Local Government Energy Audit:
Energy Audit Report

George Elementary School

Palm St

Township of Washington, New Jersey

07676

Westwood Regional School District

October 4, 2018

Final Report by:

TRC Energy Services

Disclaimer

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

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

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

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

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1 Executive Summary

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

The goal of an LGEA report is to provide public facilities and local governments with valuable information on their facilities' energy usage. Each LGEA report includes specific energy conservation measures (ECMs) and energy management options, which have been determined to be likely to benefit that facility. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) and other sources which may be available to assist with ECM implementation.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey school districts in controlling energy costs and help protect our environment by promoting more efficient use of energy resources statewide.

1.1 Facility Summary

George Elementary School is a 30,604 square foot, one story facility comprised classroom space, an all-purpose room and office space. The mechanical space is located in the small basement. The building was built in 1962 and is primarily used for education. The building is occupied between 6:00 AM and 6:00 PM, Monday through Friday. There is partial occupancy on the weekends, mostly on Saturdays between 8:00 AM and 3:00 PM. The building is occupied by 263 students and 55 staff members.

The high bay lighting in the gymnasium of the George Elementary School is the main concern. 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 12 energy conservation measures of which 11 measures are recommended. The recommended measures represent an opportunity for George Elementary School to reduce its annual energy costs by $17,338 and its annual greenhouse gas emissions by 109,992 lbs CO_2e. We estimate that if all measures are implemented as recommended, the project would pay for itself in energy savings in 7.4 years. A breakdown of current utility costs is shown in Figure 1. The estimated reduction in utility costs for the proposed measures in shown in Figure 2. Together these measures represent an opportunity to reduce George Elementary School's annual energy use by 17% overall.

Figure 1 – Previous 12 Month Utility Costs

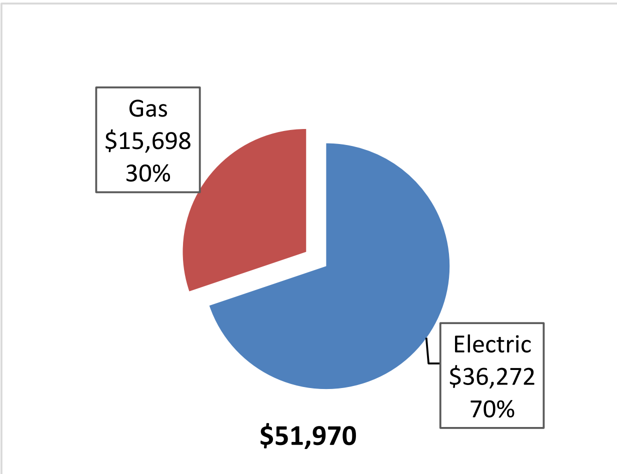
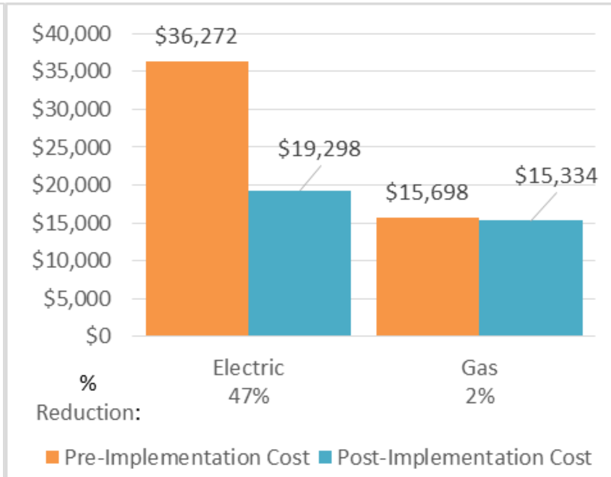


Figure 2 – Potential Post-Implementation Costs



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

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

Figure 3 – Summary of Energy Reduction Opportunities

	Energy Conservation Measure	Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	*Annual Natural Gas Savings (MMBtu)*	*Annual N/A Savings (MMBtu)*	*Annual N/A Savings (MMBtu)*	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		**56,767**	**15.4**	**0.0**	**0.0**	**0.0**	**0.0**	**$9,172.59**	**$91,315.07**	**$9,375.00**	**$81,940.07**	**8.9**	**57,164**
ECM 1	Install LED Fixtures	Yes	11,944	2.3	0.0	0.0	0.0	0.0	$1,929.99	$57,561.23	$3,450.00	$54,111.23	28.0	12,028
ECM 2	Retrofit Fixtures with LED Lamps	Yes	43,780	13.0	0.0	0.0	0.0	0.0	$7,074.16	$33,000.96	$5,925.00	$27,075.96	3.8	44,086
ECM 3	Install LED Exit Signs	Yes	1,042	0.1	0.0	0.0	0.0	0.0	$168.44	$752.89	$0.00	$752.89	4.5	1,050
	Lighting Control Measures		**14,727**	**3.4**	**0.0**	**0.0**	**0.0**	**0.0**	**$2,379.57**	**$15,992.00**	**$2,135.00**	**$13,857.00**	**5.8**	**14,829**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	12,829	3.1	0.0	0.0	0.0	0.0	$2,073.04	$15,452.00	$2,135.00	$13,317.00	6.4	12,919
ECM 5	Install Daylight Dimming Controls	Yes	1,897	0.3	0.0	0.0	0.0	0.0	$306.53	$540.00	$0.00	$540.00	1.8	1,910
	Variable Frequency Drive (VFD) Measures		**13,604**	**1.9**	**0.0**	**0.0**	**0.0**	**0.0**	**$2,198.19**	**$7,213.60**	**$0.00**	**$7,213.60**	**3.3**	**13,699**
ECM 6	Install VFDs on Hot Water Pumps	Yes	13,604	1.9	0.0	0.0	0.0	0.0	$2,198.19	$7,213.60	$0.00	$7,213.60	3.3	13,699
	Electric Unitary HVAC Measures		**2,844**	**2.1**	**0.0**	**0.0**	**0.0**	**0.0**	**$459.50**	**$11,069.06**	**$0.00**	**$11,069.06**	**24.1**	**2,864**
	Install High Efficiency Electric AC	No	2,844	2.1	0.0	0.0	0.0	0.0	$459.50	$11,069.06	$0.00	$11,069.06	24.1	2,864
	HVAC System Improvements		**834**	**0.0**	**4.6**	**0.0**	**0.0**	**4.6**	**$180.84**	**$174.00**	**$0.00**	**$174.00**	**1.0**	**1,373**
ECM 7	Install Pipe Insulation	Yes	834	0.0	4.6	0.0	0.0	4.6	$180.84	$174.00	$0.00	$174.00	1.0	1,373
	Domestic Water Heating Upgrade		**15,547**	**1.4**	**-52.1**	**0.0**	**0.0**	**-52.1**	**$1,985.69**	**$8,427.89**	**$152.00**	**$8,275.89**	**4.2**	**9,559**
ECM 8	Install High Efficiency Gas Water Heater	Yes	15,547	1.4	-53.0	0.0	0.0	-53.0	$1,975.84	$8,392.04	$152.00	$8,240.04	4.2	9,445
ECM 9	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	1.0	0.0	0.0	1.0	$9.85	$35.85	$0.00	$35.85	3.6	114
	Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**$260.45**	**$230.00**	**$0.00**	**$230.00**	**0.9**	**1,623**
ECM 10	Vending Machine Control	Yes	1,612	0.0	0.0	0.0	0.0	0.0	$260.45	$230.00	$0.00	$230.00	0.9	1,623
	Custom Measures		**1,957**	**0.0**	**83.5**	**0.0**	**0.0**	**83.5**	**$1,160.25**	**$16,478.00**	**$0.00**	**$16,478.00**	**14.2**	**11,745**
ECM 11	Computer Power Management Software	Yes	1,937	0.0	0.0	0.0	0.0	0.0	$312.99	$3,295.00	$0.00	$3,295.00	10.5	1,951
ECM 12	Building Envelope Weatherization	Yes	20	0.0	83.5	0.0	0.0	83.5	$847.26	$13,183.00	$0.00	$13,183.00	15.6	9,794
	TOTALS FOR HIGH PRIORITY MEASURES		**105,047**	**22.0**	**36.0**	**0.0**	**0.0**	**36.0**	**$17,337.59**	**$139,830.56**	**$11,662.00**	**$128,168.56**	**7.4**	**109,992**
	TOTALS		**107,891**	**24.1**	**36.0**	**0.0**	**0.0**	**36.0**	**$17,797.09**	**$150,899.62**	**$11,662.00**	**$139,237.62**	**7.8**	**112,856**

