Local Government Energy Audit:

Energy Audit Report

Paradise Knoll School

103 Paradise Road

Oak Ridge, New Jersey 07438

West Milford Township School District

September 7, 2018

Final Report by:

TRC Energy Services

Results you can rely on

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 Paradise Knoll 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

Paradise Knoll School is a 32,796 square foot facility comprised of classroom space, a multipurpose room, library, kitchen and office space. The building is one (1) floor and was originally built in 1955. The back section of the building was added in 1964 and library added in 2005. The building is in operation September through June for K-6 students. The building is occupied by about 42 full time staff members and 300 students. The regular school schedule is between 8:30AM to 2:40PM for students. The staff begins occupying the building around 7:00 AM and there are custodians that work a second shift until 11:00 PM. The building stays open in July and August but usually is only occupied by custodial staff on a regular basis.

The building is 100% heated and about 60% cooled. The packaged roof top units (RTUs) that are gas-fired forced air furnaces with a direct expansion (DX) cooling coil are aging and of standard efficiency. The main concern is the Radon underneath the building. It is an indoor quality and safety issue that in turn impacts the operation of the Energy Recovery Unit (ERU) that serves this area of the building. 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. These measures together represent an opportunity for the Paradise Knoll School to reduce annual energy costs by roughly $16,571 and annual greenhouse gas emissions by 86,832 lbs CO2e. We estimate that if all high priority measures were implemented as recommended, the project would pay for itself in roughly 5.3 years. Together these high priority measures represent an opportunity to reduce the Paradise Knoll School's annual energy costs by 18.0%.

TRC recommends 10 measures as high priority for implementation. These high priority measures together represent an opportunity for the Paradise Knoll School to reduce annual energy costs by roughly $16,185 and annual greenhouse gas emissions by 82,120 lbs CO2e. We estimate that if all high priority measures were implemented as recommended, the project would pay for itself in roughly 4.9 years. Together these high priority measures represent an opportunity to reduce the Paradise Knoll School's annual energy costs by 17.6%.

Figure 1 – Previous 12 Month Utility Costs

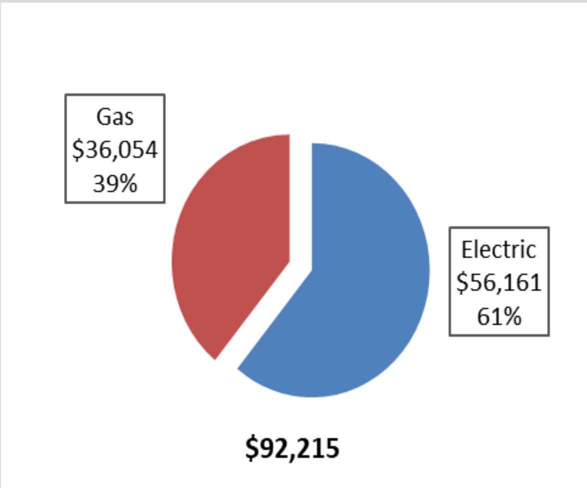


Figure 2a – Potential Post-Implementation Costs (All Measures)

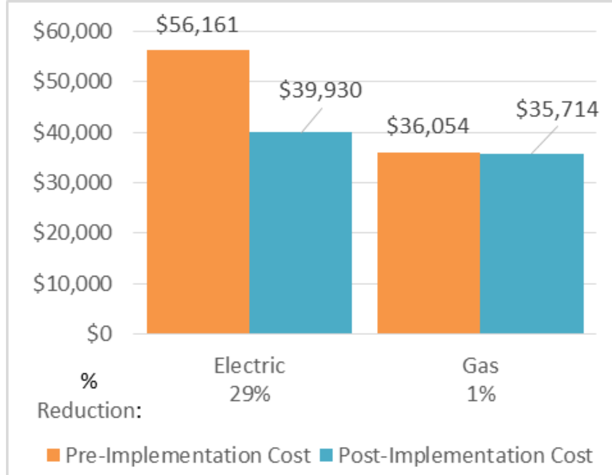
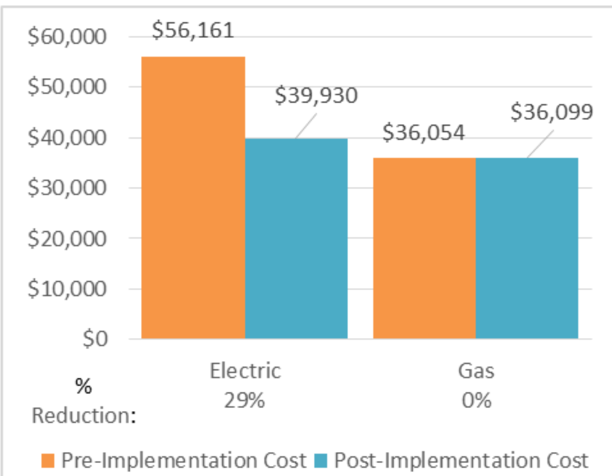


Figure 3b – Potential Post-Implementation Costs (High Priority Measures)



A detailed description of Paradise Knoll 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 4. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 4 – Summary of Energy Reduction Opportunities

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		**47,664**	**9.6**	**0.0**	**$9,423.30**	**$53,310.33**	**$8,260.00**	**$45,050.33**	**4.8**	**47,997**
ECM 1	Install LED Fixtures	7,878	0.7	0.0	$1,557.45	$25,558.21	$3,400.00	$22,158.21	14.2	7,933
ECM 2	Retrofit Fixtures with LED Lamps	39,786	8.9	0.0	$7,865.85	$27,752.12	$4,860.00	$22,892.12	2.9	40,064
Lighting Control Measures		**11,913**	**2.5**	**0.0**	**$2,355.31**	**$13,516.00**	**$1,730.00**	**$11,786.00**	**5.0**	**11,997**
ECM 3	Install Occupancy Sensor Lighting Controls	11,036	2.4	0.0	$2,181.93	$12,316.00	$1,730.00	$10,586.00	4.9	11,114
ECM 4	Install High/Low Lighitng Controls	877	0.1	0.0	$173.38	$1,200.00	$0.00	$1,200.00	6.9	883
Variable Frequency Drive (VFD) Measures		**10,091**	**1.3**	**0.0**	**$1,995.00**	**$11,473.01**	**$0.00**	**$11,473.01**	**5.8**	**10,161**
ECM 5	Install VFDs on Hot Water Pumps	10,091	1.3	0.0	$1,995.00	$11,473.01	$0.00	$11,473.01	5.8	10,161
Electric Unitary HVAC Measures		**1,154**	**0.4**	**0.0**	**$228.06**	**$1,991.52**	**$0.00**	**$1,991.52**	**8.7**	**1,162**
ECM 6	Install High Efficiency Electric AC	1,154	0.4	0.0	$228.06	$1,991.52	$0.00	$1,991.52	8.7	1,162
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**40.2**	**$385.41**	**$11,102.09**	**$1,200.00**	**$9,902.09**	**25.7**	**4,711**
	Install High Efficiency Furnaces	0	0.0	40.2	$385.41	$11,102.09	$1,200.00	$9,902.09	25.7	4,711
Domestic Water Heating Upgrade		**1,524**	**1.4**	**-4.7**	**$256.44**	**$2,399.27**	**$300.00**	**$2,099.27**	**8.2**	**986**
ECM 7	Install Tankless Water Heater	1,524	1.4	-5.2	$251.50	$2,392.10	$300.00	$2,092.10	8.3	926
ECM 8	Install Low-Flow Domestic Hot Water Devices	0	0.0	0.5	$4.94	$7.17	$0.00	$7.17	1.5	60
Food Service Equipment & Refrigeration Measures		**3,845**	**0.4**	**0.0**	**$760.22**	**$3,462.00**	**$600.00**	**$2,862.00**	**3.8**	**3,872**
ECM 9	Replace Refrigeration Equipment	3,845	0.4	0.0	$760.22	$3,462.00	$600.00	$2,862.00	3.8	3,872
Custom Measures		**5,904**	**0.0**	**0.0**	**$1,167.15**	**$3,280.00**	**$0.00**	**$3,280.00**	**2.8**	**5,945**
ECM 10	Computer Power Management Software	5,904	0.0	0.0	$1,167.15	$3,280.00	$0.00	$3,280.00	2.8	5,945
TOTALS		**82,095**	**15.6**	**35.6**	**$16,570.89**	**$100,534.22**	**$12,090.00**	**$88,444.22**	**5.3**	**86,832**
TOTALS (High Priority)		**82,095**	**15.6**	**-4.7**	**$16,185.48**	**$89,432.13**	**$10,890.00**	**$78,542.13**	**4.9**	**82,120**

