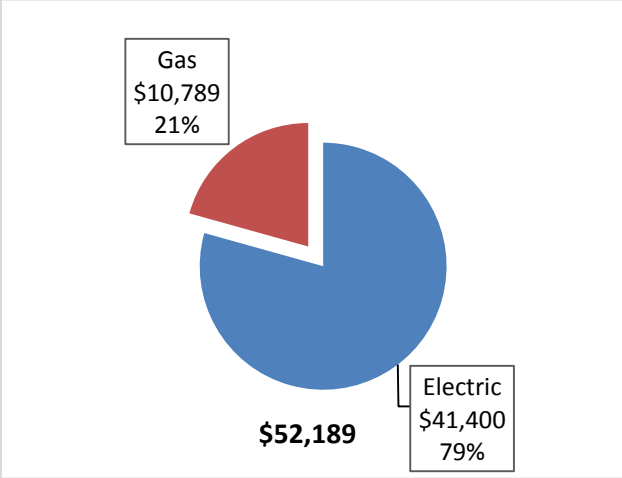
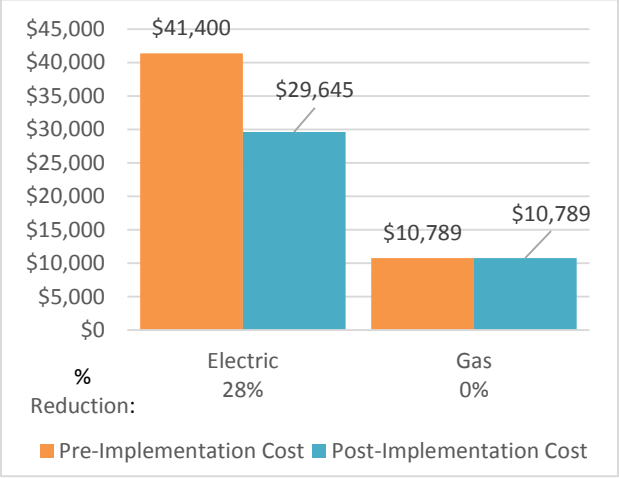


Figure 2 – Potential Post-Implementation Costs



A detailed description of Hilldale 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			**78,094**	**21.6**	**0.0**	**$9,346.19**	**$59,552.62**	**$3,405.00**	**$56,147.62**	**6.0**	**78,640**
ECM 1	Install LED Fixtures	Yes	2,327	0.3	0.0	$278.50	$1,172.03	$300.00	$872.03	3.1	2,343
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and	Yes	52,828	14.4	0.0	$6,322.33	$41,069.63	$0.00	$41,069.63	6.5	53,197
ECM 3	Retrofit Fixtures with LED Lamps	Yes	22,939	6.8	0.0	$2,745.36	$17,310.96	$3,105.00	$14,205.96	5.2	23,100
Lighting Control Measures			**4,098**	**1.1**	**0.0**	**$490.50**	**$4,398.00**	**$585.00**	**$3,813.00**	**7.8**	**4,127**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	4,098	1.1	0.0	$490.50	$4,398.00	$585.00	$3,813.00	7.8	4,127
Electric Unitary HVAC Measures			**11,830**	**8.7**	**0.0**	**$1,415.79**	**$38,901.72**	**$2,392.00**	**$36,509.72**	**25.8**	**11,913**
	Install High Efficiency Electric AC	No	11,830	8.7	0.0	$1,415.79	$38,901.72	$2,392.00	$36,509.72	25.8	11,913
Domestic Water Heating Upgrade			**4,197**	**0.0**	**0.0**	**$502.25**	**$136.23**	**$0.00**	**$136.23**	**0.3**	**4,226**
ECM 5	Install Low-Flow Domestic Hot Water Devices	Yes	4,197	0.0	0.0	$502.25	$136.23	$0.00	$136.23	0.3	4,226
TOTAL OF ALL ECMS EVALUATED			**98,219**	**31.4**	**0.0**	**$11,754.73**	**$102,988.57**	**$6,382.00**	**$96,606.57**	**8.2**	**98,906**
TOTAL OF ALL ECMS RECOMMENDED			**86,389**	**23**	**0**	**10,339**	**64,087**	**3,990**	**60,097**	**5.8**	**86,993**

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

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

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

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

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

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

Energy Efficient Practices

TRC also identified nine (9) 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 Hilldale Elementary School include:

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

For details on these Energy Efficient Practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Hilldale Elementary School. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array. 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)

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.

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.

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

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rene Rovtar	Superintendent	rene.rovtar@montville.net	973-331-7100 x 2228
Rich Medwin	Maintennace Supervisor	Rrichard.medwin@montville.net	973-331-7100 x 2250
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 14, 2017, TRC performed an energy audit at Hilldale Elementary School located in Pine Brook, New Jersey. TRC's team met with Ted Keane to review the facility operations and help focus our investigation on specific energy-using systems.