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

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

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

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.

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

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

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

Energy Efficient Practices

TRC also identified 16 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 operation and maintenance costs. Potential opportunities identified at George Elementary School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Use Fans to Reduce Cooling Load
- Install Destratification Fans
- Practice Proper Use of Thermostat Schedules and Temperature Resets

- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

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

On-Site Generation Measures

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

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

1.3 Implementation Planning

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

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

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

- SmartStart
- Direct Install
- SREC (Solar Renewable Energy Certificate) Registration Program (SRP)
- Energy Savings Improvement Program (ESIP)

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

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

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

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

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
John Baumann	Director of Buildings and Grounds	john.baumann@wwrsd.org	201-664-0880 ext 2010
Keith Rosado	School Business Administrator / Board Secretary	keith.rosado@wwrsd.org	201-664-0880 ext 2004
TRC Energy Services			
Aimee Lalonde	Auditor	alalonde@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On July 19, 2017, TRC performed an energy audit at George Elementary School located in Township of Washington, New Jersey. TRC's team met with John Baumann, Director of Buildings and Grounds to review the facility operations and help focus our investigation on specific energy-using systems.

George Elementary School is a 30,604 square foot, one story facility comprised classroom space, an all-purpose room and office space. The mechanical space is located in the small basement. The building was built in 1962 and is primarily used for education. The building is occupied between 6:00 AM and 6:00 PM, Monday through Friday. There is partial occupancy on the weekends, mostly on Saturdays between 8:00 AM and 3:00 PM. The building is occupied by 263 students and 55 staff members.

2.3 Building Occupancy

The building is occupied between 6:00 AM to 6:00 PM, Monday through Friday. There is partial occupancy on the weekends, mostly on Saturdays between 8:00 AM and 3:00 PM. The building is occupied by 263 students and 55 staff members. The typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
George Elementary School	Weekday	6 AM to 6 PM
George Elementary School	Weekend	Partial
Gym	Weekday	6 AM to 10 PM
Gym	Weekend	8 AM to 3 PM

2.4 Building Envelope

The building is constructed of concrete block with a brick facade. The building has flat roof sections which appear to be in fair condition. The building has double-pane windows with metal frames, which are operable. The perimeter of window frames are in poor condition and are showing signs of excessive infiltration. The exterior doors are constructed of metal with metal frames and are in fair condition. The door seals have worn or missing weather-stripping materials which increases the level of outside air infiltration. There is an opportunity for energy savings by caulking the perimeter of window frames and installing weather-stripping to exterior doors.



2.5 On-Site Generation

George Elementary School does not have any on-site electric generation capacity.

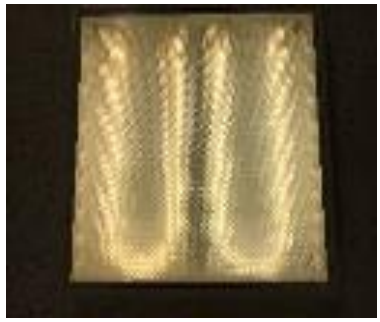
2.6 Energy-Using Systems

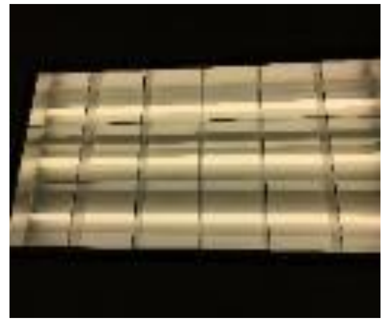
Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

Lighting System

Lighting at the facility is provided mostly by fixtures with 32-Watt linear fluorescent T8 lamps and electronic ballasts as well as some incandescent lamp fixtures. A majority of the fixtures are in good condition. The hallways have skylights that allow natural light in during the day. There is an opportunity for energy savings by installing daylight dimming controls to these fixtures. Light fixtures throughout the building are manually controlled via wall switches. Some of the classrooms have bi level switching capabilities. Exit signs in the building include incandescent lamps. There is an opportunity for energy savings by upgrading to LED technology and installing occupancy based sensors in designated locations.







The all-purpose room is illuminated by metal halide high bay fixtures. There is an opportunity for energy savings by replacing these one for one with reduced wattage LED high bay fixtures with occupancy based controls.

The exterior includes metal halide and LED fixtures. A majority of these fixtures are controlled by a timeclock, however there was an LED fixture that was noted to be on during the day and the timeclock is not operating correctly.

Hot Water Heating System

The hot water system consists of two gas-fired condensing hot water boilers each with a 2,000 MBH output. The boilers have a nominal combustion efficiency of 92% and are in good condition. They are modulating boilers. Hot water is supplied by two 7.5HP motors at a constant flow with triple-duty valves that are partially opened. There is an opportunity for energy savings by installing variable frequency drives to control the hot water pump motors. The heating system is controlled by basic boiler controls which include outside air temperature reset controls. The boilers provide hot water to perimeter radiators and unit ventilators throughout the building.








Air Conditioning System

Some of the classrooms and offices are cooled by window air-conditioning (AC) units. IT rooms are cooled by split AC systems. Equipment varies in efficiency and condition. There are a few units that are in poor condition and low efficiency. There is an opportunity for energy savings by replacing these less efficiency units with ENERGY STAR® high efficiency window AC Units, however, this measure is cost prohibitive. Window AC units are manually turned on and off as needed throughout the summer months. The IT rooms need to be conditioned year round. The split AC systems are controlled by a programmable thermostat that are located in the spaces they serve.