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

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

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

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

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.

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

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

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 12 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 Paradise Knoll School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Ensure Economizers are Functioning Properly
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

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

Figure 5 – Photovoltaic Potential

Potential	High	
System Potential	55	kW DC STC
Electric Generation	65,525	kWh/yr
Displaced Cost	$5,700	/yr
Installed Cost	$143,000	

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
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- 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 4 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 8.4 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 6 – 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
Designated Representative			
Gene Eisenecker	Head Custodian		
TRC Energy Services			
Smruiti Srinivasan	Auditor	SSrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 14, 2016, TRC performed an energy audit at Paradise Knoll School located in Oak Ridge, New Jersey. TRC met with Gene Eisenecker to review the facility operations and help focus our investigation on specific energy-using systems.

Paradise Knoll School is a 32,796 square foot facility comprised of classroom space, a multipurpose room, library, kitchen and office space. The building is one (1) floor and was originally built in 1955. The back section of the building was added in 1964 and library added in 2005. The building is 100% heated and about 60% cooled. The packaged roof top units (RTUs) that are gas-fired forced air furnaces with a direct expansion (DX) cooling coil are aging and of standard efficiency. New condensing high efficiency boilers were installed a year prior and are in good condition. The main concern is the radon underneath the building. It is an indoor air quality and safety issue that in turn impacts the operation of the energy recovery unit (ERU) that serves this area of the building.

2.3 Building Occupancy

The building is in operation September through June for K-6 students. The building is occupied by about 42 full time staff members and 300 students. The regular school schedule is between 8:30 AM to 2:40 PM for students. The staff begins occupying the building around 7:00 AM and there are custodians that work a second shift until 11:00 PM. The building stays open in July and August but usually is only occupied by custodial staff on a regular basis. The typical schedule is presented in the table below.

Figure 7 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Paradise Knoll School (Sept-June)	Weekday	7:00 AM - 3:00 PM
Paradise Knoll School (Sept-June)	Weekend	No Use
Paradise Knoll School (July & Aug)	Weekday	No Use
Paradise Knoll School (July & Aug)	Weekend	No Use

2.4 Building Envelope

The building has flat roofs which are in fair to good condition. The building is constructed of concrete block, and structural steel with a brick facade. The building has double pane windows which are in fair condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum and in good condition.

Figure 8-Building Envelope

2.5 On-Site Generation

Paradise Knoll 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 or 4-lamp, 2-foot or 4-foot long troffers with diffusers. The gymnasium is lit by linear fluorescent high bay fixtures with T5HO lamps and electronic ballasts. Lighting fixtures throughout the building are manually controlled by wall switches. The back-wing classrooms are controlled by occupancy sensors. The exit signs throughout the building are LED. The exterior lighting includes LED wall pack fixtures as well as some high-pressure sodium lamp wall pack fixtures. There is also an LED screw in lamp fixture, a compact fluorescent lamp fixture, and a linear fluorescent T8 fixture right above some exterior doors. The exterior light fixtures are controlled by a timeclock.

Figure 9-Lighting

Figure 10-Lighting

Hot Water Heating System

The back wing of the building and the gymnasium is heated by a hot water system consists of two (2) 2337 MBH condensing hot water boilers. The boilers have a nominal combustion efficiency of 93.5%. The boilers are configured in a constant flow primary distribution with two (2) 2HP hot water pump motors for the back wing and two (2) 3HP hot water pump motors for the gymnasium. Both sets of pumps and motors operate in lead/lag fashion. They are constant speed motors, high efficiency and are in good 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 coils in classroom unit ventilators as well we radiators. The boilers are fully modulating. They are in good condition and well maintained.

Figure 11-Space Heating Hot Water

Energy Recovery Unit (ERU)

There is a concern regarding radon which is coming from under the building. The radon presents an indoor air quality and safety issue. An energy recovery unit (ERU) was installed a few years ago to address the radon issue. This unit serves the front wing of the building which includes classrooms and office space. The ERU is in good condition, however it is operating to provide a significant amount of ventilation. Per discussions with facility personnel, the supply fan motor runs continuously due to radon safety concerns. Return air is circulated with outdoor air constantly. The furnace also cycles on and off throughout the summer as well. This has led to an excessive amount of energy consumption. This unit appears to be a custom design. The nameplate information was not available, therefore, the capacity of the unit and supply fan motor horsepower were estimated based on the space it serves and engineering judgement.

Figure 12-Energy Recovery Unit

HVAC Systems

The roof top units (RTUs) are packaged units, are aging and are of standard efficiency. These units are constant volume and multi-zone. They are gas-fired to provide heating as a furnace in the winter months. They are equipped with compressors and a direct-expansion (DX) coil to provide cooling in the summer months. They serve a few areas of classrooms, the library and teacher's room. Combined, they provide a total of 16 tons of cooling capacity to these areas. Each unit has a supply fan and exhaust fan motor. These motors are constant speed and each unit is assumed to have a standard backward inclined fan.

Figure 13-Roof Top Units

There are various offices that have window air-conditioning (AC) units. These range in capacity, efficiency and capacity. There are two (2) units that are very old and inefficient.

Figure 14-Window AC Units

Building Energy Management System (BEMS)

The hot water heating system and energy recovery unit are tied to the building energy management system (BEMS). The BEMS aggregates the DDC points from throughout the building. Roughly 50% of the building zones are DDC and the remainder have pneumatic controls which are not tied into the BMS. Per discussions with facility personnel, the heating setpoint is 71°F during occupied periods of time and is set back overnight to 64°F.

