Local Government Energy Audit:
Energy Audit Report

Upper Greenwood Lake Elementary School

41 Henry Road

Hewitt, New Jersey 07421

West Milford Township School District

September 7, 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.

Table of Contents

Table of Figures

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Upper Greenwood Lake 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 public 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

Upper Greenwood Lake Elementary School is a 41,000 square-foot facility comprised of classroom space, a multipurpose room, media center, kitchen and office space. The building is one (1) floor. The school was built in 1966 with an addition in 1973. The building is in operation September through June for K-6 students. The building is occupied by about 55 full time staff members and about 306 students. The regular school schedule is from 8:30 AM to 3:30 PM for students. The staff begins occupying the building around 6:30 AM and there are custodians that work a second shift until 11:00 PM. This school has a summer daycare program which operates in a few classrooms. During this season, the building isn't fully occupied. However, it remains open for some custodial between 7:00 AM and 3:00 PM. The building is 100% heated and roughly 20% cooled. The main concern at the facility is the condition of the building envelope, as it was said to be drafty. The windows are single pane and likely contribute to their heating issues. The building replaced their gymnasium high intensity discharge (HID) high bay lighting fixtures with linear fluorescent T5HO 4-lamp high bay fixtures through PSE&G in the summer of 2016. The windows at Upper Greenwood Lake Elementary School are aging and inefficient, in need of replacement. 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 11 measures that together represent an opportunity for Upper Greenwood Lake Elementary School to reduce annual energy costs by roughly $15,567 and annual greenhouse gas emissions by 137,601 lbs. CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 15.8 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2a, respectively. Together these measures represent an opportunity to reduce Upper Greenwood Lake Elementary School's annual energy costs by 28%.

TRC recommends eight measures as high priority, which together represent an opportunity for Upper Greenwood Lake Elementary School to reduce annual energy costs by roughly $8,692 and annual greenhouse gas emissions by 66,567 lbs. CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 6.7 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2b, respectively. Together these measures represent an opportunity to reduce Upper Greenwood Lake Elementary School's annual energy costs by 16%.

Figure 1 – Previous 12 Month Utility Costs

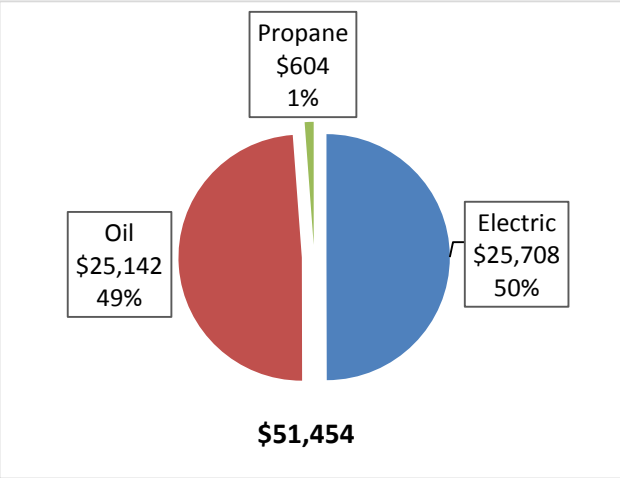


Figure 2a – Potential Post-Implementation Costs (All Measures)

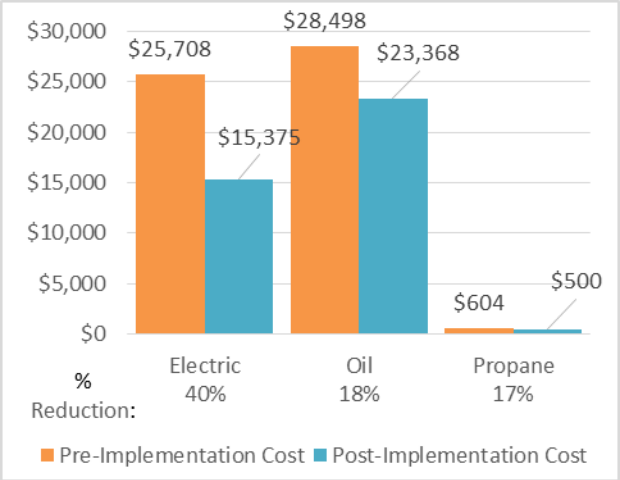
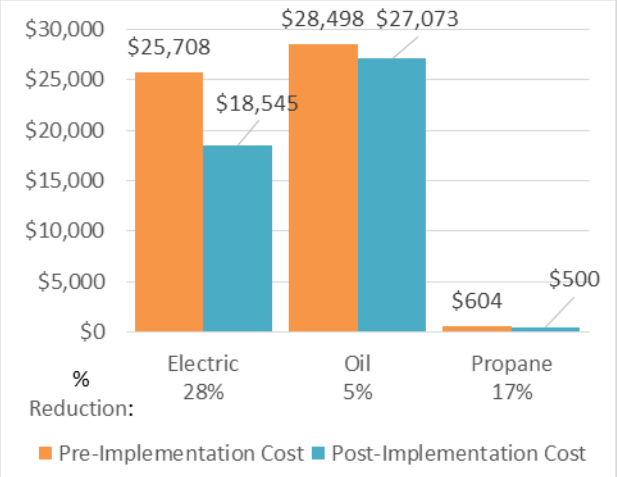


Figure 2b – Potential Post-Implementation Costs (High Priority Measures)



A detailed description of Upper Greenwood Lake 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			**45,426**	**10.5**	**0.0**	**$7,114.43**	**$101,516.65**	**$10,920.00**	**$90,596.65**	**12.7**	**45,744**
	Install LED Fixtures	No	19,711	2.7	0.0	$3,087.09	$76,397.09	$6,725.00	$69,672.09	22.6	19,849
ECM 1	Retrofit Fixtures with LED Lamps	Yes	25,715	7.9	0.0	$4,027.33	$25,119.56	$4,195.00	$20,924.56	5.2	25,895
Lighting Control Measures			**8,631**	**2.5**	**0.0**	**$1,351.76**	**$23,196.00**	**$2,960.00**	**$20,236.00**	**15.0**	**8,691**
ECM 2	Install Occupancy Sensor Lighting Controls	Yes	8,230	2.4	0.0	$1,288.87	$21,996.00	$2,960.00	$19,036.00	14.8	8,287
	Install High/Low Lighitng Controls	No	402	0.1	0.0	$62.89	$1,200.00	$0.00	$1,200.00	19.1	404
ECM 3	Install VFDs on Hot Water Pumps	Yes	5,090	1.3	0.0	$797.19	$6,551.70	$0.00	$6,551.70	8.2	5,126
HVAC System Improvements			**0**	**0.0**	**3.6**	**$50.95**	**$108.75**	**$0.00**	**$108.75**	**2.1**	**504**
ECM 4	Install Pipe Insulation	Yes	0	0.0	3.6	$50.95	$108.75	$0.00	$108.75	2.1	504
Domestic Water Heating Upgrade			**0**	**0.0**	**3.7**	**$53.13**	**$64.53**	**$0.00**	**$64.53**	**1.2**	**526**
ECM 5	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	3.7	$53.13	$64.53	$0.00	$64.53	1.2	526
Food Service Equipment & Refrigeration Measures			**3,902**	**0.4**	**0.0**	**$611.09**	**$2,150.00**	**$0.00**	**$2,150.00**	**3.5**	**3,929**
ECM 6	Replace Refrigeration Equipment	Yes	3,902	0.4	0.0	$611.09	$2,150.00	$0.00	$2,150.00	3.5	3,929
Custom Measures			**2,931**	**0.0**	**428.6**	**$5,588.57**	**$126,644.00**	**$0.00**	**$126,644.00**	**22.7**	**73,080**
ECM 7	Computer Power Management Software	Yes	2,797	0.0	0.0	$438.05	$3,580.00	$0.00	$3,580.00	8.2	2,817
ECM 8	Building Envelope Weatherization	Yes	3	0.0	119.1	$1,425.39	$5,464.00	$0.00	$5,464.00	3.8	19,484
	Window Replacements	No	131	0.0	309.6	$3,725.12	$117,600.00	$0.00	$117,600.00	31.6	50,780
TOTALS			**65,980**	**14.8**	**435.9**	**$15,567.11**	**$260,231.63**	**$13,880.00**	**$246,351.63**	**15.8**	**137,601**

* - 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).

TOTALS (High Priority)			**45,737**	**12.0**	**126.3**	**$8,692.00**	**$65,034.54**	**$7,155.00**	**$57,879.54**	**6.7**	**66,567**

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

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

Variable Frequency Drives (VFDs) are motor control devices. These measures control the speed of a motor so that the motor spins at peak efficiency during partial load conditions. Sensors adapt the speed to flow, temperature, or pressure settings which is much more efficient that usage a valve or damper to control flow rates, or running the motor at full speed when only partial power is needed. These measures save energy by controlling motor usage more efficiently.