Domestic Water Heating System

The domestic water heating system for the facility consists of two separate systems. About half of the building is served by a gas-fired storage tank water heater. This water heater is 75 gallons in capacity, with an input rating of 76 MBH and a nominal efficiency of 80%. The other half of the building is served by an electric storage tank water heater. This water heater is 80 gallons in capacity with 4.5 kW heating elements. Both of these are in good condition. However, the distribution piping is uninsulated. Recirculation pumps distribute 120°F water to the restrooms and faucets throughout the building. The sink aerators throughout the building are high flow (2.0 gallons per minute [gpm] or higher) restrictors. There is an opportunity for energy savings by installing low-flow aerators, insulating piping and replacing the electric water heater with a gas-fired condensing hot water heater.

Food Service and Refrigeration Equipment

The kitchen has a gas stove and electric food holding equipment which are used for warming up meals. There is also stand up refrigerators as well as a freezer and refrigerator chest. All of this equipment is in fair condition.

Building Plug Load

There are 53 computers throughout the building. There is no centralized PC power management software installed. Plug loads in the building also include general office and café equipment. Additionally there are many fans and smart boards in classroom spaces. There is a refrigerated snack vending machine that is not currently controlled.

2.7 Water-Using Systems

The restrooms throughout the building have sinks with higher flow restrictors. A sampling of restrooms found that the faucets are rated for 2.0 gpm or higher. There is an opportunity for energy savings by replacing these with low flow aerators.

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

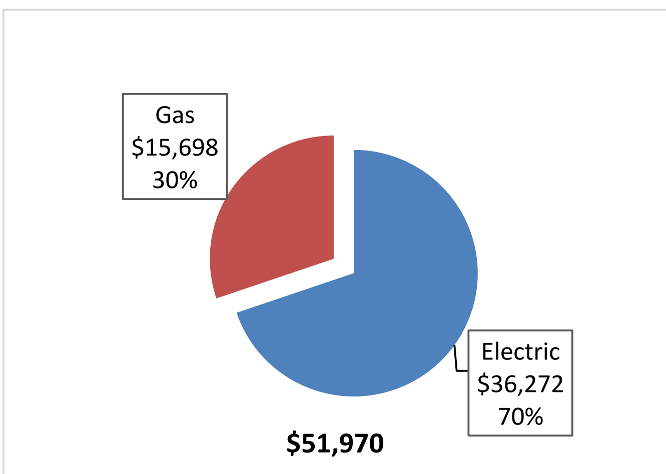
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for George Elementary School		
Fuel	**Usage**	**Cost**
Electricity	224,480 kWh	$36,272
Natural Gas	15,526 Therms	$15,698
Total		**$51,970**

The current annual energy cost for this facility is $51,970 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric rate over a recent 12-month period was $0.162/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The facility pays electric demand charges. The monthly electricity consumption and peak demand are shown in the chart below. The relatively high summer power demand is typical for year round operation for buildings with a significant cooling load.

Figure 8 - Electric Usage & Demand

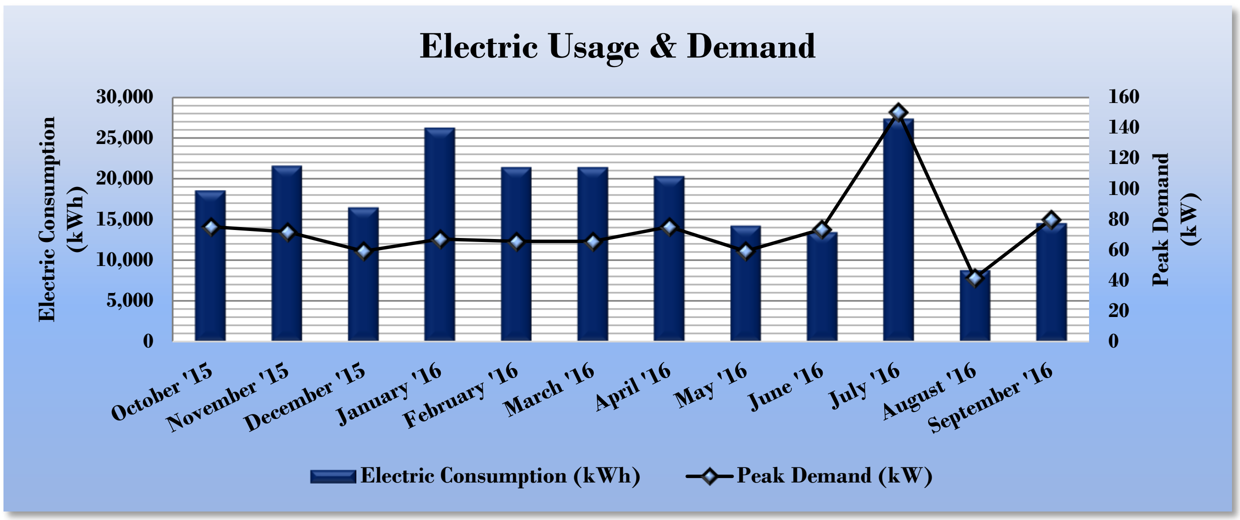


Figure 9 - Electric Usage & Demand

Electric Billing Data for George Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
10/29/15	29	18,560	75	$983	$2,611
12/1/15	33	21,600	72	$969	$2,862
12/31/15	30	16,480	59	$914	$2,338
2/1/16	32	26,240	67	$983	$3,276
3/2/16	30	21,440	66	$979	$2,816
4/1/16	30	21,440	66	$1,028	$2,895
5/2/16	31	20,320	75	$1,070	$2,816
6/1/16	30	14,240	59	$1,005	$2,169
7/1/16	30	13,440	74	$1,820	$3,046
8/2/16	32	27,360	150	$3,680	$6,148
8/30/16	28	8,800	42	$1,417	$2,171
9/29/16	30	14,560	80	$1,914	$3,125
Totals	**365**	**224,480**	**150.4**	**$16,762**	**$36,272**
Annual	**365**	**224,480**	**150.4**	**$16,762**	**$36,272**

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average natural gas rate over a recent 12-month period was found to be $1.011/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. The high winter use typifies a predominant heating-driven gas use profile.