Hilldale Elementary School is a 37,055 square foot facility comprised of various space types such as classrooms, gymnasium/cafeteria, libraries and a mechanical space. The building has single story and serves students from kindergarten through fifth grade. This is a ten (10) month school and the building schedule on a regular day is from 8:00 AM to 3:00 PM.

The building was constructed in 1974 and an addition in 2005. The addition primarily consists of classrooms. Space heating in the building is supplied by three (3) gas fired condensing boilers and space cooling is provided by packaged units and split units. Lighting at Hilldale Elementary School consists of aged and inefficient T8 and T12 linear tubes for majority spaces. Smaller spaces such as boiler room and main office are lit using compact fluorescents and incandescent bulbs.

2.3 Building Occupancy

The typical schedule is presented in the table below. It was mentioned by the site contact that the gymnasium and libraries are used for after school activities and also during some weekends for other events. During a typical day, the facility is occupied by approximately 55 full time staff (teachers, admin and maintenance) and 340 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Hilldale Elementary School	Weekday	8AM - 3PM
Hilldale Elementary School	Weekend	No operation

2.4 Building Envelope

The building is made of interconnected structures made of concrete blocks and has a concrete (and window) façade. The building has pitched roof on the original building with gravel layer and flat roof on the 2005 addition with EPDM membrane. Due to inclement weather, the auditor onsite did not have roof access. Other resources were used to obtain this information. Both sections look fairly new and in good condition. The windows in the building are double pane and the doors are made of aluminum or aluminum framed glass. These were observed to be in good condition.

Image 1 Sample of building envelope pictures

2.5 On-Site Generation

Hilldale Elementary School currently does not have any on-site electric generation systems installed.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided mostly by linear 32 Watt fluorescent T8 lamps and 60 Watt fluorescent T12 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). The fixtures are 4-foot or 8 foot with varying number of tubes in each one of them.

A small area of the building and the majority of the office spaces are primarily lit with 26-watt or 42-watt CFL lamps in recessed can ceiling fixtures. The entrance hallway is lit using LED lamps.

Lighting control in most spaces is provided by manual wall switches. Some spaces such as the oiler rooms and, staff restroom, music rooms and a few offices have occupancy sensors to control the lights. The occupancy sensors are wall mounted.

Majority of the building's exterior lighting consists of metal halide wall pack fixtures. We also observed one LED fixture and a couple of compact fluorescent fixtures. All the exit lights are 2-watt LED fixtures.

Image 2 Typical lighting fixtures at the facility

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

Hot Water (or Steam) Heating System

The hot water system consists of three (3) gas fired condensing hot water boiler from MACH. The boilers have an output capacity of 987 MBh each and a combustion efficiency of 94%. Out of the three (3) boilers, one (1) is the lead boiler installed with the temperature sensor controls. This controls the other two (2) boilers based on the outside air temperature.

The hot water is circulated to the various parts (classrooms, offices and gymnasiums) of the school using two (2) variable speed pumps of 10hp capacity. The boilers are also equipped with jockey pumps (one (1) each) used to maintain the loop temperature by circulating the water continuously. The heated air is distributed in the respective zones using terminal units such as unit ventilators and hot water baseboard heaters. The unit ventilators placed in the classrooms in the original section of the building are old and function with lower accuracy and have pneumatic controls.

The 2005 addition of the building has newer, self-contained unit ventilators with hot water coils and DX cooling coils. These unit ventilators along with the HVV unit in the gym and other parts of the newer addition are controlled using DDC building management system provided by Honeywell.

Image 3 Sample of boilers, terminal units, controls and distributing pumps at the facility

Direct Expansion Air Conditioning System (DX)

One (1) 6 ton packaged unit is placed on the roof of the original building that serves the main offices. The original section of the building has 2.5 ton split AC units (Fujitsu) per classroom serving all classrooms. These are controlled using thermostats in the individual rooms. The newer section of the building has self-contained unit ventilators with DX coils that have condensers on the roof top. The site had mentioned (in our response to the RFI) that this section has two (2) 2.5 ton and six (6) 3.5 ton unit ventilators. These are controlled using the BMS system provided by Honeywell along with the heat in these spaces.

Image 4 Split units and respective controls in the older and newer section of the building

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of three (3) electric hot water heaters. Two (2) of these have an input rating of 4.5kW (AO Smith and Rheem) and a tank capacity of 50 gallons serving the sinks and restrooms. There is one (1) smaller water heater serving just the art room with an input capacity 1.4kW and a tank capacity of four (4) gallons.

Building Plug Load

There are roughly 76 computer work stations and 23 laptops throughout the facility. The students also carry Chromebooks that are charged using the Chromebook carts during school hours. Other plug loads found in the school are printers, paper shredder, projectors and smart board. There are also kitchenette equipment like coffee machines, microwaves, refrigerators, water dispensers etc. There is no centralized PC power management software installed.

