Local Government Energy Audit:
Energy Audit Report

John C. Milanesi Elementary School

880 Harding Highway

Buena, NJ 08310

Buena Regional School District

October 12, 2018

Final Report by:

TRC Energy Services

Disclaimer

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

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

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

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

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1 Executive Summary

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

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

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey 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

John C. Milanesi Elementary School is a 39,817 square foot facility comprised of various space types such as classrooms, offices, hallways, gymnasium, kitchen, storage closets and a mechanical space. This is a single story facility. The school is mostly occupied between 9:30 AM and 4:30 PM during the weekdays. The school remains closed during the weekends.

Space heating in the building is provided by two gas-fired non-condensing hot water boilers and space cooling is provided by an air-cooled constant speed screw chiller using two air handlers and VAV boxes equipped with reheat. Lighting at the facility primarily consists of 2-foot or 4-foot linear T8 tubes, compact fluorescent lamp fixtures and LED lamps in a few spaces.

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 recommends nine measures which together represent an opportunity for John C. Milanesi Elementary School to reduce annual energy costs by $21,385 and annual greenhouse gas emissions by 127,709 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 7 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 John C. Milanesi Elementary School's annual energy use by 12%.

Figure 1 – Previous 12 Month Utility Costs

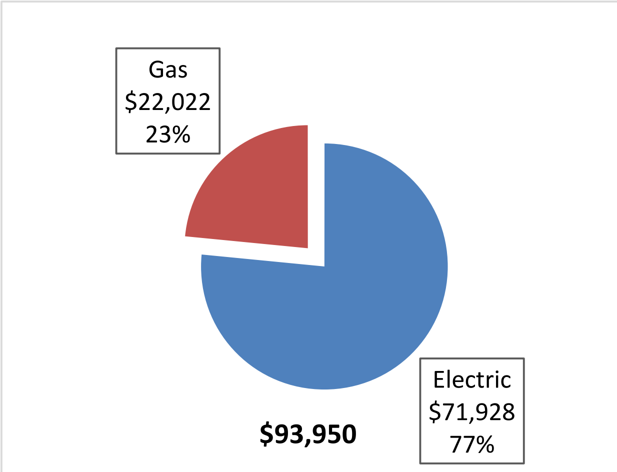
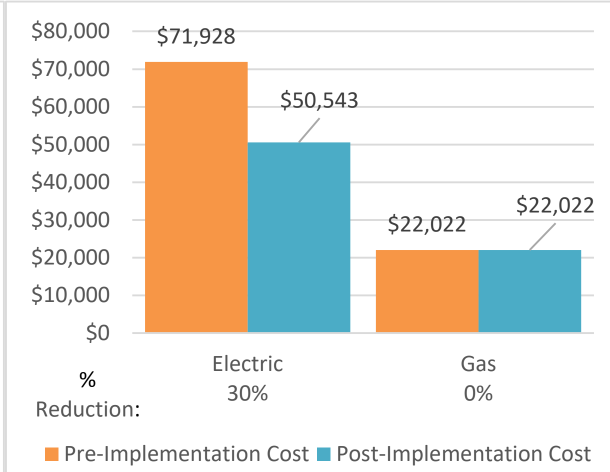