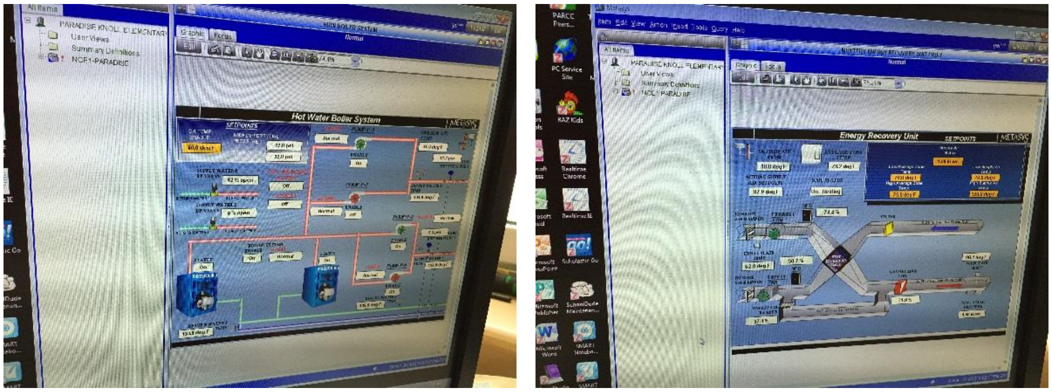


Figure 15-BEMS

The RTUs are controlled by programmable thermostats. Per discussions with facility personnel, the cooling setpoint is 69°F during occupied periods of time and set back overnight to 84°F.

Domestic Hot Water Heating Systems

There are a few domestic hot water heating systems for the facility. The majority of the building is served by a gas fired 76MBH boiler and a 50-gallon storage tank. The system has a nominal efficiency of 90%. There is a small electric storage tank water heater serving the gymnasium restrooms which is about 30 gallons in size and assumed to have a 4.5 kW heating element. Both of these water heaters were installed a few years ago and are in good condition. This system serves hand washing sinks throughout the building.

Figure 16-Domestic Hot Water

There is a tankless gas-fired domestic water heater in the kitchen. This is in good condition and high efficiency. There is a small electric storage tank water heater that serves the lower section restrooms which is about 30 gallons in size and assumed to have a 4.5 kW heating element. This unit is about 20 years old.

Food Service Equipment

The school has a kitchen that is used to prepare lunches for almost every student per day. Most of the cooking is done using a double rack oven and convection oven. Both of these are gas fired. Equipment is standard to high efficiency and is in good condition.

Figure 17-Cooking Equipment

Refrigeration

The kitchen has a few stand-up refrigerators and a few stand up freezers with solid doors and ranging in capacity. There is also a refrigerator chest. All equipment is standard to high efficiency and in good condition.

Figure 18-Refrigeration

Building Plug Load

There are roughly 52 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 with as projectors and fans.

2.7 Water-Using Systems

There are restrooms throughout this facility. A sampling of restrooms found that majority of the faucets are low flow and rated for 0.5 gallons per minute (gpm). There is also a high flow aerator rated for 2.2 gpm in the kitchen restroom.

3 Site Energy Use and Costs

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

3.1 Total Cost of Energy

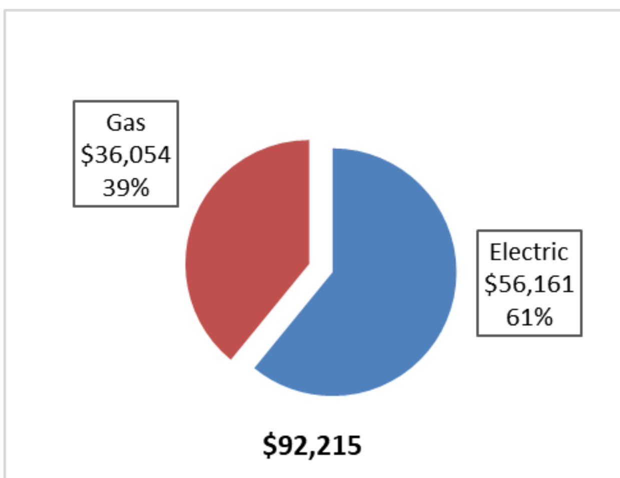
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 19 - Utility Summary

Utility Summary for Paradise Knoll School		
Fuel	**Usage**	**Cost**
Electricity	284,066 kWh	$56,161
Natural Gas	37,643 Therms	$36,054
Total		**$92,215**

The current annual energy cost for this facility is $92,215 as shown in the chart below.

Figure 20 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.198/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. This facility pays electric demand charges, however information related to demand was not available. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 21 - Electric Usage & Demand

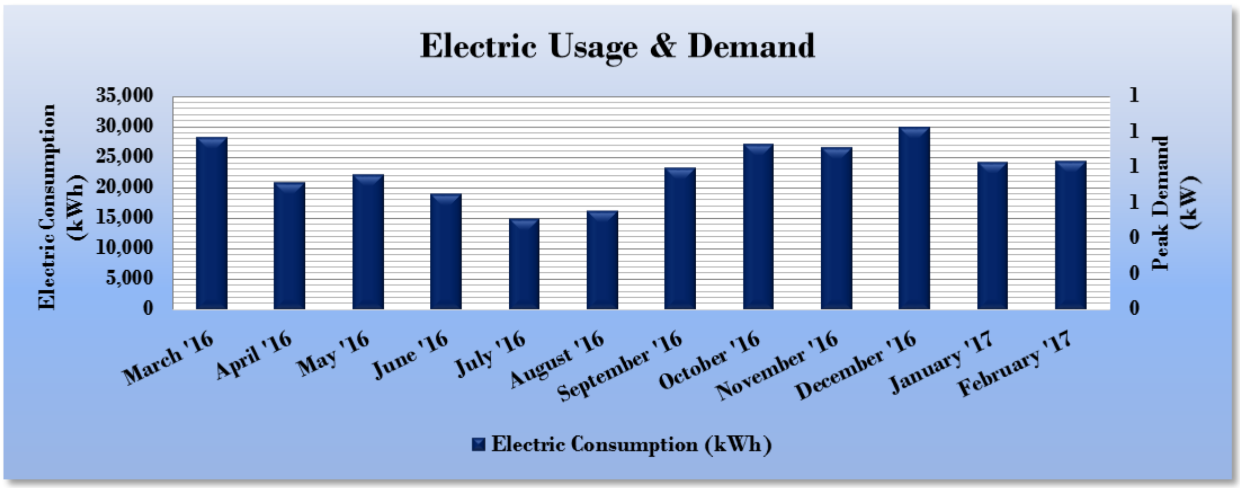


Figure 22 - Electric Usage & Demand

Electric Billing Data for Paradise Knoll School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
4/12/16	30	28,320	N/A	N/A	$3,055
5/11/16	30	20,880	N/A	N/A	$6,222
6/9/16	30	22,320	N/A	N/A	$2,454
7/12/16	32	19,040	N/A	N/A	$5,027
8/9/16	27	15,120	N/A	N/A	$4,897
9/7/16	28	16,320	N/A	N/A	$4,118
10/7/16	29	23,280	N/A	N/A	$3,840
11/8/16	31	27,200	57	$322	$2,793
12/8/16	29	26,720	N/A	N/A	$3,221
1/11/17	32	30,000	N/A	N/A	$6,701
2/10/17	29	24,240	N/A	N/A	$6,532
3/13/17	30	24,400	N/A	N/A	$6,070
Totals	**357**	**277,840**	**57.4**	**$322**	**$54,930**
Annual	**365**	**284,066**	**57.4**	**$329**	**$56,161**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.958/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 23 - Natural Gas Usage

