Local Government Energy Audit:
Energy Audit Report

Woodruff School

Upper Deerfield Township School District

1385 Highway 77
Seabrook, New Jersey 08302

April 1, 2019

Final Report by:

TRC Energy Services

Disclaimer

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information about financial incentives that may be available. Most energy conservation measures have received preliminary analysis of feasibility that identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to establish a basis for further discussion and to help prioritize energy measures.

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

TRC bases estimated installation costs on our experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from RS Means. We encourage the owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Actual installation costs can vary widely based on individual 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.

The New Jersey 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. Please review all available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

The customer and their respective contractor(s) are responsible to implement energy conservation measures in complete conformance with all applicable local, state and federal requirements.

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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 the Woodruff School.

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

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

1.1 Facility Summary

Woodruff School is a 63,500 square foot facility comprised of various space types such as classrooms, offices, hallways, gymnasium, kitchen, storage closets and a mechanical space. The building is a single-story facility. During the weekdays, the building is occupied between 6:00 AM and 8:00 PM and is shut down during weekends.

The building was constructed in 1975. Space heating in the school is provided by two gas-fired condensing hot water boilers and one furnace that is in the packaged unit serving the main office. Space cooling in the building is provided using one air-cooled reciprocating chiller serving a majority of spaces, one rooftop packaged unit serving the main office and two split units serving the computer labs. Lighting in the facility consists of linear T8 and T12 fixtures, incandescent lamps, compact fluorescent lamps (CFL) and some LED lamps. Some of these have been evaluated for replacement.

A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated 12 measures and recommended 11 measures which together represent an opportunity for the Woodruff School to reduce annual energy costs by $35,913 and annual greenhouse gas emissions by 249,709 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 3.3 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce the Woodruff School's annual energy use by 23%.

Figure 1 – Previous 12 Month Utility Costs

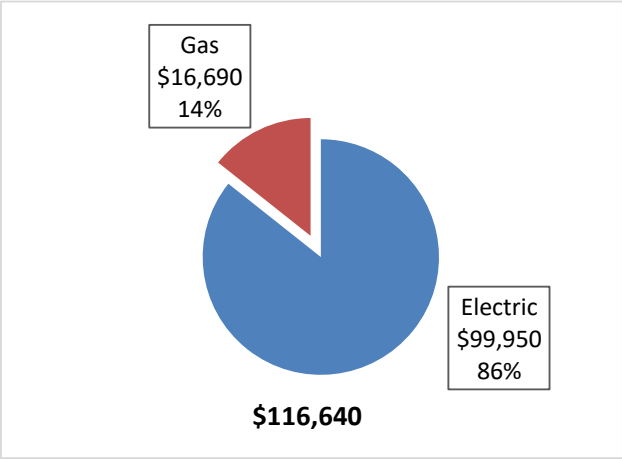
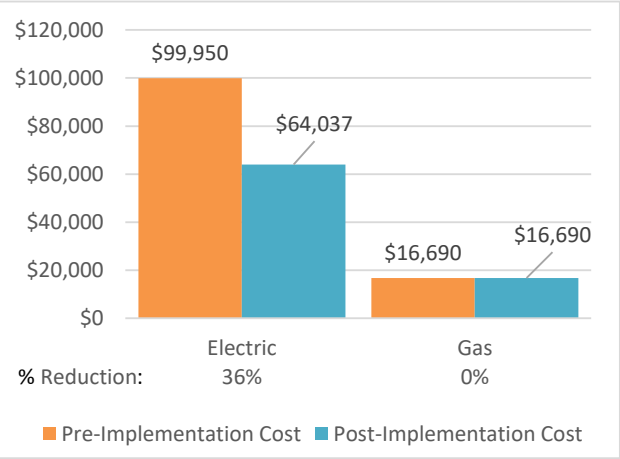


Figure 2 – Potential Post-Implementation Costs



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

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

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**185,257**	**34.4**	**0.0**	**$26,829.60**	**$97,493.27**	**$16,505.00**	**$80,988.27**	**3.0**	**186,552**
ECM 1	Install LED Fixtures	Yes	59,521	11.1	0.0	$8,620.02	$56,270.76	$8,750.00	$47,520.76	5.5	59,937
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	39,310	7.3	0.0	$5,693.04	$15,332.17	$1,930.00	$13,402.17	2.4	39,585
ECM 3	Retrofit Fixtures with LED Lamps	Yes	86,242	16.0	0.0	$12,489.90	$25,673.10	$5,825.00	$19,848.10	1.6	86,845
ECM 4	Install LED Exit Signs	Yes	184	0.0	0.0	$26.64	$217.25	$0.00	$217.25	8.2	185
Lighting Control Measures			**28,301**	**5.2**	**0.0**	**$4,098.68**	**$18,426.00**	**$1,965.00**	**$16,461.00**	**4.0**	**28,499**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	26,145	4.8	0.0	$3,786.38	$15,626.00	$1,965.00	$13,661.00	3.6	26,327
ECM 6	Install High/Low Lighitng Controls	Yes	2,156	0.4	0.0	$312.30	$2,800.00	$0.00	$2,800.00	9.0	2,172
Motor Upgrades			**1,511**	**0.5**	**0.0**	**$218.77**	**$4,109.60**	**$0.00**	**$4,109.60**	**18.8**	**1,521**
ECM 7	Premium Efficiency Motors	Yes	1,511	0.5	0.0	$218.77	$4,109.60	$0.00	$4,109.60	18.8	1,521
Variable Frequency Drive (VFD) Measures			**26,818**	**3.7**	**0.0**	**$3,883.88**	**$14,427.20**	**$0.00**	**$14,427.20**	**3.7**	**27,005**
ECM 8	Install VFDs on Chilled Water Pumps	Yes	17,749	1.8	0.0	$2,570.42	$7,213.60	$0.00	$7,213.60	2.8	17,873
ECM 9	Install VFDs on Hot Water Pumps	Yes	9,069	1.9	0.0	$1,313.46	$7,213.60	$0.00	$7,213.60	5.5	9,133
Electric Chiller Replacement			**38,707**	**49.1**	**0.0**	**$5,605.77**	**$142,785.18**	**$13,050.00**	**$129,735.18**	**23.1**	**38,978**
	Install High Efficiency Chillers	No	38,707	49.1	0.0	$5,605.77	$142,785.18	$13,050.00	$129,735.18	23.1	38,978
Food Service Equipment & Refrigeration Measures			**1,254**	**0.0**	**0.0**	**$181.59**	**$3,348.00**	**$150.00**	**$3,198.00**	**17.6**	**1,263**
ECM 10	Refrigeration Controls	Yes	1,254	0.0	0.0	$181.59	$3,348.00	$150.00	$3,198.00	17.6	1,263
Plug Load Equipment Control - Vending Machine			**4,836**	**0.0**	**0.0**	**$700.30**	**$690.00**	**$0.00**	**$690.00**	**1.0**	**4,869**
ECM 11	Vending Machine Control	Yes	4,836	0.0	0.0	$700.30	$690.00	$0.00	$690.00	1.0	4,869
TOTALS FOR HIGH PRIORITY MEASURES			**247,976**	**43.8**	**0.0**	**$35,912.81**	**$138,494.07**	**$18,620.00**	**$119,874.07**	**3.3**	**249,709**
TOTALS FOR ALL EVALUATED MEASURES			**286,683**	**93.0**	**0.0**	**$41,518.58**	**$281,279.25**	**$31,670.00**	**$249,609.25**	**6.0**	**288,688**

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

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

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

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

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium®). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

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 Chiller measures generally involve replacing older inefficient hydronic chillers with modern energy efficient systems. New chillers can provide equivalent cooling compared to older chillers at a reduced energy cost. These measures save energy by reducing chiller energy usage, due to improved electrical and heat transfer efficiency.