HVAC System Improvements generally involve the installation of automated controls to reduce heating and cooling demand during periods of reduced demand. These measures could encompass changing temperature setpoints, using outside air for free cooling, or limiting excessive outside air during extreme outdoor air temperature conditions. These measures save energy by reducing the demand on HVAC systems and the amount of time systems operate.

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.

Food Service Equipment & Refrigeration measures generally involve improvements in the efficiency of cooking, food service, dishwashing, and food storage equipment. These measures may include more efficient convection ovens, steamers, ice machines, or refrigeration. These measures save energy by reducing the energy usage with more energy efficient equipment.

Energy Efficient Practices

TRC also identified 10 low cost or no cost energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at Upper Greenwood Lake Elementary School include:

- Reduce Air Leakage
- Close Doors and Windows
- Perform Routine Motor Maintenance
- Install Destratification Fans
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Perform Maintenance on Compressed Air Systems
- 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 Upper Greenwood Lake 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.

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			
Chris Kelly	Supervisor Buildings & Grounds	chris.kelly@wmtps.org	973-229-5929
Barbara Francisco	Business Administrator	barbara.francisco@wmtps.org	973-697-1700 ext 5050
TRC Energy Services			
Aimee Lalonde	Auditor	ALalonde@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On March 27, 2018, TRC performed an energy audit at Upper Greenwood Lake Elementary School located in Hewitt, New Jersey. TRC met with facility personnel to review the facility operations and help focus our investigation on specific energy-using systems.

Upper Greenwood Lake Elementary School is a 41,000 square-foot facility comprised of classroom space, a multipurpose room, media center, kitchen and office space. The building is one (1) floor. The school was originally built in 1966 with an addition in 1973. The building is 100% heated and roughly 20% cooled. The main concern at the Upper Greenwood Lake is the condition of the building envelope, as it was explained to be drafty. The windows are single pane and likely contribute to heating issues. The building replaced their gymnasium high intensity discharge (HID) high bay lighting fixtures with linear fluorescent T5HO 4-lamp high bay fixtures through PSE&G in the summer of 2016. The windows at Upper Greenwood Lake Elementary School are aging and inefficient and in need of replacement.

2.3 Building Occupancy

The building is in operation September through June for K-6 students. The building is occupied by about 55 full time staff members and about 306 students. The regular school schedule is from 8:30 AM to 3:30 PM for students. The staff begins occupying the building around 6:30 AM and there are custodians that work a second shift until 11:00 PM. This school has a summer daycare program which operates in a few classrooms. The building isn't fully occupied during the summer; however, it remains open for some custodial work between 7:00 AM and 3:00 PM. The typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Upper Greenwood Lake Elementary (Sept-June) - Students	Weekday	6:30AM - 3:30PM
Upper Greenwood Lake Elementary (Sept-June) - Students	Weekend	No Use
Upper Greenwood Lake Elementary (Sept-June) - Staff	Weekday	6:30AM - 11:00PM
Upper Greenwood Lake Elementary (Sept-June) - Staff	Weekend	Rare Use
Upper Greenwood Lake Elementary (July & Aug) - Daycare	Weekday	7:00AM - 3:00PM
Upper Greenwood Lake Elementary (July & Aug) - Daycare	Weekend	Rare Use
Upper Greenwood Lake Elementary (July & Aug) - Staff	Weekday	7:00AM - 3:00PM
Upper Greenwood Lake Elementary (July & Aug) - Staff	Weekend	Rare Use

2.4 Building Envelope

The building has a flat roof that is in fair condition. The building is constructed of concrete block and structural steel with a brick facade. The building has single-pane windows that are in poor to fair condition. Per discussions with facility personnel, these are very drafty which causes issues with heating. The exterior doors are constructed of aluminum and in good condition except that the door seals have worn out, which increases the level of outside air infiltration. Based on visual inspections of the building envelope, there are also wall cracks and the window frames are leaky. These building envelope deficiencies are signs of excessive infiltration and heat loss.

Figure 6 – Building Envelope

Figure 7 – Building Envelope Deficiencies

2.5 On-Site Generation

Upper Greenwood Lake 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 compact fluorescent lamps (CFL) and incandescent lamps. Most of the fixtures are 2-lamp, 3-lamp or 4-lamp, 2-foot or 4-foot long troffers or wrap fixtures. About a quarter of the classrooms have fixtures that are in poor condition with yellowed lenses. Per discussions with facility personnel, these are no longer available for purchase. The multipurpose room is lit by 4-lamp T5HO lamp high bay fixtures. Lighting fixtures throughout the building are manually controlled by wall switches. The exit signs throughout the building are LED. The exterior lighting is provided by high pressure sodium wall pack fixtures, metal halide area lighting fixtures and this one LED wall pack fixture. The exterior light fixtures are controlled by a time clock.

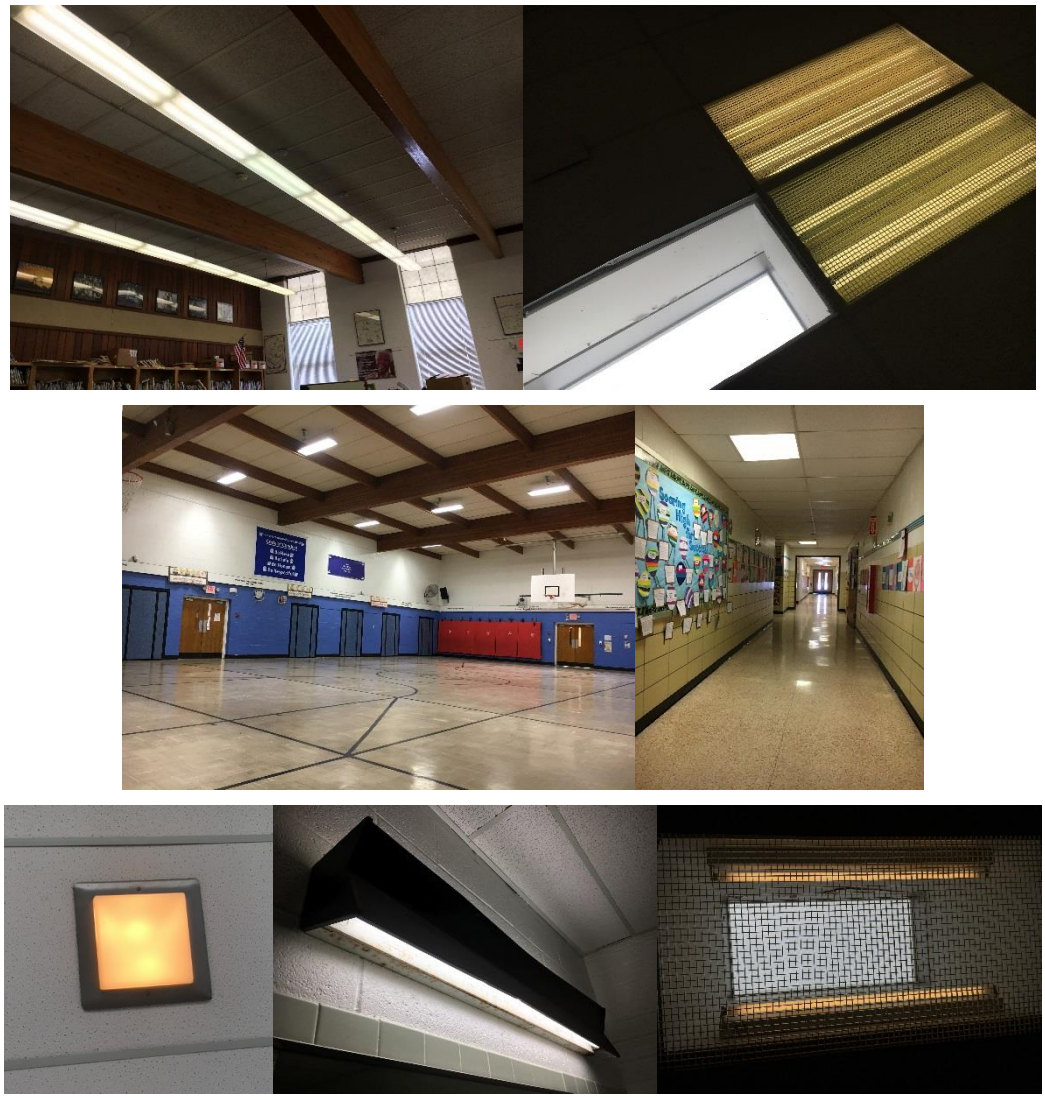


Figure 8 – Lighting Systems

Figure 9 – Lighting Fixtures in Poor Condition

Figure 10 – Exterior Lighting

Hot Water Heating System

The building is heated by a hot water system which includes two (2) oil fired 2242 MBH non-condensing hot water boilers. The boilers have a nominal combustion efficiency of 86.7%. The boilers are fully modulating. They are in good condition, installed about five years ago and are well maintained. The boilers are configured in a constant flow primary distribution with two 5 HP hot water pumps, which operate in lead/lag fashion. They are constant speed, standard efficiency motors and are in fair condition. Hot water is supplied at 180°F when the outside air temperature is low, and the setpoint is adjusted linearly to 130°F when the outside air is above 65°F. The boilers provide hot water to unit ventilators, perimeter radiators, and hot water unit heaters throughout the building.