Figure 2 – Potential Post-Implementation Costs



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

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

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			41,424	14.7	0.0	$6,984.89	$55,160.88	$8,225.00	$46,935.88	6.7	41,713
ECM 1	Install LED Fixtures	Yes	6,752	1.0	0.0	$1,138.53	$13,626.31	$850.00	$12,776.31	11.2	6,799
ECM 2	Retrofit Fixtures with LED Lamps	Yes	34,461	13.7	0.0	$5,810.91	$41,427.01	$7,375.00	$34,052.01	5.9	34,702
ECM 3	Install LED Exit Signs	Yes	210	0.0	0.0	$35.45	$107.56	$0.00	$107.56	3.0	212
Lighting Control Measures			5,437	1.9	0.0	$916.82	$12,008.00	$840.00	$11,168.00	12.2	5,475
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	4,653	1.7	0.0	$784.64	$7,408.00	$840.00	$6,568.00	8.4	4,686
	Install High/Low Lighitng Controls	No	784	0.3	0.0	$132.18	$4,600.00	$0.00	$4,600.00	34.8	789
Variable Frequency Drive (VFD) Measures			33,806	6.9	0.0	$5,700.34	$22,819.25	$3,200.00	$19,619.25	3.4	34,042
ECM 5	Install VFDs on Constant Volume (CV) HVAC	Yes	21,978	5.2	0.0	$3,706.01	$13,197.15	$3,200.00	$9,997.15	2.7	22,132
ECM 6	Install VFDs on Chilled Water Pumps	Yes	9,326	1.0	0.0	$1,572.48	$3,606.80	$0.00	$3,606.80	2.3	9,391
ECM 7	Install VFDs on Hot Water Pumps	Yes	2,502	0.8	0.0	$421.86	$6,015.30	$0.00	$6,015.30	14.3	2,519
Electric Unitary HVAC Measures			813	0.9	0.0	$137.07	$6,588.48	$138.00	$6,450.48	47.1	819
	Install High Efficiency Electric AC	No	813	0.9	0.0	$137.07	$6,588.48	$138.00	$6,450.48	47.1	819
Electric Chiller Replacement			45,328	33.0	0.0	$7,643.25	$85,318.42	$9,000.00	$76,318.42	10.0	45,645
ECM 8	Install High Efficiency Chillers	Yes	45,328	33.0	0.0	$7,643.25	$85,318.42	$9,000.00	$76,318.42	10.0	45,645
Gas Heating (HVAC/Process) Replacement			0	0.0	180.3	$1,860.42	$121,629.29	$3,711.76	$117,917.53	63.4	21,111
	Install High Efficiency Hot Water Boilers	No	0	0.0	180.3	$1,860.42	$121,629.29	$3,711.76	$117,917.53	63.4	21,111
Plug Load Equipment Control - Vending Machine			1,612	0.0	0.0	$271.79	$230.00	$0.00	$230.00	0.8	1,623
ECM 9	Vending Machine Control	Yes	1,612	0.0	0.0	$271.79	$230.00	$0.00	$230.00	0.8	1,623
TOTALS FOR HIGH PRIORITY MEASURES			126,823	56.3	0.0	$21,384.90	$170,936.55	$21,265.00	$149,671.55	7.0	127,709
TOTALS FOR ALL EVALUATED MEASURES			128,419	57.5	180.3	$23,514.58	$303,754.32	$25,114.76	$278,639.56	11.8	150,428

* - 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.

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

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

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.

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

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

Energy Efficient Practices

TRC also identified eight 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 John C. Milanesi Elementary School include:

- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- 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 John C. Milanesi Elementary 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	185	kW DC STC
Electric Generation	220,404	kWh/yr
Displaced Cost	$19,180	/yr
Installed Cost	$481,000	

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

1.3 Implementation Planning

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

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

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

- SmartStart
- SREC (Solar Renewable Energy Credit) 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.](www.njcleanenergy.com/ci)

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Joe Biluck Jr	Interim Buildings and Grounds Supervisor	jbiluck@buena.k12.nj.us	856-697-0800
Julie Scarborough	Maintenance		
TRC Energy Services			
Alexander Klieverik	Auditor	aklieverik@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On May 23, 2018, TRC performed an energy audit at John C. Milanesi Elementary School located in Buena, New Jersey. TRC's team met with Julie Scarborough, Maintenance to review the facility operations and help focus our investigation on specific energy-using systems.

Lighting at the facility is provided mostly by 4-foot and 2-foot 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some LED and CFL lamps. Most of the linear fluorescent fixtures are 2-lamp, 3-lamp or 4-lamp long troffers. Smaller spaces such as closets and restrooms are lit using (60-Watt) incandescent lamps, (9-Watt) LED lamps and (13-Watt) CFL.

The building was constructed in 1958. Lighting control in the school is provided by occupancy sensors and wall switches. The occupancy sensors are either wall or ceiling mounted depending on the space layout. The building's exterior lighting consists of LED lamps in wall packs and CFLs in canopy fixtures. Pole fixtures have 100-Watt metal halide or 250-Watt high pressure sodium lamps. The exterior lights are controlled by timers.