Figure 10 - Natural Gas Usage

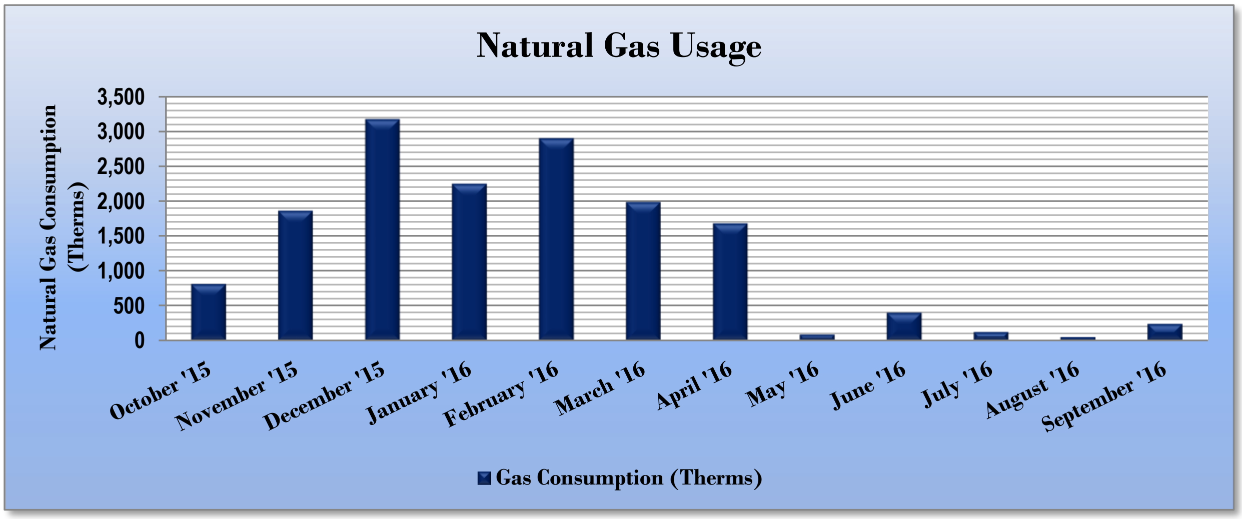


Figure 11 - Natural Gas Usage

Gas Billing Data for George Elementary School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
10/29/15	29	808	$548
12/1/15	33	1,859	$1,791
12/31/15	30	3,172	$5,445
2/1/16	32	2,246	$2,026
3/2/16	30	2,899	$2,240
4/1/16	30	1,985	$1,677
5/2/16	31	1,678	$1,014
6/1/16	30	83	$152
7/1/16	30	396	$159
8/2/16	32	119	$279
8/30/16	28	47	$133
9/29/16	30	234	$235
Totals	**365**	**15,526**	**$15,698**
Annual	**365**	**15,526**	**$15,698**

3.4 Benchmarking

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

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

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	George Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	131.9	141.4
Site Energy Use Intensity (kBtu/ft^2)	75.8	58.2

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

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

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	George Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	93.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	62.9	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% of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Your building is not is one of the building categories that are eligible to receive a score. This facility has a current score of 68.

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

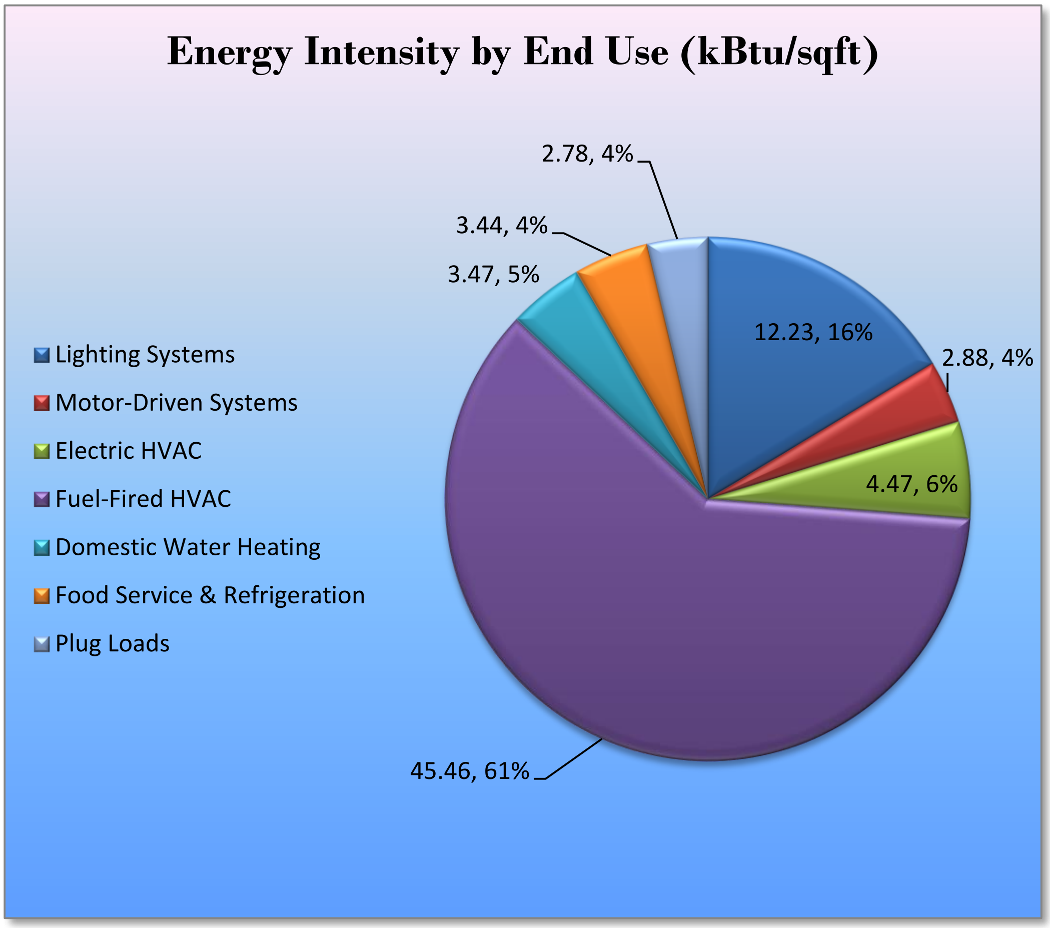
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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