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

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

Energy Efficient Practices

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

- Practice Proper Use of Thermostat Schedules and Temperature Resets
- 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 the Woodruff School. Based on the configuration of the site and its loads there is a **high** potential for installing a photovoltaic (PV) array.

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	242	kW DC STC
Electric Generation	288,312	kWh/yr
Displaced Cost	$25,080	/yr
Installed Cost	$629,200	

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
- SREC (Solar Renewable Energy Certificate Program) 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.

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

The Demand Response Energy Aggregator is a (non-NJCEP) program designed to reduce electric loads at commercial facilities, when wholesale electricity prices are high or when the reliability of the electric grid is threatened due to peak power demand. Demand Response (DR) service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability. By enabling grid operators to call upon commercial facilities to reduce their electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and facilities receive payments whether or not they are called upon to curtail their load during times of peak demand. Refer to Section 7 for additional information on this program.

Additional information on relevant incentive programs is located in Section 8. You may also check the following website for more details: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
William Widen	Supervisor of B&G	widenb@udts.org	856-455-2267 Extn: 4234
George Comparri, Jr.			856-455-2267
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	732-855-0033

2.2 General Site Information

On August 02, 2018, TRC performed an energy audit at the Woodruff School located in Seabrook, New Jersey. TRC's auditor met with George Comparri, Jr. to review the facility operations and help focus our investigation on specific energy-using systems.

Woodruff School is a 63,500 square foot facility comprised of various space types such as classrooms, offices, hallways, gymnasium, kitchen, storage closets and a mechanical space. The building is a single-story facility. During the weekdays, the building is occupied between 6:00 AM and 8:00 PM and is shut down during weekends.

The building was constructed in 1975. Space heating in the school is provided by two gas-fired condensing hot water boilers and one furnace that is in the packaged unit serving the main office. Space cooling in the building is provided using one air-cooled reciprocating chiller serving a majority of spaces, one rooftop packaged unit serving the main office and two split units serving the computer labs. Lighting in the facility consists of linear T8 and T12 fixtures, incandescent lamps, compact fluorescent lamps (CFL) and some LED lamps. Some of these have been evaluated for replacement.

2.3 Building Occupancy

The typical schedule is presented in the table below. During a typical day, the facility is occupied by 371 people including staff and students.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Woodruff School	Weekday	6:30 AM - 8:00 PM
Woodruff School	Weekend	Saturday - 6:30 AM - 8:00 PM Sunday - No operation

2.4 Building Envelope

The building is constructed of concrete block and structural steel with a brick facade. The buildings have flat roofs covered with asphalt membrane that is in good condition. The buildings have double-pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of metal framed glass and in good condition.

Image 1 Building Envelope

2.5 On-Site Generation

Woodruff 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 linear fluorescent 4-foot T8, T12 and LED tubes with electronic ballasts as well as some incandescent, compact fluorescent lamps and some LED screw in bulbs. Most of the fixtures are 2-lamp, 3-lamp or 4-lamp, 4-foot long troffers. Some spaces also have U-bent T8 fixtures.

A small area of the building and the majority of the office spaces are primarily lit with 23-Watt CFL lamps in recessed can ceiling fixtures, 60-Watt or 200-Watt incandescent lamps or 11-Watt LED screw-in bulbs.

Lighting control in most spaces is provided by manual wall switches. The building's exterior lighting consists of 150-Watt metal halide wall pack fixtures, 250-Watt and 400-Watt metal halide pole fixtures, and 23-Watt screw-in compact fluorescent lamps. The exterior light fixtures are controlled by photocells.

Exit lights at the facility consist of 2-Watt LED fixtures and 6-Watt fluorescent fixtures. These fixtures are on throughout the year.

Image 2 Lighting System

Chilled Water System

The facility is served by an air-cooled reciprocating McQuay four compressor chiller with a cooling capacity of 145 tons. The chilled water is circulated using one constant speed chilled water pump of 15 hp capacity. Chilled water is distributed at 45°F when the outside air temperature is above 58°F. The occupied cooling setpoint in the building is 72°F and the unoccupied cooling setpoint is 74°F. The space and chilled water temperatures are controlled by the building energy management system (BEMS).

The chiller plant supplies chilled water to air handlers in the gym, stage and to unit ventilators in the classrooms.

The chiller was installed in 2002 and has been evaluated for replacement.

Image 3 Chilled Water System

Hot Water Heating System

The hot water system consists of two, gas-fired Aero Benchmarking 2.0 condensing boilers, each with an output capacity of 1760 MBh and a heating efficiency of 90%. The hot water from the boilers are circulated throughout the school using two constant speed pumps of 7.5 hp capacity. These pumps are almost 14 years old and have been evaluated for replacement along with the installation of variable frequency drives to control them. Hot water is supplied at 180°F when the outside air temperature is below 50°F and the setpoint is reset to 155°F when the outside air is above 65°F. The boilers provide hot water to air handlers in the gym and the stage area as well as to the unit ventilators in the classrooms. The occupied heating setpoint in the building is 70°F and the unoccupied heating setpoint is 65°F. The temperature in the spaces are controlled by the BMS system based on the outside air temperature.

The boilers operate in a lead/lag configuration. Both boilers may be required during cold weather. The boilers are 16 years old and have been evaluated for replacement.

Image 4 Hot water system

Direct Expansion Air Conditioning System (DX)

The DX cooling systems include a single one-year old, 3 ton Lennox packaged unit serving the main office and two, 10 year old 1.5 ton Mitsubishi split air conditioning (AC) units which serve the computer lab. These have a SEER value of 11.5 and 11, respectively. The temperatures for the computer labs are controlled in the respective spaces using programmable thermostats. Both units were observed to be in good condition and well maintained.

Image 5 DX cooling systems

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of two water heaters. The gas-fired AERCO water heater has an input capacity of 1,000 MBh with a tank capacity of 23 gallons and an efficiency of 93%. The electric water heater has an input capacity of 6kW with a tank capacity of 80 gallons. The units serve the kitchen and restrooms, were installed in 2009 and 2015, respectively and are in good condition.


Image 6 DHW System

Food Service & Refrigeration

The facility has a commercial kitchen that is used to prepare lunch for the students. The ovens, range tops, griddle and steamers are all gas fired.

The kitchen is also equipped with several reach-in refrigerators and freezers. There is one walk-in refrigerator and one walk-in freezer in the kitchen that are used to store food. The dishwasher in the kitchen is a single tank conveyor, high temperature unit that uses water from the electric water heater. All kitchen equipment is ENERGY STAR® rated.


Image 7 Food Service and Refrigeration

Building Plug Load

There are seven computer work stations and laptops throughout the facility. Ninety percent of the computers are desktop units with LCD monitors. There is no centralized PC power management software installed. Other plug loads in the facility include Chromebooks (300), printers, copiers, microwave ovens, refrigerators, coffee machines, flat screen TVs, electric rangers, washing machine and dryer.

The facility has three refrigerated vending machines (in the faculty lounge and cafeteria) and one non-refrigerated vending machine. There are no controls on the refrigerated vending machines.

2.7 Water-Using Systems

The restroom faucets are rated for 2.2 gallons per minute (gpm) or lower, the toilets are rated at 1.6 gallons per flush (gpf) and the urinals are rated at 1 gpf.