2.3 Building Occupancy

The typical schedule is presented in the table below. During a typical day, the facility is occupied by 100 staff and 450 students.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
John C. Milanesi Elementary School	Weekday	9:30 AM - 4:00 PM
John C. Milanesi Elementary School	Weekend	No operation

2.4 Building Envelope

The building is constructed of concrete block with a brick facade. The building has a pitched roof with asphalt shingles in most areas. The roof over the media center and in a small portion above the janitors' closet have black EPDM membranes. The buildings have double-pane windows which are in good condition. The exterior doors are constructed of aluminum and in good condition.

Image 1 Building Envelope

2.5 On-Site Generation

John C. Milanesi Elementary School does not have any on-site electric generation systems currently installed.

2.6 Energy-Using Systems

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

Lighting System

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Image 2 Lighting System

Hot Water Heating System

The hot water system consists of two gas-fired non-condensing HB Smith hot water boilers with output capacities of 4200 MBh and 2855 MBh, both with efficiency ratings of 80%. The hot water from the boiler is circulated throughout the school using three sets of pumps; two 1.5 hp, two 3 hp, and a single 1 hp pump. The boilers provide hot water to radiators and unit ventilators throughout the building, as well as coils within VAV units.

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 are 58 years old and 45 years old, respectively, and have been evaluated for replacement.

Image 3 Hot water heating system

Chilled Water Air Conditioning System (CHW)

The facility is served by a single air-cooled, 100-ton Trane screw chiller producing 40°F chilled water. Chilled water is supplied to the VAV units and air handler unit (AHU) cooling coils by a dedicated pump with a 7.5 hp constant speed motor. Conditioned air is distributed by the AHU across various spaces by a 25 hp supply air fan and 15 hp return air fan. The air handling unit is equipped with VAV boxes with hot and chilled water coils. The chiller is 17 years old and has been evaluated for replacement.

Image 4 Chilled Water System

Direct Expansion Air Conditioning System (DX)

Many classrooms and office spaces are cooled using window AC units with capacities ranging from 1 to 2 tons. Most of these window AC units are less than ten10 years old and in good condition. The Main Office and Principal's Office, however, are cooled using 0.75 ton Sanyo split AC units that are 28 years old.

The media center has two rooftop packaged units serving the space. The capacity of these two units are assumed to be 5 tons for analytical purposes. These units are very old and are past their useful life. The space temperatures are controlled using programmable thermostats in the respective zones.

Image 5 Direct Expansion AC system

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one electric and one gas-fired hot water heater with tank capacities of 120 and 100 gallons, respectively. The electric water heater is 12 years old and the gas-fired unit is seven years old. Both units were found to be in fair condition.


Food Service & Refrigeration

The kitchen has a combination of gas and electric equipment. These include steamers, gas range with eight burners and gas-fired convection oven. The refrigeration equipment consists of one walk in refrigerator, one stand-up refrigerator and one refrigerator chest. The kitchen also has a commercial dishwasher with an electric booster.

Building Plug Load

There are 50 computer work stations and laptops throughout the facility. Other office plug loads include printers, projectors, smart boards etc. There are a few kitchenette plug loads that include refrigerators, toaster oven, coffee machines and microwave oven. There is no centralized PC power management software installed. There is one refrigerated vending machine in the facility. It is recommended that we install occupancy-based controls on the machine.

2.7 Water-Using Systems

The restroom faucets are rated for 2.2 gallons per minute (gpm) or lower, the toilets are rated at 1.5 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

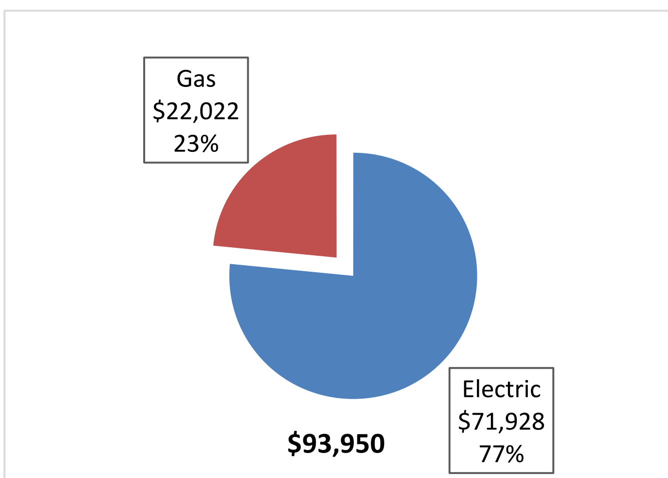
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for John C. Milanesi Elementary School		
Fuel	Usage	Cost
Electricity	426,569 kWh	$71,928
Natural Gas	21,342 Therms	$22,022
Total		$93,950