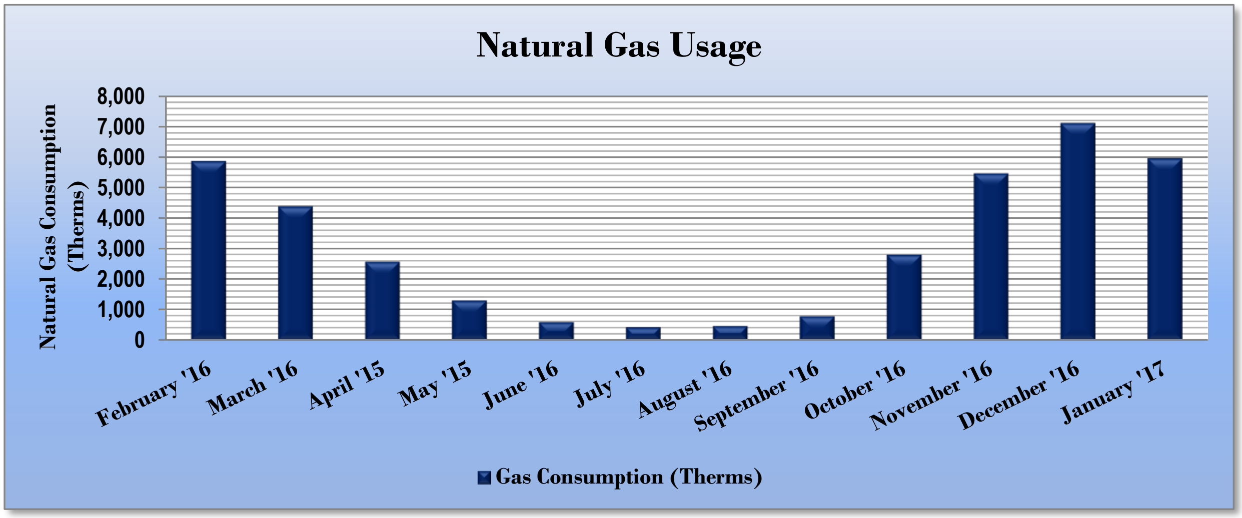


Figure 24 - Natural Gas Usage

Gas Billing Data for Paradise Knoll School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
3/11/16	30	5,860	$5,007
4/12/16	32	4,378	$2,848
5/11/15	29	2,562	$1,713
6/10/15	30	1,298	$922
7/12/16	32	588	$477
8/10/16	29	424	$373
9/9/16	29	454	$393
10/10/16	31	780	$601
11/8/16	29	2,790	$3,014
12/12/16	34	5,454	$4,990
1/12/17	31	7,103	$10,431
2/10/17	29	5,952	$5,285
Totals	**365**	**37,643**	**$36,054**
Annual	**365**	**37,643**	**$36,054**

3.4 Benchmarking

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

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

Figure 25 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Paradise Knoll School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	213.3	141.4
Site Energy Use Intensity (kBtu/ft^2)	144.3	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 26 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Paradise Knoll School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	186.6	141.4
Site Energy Use Intensity (kBtu/ft^2)	135.9	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 2.

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

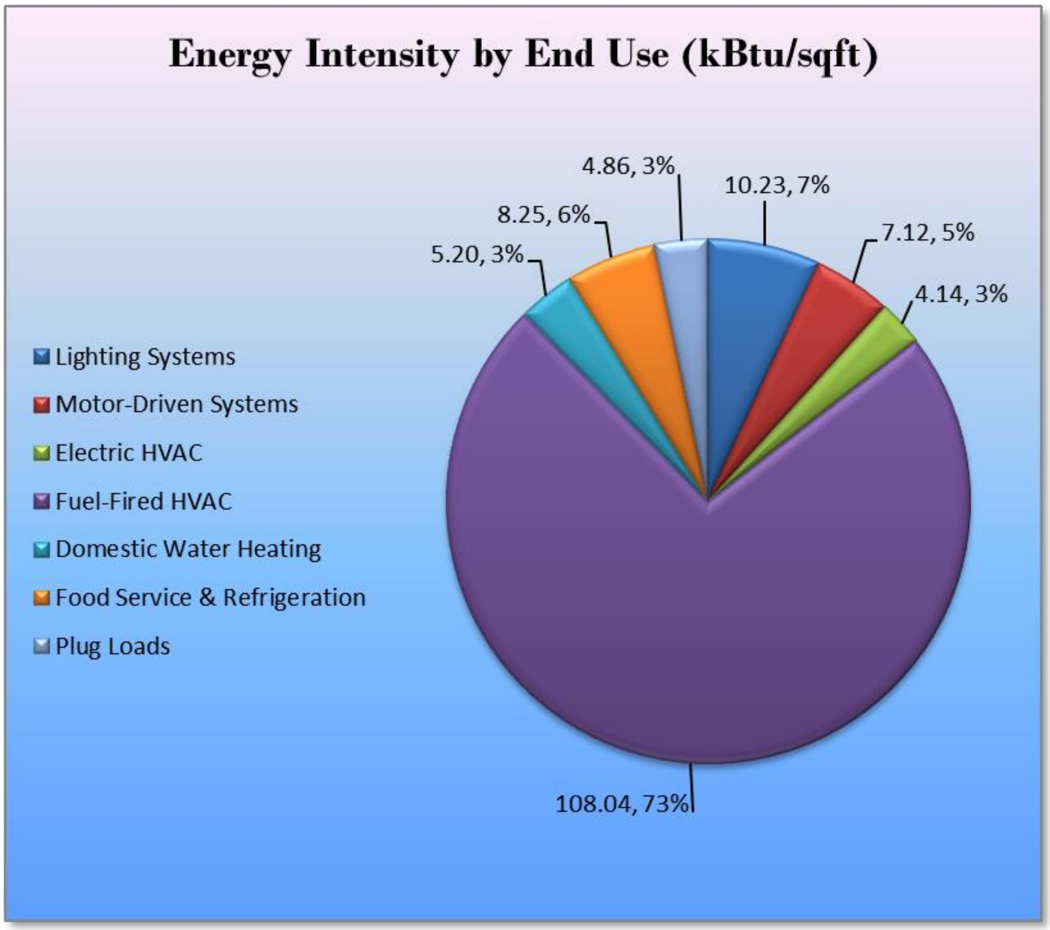
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed. 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 27 - 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 Paradise Knoll 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 28 – 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		**47,664**	**9.6**	**0.0**	**$9,423.30**	**$53,310.33**	**$8,260.00**	**$45,050.33**	**4.8**	**47,997**
ECM 1	Install LED Fixtures	7,878	0.7	0.0	$1,557.45	$25,558.21	$3,400.00	$22,158.21	14.2	7,933
ECM 2	Retrofit Fixtures with LED Lamps	39,786	8.9	0.0	$7,865.85	$27,752.12	$4,860.00	$22,892.12	2.9	40,064
Lighting Control Measures		**11,913**	**2.5**	**0.0**	**$2,355.31**	**$13,516.00**	**$1,730.00**	**$11,786.00**	**5.0**	**11,997**
ECM 3	Install Occupancy Sensor Lighting Controls	11,036	2.4	0.0	$2,181.93	$12,316.00	$1,730.00	$10,586.00	4.9	11,114
ECM 4	Install High/Low Lighitng Controls	877	0.1	0.0	$173.38	$1,200.00	$0.00	$1,200.00	6.9	883
Variable Frequency Drive (VFD) Measures		**10,091**	**1.3**	**0.0**	**$1,995.00**	**$11,473.01**	**$0.00**	**$11,473.01**	**5.8**	**10,161**
ECM 5	Install VFDs on Hot Water Pumps	10,091	1.3	0.0	$1,995.00	$11,473.01	$0.00	$11,473.01	5.8	10,161
Electric Unitary HVAC Measures		**1,154**	**0.4**	**0.0**	**$228.06**	**$1,991.52**	**$0.00**	**$1,991.52**	**8.7**	**1,162**
ECM 6	Install High Efficiency Electric AC	1,154	0.4	0.0	$228.06	$1,991.52	$0.00	$1,991.52	8.7	1,162
Domestic Water Heating Upgrade		**1,524**	**1.4**	**-4.7**	**$256.44**	**$2,399.27**	**$300.00**	**$2,099.27**	**8.2**	**986**
ECM 7	Install Tankless Water Heater	1,524	1.4	-5.2	$251.50	$2,392.10	$300.00	$2,092.10	8.3	926
ECM 8	Install Low-Flow Domestic Hot Water Devices	0	0.0	0.5	$4.94	$7.17	$0.00	$7.17	1.5	60
Food Service Equipment & Refrigeration Measures		**3,845**	**0.4**	**0.0**	**$760.22**	**$3,462.00**	**$600.00**	**$2,862.00**	**3.8**	**3,872**
ECM 9	Replace Refrigeration Equipment	3,845	0.4	0.0	$760.22	$3,462.00	$600.00	$2,862.00	3.8	3,872
Custom Measures		**5,904**	**0.0**	**0.0**	**$1,167.15**	**$3,280.00**	**$0.00**	**$3,280.00**	**2.8**	**5,945**
ECM 10	Computer Power Management Software	5,904	0.0	0.0	$1,167.15	$3,280.00	$0.00	$3,280.00	2.8	5,945
TOTALS		**82,095**	**15.6**	**-4.7**	**$16,185.48**	**$89,432.13**	**$10,890.00**	**$78,542.13**	**4.9**	**82,120**