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

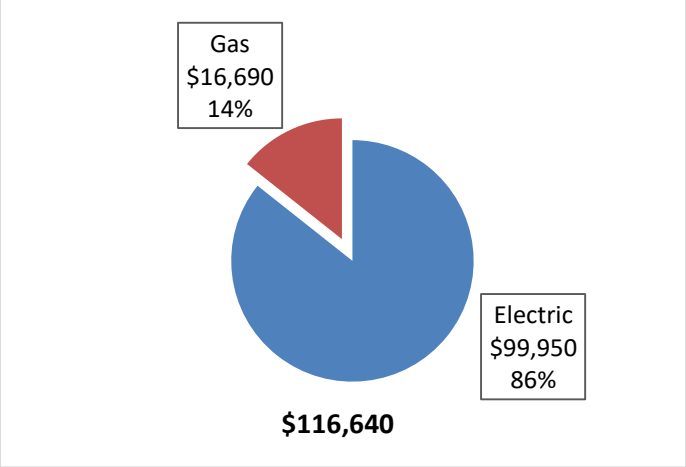
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Woodruff School		
Fuel	**Usage**	**Cost**
Electricity	690,146 kWh	$99,950
Natural Gas	13,486 Therms	$16,690
Total		**$116,640**

The current annual energy cost for this facility is $116,640 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by Atlantic City Electric. The average electric cost over the past 12 months was $0.145/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. Electrical demand is slightly higher in the summer months than the winter months reflecting the use of electrical space cooling. The monthly electricity consumption and peak demand are shown in the chart below. The electricity use profile reflects high cooling loads in the summer months.

Figure 9 - Electric Usage & Demand

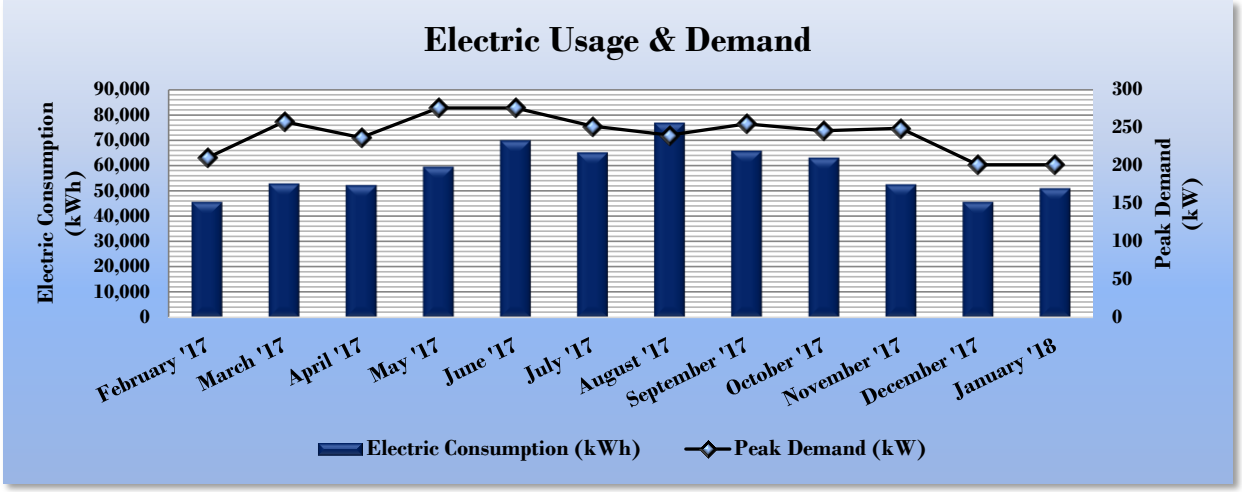


Figure 10 - Electric Usage & Demand

Electric Billing Data for Woodruff School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost	TRC Estimated Usage?
2/24/17	30	45,600	210	$7,698	No
3/28/17	32	52,800	258	$8,875	No
4/27/17	30	52,200	237	$8,624	No
5/26/17	29	59,400	276	$9,446	No
6/28/17	33	69,900	276	$9,440	No
7/27/17	29	65,100	252	$8,488	No
8/29/17	33	76,800	240	$9,925	No
9/27/17	29	65,700	255	$8,739	No
10/27/17	30	63,000	246	$3,901	No
11/29/17	33	52,500	249	$12,227	No
12/28/17	29	45,600	201	$6,463	No
1/30/18	33	51,000	201	$7,492	No
Totals	**370**	**699,600**	**276**	**$101,319**	0
Annual	**365**	**690,146**	**276**	**$99,950**	

3.3 Natural Gas Usage

Natural gas is provided by South Jersey Gas. The average gas cost for the past 12 months is $1.238/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. The gas use profile is typical for a facility with a significant heating load relative to other end uses.

Figure 11 - Natural Gas Usage

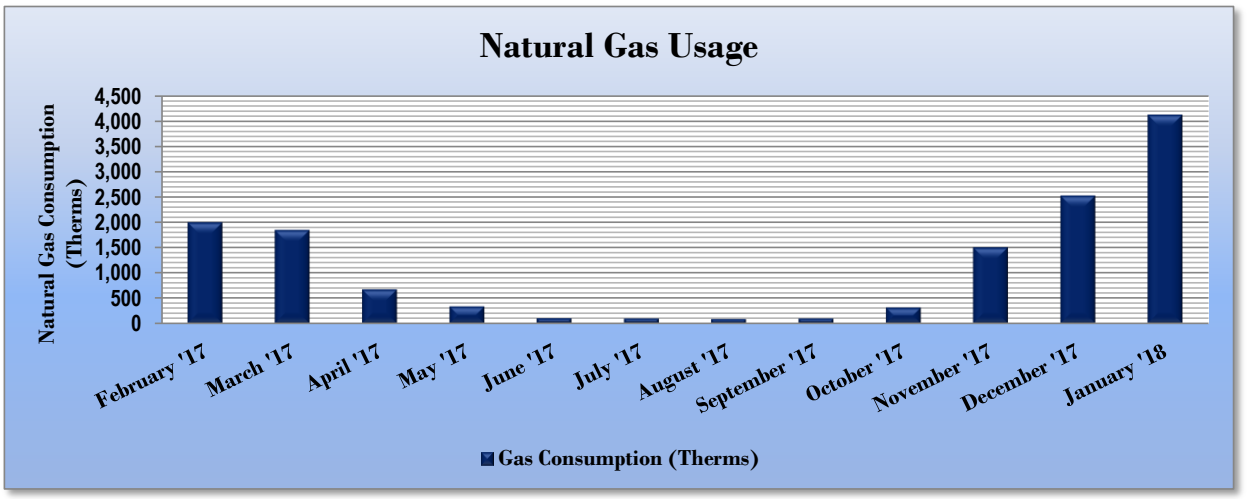


Figure 12 - Natural Gas Usage

Gas Billing Data for Woodruff School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/24/17	30	1,997	$2,758
3/28/17	32	1,844	$2,554
4/27/17	30	669	$706
5/26/17	29	332	$364
6/28/17	33	103	$137
7/27/17	29	95	$71
8/29/17	33	83	$117
9/27/17	29	93	$124
10/27/17	30	311	$356
11/29/17	33	1,501	$1,768
12/28/17	29	2,522	$3,068
1/30/18	33	4,120	$4,896
Totals	**370**	**13,671**	**$16,919**
Annual	**365**	**13,486**	**$16,690**

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 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Woodruff School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	138.7	141.4
Site Energy Use Intensity (kBtu/ft^2)	58.3	58.2

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

Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Woodruff School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	96.9	141.4
Site Energy Use Intensity (kBtu/ft^2)	45.0	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. This facility has a current score of 28.