The current annual energy cost for this facility is $93,950 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 $0.169/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The third party electric supply is provided by Constellation. The monthly electricity consumption and peak demand are shown in the chart below. High summer use indicates the seasonal use of cooling systems.

Figure 9 - Electric Usage & Demand

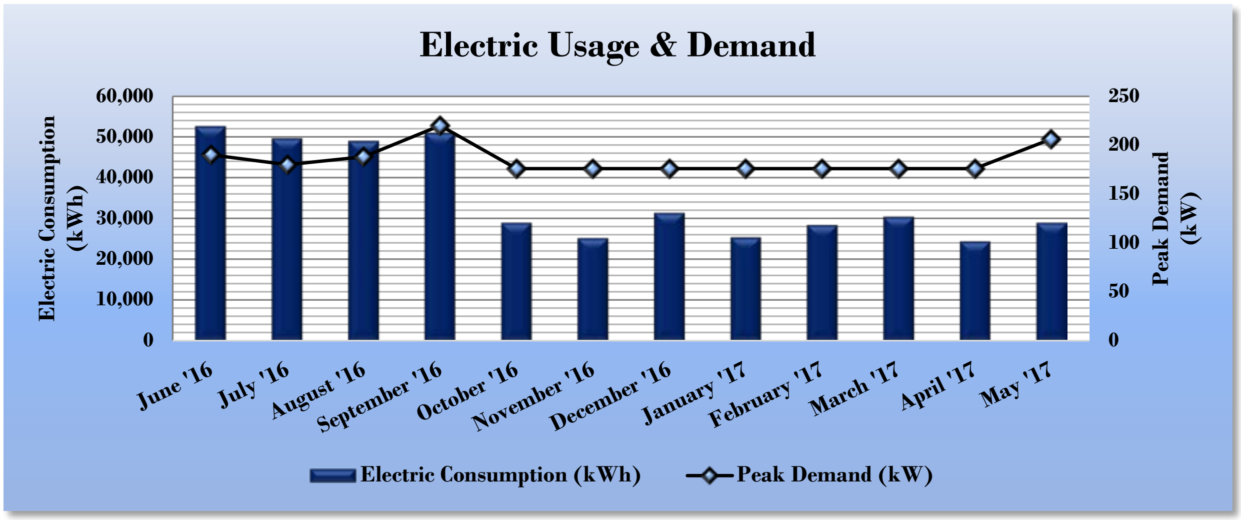


Figure 10 - Electric Usage & Demand

Electric Billing Data for John C. Milanesi Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
6/24/16	30	52,600	190		$7,870
7/26/16	32	49,600	180		$7,592
8/25/16	30	49,000	188		$7,437
9/28/16	34	51,000	220		$8,478
10/26/16	28	29,000	176		$5,039
11/23/16	28	25,200	176		$4,604
12/28/16	35	31,400	176		$5,744
1/25/17	28	25,400	176		$4,619
2/23/17	29	28,400	176		$5,018
3/27/17	32	30,400	176		$5,431
4/23/17	27	24,400	176		$4,630
5/24/17	31	29,000	206		$5,269
Totals	364	425,400	220	$0	$71,731
Annual	365	426,569	220	$0	$71,928

3.3 Natural Gas Usage

Natural gas is provided by South Jersey Gas. The average gas cost for the past 12 months is $1.032/therm, which is the blended rate used throughout the analyses in this report. The third party gas supply is provided by Direct Energy. The monthly gas consumption is shown in the chart below. Gas is mainly used for space heating at this facility.