2.7 Water-Using Systems

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

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

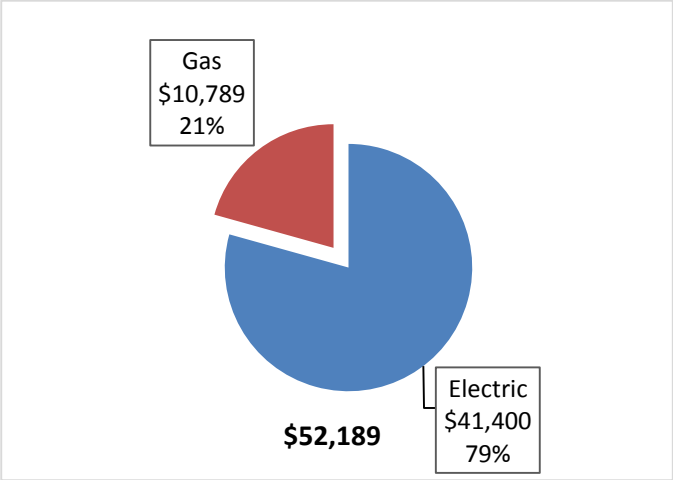
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Hilldale Elementary School		
Fuel	**Usage**	**Cost**
Electricity	345,926 kWh	$41,400
Natural Gas	7,799 Therms	$10,789
Total		**$52,189**

The current annual energy cost for this facility is $52,189 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.120/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The third party electric supply is provided by First Energy Sol. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

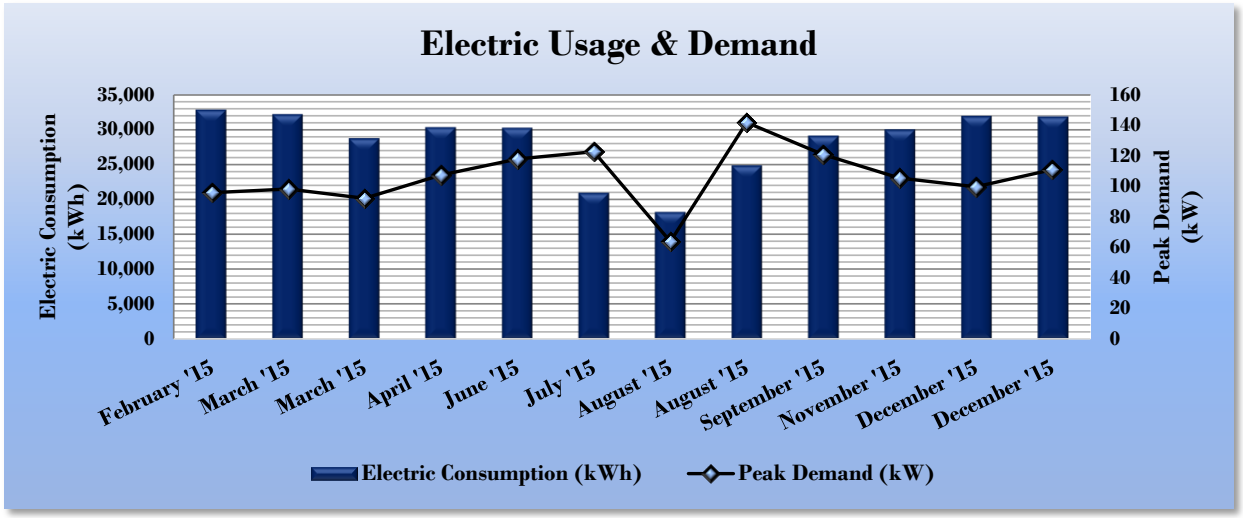


Figure 9 - Electric Usage & Demand

Electric Billing Data for Hilldale Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/18/15	30	32,720	96	$556	$3,756
3/17/15	27	32,080	98	$571	$3,727
4/15/15	29	28,640	92	$495	$3,340
5/14/15	29	30,240	107	$546	$3,566
6/16/15	33	30,160	118	$649	$3,658
7/18/15	32	20,880	123	$677	$2,779
8/17/15	30	18,160	64	$323	$2,159
9/14/15	28	24,800	142	$792	$3,277
10/14/15	30	29,040	121	$622	$3,520
11/19/15	36	29,920	106	$536	$3,524
12/16/15	27	31,840	100	$503	$3,679
1/13/16	28	31,760	111	$567	$3,735
Totals	**359**	**340,240**	**141.8**	**$6,837**	**$40,719**
Annual	**365**	**345,926**	**141.8**	**$6,951**	**$41,400**

3.3 Natural Gas Usage

Natural gas is provided by New Jersey Natural Gas. The average gas cost for the past 12 months is $1.383/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