3.5 Energy End-Use Breakdown

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

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



4 Energy Conservation Measures

Level of Analysis

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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**56,767**	**15.4**	**0.0**	**$9,172.59**	**$91,315.07**	**$9,375.00**	**$81,940.07**	**8.9**	**57,164**
ECM 1	Install LED Fixtures	11,944	2.3	0.0	$1,929.99	$57,561.23	$3,450.00	$54,111.23	28.0	12,028
ECM 2	Retrofit Fixtures with LED Lamps	43,780	13.0	0.0	$7,074.16	$33,000.96	$5,925.00	$27,075.96	3.8	44,086
ECM 3	Install LED Exit Signs	1,042	0.1	0.0	$168.44	$752.89	$0.00	$752.89	4.5	1,050
Lighting Control Measures		**14,727**	**3.4**	**0.0**	**$2,379.57**	**$15,992.00**	**$2,135.00**	**$13,857.00**	**5.8**	**14,829**
ECM 4	Install Occupancy Sensor Lighting Controls	12,829	3.1	0.0	$2,073.04	$15,452.00	$2,135.00	$13,317.00	6.4	12,919
ECM 5	Install Daylight Dimming Controls	1,897	0.3	0.0	$306.53	$540.00	$0.00	$540.00	1.8	1,910
Variable Frequency Drive (VFD) Measures		**13,604**	**1.9**	**0.0**	**$2,198.19**	**$7,213.60**	**$0.00**	**$7,213.60**	**3.3**	**13,699**
ECM 6	Install VFDs on Hot Water Pumps	13,604	1.9	0.0	$2,198.19	$7,213.60	$0.00	$7,213.60	3.3	13,699
HVAC System Improvements		**834**	**0.0**	**4.6**	**$180.84**	**$174.00**	**$0.00**	**$174.00**	**1.0**	**1,373**
ECM 7	Install Pipe Insulation	834	0.0	4.6	$180.84	$174.00	$0.00	$174.00	1.0	1,373
Domestic Water Heating Upgrade		**15,547**	**1.4**	**-52.1**	**$1,985.69**	**$8,427.89**	**$152.00**	**$8,275.89**	**4.2**	**9,559**
ECM 8	Install High Efficiency Gas Water Heater	15,547	1.4	-53.0	$1,975.84	$8,392.04	$152.00	$8,240.04	4.2	9,445
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	1.0	$9.85	$35.85	$0.00	$35.85	3.6	114
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$260.45**	**$230.00**	**$0.00**	**$230.00**	**0.9**	**1,623**
ECM 10	Vending Machine Control	1,612	0.0	0.0	$260.45	$230.00	$0.00	$230.00	0.9	1,623
Custom Measures		**1,957**	**0.0**	**83.5**	**$1,160.25**	**$16,478.00**	**$0.00**	**$16,478.00**	**14.2**	**11,745**
ECM 11	Computer Power Management Software	1,937	0.0	0.0	$312.99	$3,295.00	$0.00	$3,295.00	10.5	1,951
ECM 12	Building Envelope Weatherization	20	0.0	83.5	$847.26	$13,183.00	$0.00	$13,183.00	15.6	9,794
TOTALS		**105,047**	**22.0**	**36.0**	**$17,337.59**	**$139,830.56**	**$11,662.00**	**$128,168.56**	**7.4**	**109,992**

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

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

4.1.1 Lighting Upgrades

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

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**56,767**	**15.4**	**0.0**	**$9,172.59**	**$91,315.07**	**$9,375.00**	**$81,940.07**	**8.9**	**57,164**
ECM 1	Install LED Fixtures	11,944	2.3	0.0	$1,929.99	$57,561.23	$3,450.00	$54,111.23	28.0	12,028
ECM 2	Retrofit Fixtures with LED Lamps	43,780	13.0	0.0	$7,074.16	$33,000.96	$5,925.00	$27,075.96	3.8	44,086
ECM 3	Install LED Exit Signs	1,042	0.1	0.0	$168.44	$752.89	$0.00	$752.89	4.5	1,050

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	9,904	2.0	0.0	$1,600.36	$56,389.20	$3,150.00	$53,239.20	33.3	9,973
Exterior	2,040	0.3	0.0	$329.63	$1,172.03	$300.00	$872.03	2.6	2,054

Measure Description

We recommend replacing the HID high bay fixtures in the all-purpose room one-for-one with new LED high bay fixtures. The existing lamps frequently burn out and the maintenance is problematic due to the need to use a lift. The proposed fixtures are new high performance LEDs which have much longer lifespans. Therefore this measure saves energy by reducing the electrical demand and use of the gymnasium light fixtures, improves light output as well as significantly reduces required maintenance.

This measure also recommends replacing the exterior HID fixtures with LED fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable or improved light output. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice than older technologies.

This measure is recommended based on the energy savings potential as well as the condition of the existing interior fixtures. The fixtures included in this measure are in poor condition and/or were missing lenses.

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	43,780	13.0	0.0	$7,074.16	$33,000.96	$5,925.00	$27,075.96	3.8	44,086
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

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

ECM 3: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	1,042	0.1	0.0	$168.44	$752.89	$0.00	$752.89	4.5	1,050
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

4.1.2 Lighting Control Measures

Our recommendations for upgrades to existing lighting controls are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**14,727**	**3.4**	**0.0**	**$2,379.57**	**$15,992.00**	**$2,135.00**	**$13,857.00**	**5.8**	**14,829**
ECM 4	Install Occupancy Sensor Lighting Controls	12,829	3.1	0.0	$2,073.04	$15,452.00	$2,135.00	$13,317.00	6.4	12,919
ECM 5	Install Daylight Dimming Controls	1,897	0.3	0.0	$306.53	$540.00	$0.00	$540.00	1.8	1,910

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

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
12,829	3.1	0.0	$2,073.04	$15,452.00	$2,135.00	$13,317.00	6.4	12,919

Measure Description

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

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

ECM 5: Install Daylight Dimming Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,897	0.3	0.0	$306.53	$540.00	$0.00	$540.00	1.8	1,910

Measure Description

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

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

4.1.3 Variable Frequency Drive Measures

Our recommendation for variable frequency drive (VFD) measures is summarized in Figure 18 below.

Figure 18 – 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		**13,604**	**1.9**	**0.0**	**$2,198.19**	**$7,213.60**	**$0.00**	**$7,213.60**	**3.3**	**13,699**
ECM 6	Install VFDs on Hot Water Pumps	13,604	1.9	0.0	$2,198.19	$7,213.60	$0.00	$7,213.60	3.3	13,699

ECM 6: 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)
13,604	1.9	0.0	$2,198.19	$7,213.60	$0.00	$7,213.60	3.3	13,699

Measure Description

We recommend installing a variable frequency drives (VFD) to control a hot water pumps. This measure requires that a majority of the hot water coils be served by two-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.

4.1.4 HVAC System Upgrades

Our recommendation for HVAC system improvements is summarized in Figure 19 below.

Figure 19 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
HVAC System Improvements		**834**	**0.0**	**4.6**	**$180.84**	**$174.00**	**$0.00**	**$174.00**	**1.0**	**1,373**
ECM 7	Install Pipe Insulation	834	0.0	4.6	$180.84	$174.00	$0.00	$174.00	1.0	1,373

ECM 7: Install Pipe Insulation

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
834	0.0	4.6	$180.84	$174.00	$0.00	$174.00	1.0	1,373

Measure Description

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

This measure saves energy by reducing heat losses from the heating distribution system.

4.1.5 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 20 below.

Figure 20 - 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		**15,547**	**1.4**	**-52.1**	**$1,985.69**	**$8,427.89**	**$152.00**	**$8,275.89**	**4.2**	**9,559**
ECM 8	Install High Efficiency Gas Water Heater	15,547	1.4	-53.0	$1,975.84	$8,392.04	$152.00	$8,240.04	4.2	9,445
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	1.0	$9.85	$35.85	$0.00	$35.85	3.6	114

ECM 8: Install High Efficiency Gas-Fired 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)
15,547	1.4	-53.0	$1,975.84	$8,392.04	$152.00	$8,240.04	4.2	9,445

Measure Description

We recommend replacing the existing electric tank water heater with a high-efficiency tank water heater. Improvements in combustion efficiency and reductions in heat losses have improved the overall efficiency of storage water heaters. Energy savings result from using less gas to heat water, due to higher unit efficiency, and fewer run hours to maintain the tank water temperature.