Figure 11 - Natural Gas Usage

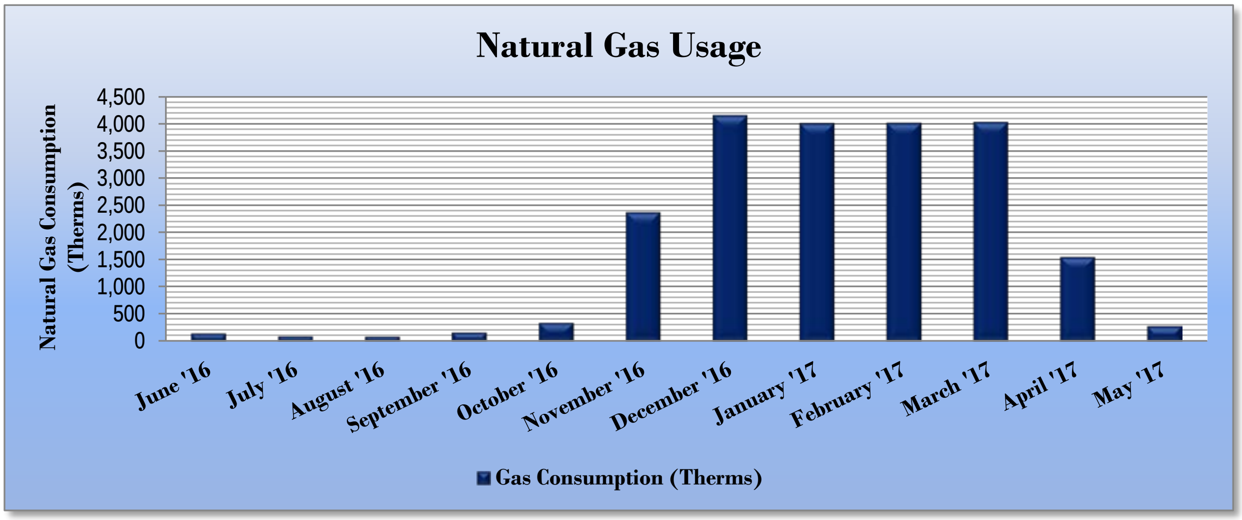


Figure 12 - Natural Gas Usage

Gas Billing Data for John C. Milanesi Elementary School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
6/24/16	30	150	$164
7/26/16	32	98	$118
8/26/16	31	93	$84
9/28/16	33	171	$185
10/25/16	27	346	$366
11/23/16	29	2,375	$2,377
12/28/16	35	4,155	$4,549
1/25/17	28	4,013	$3,912
2/23/17	29	4,016	$3,915
3/27/17	32	4,034	$4,358
4/26/17	30	1,549	$1,616
5/24/17	28	283	$318
Totals	364	21,284	$21,961
Annual	365	21,342	$22,022

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		
	John C. Milanesi Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	171.1	141.4
Site Energy Use Intensity (kBtu/ft^2)	90.2	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		
	John C. Milanesi Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	136.9	141.4
Site Energy Use Intensity (kBtu/ft^2)	79.3	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 15.