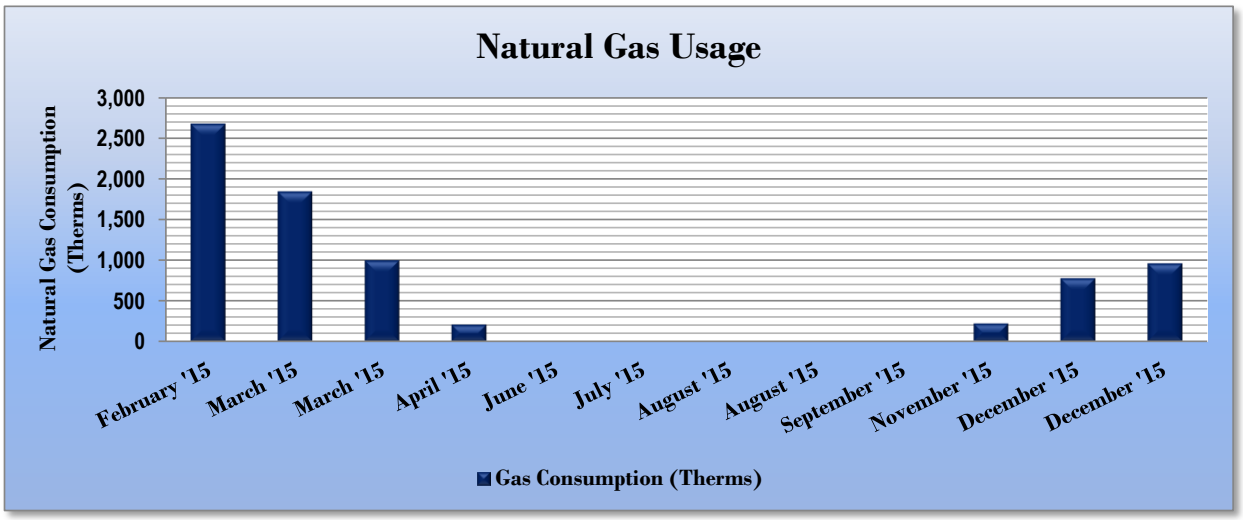


Figure 11 - Natural Gas Usage

Gas Billing Data for Hilldale Elementary School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/18/15	30	2,674	$2,637
3/17/15	27	1,841	$1,943
4/15/15	29	995	$1,172
5/14/15	29	206	$519
6/16/15	33	1	$348
7/18/15	32	1	$348
8/17/15	30	1	$348
9/14/15	28	1	$348
10/14/15	30	1	$348
11/19/15	36	218	$450
12/16/15	27	774	$1,036
1/13/16	28	957	$1,112
Totals	**359**	**7,671**	**$10,612**
Annual	**365**	**7,799**	**$10,789**

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		
	Hilldale Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	122.1	141.4
Site Energy Use Intensity (kBtu/ft^2)	52.9	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		
	Hilldale Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	97.1	141.4
Site Energy Use Intensity (kBtu/ft^2)	44.9	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 80.