Utility cost savings are significant when you compare the difference in utility rates. Converting electric and natural gas rates to the same unit of energy, a direct comparison can be made. The cost per mmBtu for natural gas vs. electric is demonstrated in the table below.

Average $/MMBtu	$47.34	Electric
Average $/MMBtu	$10.11	Natural Gas

ECM 9: 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	1.0	$9.85	$35.85	$0.00	$35.85	3.6	114

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. Low-flow 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 providing adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.1.6 Plug Load Equipment Control - Vending Machines

Our recommendation for plug load equipment controls is summarized in Figure 21 below.

Figure 21 - Summary of HVAC System Improvement ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$260.45**	**$230.00**	**$0.00**	**$230.00**	**0.9**	**1,623**
ECM 10	Vending Machine Control	1,612	0.0	0.0	$260.45	$230.00	$0.00	$230.00	0.9	1,623

ECM 10: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$260.45	$230.00	$0.00	$230.00	0.9	1,623

Measure Description

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

4.1.7 Custom Measures

Additional custom measure energy saving opportunities are addressed in this section. Our recommendations for custom measures are summarized in Figure 22 below.

Figure 22 - 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		**1,957**	**0.0**	**83.5**	**$1,160.25**	**$16,478.00**	**$0.00**	**$16,478.00**	**14.2**	**11,745**
ECM 11	Computer Power Management Software	1,937	0.0	0.0	$312.99	$3,295.00	$0.00	$3,295.00	10.5	1,951
ECM 12	Building Envelope Weatherization	20	0.0	83.5	$847.26	$13,183.00	$0.00	$13,183.00	15.6	9,794

ECM 11: 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)
1,937	0.0	0.0	$312.99	$3,295.00	$0.00	$3,295.00	10.5	1,951

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.

ECM 12: Building Envelope Weatherization

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
20	0.0	83.5	$847.26	$13,183.00	$0.00	$13,183.00	15.6	9,794

Measure Description

We recommend weather-stripping the exterior doors throughout the building. There are five double doors and 25 single doors which were noted to have missing or worn weather-stripping with clear air gaps. There is approximately 1,229 linear feet of window frames and 931 LF of roof/wall intersection, which is recommended to be caulked and properly sealed. Building envelopes that limit air infiltration and that have adequate insulation play a key role in optimizing heating and cooling efficiency, controlling moisture, and providing occupant comfort. Cracks and gaps throughout your building – around windows and doors, through utility openings, at the foundation and roof – may not seem significant, but their effects add up. Reducing uncontrolled air infiltration through air sealing is a cost effective way to improve the performance and energy efficiency of your facility. The proper sealing of sources for air infiltration and exfiltration will mitigate the air through the building and thus reduce the load on the facility's heating and cooling equipment. Exterior doors should be properly weather-stripped which may include the installation of a bottom sweep, center sweep and weather-stripping around the perimeter of the door.

4.2 ECMs Evaluated But Not Recommended

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

Figure 23 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**2,844**	**2.1**	**0.0**	**$459.50**	**$11,069.06**	**$0.00**	**$11,069.06**	**24.1**	**2,864**
Install High Efficiency Electric AC	2,844	2.1	0.0	$459.50	$11,069.06	$0.00	$11,069.06	24.1	2,864
TOTALS	**2,844**	**2.1**	**0.0**	**$459.50**	**$11,069.06**	**$0.00**	**$11,069.06**	**24.1**	**2,864**

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

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

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,844	2.1	0.0	$459.50	$11,069.06	$0.00	$11,069.06	24.1	2,864

Measure Description

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

Reasons for not Recommending

This measure is cost prohibitive. Replacement of the unit now is not recommended on the basis of energy savings alone because the payback period for replacing them exceeds the useful life of the equipment. However, this measure was at least evaluated to demonstrate the potential savings by upgrading to high-efficiency equipment that may be beneficial once the unit reaches the end of its useful life. We recommend considering this measure in the future, perhaps as a capital improvement 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 Proper Lighting Maintenance

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

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

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.

Install Destratification Fans

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

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

Practice Proper Use of Thermostat Schedules and Temperature Resets

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

Clean Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

Perform Proper 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 4.1.5 for any low-flow ECM recommendations.

6 On-Site Generation Measures

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

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

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

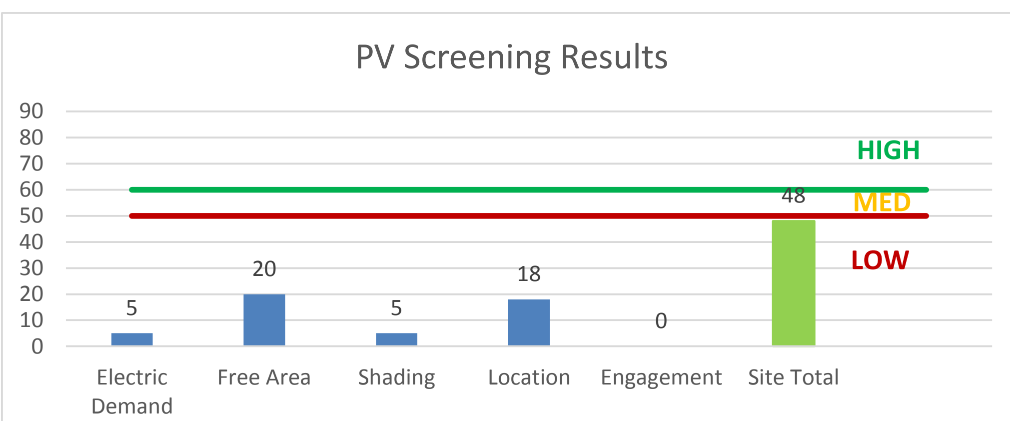
6.1 Photovoltaic

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

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

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the low to medium 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 George Elementary School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 24 - Photovoltaic Screening



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.

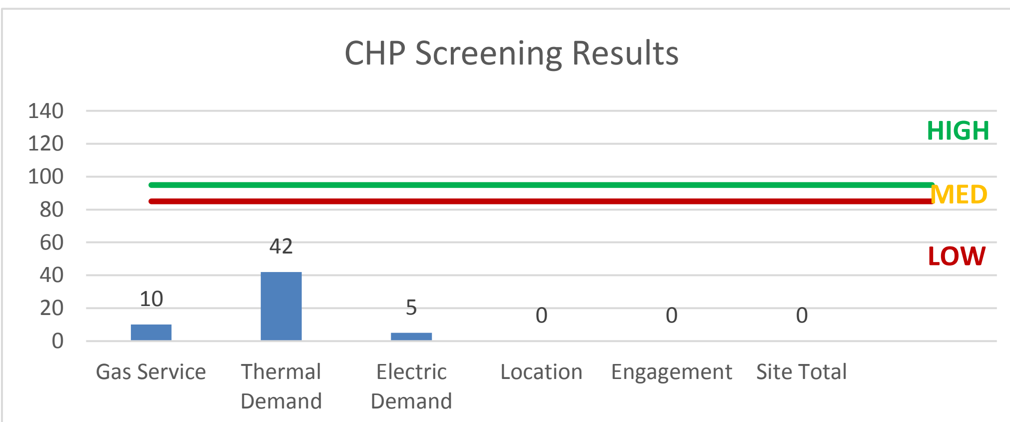
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste 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 the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

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

Figure 25 - 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.