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

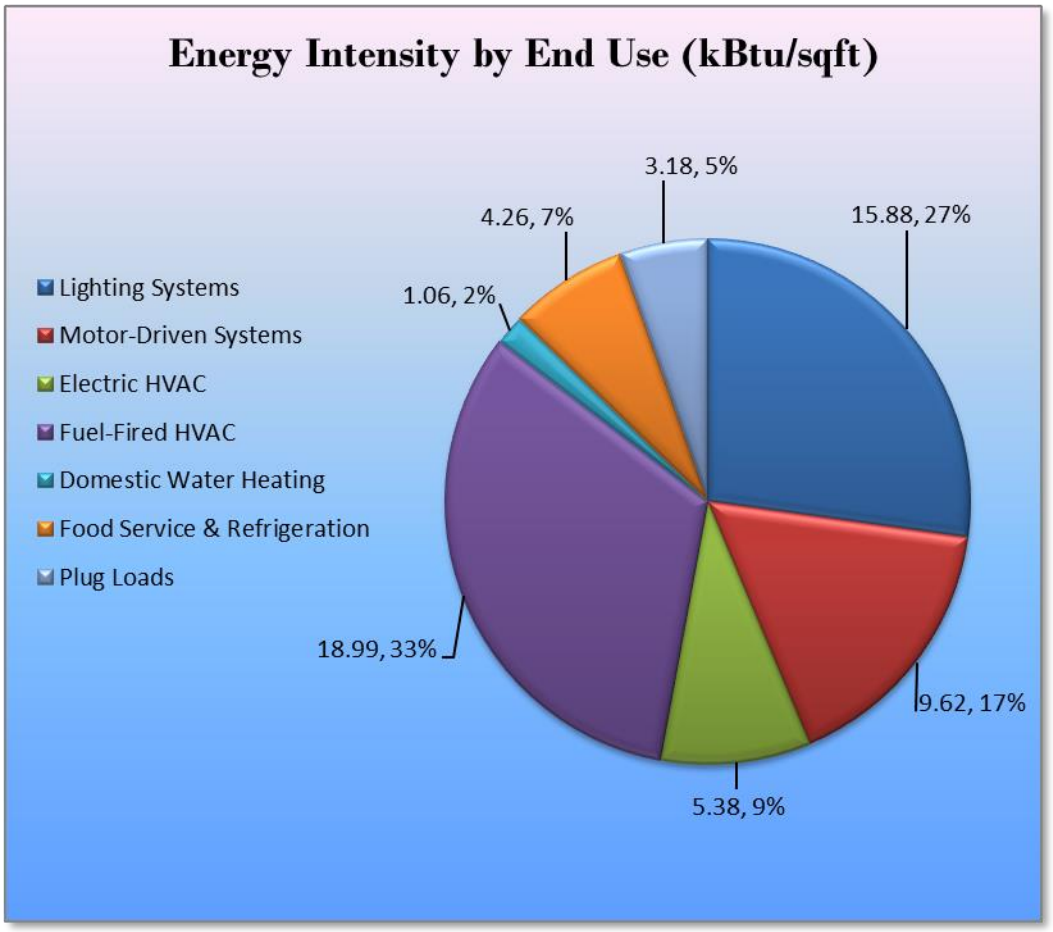
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 15 - 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 Woodruff 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 16 – 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		**185,257**	**34.4**	**0.0**	**$26,829.60**	**$97,493.27**	**$16,505.00**	**$80,988.27**	**3.0**	**186,552**
ECM 1	Install LED Fixtures	59,521	11.1	0.0	$8,620.02	$56,270.76	$8,750.00	$47,520.76	5.5	59,937
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	39,310	7.3	0.0	$5,693.04	$15,332.17	$1,930.00	$13,402.17	2.4	39,585
ECM 3	Retrofit Fixtures with LED Lamps	86,242	16.0	0.0	$12,489.90	$25,673.10	$5,825.00	$19,848.10	1.6	86,845
ECM 4	Install LED Exit Signs	184	0.0	0.0	$26.64	$217.25	$0.00	$217.25	8.2	185
Lighting Control Measures		**28,301**	**5.2**	**0.0**	**$4,098.68**	**$18,426.00**	**$1,965.00**	**$16,461.00**	**4.0**	**28,499**
ECM 5	Install Occupancy Sensor Lighting Controls	26,145	4.8	0.0	$3,786.38	$15,626.00	$1,965.00	$13,661.00	3.6	26,327
ECM 6	Install High/Low Lighitng Controls	2,156	0.4	0.0	$312.30	$2,800.00	$0.00	$2,800.00	9.0	2,172
Motor Upgrades		**1,511**	**0.5**	**0.0**	**$218.77**	**$4,109.60**	**$0.00**	**$4,109.60**	**18.8**	**1,521**
ECM 7	Premium Efficiency Motors	1,511	0.5	0.0	$218.77	$4,109.60	$0.00	$4,109.60	18.8	1,521
Variable Frequency Drive (VFD) Measures		**26,818**	**3.7**	**0.0**	**$3,883.88**	**$14,427.20**	**$0.00**	**$14,427.20**	**3.7**	**27,005**
ECM 8	Install VFDs on Chilled Water Pumps	17,749	1.8	0.0	$2,570.42	$7,213.60	$0.00	$7,213.60	2.8	17,873
ECM 9	Install VFDs on Hot Water Pumps	9,069	1.9	0.0	$1,313.46	$7,213.60	$0.00	$7,213.60	5.5	9,133
Food Service Equipment & Refrigeration Measures		**1,254**	**0.0**	**0.0**	**$181.59**	**$3,348.00**	**$150.00**	**$3,198.00**	**17.6**	**1,263**
ECM 10	Refrigeration Controls	1,254	0.0	0.0	$181.59	$3,348.00	$150.00	$3,198.00	17.6	1,263
Plug Load Equipment Control - Vending Machine		**4,836**	**0.0**	**0.0**	**$700.30**	**$690.00**	**$0.00**	**$690.00**	**1.0**	**4,869**
ECM 11	Vending Machine Control	4,836	0.0	0.0	$700.30	$690.00	$0.00	$690.00	1.0	4,869
TOTALS		**247,976**	**43.8**	**0.0**	**$35,912.81**	**$138,494.07**	**$18,620.00**	**$119,874.07**	**3.3**	**249,709**

* - 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 17 below.

Figure 17 – 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		**185,257**	**34.4**	**0.0**	**$26,829.60**	**$97,493.27**	**$16,505.00**	**$80,988.27**	**3.0**	**186,552**
ECM 1	Install LED Fixtures	59,521	11.1	0.0	$8,620.02	$56,270.76	$8,750.00	$47,520.76	5.5	59,937
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	39,310	7.3	0.0	$5,693.04	$15,332.17	$1,930.00	$13,402.17	2.4	39,585
ECM 3	Retrofit Fixtures with LED Lamps	86,242	16.0	0.0	$12,489.90	$25,673.10	$5,825.00	$19,848.10	1.6	86,845
ECM 4	Install LED Exit Signs	184	0.0	0.0	$26.64	$217.25	$0.00	$217.25	8.2	185

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	48,385	9.0	0.0	$7,007.30	$37,969.22	$7,350.00	$30,619.22	4.4	48,723
Exterior	11,136	2.2	0.0	$1,612.72	$18,301.53	$1,400.00	$16,901.53	10.5	11,214

Measure Description

We recommend replacing metal halide fixtures in the gym and media center with new high-performance LED light fixtures. Similarly, we recommend replacing exterior metal halide wall pack and pole mounted fixtures with LED sources. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of metal halide light sources.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	39,310	7.3	0.0	$5,693.04	$15,332.17	$1,930.00	$13,402.17	2.4	39,585
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tube.

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	86,061	15.9	0.0	$12,463.64	$25,518.07	$5,780.00	$19,738.07	1.6	86,662
Exterior	181	0.0	0.0	$26.26	$155.03	$45.00	$110.03	4.2	183

Measure Description

We recommend retrofitting existing incandescent, linear T8 tubes or CFL lighting technologies with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space. Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tube and more than ten times longer than many incandescent lamps.

ECM 4: 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	184	0.0	0.0	$26.64	$217.25	$0.00	$217.25	8.2	185
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

4.1.2 Lighting Control Measures

Our recommendations for upgrades to lighting control measures are summarized in Figure 18 below.