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

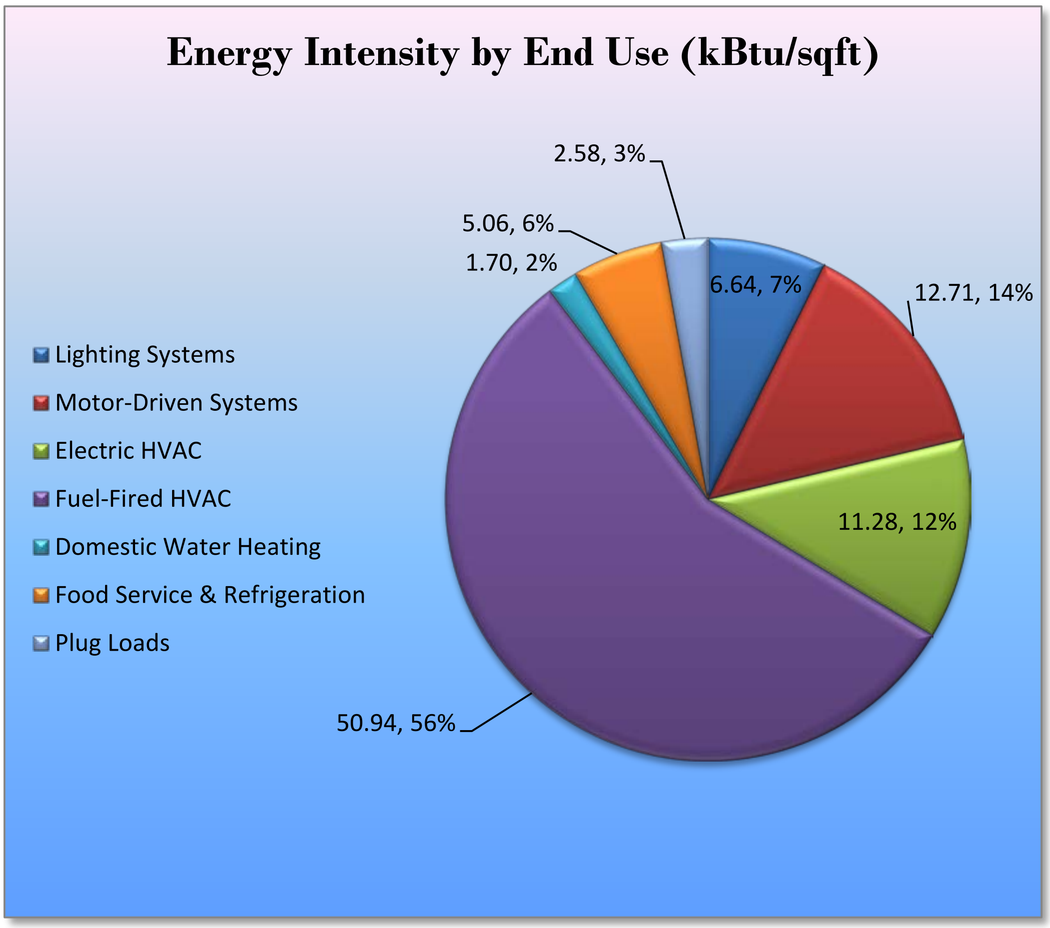
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 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		41,424	14.7	0.0	$6,984.89	$55,160.88	$8,225.00	$46,935.88	6.7	41,713
ECM 1	Install LED Fixtures	6,752	1.0	0.0	$1,138.53	$13,626.31	$850.00	$12,776.31	11.2	6,799
ECM 2	Retrofit Fixtures with LED Lamps	34,461	13.7	0.0	$5,810.91	$41,427.01	$7,375.00	$34,052.01	5.9	34,702
ECM 3	Install LED Exit Signs	210	0.0	0.0	$35.45	$107.56	$0.00	$107.56	3.0	212
Lighting Control Measures		4,653	1.7	0.0	$784.64	$7,408.00	$840.00	$6,568.00	8.4	4,686
ECM 4	Install Occupancy Sensor Lighting Controls	4,653	1.7	0.0	$784.64	$7,408.00	$840.00	$6,568.00	8.4	4,686
Variable Frequency Drive (VFD) Measures		33,806	6.9	0.0	$5,700.34	$22,819.25	$3,200.00	$19,619.25	3.4	34,042
ECM 5	Install VFDs on Constant Volume (CV) HVAC	21,978	5.2	0.0	$3,706.01	$13,197.15	$3,200.00	$9,997.15	2.7	22,132
ECM 6	Install VFDs on Chilled Water Pumps	9,326	1.0	0.0	$1,572.48	$3,606.80	$0.00	$3,606.80	2.3	9,391
ECM 7	Install VFDs on Hot Water Pumps	2,502	0.8	0.0	$421.86	$6,015.30	$0.00	$6,015.30	14.3	2,519
Electric Chiller Replacement		45,328	33.0	0.0	$7,643.25	$85,318.42	$9,000.00	$76,318.42	10.0	45,645
ECM 8	Install High Efficiency Chillers	45,328	33.0	0.0	$7,643.25	$85,318.42	$9,000.00	$76,318.42	10.0	45,645
Plug Load Equipment Control - Vending Machine		1,612	0.0	0.0	$271.79	$230.00	$0.00	$230.00	0.8	1,623
ECM 9	Vending Machine Control	1,612	0.0	0.0	$271.79	$230.00	$0.00	$230.00	0.8	1,623
TOTALS		126,823	56.3	0.0	$21,384.90	$170,936.55	$21,265.00	$149,671.55	7.0	127,709