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 26 for a list of the eligible programs identified for each recommended ECM.

Figure 26 - 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 LED Exit Signs			x			
ECM 4	Install Occupancy Sensor Lighting Controls	x		x			
ECM 5	Install Daylight Dimming Controls	x		x			
ECM 6	Install VFDs on Hot Water Pumps			x			
ECM 7	Install Pipe Insulation			x			
ECM 8	Install High Efficiency Gas Water Heater	x		x			
ECM 9	Install Low-Flow Domestic Hot Water Devices			x			
ECM 10	Vending Machine Control			x			
ECM 11	Computer Power Management Software						
ECM 12	Building Envelope Weatherization						

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

To participate in the SmartStart program you will need to 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 an average peak electric demand that does not exceed 200 kW over the recent 12-month period. You work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

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

How to Participate

To participate in Direct Install, you will need to contact the participating contractor assigned to the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct 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.

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

8.3 Energy Savings Improvement Program

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

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

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

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

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

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

9 Energy Purchasing and Procurement Strategies

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	8	Incandescent: Screw in Lamp	Wall Switch	100	1,000	Relamp	No	8	LED Screw-In Lamps: Screw in Lamp	Wall Switch	15	1,000	0.39	680	0.0	$109.88	$430.02	$40.00	3.55
Boiler Room	1	Halogen Incandescent: Screw in Lamp	Wall Switch	100	1,000	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	15	1,000	0.06	98	0.0	$15.79	$53.75	$5.00	3.09
Storage	4	Incandescent: Screw in Lamp	Wall Switch	100	100	Relamp	No	4	LED Screw-In Lamps: Screw in Lamp	Wall Switch	15	100	0.22	39	0.0	$6.32	$215.01	$20.00	30.87
Stairs	2	Incandescent: Screw in Lamp	Wall Switch	100	3,484	Relamp	No	2	LED Screw-In Lamps: Screw in Lamp	Wall Switch	15	3,484	0.11	681	0.0	$110.06	$107.51	$10.00	0.89
All Purpose Room	15	Metal Halide: (1) 250W Lamp	Wall Switch	295	3,484	Fixture Replacement	Yes	15	LED - Fixtures: High-Bay	Occupancy Sensor	125	2,439	2.04	12,471	0.0	$2,015.04	$43,578.00	$2,775.00	20.25
Stage	18	Halogen Incandescent: Screw in Lamp	Wall Switch	200	200	Relamp	No	18	LED Screw-In Lamps: Screw in Lamp	Wall Switch	30	200	2.01	704	0.0	$113.72	$967.55	$90.00	7.72
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	100	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	100	0.02	4	0.0	$0.61	$58.50	$10.00	79.09
Stage	6	Metal Halide: (1) 250W Lamp	Wall Switch	295	1,000	Fixture Replacement	No	6	LED - Fixtures: High-Bay	Wall Switch	125	1,000	0.67	1,173	0.0	$189.54	$16,111.20	$900.00	80.25
Entrance and Hallway	24	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,484	Relamp	Yes	24	LED - Linear Tubes: (2) U-Lamp	Daylight Dimming	33	1,742	0.72	4,375	0.0	$706.96	$1,786.80	$0.00	2.53
Main Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.29	1,140	0.0	$184.13	$686.80	$140.00	2.97
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	60	1,742	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,742	0.03	102	0.0	$16.51	$53.75	$5.00	2.95
Large Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,250	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,575	0.16	647	0.0	$104.61	$416.80	$80.00	3.22
Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,484	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,484	0.04	224	0.0	$36.25	$95.13	$20.00	2.07
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	60	1,742	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,742	0.03	102	0.0	$16.51	$53.75	$5.00	2.95
Classroom 1	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Classroom 2	14	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	14	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.67	2,659	0.0	$429.64	$1,871.87	$350.00	3.54
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	60	1,742	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,742	0.03	102	0.0	$16.51	$53.75	$5.00	2.95
Classroom 3	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Closet	1	Incandescent: Screw in Lamp	Wall Switch	60	100	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	100	0.03	6	0.0	$0.95	$53.75	$5.00	51.44
Classroom 4	14	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	14	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.67	2,659	0.0	$429.64	$1,871.87	$350.00	3.54
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	60	1,742	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,742	0.03	102	0.0	$16.51	$53.75	$5.00	2.95
Classroom 5	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Classroom 6	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Classroom 7	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Display Cases	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,484	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,484	0.02	132	0.0	$21.36	$58.50	$10.00	2.27

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 8	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Special Services	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,250	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,575	0.08	324	0.0	$52.30	$266.40	$50.00	4.14
Nurses Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,250	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,250	0.02	85	0.0	$13.80	$58.50	$10.00	3.52
Nurses Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	No	5	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,250	0.18	725	0.0	$117.07	$475.67	$100.00	3.21
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	60	1,742	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,742	0.03	102	0.0	$16.51	$53.75	$5.00	2.95
Kitchen	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,250	Relamp	No	11	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,250	0.21	825	0.0	$133.37	$695.20	$0.00	5.21
Storage/Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,000	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,000	0.02	38	0.0	$6.13	$58.50	$10.00	7.91
Teacher's Lounge	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.19	760	0.0	$122.75	$612.53	$120.00	4.01
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	60	1,742	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,742	0.03	102	0.0	$16.51	$53.75	$5.00	2.95
Hallway	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,484	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,484	0.04	232	0.0	$37.55	$126.40	$0.00	3.37
Restroom	1	Incandescent: Screw in Lamp	Wall Switch	60	1,742	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,742	0.03	102	0.0	$16.51	$53.75	$5.00	2.95
Speech Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,250	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,575	0.08	324	0.0	$52.30	$266.40	$50.00	4.14
PT Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,250	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,575	0.16	647	0.0	$104.61	$416.80	$80.00	3.22
Music Room 9	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
IT/Store Room	3	Incandescent: Screw in Lamp	Wall Switch	100	2,250	Relamp	No	3	LED Screw-In Lamps: Screw in Lamp	Wall Switch	15	2,250	0.17	660	0.0	$106.62	$161.26	$15.00	1.37
Hallway	9	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,484	Relamp	Yes	9	LED - Linear Tubes: (2) U-Lamp	Daylight Dimming	33	1,742	0.27	1,641	0.0	$265.11	$838.80	$0.00	3.16
Art Room 10	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Girl's Restroom	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,742	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,219	0.08	234	0.0	$37.78	$459.60	$35.00	11.24
Classroom 11	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Library	20	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	20	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.96	3,798	0.0	$613.77	$2,442.67	$470.00	3.21
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	100	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	100	0.04	8	0.0	$1.23	$117.00	$20.00	79.09
Men's Restroom	1	Incandescent: Screw in Lamp	Wall Switch	60	1,742	Relamp	No	1	LED Screw-In Lamps: Screw in Lamp	Wall Switch	9	1,742	0.03	102	0.0	$16.51	$53.75	$5.00	2.95
Slop Sink	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	100	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	100	0.02	4	0.0	$0.61	$58.50	$10.00	79.09
Storage	2	Incandescent: Screw in Lamp	Wall Switch	100	100	Relamp	No	2	LED Screw-In Lamps: Screw in Lamp	Wall Switch	15	100	0.11	20	0.0	$3.16	$107.51	$10.00	30.87
Boy's Restroom	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,742	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,219	0.08	234	0.0	$37.78	$459.60	$35.00	11.24