Figure 11 – Hot Water Heating System

Figure 12 – Unit Ventilators

Air Conditioning Equipment

There are some classrooms and the faculty room that have air conditioning (AC) units for cooling in the summer months. They are either window AC units or portable AC units. These range in capacity but are all in fair to good condition. They range in efficiency between 9.8 EER to 11.1 EER.

Figure 13 – Typical Window AC Unit

HVAC Controls

The unit ventilators throughout the building have supply fan motors, dampers, and valves, which operate using a pneumatic control system. This system is original to the building and appears to be in fair operating condition. The air compressor for this system is in the boiler room, which is in fair condition and is equipped with standard efficiency motors. Per discussions with facility personnel, this is scheduled to be replaced in the near future. The proposed unit should be equipped with premium efficiency motors.

Figure 14 – Pneumatic Control System

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of a propane fired 199 MBH storage tank water. This has storage capacity of 72 gallons and has a nominal efficiency of 80%. This system is in fair condition and serves a majority of the building. The systems serve hand washing sinks throughout the building and the kitchen. The distribution piping located in the boiler room was noted to have missing pipe insulation.

Figure 15 – Domestic Hot Water System and Missing Pipe Insulation

Food Service Equipment

The school has an all-electric kitchen that is used to prepare lunches for almost every student each school day. Most of the cooking is done using a griddle and convection oven. Bulk prepared foods are held in an electric holding cabinet. Equipment is high efficiency and is in good condition.

Figure 16 – Food Service Equipment

Refrigeration

The kitchen has several reach-in refrigerators with both solid and glass doors. There is also a freezer and refrigerator chests. All equipment is standard to high efficiency and is in fair to good condition.

Figure 17 – Refrigeration Equipment

Building Plug Load

There are roughly 72 computer work stations throughout the facility. It is assumed that there is no centralized PC power management software installed. Plug loads throughout the building include general café and office equipment. There are classroom typical loads such as smart boards, projectors, and fans. There are also several residential style mini-fridges throughout the building.

Figure 18 – Computer Work Stations

2.7 Water-Using Systems

There are restrooms throughout this facility. A sampling of restrooms found that majority of the faucets are rated for 2.2 gallons per minute (gpm) or higher.

3 SITE ENERGY USE AND COSTS

Utility data for electricity, No. 2 fuel oil and propane was analyzed to identify opportunities for savings. In addition, data for electricity, No. 2 fuel oil and propane 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 several 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 3.5 for additional information.

3.1 Total Cost of Energy

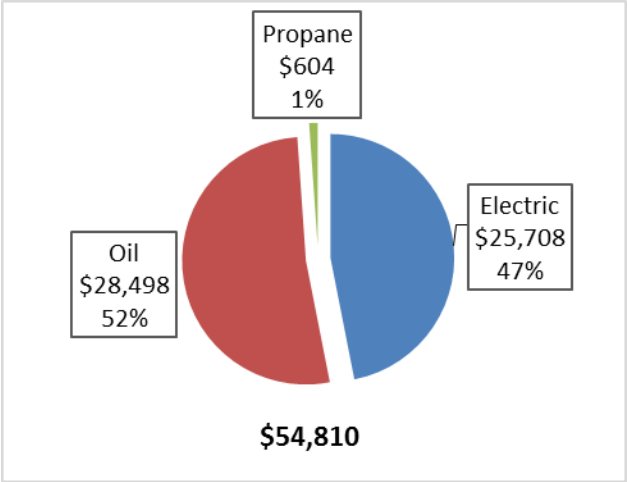
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 19 - Utility Summary

Utility Summary for Upper Greenwood Lake Elementary School		
Fuel	**Usage**	**Cost**
Electricity	164,149 kWh	$25,708
No. 2 Fuel Oil	17,182 Gallons	$28,498
Propane	461 Gallons	$604
Total		**$54,810**

The current annual energy cost for this facility is $54,810 as shown in the chart below.

Figure 20 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by Rockland Electric. The average electric cost over the past 12 months was $0.157/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 pays electric demand charges. The monthly electricity consumption and peak demand are shown in the chart below. The energy use profile looks normal for a building with a school annual occupancy schedule. The bump up just before and after the summer break are likely due to the air conditioning load. The same thing applies the demand spike in May.

Figure 21 - Electric Usage & Demand

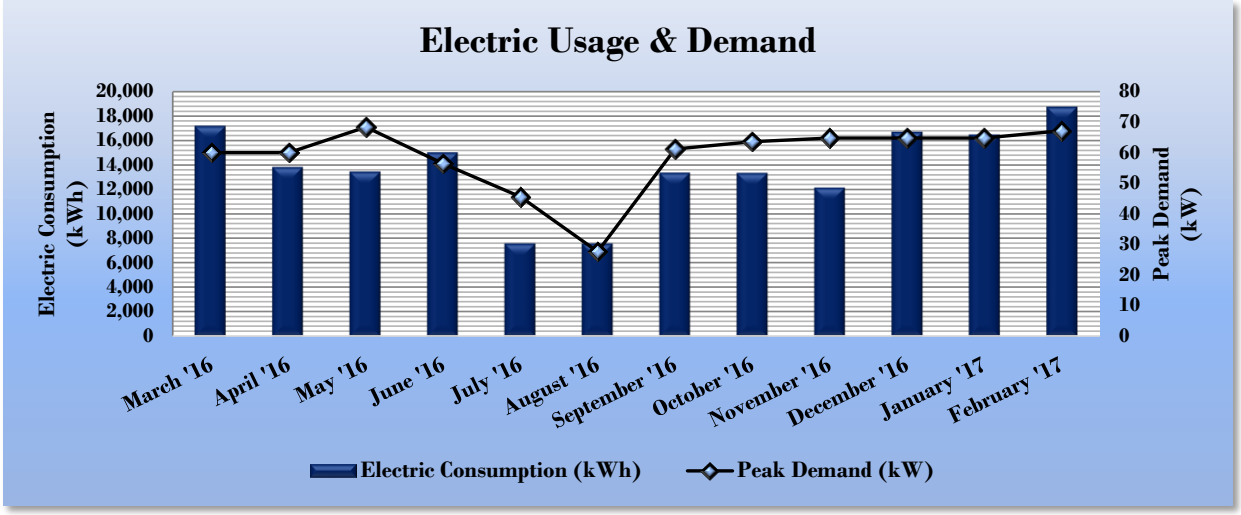


Figure 22 - Electric Usage & Demand

Electric Billing Data for Upper Greenwood Lake Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
3/21/16	31	17,189	60		$2,557
4/19/16	29	13,829	60		$2,132
5/17/16	28	13,469	68		$2,127
6/20/16	34	15,029	56		$2,304
7/19/16	29	7,589	46		$1,319
8/19/16	31	7,589	28		$1,214
9/22/16	34	13,379	61		$2,102
10/21/16	29	13,349	64		$2,096
11/21/16	31	12,149	65		$2,310
12/20/16	29	16,709	65		$2,508
1/20/17	31	16,469	65		$2,476
2/21/17	32	18,749	67		$2,775
Totals	**368**	**165,498**	**68.4**	**$0**	**$25,919**
Annual	**365**	**164,149**	**68.4**	**$0**	**$25,708**

3.3 No. 2 Fuel Oil Usage

No. 2 fuel oil is provided by Finch Fuel Oil Company. The average oil cost for the past 12 months is $1.658/Gallon, which is the blended rate used throughout the analyses in this report. The oil consumption is shown in the table below. The table reflects the annual use, but the graph is a profile based on the delivery schedule.