Figure 18 – 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		**28,301**	**5.2**	**0.0**	**$4,098.68**	**$18,426.00**	**$1,965.00**	**$16,461.00**	**4.0**	**28,499**
ECM 5	Install Occupancy Sensor Lighting Controls	26,145	4.8	0.0	$3,786.38	$15,626.00	$1,965.00	$13,661.00	3.6	26,327
ECM 6	Install High/Low Lighitng Controls	2,156	0.4	0.0	$312.30	$2,800.00	$0.00	$2,800.00	9.0	2,172

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 5: 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)
26,145	4.8	0.0	$3,786.38	$15,626.00	$1,965.00	$13,661.00	3.6	26,327

Measure Description

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

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

ECM 6: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,156	0.4	0.0	$312.30	$2,800.00	$0.00	$2,800.00	9.0	2,172

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are stairwells, interior corridors, parking lots, and parking garages. For this site, we have evaluated high low lighting in the major corridors.

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

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

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

4.1.3 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 19 below.

Figure 19 – Summary of Motor 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)
Motor Upgrades		**1,511**	**0.5**	**0.0**	**$218.77**	**$4,109.60**	**$0.00**	**$4,109.60**	**18.8**	**1,521**
ECM 7	Premium Efficiency Motors	1,511	0.5	0.0	$218.77	$4,109.60	$0.00	$4,109.60	18.8	1,521

ECM 7: Premium Efficiency Motors

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)
1,511	0.5	0.0	$218.77	$4,109.60	$0.00	$4,109.60	18.8	1,521

Measure Description

We recommend replacing standard efficiency hot water and chilled water motors with NEMA Premium® efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

The recommended motor replacements are for the chilled water and hot water heating pumps; new inverter duty rated motors may be required for the recommended VFD measures associated with those systems.

4.1.4 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 20 below.

Figure 20 – 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		**26,818**	**3.7**	**0.0**	**$3,883.88**	**$14,427.20**	**$0.00**	**$14,427.20**	**3.7**	**27,005**
ECM 8	Install VFDs on Chilled Water Pumps	17,749	1.8	0.0	$2,570.42	$7,213.60	$0.00	$7,213.60	2.8	17,873
ECM 9	Install VFDs on Hot Water Pumps	9,069	1.9	0.0	$1,313.46	$7,213.60	$0.00	$7,213.60	5.5	9,133

ECM 8: Install VFDs on Chilled 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)
17,749	1.8	0.0	$2,570.42	$7,213.60	$0.00	$7,213.60	2.8	17,873

Measure Description

We recommend installing a variable frequency drives (VFD) to control the chilled water pump. This measure requires that chilled water coils be served by two-way valves and that a differential pressure sensor be installed in the chilled water loop. As the chilled 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 chilled water valves close. The magnitude of energy savings is based on the estimated amount of time that the system operates at reduced loads.

For systems with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping off will have to be determined during the final project design. The control system should be programmed to maintain the minimum flow through the chiller and to prevent pump cavitation.

ECM 9: 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)
9,069	1.9	0.0	$1,313.46	$7,213.60	$0.00	$7,213.60	5.5	9,133

Measure Description

We recommend installing variable frequency drives (VFD) to control the 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.

4.1.5 Food Service Equipment & Refrigeration Measures

Our recommendations for food service equipment and refrigeration measures are summarized in Figure 21 below.

Figure 21 - Summary of Food Service Equipment & Refrigeration ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Food Service Equipment & Refrigeration Measures		**1,254**	**0.0**	**0.0**	**$181.59**	**$3,348.00**	**$150.00**	**$3,198.00**	**17.6**	**1,263**
ECM 10	Refrigeration Controls	1,254	0.0	0.0	$181.59	$3,348.00	$150.00	$3,198.00	17.6	1,263

ECM 10: Walk-In Cooler or Freezer 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)
1,254	0.0	0.0	$181.59	$3,348.00	$150.00	$3,198.00	17.6	1,263

Measure Description

We recommend the installation of additional controls to optimize the operation of walk-in coolers and freezers.

Many walk-in coolers and freezers have continuously operating electric heaters on the doors to prevent condensation formation. This measure adds a control system feature to shut off the door heaters when the humidity level is low enough that condensation will not occur if the heaters are off. This is accomplished by measuring the ambient humidity and temperature of the store, comparing that to the dewpoint, and using pulse width modulation to control the anti-sweat door heaters.

Defrost controllers can be used to override defrost of evaporator fans when the defrost operation is not necessary, reducing annual energy consumption. This measure is applicable to existing evaporator fans with a traditional electric defrost mechanism.

Energy savings for each of the control measures account for reduction in compressor and fan operating hours as well as reduction in the refrigeration heat load as appropriate.

4.1.6 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment control are summarized in Figure 22 below.

Figure 22 - Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**4,836**	**0.0**	**0.0**	**$700.30**	**$690.00**	**$0.00**	**$690.00**	**1.0**	**4,869**
ECM 11	Vending Machine Control	4,836	0.0	0.0	$700.30	$690.00	$0.00	$690.00	1.0	4,869

ECM 11: 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)
4,836	0.0	0.0	$700.30	$690.00	$0.00	$690.00	1.0	4,869

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.

4.2 ECM Evaluated But Not Recommended

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

Figure 23 – Summary of Measure 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 Chiller Replacement	**38,707**	**49.1**	**0.0**	**$5,605.77**	**$142,785.18**	**$13,050.00**	**$129,735.18**	**23.1**	**38,978**
Install High Efficiency Chillers	38,707	49.1	0.0	$5,605.77	$142,785.18	$13,050.00	$129,735.18	23.1	38,978

Install High Efficiency Chillers

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)
38,707	49.1	0.0	$5,605.77	$142,785.18	$13,050.00	$129,735.18	23.1	38,978

Measure Description

We evaluated replacing older inefficient electric chillers with new high efficiency chillers. The type of chiller to be installed depends on the magnitude of the cooling load and variability of the cooling load profile. Positive displacement chillers are usually under 600 tons of cooling capacity and centrifugal chillers generally start at 150 tons of cooling capacity. Constant speed chillers should be used to meet cooling loads with little or no variation while variable speed chillers are more efficient for variable cooling load profiles. Water cooled chillers are more efficient than air cooled chillers but require cooling towers and additional pumps to circulate the cooling water. In any given size range variable speed chillers tend to have better partial load efficiency, but worse full load efficiency, than constant speed chillers.

The savings result from the improvement in chiller efficiency and matching the right type of chiller to the cooling load. The energy savings associated with this measure is based on the cooling capacity of the new chiller, the improvement in efficiency compared with the base case equipment, the cooling load profile, and the estimated annual operating hours of the chiller before and after the upgrade. Energy savings are maximized by proper selection of new equipment based on the cooling load profile.

Reasons for not Recommending

Upon evaluating this measure for replacing the older chiller, the payback period was found to be greater than the useful life of the replacement equipment. When the equipment is due for replacement in the future, we suggest replacing with an energy efficient chiller at the time.

5 ENERGY EFFICIENT PRACTICES

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

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

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.

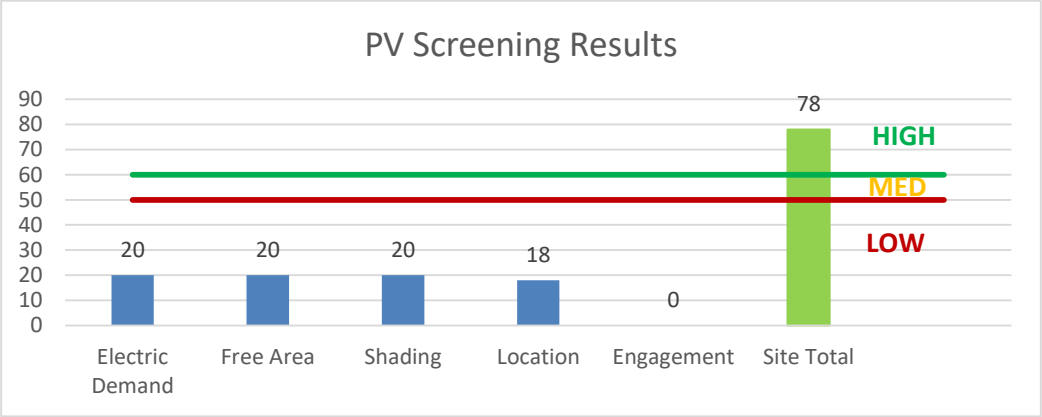
6.1 Photovoltaic

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 is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

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

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

Figure 24 - Photovoltaic Screening



Potential	High	
System Potential	242	kW DC STC
Electric Generation	288,312	kWh/yr
Displaced Cost	$25,080	/yr
Installed Cost	$629,200	

Solar projects must register their projects in the SREC (Solar Renewable Energy Certificate) Registration Program (SRP) prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.2 for additional information.