	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 12	16	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	16	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.77	3,039	0.0	$491.02	$2,062.13	$390.00	3.41
Classroom 13	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Classroom 14	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Classroom 15	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Classroom 16	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Classroom 17	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Classroom 18	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Classroom 19	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,250	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,575	0.58	2,279	0.0	$368.26	$1,681.60	$310.00	3.72
Tranision Areas	7	Exit Signs: Incandescent	None	20	8,760	Fixture Replacement	No	7	LED Exit Signs: 2 W Lamp	None	3	8,760	0.08	1,199	0.0	$193.71	$752.89	$0.00	3.89
Exterior	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	23	8,760	None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	23	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	11	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	23	4,000	None	No	11	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	23	4,000	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	1	Metal Halide: (1) 250W Lamp	None	295	4,000	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	125	4,000	0.11	782	0.0	$126.36	$390.68	$100.00	2.30
Exterior	1	Metal Halide: (1) 250W Lamp	None	295	4,000	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	125	4,000	0.11	782	0.0	$126.36	$390.68	$100.00	2.30
Exterior	1	Metal Halide: (1) 250W Lamp	None	295	4,000	Fixture Replacement	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	None	125	4,000	0.11	782	0.0	$126.36	$390.68	$100.00	2.30

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
George Elementary	Cabinet Heaters	11	Supply Fan	0.2	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Hydronic Heating System	2	Heating Hot Water Pump	7.5	91.0%	No	2,543	No	91.0%	Yes	2	1.85	13,604	0.0	$2,198.19	$7,213.60	$0.00	3.28
Gym	HV Units	2	Supply Fan	1.0	85.0%	No	2,059	No	85.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Various	HV Units	20	Supply Fan	0.2	72.0%	No	2,059	No	72.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Office	Office	3	Window AC	1.54		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom	Classroom	2	Window AC	2.08		Yes	2	Window AC	2.08		12.00		No	0.78	1,058	0.0	$170.94	$4,536.50	$0.00	26.54
Classroom	Classroom	1	Window AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom	Classroom	3	Window AC	2.00		Yes	3	Window AC	2.00		12.00		No	1.32	1,786	0.0	$288.56	$6,532.56	$0.00	22.64
IT Room	Split AC	2	Split-System AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Hydronic Heating System	2	Condensing Hot Water Boiler	2,000.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Pipe Insulation Recommendations

		Recommendation Inputs		Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Affected	Length of Uninsulated Pipe (ft)	Pipe Diameter (in)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Domestic Water	20	1.00	0.00	834	0.0	$134.79	$87.00	$0.00	0.65
Boiler Room	Domestic Water	20	1.50	0.00	0	4.6	$46.06	$87.00	$0.00	1.89

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	Half the Building	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Half the Building	1	Storage Tank Water Heater (> 50 Gal)	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	92.00%	Et	1.35	15,547	-53.0	$1,975.84	$8,392.04	$152.00	4.17

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Restrooms	3	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	0.6	$5.91	$21.51	$0.00	3.64
Restrooms	2	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	0.4	$3.94	$14.34	$0.00	3.64

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	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Freezer Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Lounge	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	No	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 Convection Oven (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Insulated Food Holding Cabinet (1/2 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
George Elementary	53	Computers	120.0	
George Elementary	7	Projector	250.0	
George Elementary	1	TV	120.0	
George Elementary	7	Printer	250.0	
George Elementary	14	Smart Board	200.0	
George Elementary	2	Mini Fridge	260.0	
George Elementary	1	Coffee Maker	1,100.0	
George Elementary	2	Microwave	1,500.0	
George Elementary	25	Fan	100.0	
George Elementary	8	Speakers	150.0	

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
George Elementary	1	Refrigerated	Yes	0.00	1,612	0.0	$260.45	$230.00	$0.00	0.88

Custom Recommendations

Computer Power Management Software

# of Desktops	Normal Running Mode					Idle Running Mode					Suspended/Off Mode				
53	*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	50%	10%	0%	120	**28**	5%	5%	5%	80	**8**	45%	85%	95%	5	**132**
Proposed Conditions	50%	5%	0%	120	**24**	5%	0%	0%	80	**2**	45%	95%	100%	5	**142**

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	225	90%	1,937	$313	$15.00	$2,500.0	$3,295	10.53
48	185							

Building Envelope Weatherization

Existing Conditions		Proposed Conditions		Energy Impact & Financial Analysis				
Annual Electric HVAC Energy Use (kWh)	*Annual Heating Energy Use (mmBtu)*	Assumed % Electric HVAC Savings	Assumed % Gas HVAC Savings	Total Annual kWh Savings	Total Annual mmBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Simple Payback Period (Years)
40,111	1,391.3	0.1%	6.0%	20	83	$847	$13,183	15.56

	qty	unit	$/unit	est. costs
Weather-strip Exterior Double Doors	5	EA	100	$ 500
Weather-strip Exterior Single Doors	25	EA	50	$ 1,250
Caulk the Perimeter of Windows & Seal Wall Cracks	1229	LF	4	$ 4,916
Seal the roof/wall Intersection	931	LF	7	$ 6,517
			Total Estimated Costs	**$ 13,183**

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

George Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 30,604
Built: 1962

For Year Ending: August 31, 2016
Date Generated: August 02, 2017

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
George Elementary School Palm St Township of Washington, New Jersey 07675	Westwood BOE 701 Ridgewood Rd Township of Washington, NJ 07675 201-664-0880 ext 2010	John Baumann 701 Ridgewood Rd Township of Washington, NJ 07675 201-664-0880 ext 2010 john.baumann@wwrsd.org

Property ID: 5969180

Energy Consumption and Energy Use Intensity (EUI)

Site EUI	Annual Energy by Fuel		National Median Comparison	
75.3 kBtu/ft²	Electric - Grid (kBtu)	767,582 (33%)	National Median Site EUI (kBtu/ft²)	89.8
	Natural Gas (kBtu)	1,536,115 (67%)	National Median Source EUI (kBtu/ft²)	156.8
			% Diff from National Median Source EUI	-16%
Source EUI			**Annual Emissions**	
131.5 kBtu/ft²			Greenhouse Gas Emissions (Metric Tons CO2e/year)	124

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

Aimee Lalonde
1430 Broadway
10th Floor
New York, NY 10018
347-913-2422
alalonde@trcsolutions.com

Professional Engineer Stamp (if applicable)