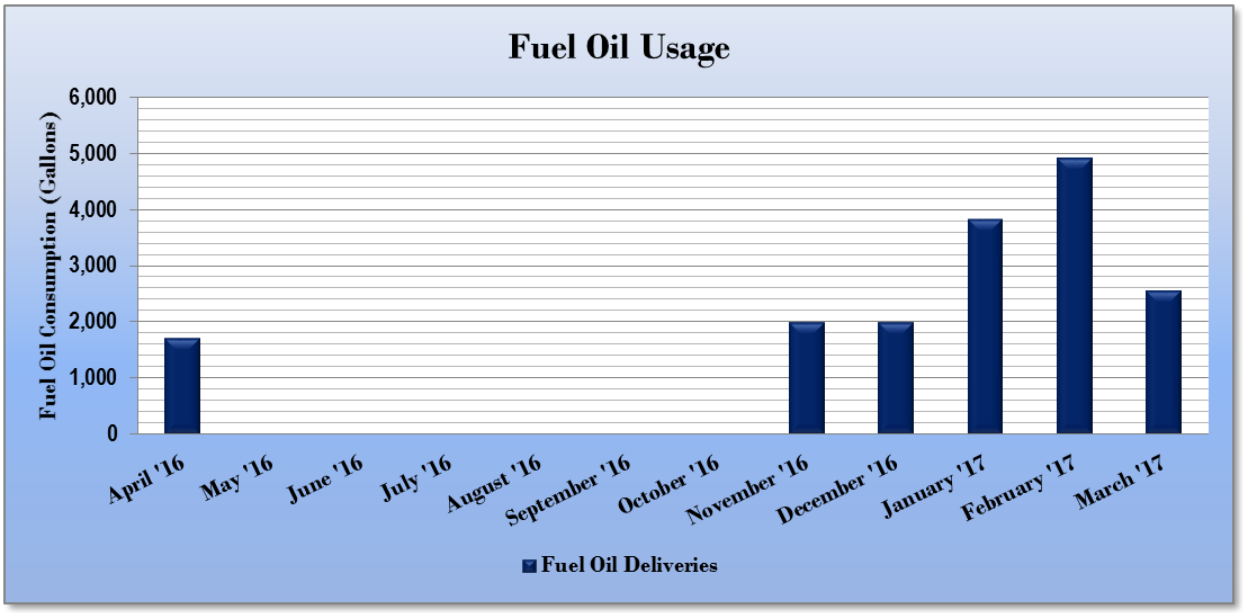


Figure 23 – No. 2 Fuel Oil Usage

No. 2 Fuel Oil Billing Data for Upper Greenwood Lake ES			
Period Ending	Days in Period	Oil Usage (Gallons)	Fuel Cost
4/19/16	30	1,709	$2,261
5/17/16	33	0	$0
6/20/16	28	0	$0
7/19/16	28	0	$0
8/19/16	21	0	$0
9/22/16	31	0	$0
10/21/16	31	0	$0
11/21/16	32	2,000	$3,319
12/20/16	32	2,000	$3,319
1/20/17	32	3,827	$6,513
2/21/17	31	4,902	$8,609
3/1/17	32	2,555	$4,165
Totals	**361**	**16,993**	**$28,185**
Annual	**365**	**17,182**	**$28,498**

Figure 24 – No. 2 Fuel Oil Usage

3.4 Propane Usage

Propane is provided by Eastern Propane. The average propane cost for the past 12 months is $1.311/gallon, which is the blended rate used throughout the analyses in this report. The propane consumption is shown in the table below. The table reflects the annual use, but the graph is a profile based on the delivery schedule. Therefore, a large delivery is shown in September at the beginning of the school year.

Figure 25 – Propane Usage

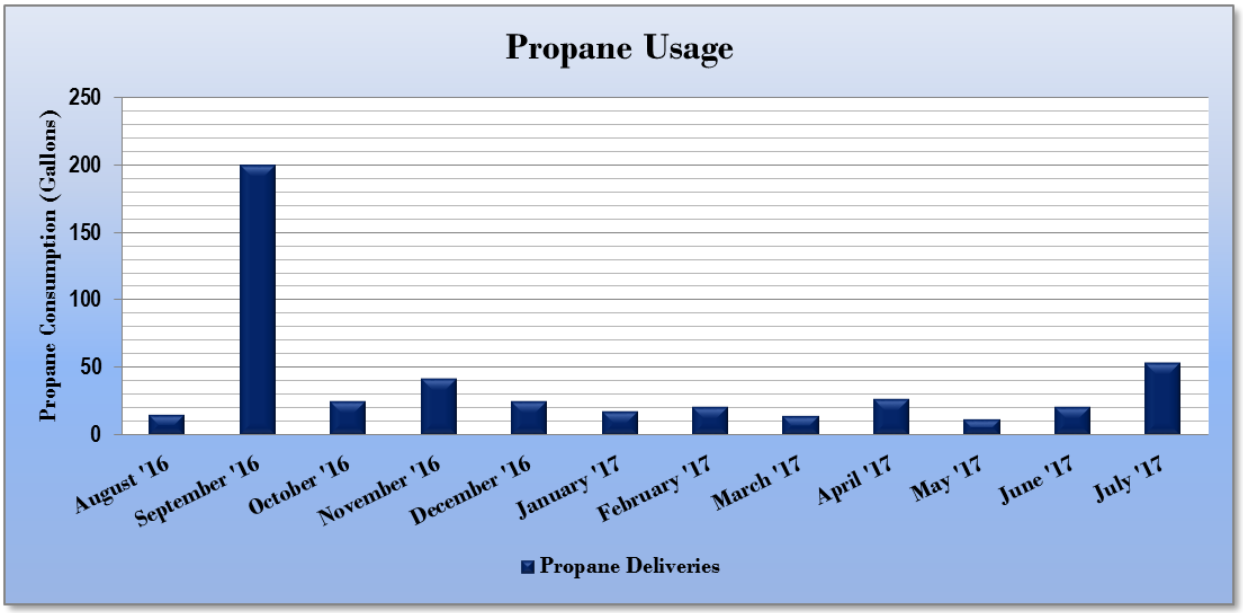


Figure 26 – Propane Usage

Propane Billing Data for Upper Greenwood Lake Elementary School			
Period Ending	Days in Period	Propane Usage (Gallons)	Fuel Cost
8/22/16	40	15	$27
9/20/16	29	200	$38
10/18/16	28	25	$49
11/18/16	31	42	$82
12/18/16	30	26	$53
1/11/17	24	18	$39
2/2/17	22	21	$52
2/20/17	18	15	$36
3/17/17	25	27	$64
4/16/17	30	12	$27
5/18/17	32	22	$46
7/25/17	68	54	$112
Totals	**377**	**476**	**$624**
Annual	**365**	**461**	**$604**

3.5 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 27 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Upper Greenwood Lake Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	102.6	141.4
Site Energy Use Intensity (kBtu/ft^2)	110.1	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 28 - Energy Use Intensity Comparison – Following Installation of All Measures

Energy Use Intensity Comparison - Following Installation of All Evaluated Measures		
	Upper Greenwood Lake Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	87.5	141.4
Site Energy Use Intensity (kBtu/ft^2)	65.9	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 73.

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

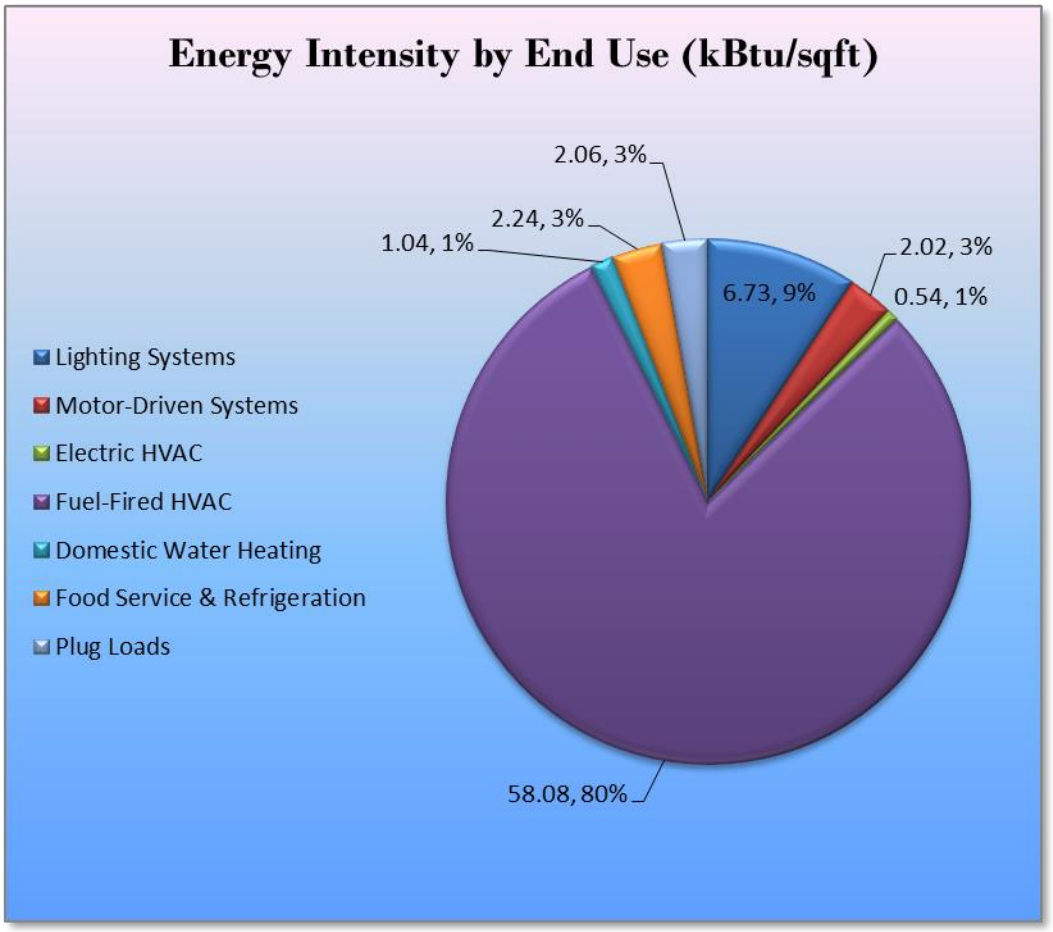
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1/.