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

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

6.2 Combined Heat and Power

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

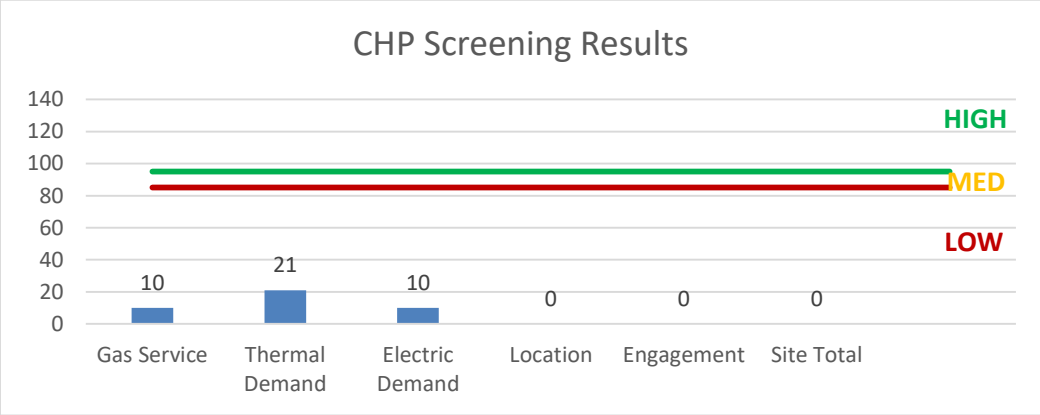
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

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

Low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to 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.

In our opinion, this facility is not a good candidate for the Demand Response Program.

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					
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x					
ECM 3	Retrofit Fixtures with LED Lamps	x					
ECM 4	Install LED Exit Signs						
ECM 5	Install Occupancy Sensor Lighting Controls	x					
ECM 6	Install High/Low Lighitng Controls						
ECM 7	Premium Efficiency Motors						
ECM 8	Install VFDs on Chilled Water Pumps						
ECM 9	Install VFDs on Hot Water Pumps						
ECM 10	Refrigeration Controls						
ECM 11	Vending Machine Control						

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 SREC Registration Program

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

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

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

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

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

8.3 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.

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	6	Incandescent: Screw-in lamp - 1 Lamp	Wall Switch	200	3,080	Relamp	No	6	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	30	3,080	0.58	3,142	0.0	$454.98	$211.08	$30.00	0.40
Boiler Room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mechanical Room	3	Incandescent: Screw-in lamp - 1 Lamp	Wall Switch	200	3,080	Relamp	No	3	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	30	3,080	0.33	1,806	0.0	$261.61	$105.54	$15.00	0.35
Library - 6th Grade Hall	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,156	0.16	886	0.0	$128.34	$419.09	$60.00	2.80
Library	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
6th grade hallway	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	2,156	0.66	3,545	0.0	$513.38	$1,476.36	$240.00	2.41
6th grade hallway	9	Compact Fluorescent: Plug-in - 4 pin - 1 Lamp	Wall Switch	26	3,080	Relamp	Yes	9	LED Screw-In Lamps: Plug-in 1 Lamp	High/Low Control	18	2,156	0.08	423	0.0	$61.22	$644.62	$0.00	10.53
6th grade hallway	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	3	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
6th grade hallway	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,080	0.02	103	0.0	$14.88	$72.46	$0.00	4.87
Boiler room hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,156	0.16	886	0.0	$128.34	$419.09	$60.00	2.80
Boiler room hallway	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main hallway	22	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	22	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,156	0.60	3,249	0.0	$470.60	$1,803.33	$220.00	3.36
Main hallway	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	2,156	0.15	827	0.0	$119.73	$634.76	$0.00	5.30
Main hallway	2	LED Screw-In Lamps: Screw-in lamps	Wall Switch	11	3,080	None	No	2	LED Screw-In Lamps: Screw-in lamps	Wall Switch	11	3,080	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main hallway	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Admin Hall	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	2,156	0.27	1,477	0.0	$213.91	$565.15	$100.00	2.17
Music room	16	Linear Fluorescent - T12: 8' T12 (75W) - 2L	Wall Switch	158	3,080	Relamp & Reballast	Yes	16	LED - Linear Tubes: (2) 8' Lamps	Occupancy Sensor	72	2,156	1.13	6,098	0.0	$883.12	$2,329.08	$35.00	2.60
Music room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.04	234	0.0	$33.86	$73.03	$20.00	1.57
Janitor room	1	Incandescent: Screw-in lamp - 1 lamp	Wall Switch	65	3,080	Relamp	No	1	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	10	3,080	0.04	196	0.0	$28.34	$17.23	$5.00	0.43
Music Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.11	587	0.0	$85.00	$152.52	$30.00	1.44
Cafeteria	28	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	28	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,156	0.71	3,858	0.0	$558.72	$2,838.88	$105.00	4.89
Cafeteria	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Stage	5	Incandescent: Screw-in - 1 lamp	Wall Switch	200	3,080	Relamp	No	5	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	30	3,080	0.56	3,011	0.0	$436.02	$175.90	$25.00	0.35
Kitchen	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	21	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.45	2,455	0.0	$355.49	$766.82	$210.00	1.57

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.04	209	0.0	$30.27	$68.77	$10.00	1.94
Storage	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.22	1,182	0.0	$171.13	$408.12	$100.00	1.80
Kitchen	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen Admin	1	Incandescent: Screw-in - 1 Lamp	Wall Switch	65	3,080	Relamp	No	1	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	10	3,080	0.04	196	0.0	$28.34	$17.23	$5.00	0.43
Kitchen hood	8	Incandescent: Screw-in - 1 lamp	Wall Switch	65	3,080	Relamp	No	8	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	10	3,080	0.29	1,566	0.0	$226.73	$137.80	$40.00	0.43
Girls restroom	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,156	0.08	413	0.0	$59.86	$487.38	$35.00	7.56
Room 5	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.19	1,040	0.0	$150.61	$408.12	$100.00	2.05
Boys restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.08	443	0.0	$64.17	$379.55	$65.00	4.90
BOE office	6	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.27	1,439	0.0	$208.37	$682.64	$95.00	2.82
BOE office	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,080	None	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.02	92	0.0	$13.39	$0.00	$35.00	-2.61
Staff restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,080	0.03	175	0.0	$25.39	$54.77	$15.00	1.57
Storage room	3	Incandescent: Screw-in 1 lamp	Wall Switch	65	3,080	Relamp	Yes	3	LED Screw-In Lamps: Screw-in 1 Lamp	Occupancy Sensor	10	2,156	0.11	618	0.0	$89.53	$321.68	$50.00	3.03
Nurse office	5	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	No	5	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,080	0.18	992	0.0	$143.63	$365.15	$100.00	1.85
Nurse's office restroom	1	Incandescent: Screw-in 1 Lamp	Wall Switch	65	3,080	Relamp	No	1	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	10	3,080	0.04	196	0.0	$28.34	$17.23	$5.00	0.43
Nurse's office	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	3,080	0.02	103	0.0	$14.88	$72.46	$0.00	4.87
Staff restroom	2	Incandescent: Screw in - 1 Lamp	Wall Switch	65	3,080	Relamp	Yes	2	LED Screw-In Lamps: Screw-in 1 Lamp	Occupancy Sensor	10	2,156	0.08	412	0.0	$59.68	$150.45	$10.00	2.35
Faculty lounge	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.29	1,560	0.0	$225.91	$708.18	$155.00	2.45
Faculty lounge	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.03	148	0.0	$21.39	$36.52	$45.00	-0.40
Faculty lounge	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	2	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,156	0.05	276	0.0	$39.91	$144.92	$35.00	2.75
Guidance	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.10	520	0.0	$75.30	$262.06	$60.00	2.68
Main Office	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,156	0.08	413	0.0	$59.86	$333.38	$20.00	5.23
Copy room	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.10	520	0.0	$75.30	$262.06	$60.00	2.68
Superintendent	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.14	780	0.0	$112.96	$335.09	$80.00	2.26
Principal office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.10	520	0.0	$75.30	$262.06	$60.00	2.68
Reception to area	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	No	6	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,080	0.22	1,190	0.0	$172.36	$438.18	$120.00	1.85