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

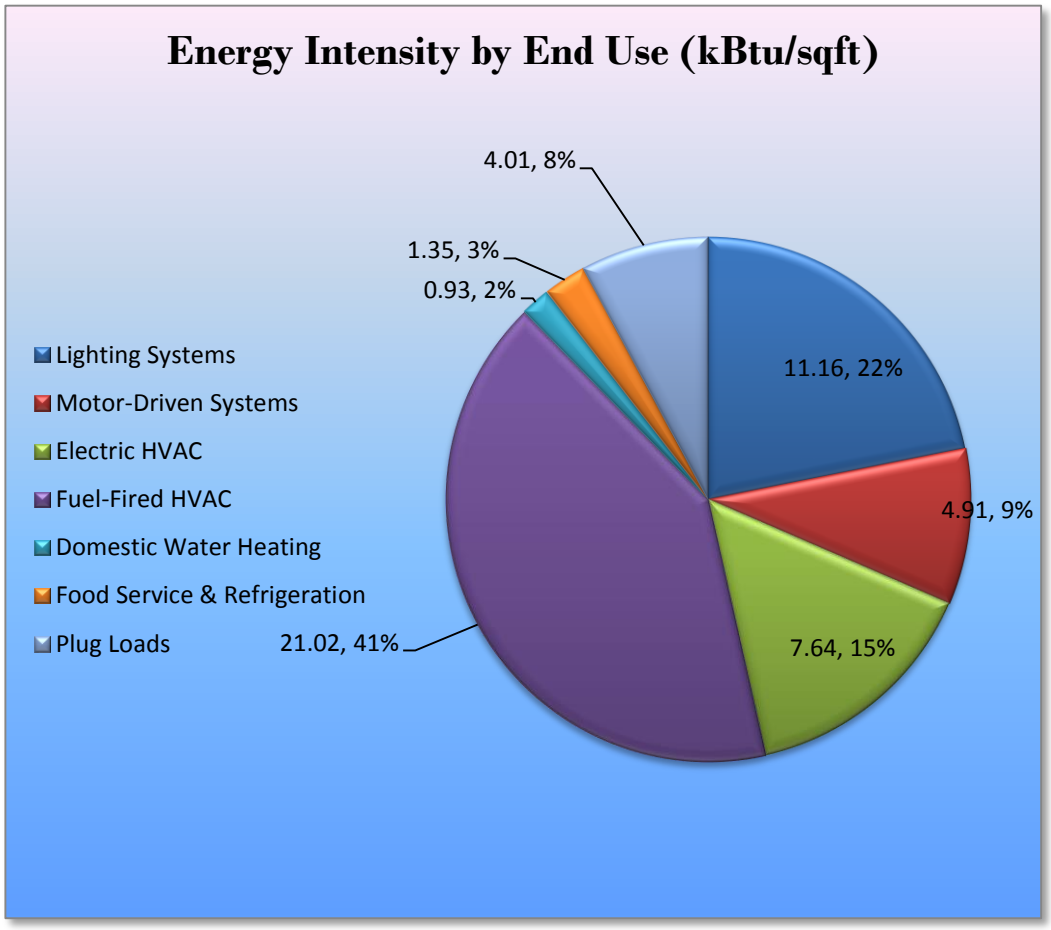
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 Hilldale 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		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			**78,094**	**21.6**	**0.0**	**$9,346.19**	**$59,552.62**	**$3,405.00**	**$56,147.62**	**6.0**	**78,640**
ECM 1	Install LED Fixtures	Yes	2,327	0.3	0.0	$278.50	$1,172.03	$300.00	$872.03	3.1	2,343
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and	Yes	52,828	14.4	0.0	$6,322.33	$41,069.63	$0.00	$41,069.63	6.5	53,197
ECM 3	Retrofit Fixtures with LED Lamps	Yes	22,939	6.8	0.0	$2,745.36	$17,310.96	$3,105.00	$14,205.96	5.2	23,100
Lighting Control Measures			**4,098**	**1.1**	**0.0**	**$490.50**	**$4,398.00**	**$585.00**	**$3,813.00**	**7.8**	**4,127**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	4,098	1.1	0.0	$490.50	$4,398.00	$585.00	$3,813.00	7.8	4,127
Electric Unitary HVAC Measures			**11,830**	**8.7**	**0.0**	**$1,415.79**	**$38,901.72**	**$2,392.00**	**$36,509.72**	**25.8**	**11,913**
	Install High Efficiency Electric AC	No	11,830	8.7	0.0	$1,415.79	$38,901.72	$2,392.00	$36,509.72	25.8	11,913
Domestic Water Heating Upgrade			**4,197**	**0.0**	**0.0**	**$502.25**	**$136.23**	**$0.00**	**$136.23**	**0.3**	**4,226**
ECM 5	Install Low-Flow Domestic Hot Water Devices	Yes	4,197	0.0	0.0	$502.25	$136.23	$0.00	$136.23	0.3	4,226
TOTAL OF ALL ECMS RECOMMENDED			**86,389**	**23**	**0**	**10,339**	**64,087**	**3,990**	**60,097**	**5.8**	**86,993**

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

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

4.1.1 Lighting Upgrades

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

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		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			**78,094**	**21.6**	**0.0**	**$9,346.19**	**$59,552.62**	**$3,405.00**	**$56,147.62**	**6.0**	**78,640**
ECM 1	Install LED Fixtures	Yes	2,327	0.3	0.0	$278.50	$1,172.03	$300.00	$872.03	3.1	2,343
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and	Yes	52,828	14.4	0.0	$6,322.33	$41,069.63	$0.00	$41,069.63	6.5	53,197
ECM 3	Retrofit Fixtures with LED Lamps	Yes	22,939	6.8	0.0	$2,745.36	$17,310.96	$3,105.00	$14,205.96	5.2	23,100

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

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	2,327	0.3	0.0	$278.50	$1,172.03	$300.00	$872.03	3.1	2,343

Measure Description

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

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

Please note that the economics in the tables above do not include incentives for replacing T12 tubes in FY17. However this program has been modified for FY18 and we request you to check back while applying for incentives.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Measure Description

We recommend retrofitting existing 4-foot and 8-foot T12 fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	363	0.0	0.0	$43.40	$107.51	$0.00	$107.51	2.5	365

Measure Description

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

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

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**4,098**	**1.1**	**0.0**	**$490.50**	**$4,398.00**	**$585.00**	**$3,813.00**	**7.8**	**4,127**
ECM 4	Install Occupancy Sensor Lighting Controls	4,098	1.1	0.0	$490.50	$4,398.00	$585.00	$3,813.00	7.8	4,127

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)
4,098	1.1	0.0	$490.50	$4,398.00	$585.00	$3,813.00	7.8	4,127

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all storage rooms, 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		**4,197**	**0.0**	**0.0**	**$502.25**	**$136.23**	**$0.00**	**$136.23**	**0.3**	**4,226**
ECM 5	Install Low-Flow Domestic Hot Water Devices	4,197	0.0	0.0	$502.25	$136.23	$0.00	$136.23	0.3	4,226