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.

3.6 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed. 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 29 - 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 Upper Greenwood Lake 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 30 – 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		**25,715**	**7.9**	**0.0**	**$4,027.33**	**$25,119.56**	**$4,195.00**	**$20,924.56**	**5.2**	**25,895**
ECM 1	Retrofit Fixtures with LED Lamps	25,715	7.9	0.0	$4,027.33	$25,119.56	$4,195.00	$20,924.56	5.2	25,895
Lighting Control Measures		**8,230**	**2.4**	**0.0**	**$1,288.87**	**$21,996.00**	**$2,960.00**	**$19,036.00**	**14.8**	**8,287**
ECM 2	Install Occupancy Sensor Lighting Controls	8,230	2.4	0.0	$1,288.87	$21,996.00	$2,960.00	$19,036.00	14.8	8,287
Variable Frequency Drive (VFD) Measures		**5,090**	**1.3**	**0.0**	**$797.19**	**$6,551.70**	**$0.00**	**$6,551.70**	**8.2**	**5,126**
ECM 3	Install VFDs on Hot Water Pumps	5,090	1.3	0.0	$797.19	$6,551.70	$0.00	$6,551.70	8.2	5,126
HVAC System Improvements		**0**	**0.0**	**3.6**	**$50.95**	**$108.75**	**$0.00**	**$108.75**	**2.1**	**504**
ECM 4	Install Pipe Insulation	0	0.0	3.6	$50.95	$108.75	$0.00	$108.75	2.1	504
Domestic Water Heating Upgrade		**0**	**0.0**	**3.7**	**$53.13**	**$64.53**	**$0.00**	**$64.53**	**1.2**	**526**
ECM 5	Install Low-Flow Domestic Hot Water Devices	0	0.0	3.7	$53.13	$64.53	$0.00	$64.53	1.2	526
Food Service Equipment & Refrigeration Measures		**3,902**	**0.4**	**0.0**	**$611.09**	**$2,150.00**	**$0.00**	**$2,150.00**	**3.5**	**3,929**
ECM 6	Replace Refrigeration Equipment	3,902	0.4	0.0	$611.09	$2,150.00	$0.00	$2,150.00	3.5	3,929
Custom Measures		**2,800**	**0.0**	**119.1**	**$1,863.44**	**$9,044.00**	**$0.00**	**$9,044.00**	**4.9**	**22,300**
ECM 7	Computer Power Management Software	2,797	0.0	0.0	$438.05	$3,580.00	$0.00	$3,580.00	8.2	2,817
ECM 8	Building Envelope Weatherization	3	0.0	119.1	$1,425.39	$5,464.00	$0.00	$5,464.00	3.8	19,484
TOTALS		**45,737**	**12.0**	**126.3**	**$8,692.00**	**$65,034.54**	**$7,155.00**	**$57,879.54**	**6.7**	**66,567**

* - 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).

4.2 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 31 below.

Figure 31 – 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		**25,715**	**7.9**	**0.0**	**$4,027.33**	**$25,119.56**	**$4,195.00**	**$20,924.56**	**5.2**	**25,895**
ECM 1	Retrofit Fixtures with LED Lamps	25,715	7.9	0.0	$4,027.33	$25,119.56	$4,195.00	$20,924.56	5.2	25,895

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 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	25,715	7.9	0.0	$4,027.33	$25,119.56	$4,195.00	$20,924.56	5.2	25,895
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing incandescent, compact fluorescent and linear fluorescent T8 fixtures 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 that are more than twice that of fluorescent tubes and more than 10 times longer than many incandescent lamps.

4.3 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 32 below.

Figure 32 – 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		**8,230**	**2.4**	**0.0**	**$1,288.87**	**$21,996.00**	**$2,960.00**	**$19,036.00**	**14.8**	**8,287**
ECM 2	Install Occupancy Sensor Lighting Controls	8,230	2.4	0.0	$1,288.87	$21,996.00	$2,960.00	$19,036.00	14.8	8,287

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 2: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
8,230	2.4	0.0	$1,288.87	$21,996.00	$2,960.00	$19,036.00	14.8	8,287

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in beneficial locations. 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.

4.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 33 below.

Figure 33 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**5,090**	**1.3**	**0.0**	**$797.19**	**$6,551.70**	**$0.00**	**$6,551.70**	**8.2**	**5,126**
ECM 3	Install VFDs on Hot Water Pumps	5,090	1.3	0.0	$797.19	$6,551.70	$0.00	$6,551.70	8.2	5,126

ECM 3: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,090	1.3	0.0	$797.19	$6,551.70	$0.00	$6,551.70	8.2	5,126

Measure Description

We recommend installing a variable frequency drives (VFD) to control the 5 HP hot water pump motors. This measure requires that the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.5 Distribution System Improvements

Our recommendations for distribution system improvement are summarized in Figure 34 below.

Figure 34 - Summary of Distribution System Improvement 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)
HVAC System Improvements		**0**	**0.0**	**3.6**	**$50.95**	**$108.75**	**$0.00**	**$108.75**	**2.1**	**504**
ECM 4	Install Pipe Insulation	0	0.0	3.6	$50.95	$108.75	$0.00	$108.75	2.1	504

ECM 4: Install Pipe Insulation

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	3.6	$50.95	$108.75	$0.00	$108.75	2.1	504

Measure Description

We recommend installing insulation on domestic hot water heating system piping. Distribution system losses are dependent on heating water system temperature, the size of the distribution system, and the level of insulation of the piping. Significant energy savings can be achieved when insulation has not been well maintained. When the insulation is exposed to water, when the insulation has been removed from some areas of the pipe, or when valves have not been properly insulated system efficiency can be significantly reduced. This measure saves energy by reducing heat losses from the domestic hot water heating distribution system.

4.6 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 35 below.

Figure 35 - 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		**0**	**0.0**	**3.7**	**$53.13**	**$64.53**	**$0.00**	**$64.53**	**1.2**	**526**
ECM 5	Install Low-Flow Domestic Hot Water Devices	0	0.0	3.7	$53.13	$64.53	$0.00	$64.53	1.2	526

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)
0	0.0	3.7	$53.13	$64.53	$0.00	$64.53	1.2	526

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 can reduce hot water usage, relative to standard aerators, which saves 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.

4.7 Food Service Equipment & Refrigeration Measures

Our recommendations for food service and refrigeration measures are summarized in Figure 36 below.

Figure 36 - Summary of Food Service Equipment & Refrigeration 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)
Food Service Equipment & Refrigeration Measures		**3,902**	**0.4**	**0.0**	**$611.09**	**$2,150.00**	**$0.00**	**$2,150.00**	**3.5**	**3,929**
ECM 6	Replace Refrigeration Equipment	3,902	0.4	0.0	$611.09	$2,150.00	$0.00	$2,150.00	3.5	3,929

ECM 6: Replace Refrigeration Equipment

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)
3,902	0.4	0.0	$611.09	$2,150.00	$0.00	$2,150.00	3.5	3,929

Measure Description

We recommend replacing existing freezer chest with a new ENERGY STAR® high efficiency equipment. There have been many improvements in refrigeration system equipment, operation, and insulation. The energy savings associated with this measure come from reduced energy usage, due to more efficient technology, and reduced run times.

4.8 Custom Measures

Additional custom measure energy saving opportunities are addressed in this section. Recommended custom measures are summarized in Figure 37 below.

Figure 37 - Summary of Custom 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)
Custom Measures		**2,800**	**0.0**	**119.1**	**$1,863.44**	**$9,044.00**	**$0.00**	**$9,044.00**	**4.9**	**22,300**
ECM 7	Computer Power Management Software	2,797	0.0	0.0	$438.05	$3,580.00	$0.00	$3,580.00	8.2	2,817
ECM 8	Building Envelope Weatherization	3	0.0	119.1	$1,425.39	$5,464.00	$0.00	$5,464.00	3.8	19,484

ECM 7: Computer Power Management Software

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)
2,797	0.0	0.0	$438.05	$3,580.00	$0.00	$3,580.00	8.2	2,817

Measure Description

We recommend the implementation of computer power management software. The computing environment in most school and office facilities includes desktops, which are typically left on over nights, weekends and holidays. Screen savers are commonly confused as a power management strategy. This contributes to excessive electrical energy consumption, which may be avoided by proper management. There are innovative software packages available in the market today that are designed to deliver significant energy saving and provide ongoing tracking measurements. Operational and maintenance benefits are captured using a central power management platform where issues may be diagnosed and problematic devices may be isolated. Energy savings policies may be enforced as well as identifying and eliminating underutilized devices. This measure investigates the potential benefits to implementing computer power management software to better match the energy use to user needs.