* - 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		41,424	14.7	0.0	$6,984.89	$55,160.88	$8,225.00	$46,935.88	6.7	41,713
ECM 1	Install LED Fixtures	6,752	1.0	0.0	$1,138.53	$13,626.31	$850.00	$12,776.31	11.2	6,799
ECM 2	Retrofit Fixtures with LED Lamps	34,461	13.7	0.0	$5,810.91	$41,427.01	$7,375.00	$34,052.01	5.9	34,702
ECM 3	Install LED Exit Signs	210	0.0	0.0	$35.45	$107.56	$0.00	$107.56	3.0	212

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	540	0.2	0.0	$91.11	$1,127.00	$50.00	$1,077.00	11.8	544
Exterior	6,212	0.8	0.0	$1,047.42	$12,499.31	$800.00	$11,699.31	11.2	6,255

Measure Description

We recommend replacing exterior fixtures containing HID lamps, including metal halide and high pressure sodium, with new high performance LED light fixtures. Fixtures in the Wash area are also recommended for replacement. 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 HID sources.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	34,367	13.7	0.0	$5,794.95	$41,212.00	$7,375.00	$33,837.00	5.8	34,607
Exterior	95	0.0	0.0	$15.95	$215.01	$0.00	$215.01	13.5	95

Measure Description

We recommend retrofitting existing incandescent, compact fluorescent, and linear T8 lamp 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 tubes and more than ten times longer than many incandescent lamps.

ECM 3: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	210	0.0	0.0	$35.45	$107.56	$0.00	$107.56	3.0	212
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend replacing all incandescent or 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 recommendation for upgrades to existing lighting control measures is 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		4,653	1.7	0.0	$784.64	$7,408.00	$840.00	$6,568.00	8.4	4,686
ECM 4	Install Occupancy Sensor Lighting Controls	4,653	1.7	0.0	$784.64	$7,408.00	$840.00	$6,568.00	8.4	4,686

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

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
4,653	1.7	0.0	$784.64	$7,408.00	$840.00	$6,568.00	8.4	4,686

Measure Description

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

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

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 19 below.

Figure 19 – 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		33,806	6.9	0.0	$5,700.34	$22,819.25	$3,200.00	$19,619.25	3.4	34,042
ECM 5	Install VFDs on Constant Volume (CV) HVAC	21,978	5.2	0.0	$3,706.01	$13,197.15	$3,200.00	$9,997.15	2.7	22,132
ECM 6	Install VFDs on Chilled Water Pumps	9,326	1.0	0.0	$1,572.48	$3,606.80	$0.00	$3,606.80	2.3	9,391
ECM 7	Install VFDs on Hot Water Pumps	2,502	0.8	0.0	$421.86	$6,015.30	$0.00	$6,015.30	14.3	2,519

ECM 5: Install VFDs on Constant Volume (CV) HVAC

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)
21,978	5.2	0.0	$3,706.01	$13,197.15	$3,200.00	$9,997.15	2.7	22,132

Measure Description

We recommend installing variable frequency drives (VFDs) on AHU 1 to control 25 hp supply fan motor and 15 hp return fan motor speeds to convert a constant-volume, single-zone air handling system into a variable-air-volume (VAV) system. A separate VFD is usually required to control the return fan motor or dedicated exhaust fan motor, if the air handler has one. Zone thermostats will cause the VFD to modulate fan speed to maintain the appropriate temperature in the zone, while maintaining a constant supply air temperature. Energy savings results from reducing fan speed (and power) when there is a reduced load required for the zone. The magnitude of energy savings is based on the estimated amount of time that fan motors operate at partial load.

For air handlers with direct expansion (DX) cooling systems, the minimum air flow across the cooling coil required to prevent the coil from freezing will have to be determined during the final project design. The control system should be programmed to maintain the minimum air flow whenever the compressor is operating.