ECM 5: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
4,197	0.0	0.0	$502.25	$136.23	$0.00	$136.23	0.3	4,226

Measure Description

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

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

4.2 ECMs Evaluated But Not Recommended

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

Figure 19 – 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	**11,830**	**8.7**	**0.0**	**$1,415.79**	**$38,901.72**	**$2,392.00**	**$36,509.72**	**25.8**	**11,913**
Install High Efficiency Electric AC	11,830	8.7	0.0	$1,415.79	$38,901.72	$2,392.00	$36,509.72	25.8	11,913
TOTALS	**11,830**	**8.7**	**0.0**	**$1,415.79**	**$38,901.72**	**$2,392.00**	**$36,509.72**	**25.8**	**11,913**

* - 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 Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
11,830	8.7	0.0	$1,415.79	$38,901.72	$2,392.00	$36,509.72	25.8	11,913

Measure Description

We evaluated replacing standard efficiency split AC units (two (2) 2.5 ton units and six 3.5 ton units serving the classrooms) with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Reasons for not Recommending

Although the AC units evaluated for replacement are 18 years old, the payback period on replacing these units are very high as an individual measure. We suggest that these be replaced as a package along with other measures which gives a return on investment in eight (8) years. Or, replace them with higher efficiency units when they absolutely come to the end of their useful life (which will not improve the payback but at this point it is necessary).

5 Energy Efficient Practices

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

Reduce Air Leakage

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

Close Doors and Windows

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

Use Window Treatments/Coverings

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

Ensure Lighting Controls Are Operating Properly

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

Practice 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.

Perform Proper Boiler Maintenance

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

Perform Proper Water Heater Maintenance

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

Plug Load Controls

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

Water Conservation

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

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

Refer to Section 4.1.3 for any low-flow ECM recommendations.

6 On-Site Generation Measures

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

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

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

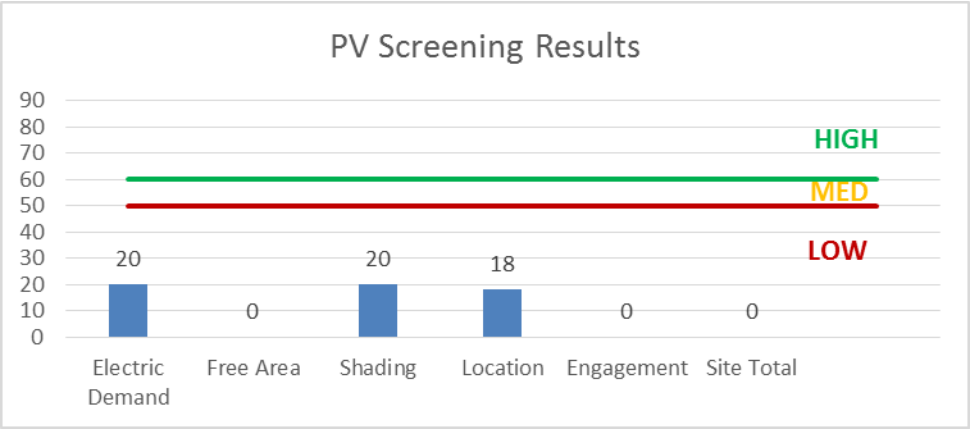
6.1 Photovoltaic

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

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

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

Figure 20 - Photovoltaic Screening



Potential	None	
System Potential	43	kW DC STC
Electric Generation	51,229	kWh/yr
Displaced Cost	$4,460	/yr
Installed Cost	$111,800	

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

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

6.2 Combined Heat and Power

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

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

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

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

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

7 Demand Response

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

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

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

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

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

The first step toward participation in a DR program is to contact a Curtailment Service Provider. 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 21 for a list of the eligible programs identified for each recommended ECM.