ECM 8: Building Envelope Weatherization

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)
3	0.0	119.1	$1,425.39	$5,464.00	$0.00	$5,464.00	3.8	19,484

Measure Description

We recommend weather-stripping the exterior doors, caulking perimeter of window frames and seal wall cracks throughout the building. Building envelopes that limit air infiltration and that have adequate insulation play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Cracks and gaps throughout your building – around windows and doors, through utility openings, at the foundation and roof – may not seem significant, but their effects add up. Reducing uncontrolled air infiltration through air sealing is a cost-effective way to improve the performance and energy efficiency of your facility. The proper sealing of sources for air infiltration and exfiltration will mitigate the air through the building and thus reduce the load on the facility's heating and cooling equipment. Exterior doors should be properly weather-stripped which may include the installation of a bottom sweep, center sweep and weather-stripping around the perimeter of the door.

Further Considerations

We recommend removing window AC units in the winter months to reduce air infiltration. If they stay in year round, we recommend installing thermal sleeves to mitigate heat loss at these units.

4.9 ECMs Evaluated, But Not Recommended as High Priority

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 38 – Summary of Measures Evaluated, But Not Recommended as High Priority

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	**19,711**	**2.7**	**0.0**	**$3,087.09**	**$76,397.09**	**$6,725.00**	**$69,672.09**	**22.6**	**19,849**
Install LED Fixtures	19,711	2.7	0.0	$3,087.09	$76,397.09	$6,725.00	$69,672.09	22.6	19,849
Lighting Control Measures	**402**	**0.1**	**0.0**	**$62.89**	**$1,200.00**	**$0.00**	**$1,200.00**	**19.1**	**404**
Install High/Low Lighitng Controls	402	0.1	0.0	$62.89	$1,200.00	$0.00	$1,200.00	19.1	404
Custom Measures	**131**	**0.0**	**309.6**	**$3,725.12**	**$117,600.00**	**$0.00**	**$117,600.00**	**31.6**	**50,780**
Window Replacements	131	0.0	309.6	$3,725.12	$117,600.00	$0.00	$117,600.00	31.6	50,780
TOTALS	**20,244**	**2.8**	**309.6**	**$6,875.11**	**$195,197.09**	**$6,725.00**	**$188,472.09**	**27.4**	**71,034**

* - 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 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	9,227	2.7	0.0	$1,445.15	$66,540.98	$6,190.00	$60,350.98	41.8	9,292
Exterior	10,484	0.0	0.0	$1,641.94	$9,856.11	$535.00	$9,321.11	5.7	10,557

Measure Description

We evaluated replacing existing linear fluorescent T8 fixtures in classrooms that are in poor condition and whose lenses are no longer available with new reduced wattage high performance LED fixtures. We evaluated replacing existing linear fluorescent high bay fixtures in the gymnasium with new high performance LED light fixtures. We also evaluated the replacement of existing exterior fixtures containing metal halide and high pressure sodium lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are much longer than traditional lighting technologies.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings exceeds the expected useful life of the replacement equipment. The installation of LED high bay fixtures cannot be justified by energy savings alone. However, based on the difficulty of performing maintenance on elevated fixtures and the maintenance savings associated with longer life equipment, we suggest considering this measure for implementation based on other benefits such as improved light quality, reduced maintenance and increased efficiency.

Considerations

If the entire school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure. It should also be noted that the cost effectiveness for LED fixture replacements depends on application. Exterior fixture upgrades are much more advantageous than the interior applications.

Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
402	0.1	0.0	$62.89	$1,200.00	$0.00	$1,200.00	19.1	404

Measure Description

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

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

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

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings exceeds the expected useful life of the replacement equipment. The installation of high/low controls cannot be justified by energy savings alone. We suggest considering this measure for implementation based on other benefits such as reduced maintenance and increased efficiency.

Considerations

If the entire school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure.

Window Replacements

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)
131	0.0	309.6	$3,725.12	$117,600.00	$0.00	$117,600.00	31.6	50,780

Measure Description

Energy efficient windows are an important consideration when improving the building envelope. The heat transfer through the glass panes are responsible for a significant portion of the facility's heating and cooling energy consumption. We recommend replacing the old single pane windows with double pane windows, considering models that are gas-filled with low-e coatings to reduce heat loss. Windows should be selected with low- U-factors to maximize energy savings. The U-factor is the rate at which the window conducts non-solar heat flow and is a key indicator of performance. The lower the U-factor, the higher the efficiency of the window. Window frames and sashes should be efficient as well. If metal frames are specified or required by code, the frame extrusions should have a thermal break to reduce conduction through the frame. As part of the installation, the window frames should be properly sealed with caulk materials to ensure the mitigation of air infiltration. Building envelopes that limit air infiltration and that have adequate fenestrations play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort.

Reasons for not Recommending as a High Priority Measure

The projected payback period for this measure based on the energy savings exceeds the expected useful life of the replacement equipment. The replacement of windows cannot be justified by energy savings alone. We suggest considering this measure for implementation based on other benefits such as improved occupant comfort, reduced maintenance and increased efficiency.

Considerations

If the entire school district moves forward toward implementation of a comprehensive project under the Energy Savings Improvement Program, we would recommend including this measure.

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 Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. To prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Install Destratification Fans

Allowing air to thermally stratify in spaces with high ceilings results in additional energy consumption by requiring the heating system to heat a volume of space much larger than the actual occupied space. Additional inefficiencies also occur because there are higher temperatures at the ceiling level than at the floor level. Higher temperatures at the ceiling accelerate heat loss through the roof, requiring additional energy consumption by the heating equipment to compensate for the accelerated heat transfer.

Destratification fans are specially designed to deliver a columnar, laminar flow of air balancing the air temperature from floor to ceiling. In addition to fuel savings, the use of destratification fans will reduce the recovery time necessary to warm the space after nightly temperature setbacks and will increase the comfort level of the occupants.

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 Regular 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 to sustain efficiency and equipment life.

Perform Regular 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.

Perform Maintenance on Pneumatic HVAC Control System

Like all electro-mechanical equipment, compressed air systems require periodic maintenance to operate at peak efficiency. A maintenance plan should be developed for process related compressed air systems to include inspection, cleaning, and replacement of inlet filter cartridges, cleaning of drain traps, daily inspection of lubricant levels to reduce unwanted friction, inspection of belt condition and tension, checking for system leaks and adjustment of loose connections, and overall system cleaning. Contact a qualified HVAC technician skilled in maintaining pneumatic systems for help with setting up periodic maintenance schedule.

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 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.6 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 deciding 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.

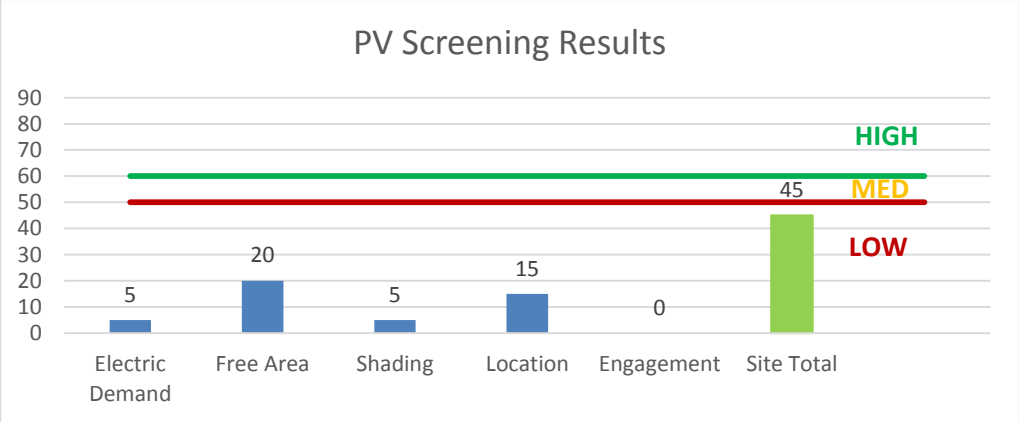
6.1 Photovoltaic

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.