	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
Girls locker room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.22	1,182	0.0	$171.13	$562.12	$115.00	2.61
Gym office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.05	295	0.0	$42.78	$189.03	$20.00	3.95
Gym restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.02	117	0.0	$16.93	$36.52	$10.00	1.57
Shower room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.05	295	0.0	$42.78	$189.03	$20.00	3.95
Girls restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.08	443	0.0	$64.17	$379.55	$65.00	4.90
Gym	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	4	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym	25	Metal Halide: (1) 400W Lamp	Wall Switch	458	3,080	Fixture Replacement	Yes	25	LED - Fixtures: High-Bay	Occupancy Sensor	137	2,156	5.93	32,039	0.0	$4,640.04	$20,992.05	$3,960.00	3.67
Gym	8	LED Screw-In Lamps: Screw-in 1 lamp	Wall Switch	11	3,080	None	Yes	8	LED Screw-In Lamps: Screw-in 1 lamp	Occupancy Sensor	11	2,156	0.02	94	0.0	$13.54	$0.00	$20.00	-1.48
Gym storage	3	Incandescent: Screw-in 1 lamp	Wall Switch	65	3,080	Relamp	Yes	3	LED Screw-In Lamps: Screw-in 1 Lamp	Occupancy Sensor	10	2,156	0.11	618	0.0	$89.53	$167.68	$15.00	1.71
Girls locker room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Girls locker room	1	LED Screw-In Lamps: Screw-in 1 lamp	Wall Switch	11	3,080	None	No	1	LED Screw-In Lamps: Screw-in 1 lamp	Wall Switch	11	3,080	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boys locker room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boys locker room	1	LED Screw-In Lamps: Screw-in 1 lamp	Wall Switch	11	3,080	None	No	1	LED Screw-In Lamps: Screw-in 1 lamp	Wall Switch	11	3,080	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	1	Compact Fluorescent: Screw-in - 1 lamp	Wall Switch	23	3,080	Relamp	No	1	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	16	3,080	0.00	24	0.0	$3.54	$17.23	$5.00	3.45
Boys locker room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.27	1,477	0.0	$213.91	$635.15	$135.00	2.34
Shower room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.08	443	0.0	$64.17	$225.55	$30.00	3.05
Gym office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	3,080	0.04	198	0.0	$28.73	$73.03	$20.00	1.85
Storage room	1	Compact Fluorescent: Screw-in 1 lamp	Wall Switch	23	3,080	Relamp	No	1	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	16	3,080	0.00	24	0.0	$3.54	$17.23	$5.00	3.45
Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,080	0.03	175	0.0	$25.39	$54.77	$15.00	1.57
Boys restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.05	295	0.0	$42.78	$189.03	$20.00	3.95
Room 8-2	13	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.58	3,117	0.0	$451.46	$1,164.04	$165.00	2.21
Room 8-2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.11	591	0.0	$85.56	$146.06	$75.00	0.83
Room 8-1	22	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	22	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.90	4,874	0.0	$705.89	$1,745.00	$400.00	1.91
Room 7-1	22	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	22	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.90	4,874	0.0	$705.89	$1,745.00	$400.00	1.91
Room 8-5	13	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.58	3,117	0.0	$451.46	$1,164.04	$165.00	2.21

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 8-5	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.11	591	0.0	$85.56	$146.06	$75.00	0.83
Room 8-3	11	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.49	2,638	0.0	$382.01	$1,026.50	$145.00	2.31
Room 8-3	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.11	591	0.0	$85.56	$146.06	$75.00	0.83
Room 8-4	13	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.58	3,117	0.0	$451.46	$1,164.04	$165.00	2.21
Room 8-4	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.11	591	0.0	$85.56	$146.06	$75.00	0.83
Media Center	24	Metal Halide: (1) 400W Lamp	Wall Switch	458	3,080	Fixture Replacement	Yes	24	LED - Fixtures: High-Bay	Occupancy Sensor	137	2,156	5.69	30,758	0.0	$4,454.44	$19,137.17	$3,670.00	3.47
Media Center	3	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	100	3,080	None	Yes	3	LED Screw-In Lamps: Screw-in 1 Lamp	Occupancy Sensor	100	2,156	0.06	319	0.0	$46.17	$0.00	$35.00	-0.76
Media Center	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Media Center	23	Incandescent: Screw-in 1 Lamp	Wall Switch	250	3,080	Relamp	Yes	23	LED Screw-In Lamps: Screw-in 1 Lamp	Occupancy Sensor	38	2,156	3.37	18,228	0.0	$2,639.85	$809.14	$185.00	0.24
Room 6-5	20	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.89	4,796	0.0	$694.56	$1,645.45	$235.00	2.03
Storage	3	Incandescent: Screw-in 1 lamp	Wall Switch	65	3,080	Relamp	Yes	3	LED Screw-In Lamps: Screw-in 1 Lamp	Occupancy Sensor	10	2,156	0.11	618	0.0	$89.53	$167.68	$15.00	1.71
Storage	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cooking class	20	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.89	4,796	0.0	$694.56	$2,185.45	$305.00	2.71
Library Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,080	0.13	701	0.0	$101.57	$219.09	$60.00	1.57
Room 7-3	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.11	591	0.0	$85.56	$146.06	$75.00	0.83
Room 7-3	20	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.89	4,796	0.0	$694.56	$1,645.45	$235.00	2.03
Room 7-2	14	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.62	3,357	0.0	$486.19	$1,232.82	$175.00	2.18
Room 7-2	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.19	1,034	0.0	$149.73	$255.61	$105.00	1.01
Room 7-2	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Art room	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Art room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.11	591	0.0	$85.56	$146.06	$75.00	0.83
Art room	19	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.84	4,556	0.0	$659.83	$1,576.68	$225.00	2.05
Art room	1	Exit Signs: Fluorescent	None	13	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.00	71	0.0	$10.21	$72.42	$0.00	7.09
Art room	1	Incandescent: Screw-in 1 lamp	Wall Switch	65	3,080	Relamp	Yes	1	LED Screw-In Lamps: Screw-in 1 Lamp	Occupancy Sensor	10	2,156	0.04	206	0.0	$29.84	$17.23	$40.00	-0.76
Storage Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.02	117	0.0	$16.93	$36.52	$10.00	1.57