* - 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 29 below.

Figure 29 – 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		**47,664**	**9.6**	**0.0**	**$9,423.30**	**$53,310.33**	**$8,260.00**	**$45,050.33**	**4.8**	**47,997**
ECM 1	Install LED Fixtures	7,878	0.7	0.0	$1,557.45	$25,558.21	$3,400.00	$22,158.21	14.2	7,933
ECM 2	Retrofit Fixtures with LED Lamps	39,786	8.9	0.0	$7,865.85	$27,752.12	$4,860.00	$22,892.12	2.9	40,064

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

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	4,856	0.7	0.0	$959.95	$24,386.18	$3,100.00	$21,286.18	22.2	4,889
Exterior	3,022	0.0	0.0	$597.50	$1,172.03	$300.00	$872.03	1.5	3,043

Measure Description

We recommend replacing existing high-pressure sodium lamp wall pack fixtures with new high performance LED fixtures as well as replace the gymnasium T5HO high bay fixtures with new high performance LED high bay 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 technologies.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	39,602	8.9	0.0	$7,829.48	$27,596.41	$4,850.00	$22,746.41	2.9	39,879
Exterior	184	0.0	0.0	$36.37	$155.71	$10.00	$145.71	4.0	185

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 which 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 30 below.

Figure 30 – 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		**11,913**	**2.5**	**0.0**	**$2,355.31**	**$13,516.00**	**$1,730.00**	**$11,786.00**	**5.0**	**11,997**
ECM 3	Install Occupancy Sensor Lighting Controls	11,036	2.4	0.0	$2,181.93	$12,316.00	$1,730.00	$10,586.00	4.9	11,114
ECM 4	Install High/Low Lighitng Controls	877	0.1	0.0	$173.38	$1,200.00	$0.00	$1,200.00	6.9	883

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 3: 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)
11,036	2.4	0.0	$2,181.93	$12,316.00	$1,835.00	$10,481.00	4.8	11,114

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.

ECM 4: 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)
877	0.1	0.0	$173.38	$1,200.00	$0.00	$1,200.00	6.9	883

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are stairwells 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 of time. Energy savings results from only providing full lighting levels when it is required.

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

Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

4.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 31 below.

Figure 31 – 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		**10,091**	**1.3**	**0.0**	**$1,995.00**	**$11,473.01**	**$0.00**	**$11,473.01**	**5.8**	**10,161**
ECM 5	Install VFDs on Hot Water Pumps	10,091	1.3	0.0	$1,995.00	$11,473.01	$0.00	$11,473.01	5.8	10,161

ECM 5: 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)
10,091	1.3	0.0	$1,995.00	$11,473.01	$0.00	$11,473.01	5.8	10,161

Measure Description

We recommend installing a variable frequency drives (VFD) to control all of the hot water pumps. This measure requires that a majority of 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 Electric Unitary HVAC Measures

Our recommendations for unitary HVAC measures are summarized in Figure 32 below.

Figure 32 - Summary of Unitary HVAC ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**1,479**	**0.4**	**0.0**	**$292.42**	**$1,991.52**	**$0.00**	**$1,991.52**	**6.8**	**1,489**
ECM 6	Install High Efficiency Electric AC	1,479	0.4	0.0	$292.42	$1,991.52	$0.00	$1,991.52	6.8	1,489

ECM 6: Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,479	0.4	0.0	$292.42	$1,991.52	$0.00	$1,991.52	6.8	1,489

Measure Description

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

4.6 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 33 below.

Figure 33 - 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		**1,524**	**1.4**	**-4.7**	**$256.44**	**$2,399.27**	**$300.00**	**$2,099.27**	**8.2**	**986**
ECM 7	Install Tankless Water Heater	1,524	1.4	-5.2	$251.50	$2,392.10	$300.00	$2,092.10	8.3	926
ECM 8	Install Low-Flow Domestic Hot Water Devices	0	0.0	0.5	$4.94	$7.17	$0.00	$7.17	1.5	60

ECM 7: Install Tankless Hot Water Heater

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,524	1.4	-5.2	$251.50	$2,392.10	$300.00	$2,092.10	8.3	926

Measure Description

We recommend replacing the existing electric storage tank water heater that is 20 years old serving the lower section of classrooms with a gas fired tankless water heating system. Tankless water heaters (a.k.a. "on-demand water heaters") only heat water when hot water is needed. Water is heated as it flows through the pipe to the hot water tap. Energy savings from a tankless water heater is based from eliminating heat losses associated with maintaining unnecessary standby hot water capacity.

ECM 8: 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	0.5	$4.94	$7.17	$0.00	$7.17	1.5	60

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 34 below.

Figure 34 - 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		**3,845**	**0.4**	**0.0**	**$760.22**	**$3,462.00**	**$600.00**	**$2,862.00**	**3.8**	**3,872**
ECM 9	Replace Refrigeration Equipment	3,845	0.4	0.0	$760.22	$3,462.00	$600.00	$2,862.00	3.8	3,872

ECM 9: 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)
3,845	0.4	0.0	$760.22	$3,462.00	$600.00	$2,862.00	3.8	3,872

Measure Description

We recommend replacing the existing large stand up commercial freezer 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 35 below.