Figure 21 - ECM Incentive Program Eligibility

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

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 Direct Install

Overview

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

Incentives

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

How to Participate

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

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

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

8.3 Energy Savings Improvement Program

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

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

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

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

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

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

9 Energy Purchasing and Procurement Strategies

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Gym	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,090	Relamp & Reballast	No	16	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,090	0.59	2,154	0.0	$257.73	$2,589.33	$320.00	8.81
Entrance hall	1	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	176	2,090	Relamp	No	1	LED - Linear Tubes: (6) 4' Lamps	Wall Switch	87	2,090	0.06	214	0.0	$25.60	$134.22	$30.00	4.07
Main office	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,090	0.26	952	0.0	$113.91	$601.60	$120.00	4.23
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,463	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	0.13	333	0.0	$39.87	$300.80	$60.00	6.04
Office	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,090	0.02	70	0.0	$8.34	$63.20	$0.00	7.58
Hallway	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	24	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.52	1,904	0.0	$227.82	$1,404.00	$240.00	5.11
Library	24	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	24	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	1.35	4,961	0.0	$593.70	$4,373.04	$0.00	7.37
Library	8	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	8	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	0.45	1,654	0.0	$197.90	$1,457.68	$0.00	7.37
Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.16	601	0.0	$71.97	$467.00	$80.00	5.38
Tech room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,090	0.06	238	0.0	$28.48	$150.40	$30.00	4.23
Tech room	1	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	2,090	Fixture Replacement	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,090	0.02	76	0.0	$9.06	$62.52	$0.00	6.90
Tech room	1	Linear Fluorescent - T12: 8' T12 (75W) - 1L	Wall Switch	92	2,090	Fixture Replacement	No	1	LED - Linear Tubes: (1) 8' Lamp	Wall Switch	36	2,090	0.04	135	0.0	$16.11	$111.91	$0.00	6.95
Hallway	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	19	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.41	1,507	0.0	$180.35	$1,111.50	$190.00	5.11
Hallway	15	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,090	Relamp	No	15	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,090	0.16	577	0.0	$69.04	$723.00	$150.00	8.30
Room 15,16	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	No	24	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,090	0.78	2,855	0.0	$341.72	$1,804.80	$360.00	4.23
Room 20,21,18,17	44	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,090	Relamp	Yes	44	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	1.80	6,615	0.0	$791.66	$4,388.80	$800.00	4.53
Room 20,21,18,17	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	3	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,090	0.06	209	0.0	$25.03	$189.60	$0.00	7.58
Room 20,21,18,17	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,090	Relamp	No	3	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,090	0.03	115	0.0	$13.81	$144.60	$30.00	8.30
Music,23,22,21	32	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,463	Relamp	No	32	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,463	1.04	2,665	0.0	$318.94	$2,406.40	$480.00	6.04
Staff restroom	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Occupancy Sensor	33	1,463	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,463	0.04	108	0.0	$12.89	$192.80	$40.00	11.86
Girls' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.04	59	0.0	$7.09	$117.00	$20.00	13.69
Boys' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.04	59	0.0	$7.09	$117.00	$20.00	13.69
Girls' restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	780	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	780	0.01	14	0.0	$1.72	$48.20	$10.00	22.24
Boys' restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	780	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	780	0.01	14	0.0	$1.72	$48.20	$10.00	22.24
Room 1	8	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,090	Fixture Replacement	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.31	1,134	0.0	$135.77	$667.44	$0.00	4.92