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 39 - 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

6.2 Combined Heat and Power

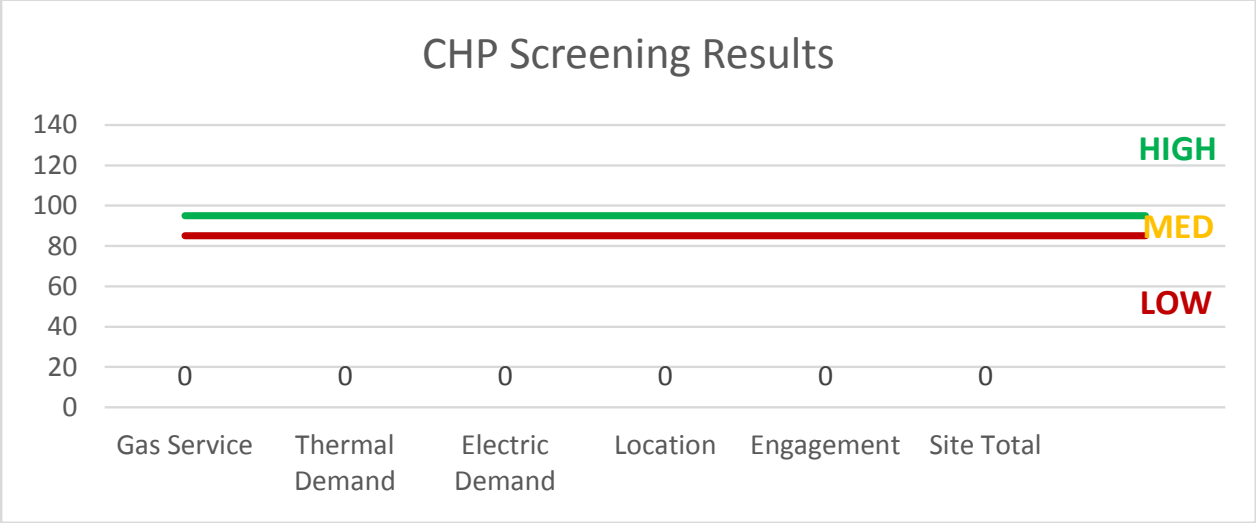
Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric 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 space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for 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 no potential for installing a cost-effective CHP system. Lack of gas service results in **no potential** for CHP at the site.

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

Figure 40 - Combined Heat and Power Screening



7 DEMAND RESPONSE

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

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

Typically, an electric customer needs to can reduce their electric demand, within minutes, by at least 100 kW or more 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, 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 provides 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 41 for a list of the eligible programs identified for each recommended ECM.

Figure 41 - 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 Fixtures with LED Lamps	x		x			
ECM 2	Install Occupancy Sensor Lighting Controls	x		x			
ECM 3	Install VFDs on Hot Water Pumps			x			
ECM 4	Install Pipe Insulation			x			
ECM 5	Install Low-Flow Domestic Hot Water Devices			x			
ECM 6	Replace Refrigeration Equipment			x			
ECM 7	Computer Power Management Software						
ECM 8	Building Envelope Weatherization						

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

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

8.2 Direct Install

Overview

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

Incentives

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

How to Participate

To participate in the Direct Install program, you will need to contact the participating contractor who 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.

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 of 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
Vestibule	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,980	0.06	196	0.0	$30.70	$150.40	$30.00	3.92
Hallway	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	1,386	0.08	285	0.0	$44.61	$350.40	$30.00	7.18
Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,386	0.22	760	0.0	$118.97	$668.00	$80.00	4.94
Boiler Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.13	228	0.0	$35.66	$351.00	$60.00	8.16
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	200	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	200	0.04	15	0.0	$2.38	$117.00	$20.00	40.80
Main Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.11	380	0.0	$59.48	$504.00	$75.00	7.21
Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,980	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,386	0.08	285	0.0	$44.61	$266.40	$50.00	4.85
Copy Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.04	150	0.0	$23.54	$117.00	$20.00	4.12
Nurses Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.13	451	0.0	$70.61	$351.00	$60.00	4.12
Nurses Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.04	150	0.0	$23.54	$117.00	$20.00	4.12
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	180	800	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	18	800	0.11	149	0.0	$23.34	$107.51	$10.00	4.18
Hallway	3	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,980	Relamp	Yes	3	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	1,386	0.04	144	0.0	$22.57	$344.60	$30.00	13.94
Hallway	5	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,980	Relamp	Yes	5	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	1,386	0.07	240	0.0	$37.62	$441.00	$50.00	10.39
Hallway	5	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,980	Relamp	Yes	5	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	1,386	0.07	240	0.0	$37.62	$441.00	$50.00	10.39
Library	31	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	31	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.85	2,943	0.0	$460.99	$2,083.50	$345.00	3.77
Speech Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.11	380	0.0	$59.48	$504.00	$75.00	7.21
Custodial Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.02	75	0.0	$11.77	$58.50	$10.00	4.12
Vestibule	1	Incandescent: Screw in Lamp	Wall Switch	60	1,980	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,980	0.03	116	0.0	$18.19	$53.75	$5.00	2.68
Classroom 9	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Fixture Replacement	Yes	14	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	29	1,386	0.38	1,329	0.0	$208.19	$6,124.32	$665.00	26.22
Classroom 10	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Fixture Replacement	Yes	14	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	29	1,386	0.38	1,329	0.0	$208.19	$6,124.32	$665.00	26.22
Classroom 11	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Fixture Replacement	Yes	14	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	29	1,386	0.38	1,329	0.0	$208.19	$6,124.32	$665.00	26.22
Classroom 12	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Fixture Replacement	Yes	14	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	29	1,386	0.38	1,329	0.0	$208.19	$6,124.32	$665.00	26.22
Classroom 13	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Fixture Replacement	Yes	14	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	29	1,386	0.38	1,329	0.0	$208.19	$6,124.32	$665.00	26.22
Classroom 15	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Fixture Replacement	Yes	14	LED - Fixtures: Ambient - 4' - Direct Fixture	Occupancy Sensor	29	1,386	0.38	1,329	0.0	$208.19	$6,124.32	$665.00	26.22
Classroom Restrooms	3	Compact Fluorescent: Screw in Lamp	Wall Switch	13	800	Relamp	No	3	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	800	0.01	11	0.0	$1.73	$161.26	$0.00	93.27

	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
Classroom 17	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom 18	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom 19	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom 20	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom 21	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom 22	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom 23	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom 24	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom 25	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom 26	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom 27	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.33	1,139	0.0	$178.45	$1,512.00	$225.00	7.21
Classroom Restrooms	4	Compact Fluorescent: Screw in Lamp	Wall Switch	13	800	Relamp	No	4	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	800	0.01	15	0.0	$2.31	$215.01	$0.00	93.27
Vestibule	1	Incandescent: Screw in Lamp	Wall Switch	60	1,980	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,980	0.03	116	0.0	$18.19	$53.75	$5.00	2.68
Custodial Closet	1	Incandescent: Screw in Lamp	Wall Switch	60	200	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	200	0.03	12	0.0	$1.84	$53.75	$5.00	26.54
Restroom	1	Compact Fluorescent: Screw in Lamp	Wall Switch	13	800	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	800	0.00	4	0.0	$0.58	$53.75	$0.00	93.27
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	800	Fixture Replacement	No	1	LED - Fixtures: Other	Wall Switch	29	800	0.02	30	0.0	$4.75	$282.24	$5.00	58.31
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	800	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	800	0.03	46	0.0	$7.13	$75.20	$15.00	8.44
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	800	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	800	0.02	30	0.0	$4.75	$58.50	$10.00	10.20
Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.02	75	0.0	$11.77	$58.50	$10.00	4.12
Stage	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,980	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,980	0.11	383	0.0	$59.91	$285.40	$60.00	3.76
Stage	1	High-Pressure Sodium: (1) 50W Lamp	Wall Switch	66	1,980	Fixture Replacement	No	1	LED - Fixtures: Other	Wall Switch	15	1,980	0.03	116	0.0	$18.19	$282.24	$5.00	15.24
Gym	16	Linear Fluorescent - T5HO: 4' T5HO (54W) - 4L	Wall Switch	234	1,980	Fixture Replacement	Yes	16	LED - Fixtures: High-Bay	Occupancy Sensor	120	1,386	1.57	5,465	0.0	$855.87	$34,370.56	$2,960.00	36.70
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	800	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	800	0.02	30	0.0	$4.75	$58.50	$10.00	10.20
Custodial Storage	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	800	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	800	0.02	29	0.0	$4.61	$96.40	$20.00	16.57
Kitchen	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.17	601	0.0	$94.15	$468.00	$80.00	4.12