Figure 35 - 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		**5,904**	**0.0**	**0.0**	**$1,167.15**	**$3,280.00**	**$0.00**	**$3,280.00**	**2.8**	**5,945**
ECM 10	Computer Power Management Software	5,904	0.0	0.0	$1,167.15	$3,280.00	$0.00	$3,280.00	2.8	5,945

ECM 10: 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)
5,904	0.0	0.0	$1,167.15	$3,280.00	$0.00	$3,280.00	2.8	5,945

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 through the use of 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. The image to the right is for demonstration purposes only and represents the difference between potential duration of devices being in Power-On States vs. the duration of User Activity. This difference provides an opportunity for energy savings by implementing power management software.

Installation of a Radon Mitigation System and Commission ERU

Measure Description

We recommend consulting with a qualified contractor to provide testing of the building for radon in accordance with the Environmental Protection Agency (EPA) guidelines for schools. Based on the outcome of the testing the district should consider installing a radon mitigation system. If the district decides it will be beneficial to continue using the ERU we recommend consulting a qualified HVAC contractor to commission the ERU. The focus of commissioning the ERU should be to determine the appropriate amount of outside the unit should supply and the operation of the furnace as these two components have a definite impact on the school's energy use. Due to the safety and air quality issues related to the operation of the ERU the estimate of potential savings and cost are outside the scope of this study. It is likely the radon testing and commissioning costs will be in the thousands of dollars. Continuous operation of a ventilation system that introduces high volumes of outside air and heats that air is very energy intensive. Reducing the amount of outside air and the subsequent heating to just the level required to maintain safe air quality will reduce the overall energy use of the ERU.

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 36 – 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)
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**44.5**	**$426.61**	**$11,102.09**	**$1,200.00**	**$9,902.09**	**23.2**	**5,215**
	Install High Efficiency Furnaces	0	0.0	44.5	$426.61	$11,102.09	$1,200.00	$9,902.09	23.2	5,215
TOTALS		**0**	**0.0**	**44.5**	**$426.61**	**$11,102.09**	**$1,200.00**	**$9,902.09**	**23.2**	**5,215**

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

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

Install High Efficiency Furnaces

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	44.5	$426.61	$11,102.09	$1,200.00	$9,902.09	23.2	5,215

Measure Description

We recommend replacing existing standard efficiency furnaces with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases which can significantly improve furnace efficiency. Savings result from improved system efficiency.

Reasons for not Recommending as a High Priority Measure

This measure is not recommended based on the poor payback period. These units are aging and nearing the end of their effective useful life, however their replacement cannot be justified by energy savings alone. However, based on the existing condition we suggest considering this measure for implementation based on other benefits such as improved indoor air 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.

5 Energy Efficient Practices

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

Reduce Air Leakage

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

Close Doors and Windows

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

Use Window Treatments/Coverings

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

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order 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.

Use Fans to Reduce Cooling Load

Utilizing ceiling fans to supplement cooling is a low cost strategy to reduce cooling load considerably. Thermostat settings can be increased by 4°F with no change in overall occupant comfort when the wind chill effect of moving air is employed for cooling.

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

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.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5 to 25 percent of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Perform Proper Boiler Maintenance

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

Perform Proper Water Heater Maintenance

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

Plug Load Controls

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

Water Conservation

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

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 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 making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

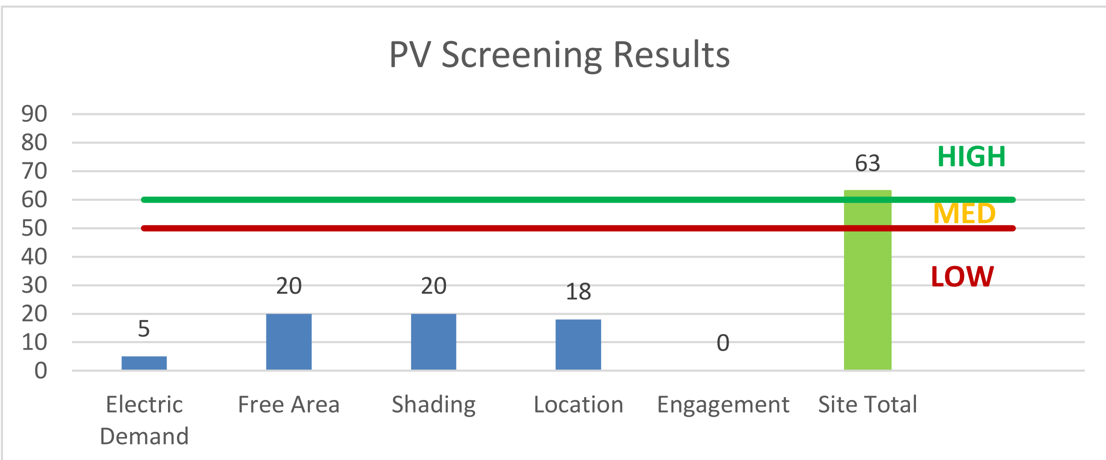
6.1 Photovoltaic

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

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

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the main building/ground next to the building/over the main parking lot may be feasible. If Paradise Knoll School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 37 - Photovoltaic Screening



Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (SRP) prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

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

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

6.2 Combined Heat and Power

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

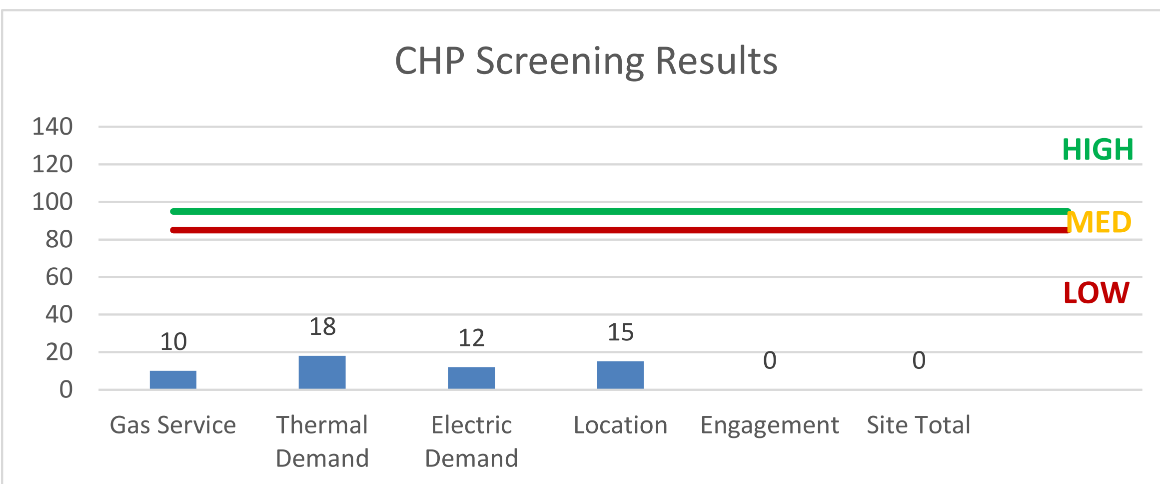
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

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

Low or infrequent thermal load and lack of space near the existing boilers are the most significant factors contributing to no potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

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

Figure 38 - Combined Heat and Power Screening



7 DEMAND RESPONSE

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

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

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

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

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

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

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

In our opinion this building is not a good candidate for DR.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 39 for a list of the eligible programs identified for each recommended ECM.