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 7-4	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.11	591	0.0	$85.56	$146.06	$75.00	0.83
Room 7-4	13	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.58	3,117	0.0	$451.46	$1,164.04	$165.00	2.21
Room 7-4	1	Exit Signs: Fluorescent	None	13	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.00	71	0.0	$10.21	$72.42	$0.00	7.09
Room 4	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.11	591	0.0	$85.56	$146.06	$75.00	0.83
Room 4	14	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.62	3,357	0.0	$486.19	$1,232.82	$175.00	2.18
Room 4	1	Exit Signs: Fluorescent	None	13	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.00	71	0.0	$10.21	$72.42	$0.00	7.09
Media Center offices	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.10	520	0.0	$75.30	$262.06	$60.00	2.68
Storage room	2	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.08	418	0.0	$60.53	$137.55	$20.00	1.94
Computer lab	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.98	5,317	0.0	$770.07	$1,854.54	$430.00	1.85
Room 3	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.11	591	0.0	$85.56	$146.06	$75.00	0.83
Room 3	14	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	3,080	Relamp & Reballast	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.62	3,357	0.0	$486.19	$1,232.82	$175.00	2.18
Room 2	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.49	2,659	0.0	$385.03	$927.27	$215.00	1.85
Room 1	16	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	16	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.66	3,545	0.0	$513.38	$1,146.36	$275.00	1.70
Basic Skills	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.25	1,329	0.0	$192.52	$598.64	$125.00	2.46
Room 6	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.25	1,329	0.0	$192.52	$598.64	$125.00	2.46
Boys restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.16	886	0.0	$128.34	$489.09	$95.00	3.07
Girls restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.16	886	0.0	$128.34	$489.09	$95.00	3.07
Staff restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	No	1	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	3,080	0.03	175	0.0	$25.39	$54.77	$15.00	1.57
Room 6-3	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,156	0.03	138	0.0	$19.95	$72.46	$35.00	1.88
Room 6-3	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.82	4,431	0.0	$641.72	$1,365.45	$335.00	1.61
Room 6-2	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,156	0.03	138	0.0	$19.95	$72.46	$35.00	1.88
Room 6-2	18	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	18	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.74	3,988	0.0	$577.55	$1,255.91	$305.00	1.65
Room 6-1	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.49	2,659	0.0	$385.03	$927.27	$215.00	1.85
Room 6-4	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	3,080	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	2,156	0.49	2,659	0.0	$385.03	$927.27	$215.00	1.85
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	3,080	0.04	234	0.0	$33.86	$73.03	$20.00	1.57

	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
Storage	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
World language	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	2,156	0.08	413	0.0	$59.86	$217.38	$35.00	3.05
World language	10	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	3,080	Relamp	Yes	10	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	2,156	0.48	2,600	0.0	$376.52	$1,000.30	$235.00	2.03
World language	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	3,080	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,156	0.05	295	0.0	$42.78	$73.03	$55.00	0.42
World language storage	1	Incandescent: Screw-in 1 Lamp	Wall Switch	200	3,080	Relamp	No	1	LED Screw-In Lamps: Screw-in 1 Lamp	Wall Switch	30	3,080	0.11	602	0.0	$87.20	$35.18	$5.00	0.35
Exterior wall pack	8	Metal Halide: (1) 150W Lamp	Daylight Dimming	190	2,920	Fixture Replacement	No	8	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	57	2,920	0.70	3,573	0.0	$517.44	$7,727.72	$800.00	13.39
Exterior recessed	9	Compact Fluorescent: Screw-in 1 Lamp	Daylight Dimming	23	2,920	Relamp	No	9	LED Screw-In Lamps: Screw-in 1 Lamp	Daylight Dimming	16	2,920	0.04	209	0.0	$30.20	$155.03	$45.00	3.64
Exterior wall pack	6	Metal Halide: (1) 400W Lamp	Daylight Dimming	458	2,920	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	137	2,920	1.26	6,459	0.0	$935.48	$5,795.79	$600.00	5.55
Pole lighting	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	65	2,920	None	No	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	65	2,920	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Pole lighting	4	Metal Halide: (1) 250W Lamp	Daylight Dimming	295	2,920	Fixture Replacement	No	4	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	Daylight Dimming	89	2,920	0.54	2,774	0.0	$401.70	$4,778.02	$0.00	11.89

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Girls Locker room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gym storage room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gym storage room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Main Office	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Teachers lounge	3	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Nurse office	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	8th grade science room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	8th grade science room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	7th grade science room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Music room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen restroom	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Dishwasher	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Dishwasher	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen	2	Kitchen Hood Exhaust Fan	0.4	60.0%	No	5,250	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Kitchen storage	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Girls restroom	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Hallway	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Boiler room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Boiler room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Boiler room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	6th grade science room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cooking Class	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cooking Class	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Computer lab	2	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Storage room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Boys restroom	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Boys locker room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Boys restroom	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Hallways	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Art room	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Room 374	1	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Library	2	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Gym	2	Exhaust Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Heating system	2	Heating Hot Water Pump	7.5	85.5%	No	1,696	Yes	91.0%	Yes	2	2.25	9,975	0.0	$1,444.57	$9,476.48	$0.00	6.56
Boiler room	Cooling System	1	Chilled Water Pump	15.0	91.0%	No	3,391	Yes	93.0%	Yes	2	1.95	18,354	0.0	$2,658.09	$9,060.32	$0.00	3.41
Cafeteria	Stage	2	Supply Fan	7.5	85.5%	No	3,391	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gym	Gym	2	Supply Fan	7.5	85.5%	No	3,391	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		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
Classrooms	Unit Ventilators	43	Supply Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Main office	1	Supply Fan	1.0	85.5%	No	2,745	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Main office	1	Packaged AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Computer lab	2	Split-System AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	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
Ground	Cooling system	1	Air-Cooled Reciprocating Chiller	145.00	Yes	1	Air-Cooled Screw Chiller	Variable	145.00	1.24	0.74	49.12	38,707	0.0	$5,605.77	$142,785.18	$13,050.00	23.14

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	School	2	Condensing Hot Water Boiler	1,760.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Main Office	1	Furnace	86.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

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

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	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	Medium Temp Freezer (0F to 30F)	No	No	Yes	0.02	729	0.0	$105.56	$1,674.00	$75.00	15.15
Kitchen	1	Cooler (35F to 55F)	No	No	Yes	0.01	525	0.0	$76.03	$1,674.00	$75.00	21.03

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Ice Maker Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Ice Maker 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	Self-Contained Unit (≥175 lbs/day), Batch	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Insulated Food Holding Cabinet (1/2 Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Convection Oven (Half Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Steamer	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Steamer	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel 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	Payback w/ Incentives in Years
Kitchen	1	Single Tank Conveyor (High Temp)	Electric	N/A	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?
Woodruff School	67	Desktop + LCD monitors	145.0	Yes
Woodruff School	300	Chrome Books	30.0	Yes
Woodruff School	23	Printers	60.0	Yes
Woodruff School	4	Copiers	200.0	Yes
Woodruff School	5	Microwave	900.0	Yes
Woodruff School	4	Refrigerators	219.0	Yes
Woodruff School	3	Coffee Machine	400.0	Yes
Woodruff School	21	Wall TV - flat screens	120.0	Yes
Woodruff School	3	Electric rangers	1,500.0	Yes
Woodruff School	1	Washing machine	900.0	Yes
Woodruff School	1	Dryer machine	1,500.0	Yes

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
Faculty Lounge	1	Refrigerated	Yes	0.00	1,612	0.0	$233.43	$230.00	$0.00	0.99
Cafeteria	2	Refrigerated	Yes	0.00	3,224	0.0	$466.87	$460.00	$0.00	0.99

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR® Score[1]

Woodruff School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 63,500
Built: 1975

For Year Ending: December 31, 2017
Date Generated: September 24, 2018

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Woodruff School 1385 Highway 77 Seabrook, New Jersey 08302	Upper Deerfield Township SD 1385 Highway 77 Seabrook, NJ 08302 (____)____-_____	William Widen 1385 Highway 77 Seabrook, NJ 08302 856-455-2267 X4234 WIDENW@UDTS.ORG

Property ID: 6334496

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
56.3 kBtu/ft²

Source EUI
124.7 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	2,377,162 (66%)
Natural Gas (kBtu)	1,200,038 (34%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	45.2
National Median Source EUI (kBtu/ft²)	100
% Diff from National Median Source EUI	25%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	305

Signature & Stamp of Verifying Professional

I _____ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _____ Date: _____

Licensed Professional

____ _____
,
(____)____-_____
_____

Professional Engineer Stamp
(if applicable)