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Back Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,980	0.04	150	0.0	$23.54	$117.00	$20.00	4.12
Gym Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	400	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	400	0.04	30	0.0	$4.75	$117.00	$20.00	20.40
Restroom	1	Compact Fluorescent: Plug in Lamps	Wall Switch	26	800	Relamp	No	1	LED Screw-In Lamps: Plug in Lamps	Wall Switch	14	800	0.01	11	0.0	$1.73	$107.51	$0.00	62.18
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	800	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	800	0.02	30	0.0	$4.75	$58.50	$10.00	10.20
Restroom	1	Compact Fluorescent: Plug in Lamps	Wall Switch	26	800	Relamp	No	1	LED Screw-In Lamps: Plug in Lamps	Wall Switch	14	800	0.01	11	0.0	$1.73	$107.51	$0.00	62.18
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	800	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	800	0.02	30	0.0	$4.75	$58.50	$10.00	10.20
Hallway	8	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,980	Relamp	Yes	8	LED - Linear Tubes: (2) 2' Lamps	High/Low Control	17	1,386	0.11	384	0.0	$60.20	$585.60	$80.00	8.40
Hallway	2	Linear Fluorescent - T8: 3' T8 (25W) - 1L	Wall Switch	27	1,980	Relamp	No	2	LED - Linear Tubes: (1) 3' Lamp	Wall Switch	11	1,980	0.02	75	0.0	$11.77	$69.60	$0.00	5.91
Custodial Closet	1	Compact Fluorescent: Plug in Lamps	Wall Switch	26	200	Relamp	No	1	LED Screw-In Lamps: Plug in Lamps	Wall Switch	14	200	0.01	3	0.0	$0.43	$107.51	$0.00	248.71
Faculty Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	700	0.19	336	0.0	$52.57	$679.50	$105.00	10.93
Vestibule	1	Incandescent: Screw in Lamp	Wall Switch	60	1,980	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,980	0.03	116	0.0	$18.19	$53.75	$5.00	2.68
Classroom 1	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.52	1,804	0.0	$282.54	$1,921.50	$295.00	5.76
Classroom 2	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.49	1,709	0.0	$267.67	$1,863.00	$285.00	5.90
Classroom 3	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.52	1,804	0.0	$282.54	$1,921.50	$295.00	5.76
Classroom 4	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.49	1,709	0.0	$267.67	$1,863.00	$285.00	5.90
Classroom 5	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.38	1,329	0.0	$208.19	$1,359.00	$210.00	5.52
Classroom 6	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.38	1,329	0.0	$208.19	$1,359.00	$210.00	5.52
Classroom 7	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.38	1,329	0.0	$208.19	$1,359.00	$210.00	5.52
Classroom 8	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,980	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,386	0.38	1,329	0.0	$208.19	$1,359.00	$210.00	5.52
Transition Spaces	10	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	10	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Art Room	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,584	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,109	0.41	1,139	0.0	$178.45	$1,687.50	$255.00	8.03
Band Room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,584	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,109	0.27	760	0.0	$118.97	$1,125.00	$170.00	8.03
Exterior	5	High-Pressure Sodium: (1) 50W Lamp	None	66	4,000	Fixture Replacement	No	5	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	15	4,000	0.00	1,020	0.0	$159.75	$1,953.39	$500.00	9.10
Exterior	7	Metal Halide: (1) 400W Lamp	None	458	4,000	Fixture Replacement	No	7	LED - Fixtures: Other	None	120	4,000	0.00	9,464	0.0	$1,482.20	$7,902.72	$35.00	5.31

	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
Exterior	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	12	4,000	None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	12	4,000	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	Heating System	2	Heating Hot Water Pump	5.0	87.5%	No	1,373	No	87.5%	Yes	2	1.29	5,090	0.0	$797.19	$6,551.70	$0.00	8.22
Boiler Room	Boiler Burners	2	Other	2.0	87.5%	No	1,373	No	87.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms & Offices	Unit Ventilators	43	Supply Fan	0.1	74.0%	No	1,830	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Pneumatic Controls	2	Air Compressor	1.0	86.5%	No	2,479	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Multipurpose Room	HV Unit	1	Supply Fan	1.0	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Fuel Oil Pumps for Boilers	2	Other	0.3	74.0%	No	1,373	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Domestic Water Circulator	1	Water Supply Pump	0.3	74.0%	No	2,745	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	Exhaust Hood	2	Other	0.3	74.0%	No	1,373	No	74.0%	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	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Portable AC	1	Window AC	1.08		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Faculty Room	Faculty Room	1	Window AC	0.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Classrooms	1	Window AC	0.83		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Classrooms	1	Window AC	1.50		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	Heating System	2	Non-Condensing Hot Water Boiler	2,242.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Pipe Insulation Recommendations

		Recommendation Inputs		Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	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	Domestic Hot Water Supply	25	1.00	0.00	0	3.6	$50.95	$108.75	$0.00	2.13

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	Domestic Hot Water	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
Restrooms	9	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	3.7	$53.13	$64.53	$0.00	1.21

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Stand-Up Refrigerator, Glass Door (≤15 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
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	Freezer Chest	No	Yes	0.45	3,902	0.0	$611.09	$2,150.00	$0.00	3.52

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 Griddle (3 Feet Width)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Electric Convection Oven (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Insulated Food Holding Cabinet (1/2 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Upper Greenwood	72	Computer	120.0	
Upper Greenwood	13	Small Printer	90.0	
Upper Greenwood	4	Speakers	500.0	
Upper Greenwood	2	Large Printer	1,200.0	
Upper Greenwood	4	Large Fans	250.0	
Upper Greenwood	24	Projector	500.0	
Upper Greenwood	4	Microwave	1,500.0	
Upper Greenwood	4	Small Fridge	260.0	
Upper Greenwood	1	Large Fridge	690.0	
Upper Greenwood	2	Coffee Machine	1,200.0	
Upper Greenwood	35	Fans	90.0	
Upper Greenwood	16	Smart Board	900.0	

Custom Recommendations

Computer Power Management Software

# of Desktops	Normal Running Mode					Idle Running Mode					Suspended/Off Mode				
72	*Mon - Fri 8AM-5PM*	*Mon - Fri 5PM-8AM*	*Weekends & Holidays*	Energy Rate (W)*	Weekly Run Hours	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	*Weekends & Holidays*	*Energy Rate (W)**	*Weekly Run Hours*	Mon - Fri 8AM-5PM	Mon - Fri 5PM-8AM	Weekends & Holidays	Energy Rate (W)*	*Weekly Run Hours*
Existing Conditions	25%	5%	0%	120	**14**	5%	5%	5%	80	**8**	70%	90%	95%	5	**146**
Proposed Conditions	25%	0%	0%	120	**10**	0%	0%	0%	80	**0**	75%	100%	100%	5	**158**

Usage per Device			Energy Impact & Financial Analysis					
Weeks of Use	Annual kWh Usage	*Diversity Factor***	Total Annual kWh Savings	Total Annual Energy Cost Savings	*Cost per Desktop*	*Add'l Hardware Cost*	Total Installation Cost	Simple Payback Period (Years)
44	136	90%	2,797	$438	$15.00	$2,500.0	$3,580	8.17
44	92							

Building Envelope Weatherization

Existing Conditions			Proposed Conditions		Energy Impact & Financial Analysis					
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Gas Use (mmBtu)*	*Annual Heating Oil Use (mmBtu)*	Assumed % Electric HVAC Savings	Assumed % Fuel HVAC Savings	Total Annual kWh Savings	Total Annual Gas mmBtu Savings	Total Annual Fuel mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
6,527	0	2,381	0.1%	5.0%	3	0	119	$1,425	$5,464	3.83

	qty	$/unit	est. costs
Weather-strip Exterior Double Doors	7	100	$ 700
Weather-strip Exterior Single Doors	1	60	$ 60
Caulk the Perimeter of Windows and Wall Cracks	1176	4	$ 4,704
		Total Estimated Costs	**$ 5,464**

Window Replacements

Existing Conditions		
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Gas Use (mmBtu)*	*Annual Heating Oil Use (mmBtu)*
6,527	0.0	2,381

Proposed Conditions			Energy Impact & Financial Analysis					
Assumed % Cooling Savings	Assumed % Heating Gas Savings	Assumed % Heating Fuel Savings	Total Annual kWh Savings	Total Annual Gas mmBtu Savings	Total Annual Fuel mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
2%	0%	13%	131	0	310	$3,725	$117,600	31.57

Equations: (Based on Industry Standards)

Estimated Average Cost for window replacements $50/sqft of Glass

Energy savings range between 10% and 20% with a typical payback of 30 years

APPENDIX B: ENERGY STAR® STATEMENT OF ENERGY PERFORMANCE

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

73

ENERGY STAR® Score[1]

Upper Greenwood Lake Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 41,000
Built: 1966

For Year Ending: March 31, 2017
Date Generated: April 24, 2018

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Upper Greenwood Lake Elementary School 41 Henry Road Hewitt, New Jersey 07421	West Milford Township School District 46 Highlander Drive West Milford, NJ 07480 (973) 697-1700	Barbara Francisco 46 Highlander Drive West Milford, NJ 07480 (973) 697-1700 Ext. 5050 barbara.francisco@wmtps.org

Property ID: 6274705

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
59 kBtu/ft²

Source EUI
87.7 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	541,716 (22%)
Fuel Oil (No. 2) (kBtu)	1,833,192 (76%)
Propane (kBtu)	43,792 (2%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	74.3
National Median Source EUI (kBtu/ft²)	110.6
% Diff from National Median Source EUI	-21%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	165

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)