Figure 39 - 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	Install LED Fixtures	x		x			
ECM 2	Retrofit Fixtures with LED Lamps	x		x			
ECM 3	Install Occupancy Sensor Lighting Controls	x		x			
ECM 4	Install High/Low Lighitng Controls			x			
ECM 5	Install VFDs on Hot Water Pumps			x			
ECM 6	Install High Efficiency Electric AC			x			
ECM 7	Install Tankless Water Heater	x		x			
ECM 8	Install Low-Flow Domestic Hot Water Devices			x			
ECM 9	Replace Refrigeration Equipment	x					
ECM 10	Computer Power Management Software						

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.](http://www.njcleanenergy.com/ci)

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 Direct Install

Overview

Direct Install is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for 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 SREC Registration Program

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

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

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

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

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

8.4 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.

8.5 Demand Response Energy Aggregator

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

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

See Section 7 for additional information.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

APPENDIX A: EQUIPMENT INVENTORY & RECOMMENDATIONS

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.13	407	0.0	$80.38	$409.50	$70.00	4.22
Media Center	17	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,000	Relamp	Yes	17	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,800	0.70	4,891	0.0	$967.05	$1,818.40	$325.00	1.54
Outside Media Center	2	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	4,000	Relamp	No	2	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	4,000	0.04	253	0.0	$50.02	$123.40	$30.00	1.87
Gym	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,000	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,000	0.04	304	0.0	$60.02	$117.00	$20.00	1.62
Gym	20	Linear Fluorescent - T5HO: 4' T5HO (54W) - 3L	Wall Switch	179	4,000	Fixture Replacement	Yes	20	LED - Fixtures: High-Bay	Occupancy Sensor	120	2,800	1.25	8,740	0.0	$1,727.92	$28,395.50	$3,700.00	14.29
Stage Entrance	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Stage Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.02	67	0.0	$13.20	$58.50	$10.00	3.67
Stage	1	Metal Halide: (1) 70W Lamp	Wall Switch	95	1,760	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	18	1,760	0.05	156	0.0	$30.81	$390.68	$100.00	9.43
Kitchen	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,520	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,520	0.17	1,069	0.0	$211.28	$468.00	$80.00	1.84
Kitchen	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,520	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,520	0.01	65	0.0	$12.80	$48.20	$10.00	2.98
Kitchen Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,520	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,520	0.04	267	0.0	$52.82	$117.00	$20.00	1.84
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Entrance	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,200	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,200	0.02	159	0.0	$31.51	$58.50	$10.00	1.54
Outside Main Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,200	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,200	0.02	159	0.0	$31.51	$58.50	$10.00	1.54
Side Entrance	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,200	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,200	0.02	159	0.0	$31.51	$58.50	$10.00	1.54
KG-9	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.46	1,794	0.0	$354.58	$1,264.50	$205.00	2.99
KG-9	2	Compact Fluorescent: Screw in Lamp	Wall Switch	26	2,200	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	Wall Switch	13	2,200	0.02	66	0.0	$13.00	$107.51	$0.00	8.27
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
KG-7	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$250.29	$972.00	$155.00	3.26
KG-5	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$250.29	$972.00	$155.00	3.26
KG-4	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$250.29	$972.00	$155.00	3.26
Classroom 8	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,200	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.22	844	0.0	$166.86	$738.00	$115.00	3.73
Classroom 6	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,200	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.22	844	0.0	$166.86	$738.00	$115.00	3.73
Classroom 3	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,200	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.22	844	0.0	$166.86	$738.00	$115.00	3.73

	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 2	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,200	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.22	844	0.0	$166.86	$738.00	$115.00	3.73
Classroom 1	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,200	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.22	844	0.0	$166.86	$738.00	$115.00	3.73
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,000	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,000	0.04	228	0.0	$45.02	$117.00	$20.00	2.15
Janitors Closet	1	Compact Fluorescent: Screw in Lamp	Wall Switch	13	1,760	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	1,760	0.00	8	0.0	$1.60	$53.75	$0.00	33.58
Janitors Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,000	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,000	0.04	228	0.0	$45.02	$117.00	$20.00	2.15
Classroom 7	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,200	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.19	739	0.0	$146.00	$679.50	$105.00	3.93
Classroom 5	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,200	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.19	739	0.0	$146.00	$679.50	$105.00	3.93
Classroom 4	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	2,200	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.19	739	0.0	$146.00	$679.50	$105.00	3.93
Hallway	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,200	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,940	0.19	1,410	0.0	$278.74	$809.50	$70.00	2.65
Main Office Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,200	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,940	0.16	1,208	0.0	$238.92	$751.00	$60.00	2.89
Main Office Suite	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,520	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,464	0.25	1,519	0.0	$300.35	$721.20	$125.00	1.98
Princ. Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,848	0.12	570	0.0	$112.63	$341.60	$65.00	2.46
Nurse's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,640	0.13	601	0.0	$118.84	$300.80	$60.00	2.03
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Gym Hallway	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,200	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,940	0.08	604	0.0	$119.46	$375.50	$30.00	2.89
Copy Room	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.02	65	0.0	$12.80	$96.40	$20.00	5.97
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,000	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,000	0.04	228	0.0	$45.02	$117.00	$20.00	2.15
Restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	3,000	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	3,000	0.02	110	0.0	$21.83	$96.40	$20.00	3.50
Gym Storage	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Janitors Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Custodian Office	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,200	Relamp	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,200	0.02	81	0.0	$16.01	$96.40	$20.00	4.77
Reading Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.12	380	0.0	$75.09	$341.60	$65.00	3.68
Tech Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.02	67	0.0	$13.20	$58.50	$10.00	3.67

	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
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Media Center	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,520	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,464	0.30	1,857	0.0	$367.10	$913.50	$145.00	2.09
Classroom Encore	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.12	380	0.0	$75.09	$341.60	$65.00	3.68
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Teacher's Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,000	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,400	0.16	575	0.0	$113.77	$416.80	$80.00	2.96
Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 3L	Wall Switch	53	1,760	Relamp	No	1	LED - Linear Tubes: (3) 2' Lamps	Wall Switch	26	1,760	0.02	56	0.0	$11.00	$61.70	$15.00	4.24
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Classroom 10	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,540	0.12	475	0.0	$93.86	$341.60	$65.00	2.95
Classroom 11	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,540	0.37	1,424	0.0	$281.58	$946.80	$170.00	2.76
Closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,760	0.01	32	0.0	$6.40	$48.20	$10.00	5.97
Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.02	67	0.0	$13.20	$58.50	$10.00	3.67
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,000	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,000	0.04	228	0.0	$45.02	$117.00	$20.00	2.15
Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,000	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,000	0.04	228	0.0	$45.02	$117.00	$20.00	2.15
Faculty Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.02	67	0.0	$13.20	$58.50	$10.00	3.67
Custodian Closet	1	Incandescent: Screw in Lamp	Wall Switch	60	1,760	Relamp	No	1	LED Screw-In Lamps: Screw in Lamps	Wall Switch	9	1,760	0.03	103	0.0	$20.41	$53.75	$5.00	2.39
Music Room	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.57	2,216	0.0	$438.01	$1,498.50	$245.00	2.86
Classroom 13	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.57	2,216	0.0	$438.01	$1,498.50	$245.00	2.86
Classroom 14	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.57	2,216	0.0	$438.01	$1,498.50	$245.00	2.86
Classroom 15	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.57	2,216	0.0	$438.01	$1,498.50	$245.00	2.86
Classroom 16	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.57	2,216	0.0	$438.01	$1,498.50	$245.00	2.86
Classroom 17	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.57	2,216	0.0	$438.01	$1,498.50	$245.00	2.86
Classroom 18	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.57	2,216	0.0	$438.01	$1,498.50	$245.00	2.86
Classroom 19	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.57	2,216	0.0	$438.01	$1,498.50	$245.00	2.86
Classroom 20	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.57	2,216	0.0	$438.01	$1,498.50	$245.00	2.86
Speech Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,540	0.08	317	0.0	$62.57	$266.40	$50.00	3.46