	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
Room 1	8	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	8	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	0.45	1,654	0.0	$197.90	$1,457.68	$0.00	7.37
Nurse's office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,090	0.09	317	0.0	$37.97	$234.00	$40.00	5.11
Hallway	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,090	Relamp	No	3	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,090	0.06	209	0.0	$25.03	$189.60	$0.00	7.58
Room 2,3,4,5,6	40	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,090	Fixture Replacement	Yes	40	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	1.78	6,509	0.0	$778.95	$4,687.20	$175.00	5.79
Room 2,3,4,5,6	40	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	40	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	2.25	8,268	0.0	$989.51	$7,288.40	$0.00	7.37
Boys' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.06	89	0.0	$10.63	$175.50	$30.00	13.69
Girls' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.04	59	0.0	$7.09	$117.00	$20.00	13.69
Entrance hallway	17	LED Screw-In Lamps: 1 lamp	Wall Switch	15	2,090	None	No	17	LED Screw-In Lamps: 1 lamp	Wall Switch	15	2,090	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	5	Compact Fluorescent: 1 lamp	Wall Switch	42	2,090	Relamp	No	5	LED Screw-In Lamps: 1 lamp	Wall Switch	7	2,090	0.11	421	0.0	$50.34	$268.77	$0.00	5.34
Main office	4	Compact Fluorescent: 1 lamp	Occupancy Sensor	26	1,463	Relamp	No	4	LED Screw-In Lamps: 1 lamp	Occupancy Sensor	4	1,463	0.06	148	0.0	$17.72	$215.01	$0.00	12.13
Office	2	Incandescent: 1 lamp	Wall Switch	40	2,090	Relamp	No	2	LED Screw-In Lamps: 1 lamp	Wall Switch	7	2,090	0.04	159	0.0	$18.98	$107.51	$10.00	5.14
Room 7,8	12	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,090	Fixture Replacement	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	0.53	1,953	0.0	$233.68	$1,233.16	$40.00	5.11
Room 7,8	12	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	12	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	0.68	2,480	0.0	$296.85	$2,186.52	$0.00	7.37
Room 9,10,11,12,13,14	72	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,090	Fixture Replacement	Yes	72	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,463	3.20	11,716	0.0	$1,402.11	$7,626.96	$210.00	5.29
Room 9,10,11,12,13,14	72	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	2,090	Fixture Replacement	No	72	LED - Linear Tubes: (2) 8' Lamps	Wall Switch	72	2,090	4.06	14,882	0.0	$1,781.11	$13,119.12	$0.00	7.37
Boys' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.06	89	0.0	$10.63	$175.50	$30.00	13.69
Girls' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.04	59	0.0	$7.09	$117.00	$20.00	13.69
Teacher's office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,090	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,090	0.15	538	0.0	$64.43	$380.53	$80.00	4.66
Room 7,8	2	Incandescent: 1 lamp	Wall Switch	60	2,090	Relamp	No	2	LED Screw-In Lamps: 1 lamp	Wall Switch	8	2,090	0.07	250	0.0	$29.92	$107.51	$10.00	3.26
Custodian closet	1	Incandescent: 1 lamp	Wall Switch	100	52	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Wall Switch	14	52	0.06	5	0.0	$0.62	$53.75	$5.00	79.21
Hallway	6	Incandescent: 1 lamp	Wall Switch	40	2,090	Relamp	No	6	LED Screw-In Lamps: 1 lamp	Wall Switch	7	2,090	0.13	476	0.0	$56.95	$322.52	$30.00	5.14
Exterior	3	Metal Halide: (1) 250W Lamp	Wall Switch	295	4,380	Fixture Replacement	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	141	4,380	0.30	2,327	0.0	$278.50	$1,172.03	$300.00	3.13
Exterior	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	50	4,380	None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	50	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	2	Compact Fluorescent: 1 lamp	Wall Switch	50	4,380	Relamp	No	2	LED Screw-In Lamps: 1 lamp	Wall Switch	14	4,380	0.05	363	0.0	$43.40	$107.51	$0.00	2.48
All school	15	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	15	Exit Signs: LED - 2 W Lamp	None	6	8,760	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
Boiler room	Boiler	2	Heating Hot Water Pump	10.0	91.7%	Yes	3,391	No	91.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Boiler	2	Other	0.3	77.0%	Yes	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Air compressor	1	Air Compressor	1.0	77.0%	No	4,957	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	All school	7	Exhaust Fan	0.5	77.0%	No	4,380	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway heating	AHU	1	Supply Fan	1.5	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Unit heater	2	Supply Fan	0.3	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Classrooms heat suply	20	Supply Fan	0.3	77.0%	No	2,745	No	77.0%	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
Hilldale	Offices	1	Packaged AC	6.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hilldale	Offices	1	Split-System AC	4.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hilldale	Classrooms	2	Split-System AC	2.50		Yes	2	Split-System AC	2.50		16.00		No	1.68	2,275	0.0	$272.27	$7,481.10	$460.00	25.79
Hilldale	Classrooms	6	Split-System AC	3.50		Yes	6	Split-System AC	3.50		16.00		No	7.04	9,555	0.0	$1,143.53	$31,420.62	$1,932.00	25.79
Hilldale	Room 1,2,3,4,5,6,9,10,11,12,13, 14	12	Split-System AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hilldale	Gym, Room 7,8	7	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	All school	3	Condensing Hot Water Boiler	987.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

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

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main office, CR 15,16,20,21,18,17	7	Faucet Aerator (Kitchen)	2.50	2.20	0.00	534	0.0	$63.92	$50.19	$0.00	0.79
Girls' restroom, Boys' restroom	12	Faucet Aerator (Lavatory)	2.20	1.00	0.00	3,663	0.0	$438.33	$86.04	$0.00	0.20

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
Teachers lounge	1	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?
Hilldale elementary school	76	Computer	150.0	Yes
Hilldale elementary school	23	Laptop	45.0	Yes
Hilldale elementary school	7	Printer small	20.0	Yes
Hilldale elementary school	7	Printer - Medium	60.0	Yes
Hilldale elementary school	3	Printer - Large	600.0	Yes
Hilldale elementary school	1	paper shredder	150.0	Yes
Hilldale elementary school	20	Projector	200.0	Yes
Hilldale elementary school	5	Microwave	1,000.0	No
Hilldale elementary school	2	Refrigerator - large	200.0	No
Hilldale elementary school	2	Coffee machine	900.0	Yes
Hilldale elementary school	16	CRT - television	120.0	No
Hilldale elementary school	1	LED - TV	100.0	Yes
Hilldale elementary school	2	Space Heater	1,500.0	No
Hilldale elementary school	1	Water dispenser	500.0	Yes
Hilldale elementary school	4	Standing fan	100.0	No
Hilldale elementary school	9	Chrome book cart	40.0	Yes
Hilldale elementary school	16	Smart Board	5.0	Yes

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

Hilldale Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 37,055
Built: 1974

For Year Ending: January 31, 2016
Date Generated: August 22, 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
Hilldale Elementary School 123 Konner Avenue Pine Brook, New Jersey 07058	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5944583

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
50.7 kBtu/ft²

Source EUI
117.6 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	736,929 (39%)
Electric - Grid (kBtu)	1,141,050 (61%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	68
National Median Source EUI (kBtu/ft²)	157.6
% Diff from National Median Source EUI	-25%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	166

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)