	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
Hallway	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,200	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,940	0.30	2,216	0.0	$438.01	$1,043.50	$110.00	2.13
Back Entrance	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,200	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,200	0.02	159	0.0	$31.51	$58.50	$10.00	1.54
Media Center Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,200	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,200	0.02	159	0.0	$31.51	$58.50	$10.00	1.54
Transition Spaces	14	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	14	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	3	High-Pressure Sodium: (1) 250W Lamp	None	295	4,380	Fixture Replacement	No	3	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	65	4,380	0.00	3,022	0.0	$597.50	$1,172.03	$300.00	1.46
Exterior	14	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	70	4,380	None	No	14	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	70	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	1	LED Screw-In Lamps: Screw in Lamp	None	9	4,380	None	No	1	LED Screw-In Lamps: Screw in Lamp	None	9	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	4,380	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	4,380	0.00	70	0.0	$13.86	$48.20	$10.00	2.76
Exterior	2	Compact Fluorescent: Screw in Lamp	None	26	4,380	Relamp	No	2	LED Screw-In Lamps: Screw in Lamps	None	13	4,380	0.00	114	0.0	$22.51	$107.51	$0.00	4.77

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	Back Section	2	Heating Hot Water Pump	2.0	86.5%	No	2,745	No	86.5%	Yes	2	0.52	4,119	0.0	$814.38	$5,457.71	$0.00	6.70
Boiler Room	Gym	2	Heating Hot Water Pump	3.0	89.5%	No	2,745	No	89.5%	Yes	2	0.75	5,972	0.0	$1,180.62	$6,015.30	$0.00	5.10
Boiler Room	Air Compressor	2	Air Compressor	2.0	86.5%	No	2,479	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU3	RTU3	1	Supply Fan	1.0	86.5%	No	4,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU1	RTU1	1	Supply Fan	3.0	89.5%	No	4,000	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU2	RTU2	1	Supply Fan	1.0	86.5%	No	4,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU3	RTU3	1	Exhaust Fan	0.3	74.0%	No	4,000	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU1	RTU1	1	Exhaust Fan	1.0	86.5%	No	4,000	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU2	RTU2	1	Exhaust Fan	0.3	74.0%	No	4,000	No	74.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
ERU	ERU	1	Supply Fan	5.0	89.5%	No	8,760	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
RTU3	3 Classrooms and Teacher's Room	1	Packaged AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU1	Media Center	1	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU2	2 Classrooms	1	Packaged AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Window	Principles Office	1	Window AC	1.00		Yes	1	Window AC	1.00		12.00		No	0.22	809	0.0	$159.87	$1,088.76	$0.00	6.81
Window	Main Office	1	Window AC	0.83		Yes	1	Window AC	0.83		12.00		No	0.19	670	0.0	$132.56	$902.76	$0.00	6.81
Window	Restrooms	1	Window AC	0.67		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Window	Nurse's Office	1	Window AC	0.75		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Window	Classroom	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Window	Custodian Office	1	Window AC	0.67		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
RTU3	3 Classrooms and Teacher's Room	1	Furnace	120.00	Yes	1	Furnace	120.00	95.00%	AFUE	0.00	0	9.9	$94.39	$2,718.88	$400.00	24.57
RTU1	Media Center	1	Furnace	250.00	Yes	1	Furnace	250.00	95.00%	AFUE	0.00	0	20.5	$196.64	$5,664.33	$400.00	26.77
RTU2	2 Classrooms	1	Furnace	120.00	Yes	1	Furnace	120.00	95.00%	AFUE	0.00	0	9.9	$94.39	$2,718.88	$400.00	24.57
Boiler Room	Back Wing & Gym	2	Condensing Hot Water Boiler	2,337.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
ERU	Front Wing of the Building	1	Furnace	570.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen Office	Kitchen	1	Tankless Water Heater	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Closet	Lower Section Restrooms	1	Storage Tank Water Heater (≤ 50 Gal)	Yes	1	Tankless Water Heater	Natural Gas	82.00%	EF	1.35	1,524	-5.2	$251.50	$2,392.10	$300.00	8.32
Tech Closet	Gym Restroom	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
Kitchen Restroom	1	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	0.5	$4.94	$7.17	$0.00	1.45

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Stand-Up Refrigerator, Solid Door (>50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Freezer, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Freezer, Solid Door (>50 cu. ft.)	No	Yes	0.44	3,845	0.0	$760.22	$3,462.00	$600.00	3.76
Kitchen	1	Refrigerator Chest	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Rack Oven (Double)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Paradise Knolls	52	Computer	120.0	
Paradise Knolls	7	Small Printer	90.0	
Paradise Knolls	1	Medium Printer	250.0	
Paradise Knolls	3	Large Printer	1,200.0	
Paradise Knolls	1	Shredder	400.0	
Paradise Knolls	19	Projector	500.0	
Paradise Knolls	4	Microwave	1,500.0	
Paradise Knolls	1	Small Fridge	360.0	
Paradise Knolls	3	Large Fridge	720.0	
Paradise Knolls	1	Coffee Machine	1,200.0	
Paradise Knolls	2	Toaster	1,100.0	
Paradise Knolls	14	Fans	90.0	
Paradise Knolls	1	Smart Board	900.0	
Paradise Knolls	1	Misc Loads	2,500.0	

Custom Recommendations

Computer Power Management Software

# of Desktops 52	Normal Running Mode					Idle Running Mode					Suspended/Off Mode				
	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	75%	25%	0%	120	**50**	25%	5%	5%	80	**16**	0%	70%	95%	5	**102**
Proposed Conditions	75%	5%	0%	120	**34**	5%	0%	0%	80	**2**	20%	95%	100%	5	**132**

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)
48	375	90%	5,904	$1,167	$15.00	$2,500.0	$3,280	2.81
48	249							

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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2

ENERGY STAR® Score[1]

Paradise Knoll Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 32,796
Built: 1955

For Year Ending: January 31, 2017
Date Generated: April 25, 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
Paradise Knoll Elementary School
103 Paradise Road
Oak Ridge, New Jersey 07438

Property Owner
West Milford Township School District
46 Highlander Drive
West Milford, NJ 07480
(973) 697-1700

Primary Contact
Barbara Francisco
46 Highlander Drive
West Milford, NJ 07480
(973) 697-1700 Ext. 5050
barbara.francisco@wmtps.org

Property ID: 6274636

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
146.7 kBtu/ft²

Source EUI
220.6 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	3,764,299 (78%)
Electric - Grid (kBtu)	1,045,556 (22%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	76.7
National Median Source EUI (kBtu/ft²)	115.3
% Diff from National Median Source EUI	91%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	316

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)