ECM 6: 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)
9,326	1.0	0.0	$1,572.48	$3,606.80	$0.00	$3,606.80	2.3	9,391

Measure Description

We recommend installing a variable frequency drives (VFD) to control the 7.5 hp chilled water pump. This measure requires that chilled water coils be served by 2-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 7: 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)
2,502	0.8	0.0	$421.86	$6,015.30	$0.00	$6,015.30	14.3	2,519

Measure Description

We recommend installing a variable frequency drives (VFD) to control the two 3 hp hot water pumps. This measure requires that a majority of the hot water coils be served by two-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.4 Electric Chiller Replacement

Our recommendation for upgrades to electric chillers is summarized in Figure 20 below.

Figure 20 – Summary of Electric Chiller ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Chiller Replacement		45,328	33.0	0.0	$7,643.25	$85,318.42	$9,000.00	$76,318.42	10.0	45,645
ECM 8	Install High Efficiency Chillers	45,328	33.0	0.0	$7,643.25	$85,318.42	$9,000.00	$76,318.42	10.0	45,645

ECM 8: 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)
45,328	33.0	0.0	$7,643.25	$85,318.42	$9,000.00	$76,318.42	10.0	45,645

Measure Description

We recommend replacing older inefficient constant speed 100 ton electric chiller 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.

4.1.5 Plug Load Equipment Control - Vending Machines

Our recommendation for upgrades to plug load equipment control – vending machines is summarized in Figure 21 below.

Figure 21 – 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		1,612	0.0	0.0	$271.79	$230.00	$0.00	$230.00	0.8	1,623
ECM 9	Vending Machine Control	1,612	0.0	0.0	$271.79	$230.00	$0.00	$230.00	0.8	1,623

ECM 9: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$271.79	$230.00	$0.00	$230.00	0.8	1,623

Measure Description

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

4.2 ECMs Evaluated But Not Recommended

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

Figure 22 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Control Measures	784	0.3	0.0	$132.18	$4,600.00	$0.00	$4,600.00	34.8	789
Install High/Low Lighitng Controls	784	0.3	0.0	$132.18	$4,600.00	$0.00	$4,600.00	34.8	789
Electric Unitary HVAC Measures	813	0.9	0.0	$137.07	$6,588.48	$138.00	$6,450.48	47.1	819
Install High Efficiency Electric AC	813	0.9	0.0	$137.07	$6,588.48	$138.00	$6,450.48	47.1	819
Gas Heating (HVAC/Process) Replacement	0	0.0	180.3	$1,860.42	$121,629.29	$3,711.76	$117,917.53	63.4	21,111
Install High Efficiency Hot Water Boilers	0	0.0	180.3	$1,860.42	$121,629.29	$3,711.76	$117,917.53	63.4	21,111
TOTALS	1,597	1.2	180.3	$2,129.67	$132,817.77	$3,849.76	$128,968.01	60.6	22,719

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

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

Install High/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)
784	0.3	0.0	$132.18	$4,600.00	$0.00	$4,600.00	34.8	789

Measure Description

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

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

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

Reasons for not Recommending

The simple payback for this control measure at over 30 years cannot be justified just on the basis of energy savings alone. However, the site may wish to consider controls for other reasons, including maintenance savings and reliability.

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
813	0.9	0.0	$137.07	$6,588.48	$138.00	$6,450.48	47.1	819

Measure Description

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

Reasons for not Recommending

The simple payback for replacing the older AC units at this site with new high efficiency units at over 45 years exceeds the expected useful life of the equipment and therefore is not recommended on the basis of energy savings alone. However, the site may wish to consider replacement for other reasons, including for maintenance savings and reliability.

Install High Efficiency Hot Water Boilers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	180.3	$1,860.42	$121,629.29	$3,711.76	$117,917.53	63.4	21,111

Measure Description

We evaluated replacing the older inefficient hot water boilers with high efficiency hot water boilers. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers that can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130°F. Therefore, condensing hydronic boilers were only evaluated when the return water temperature is less than 130°F during most of the operating hours.

Reasons for not Recommending

The simple payback for replacing the existing boilers at this site with new high efficiency boilers at over 60 years exceeds the expected useful life of the equipment and therefore is not recommended on the basis of energy savings alone. However, the site may wish to consider replacement for other reasons, including for maintenance savings and reliability.

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.

Ensure Lighting Controls Are Operating Properly

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

Perform Routine Motor Maintenance

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

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.

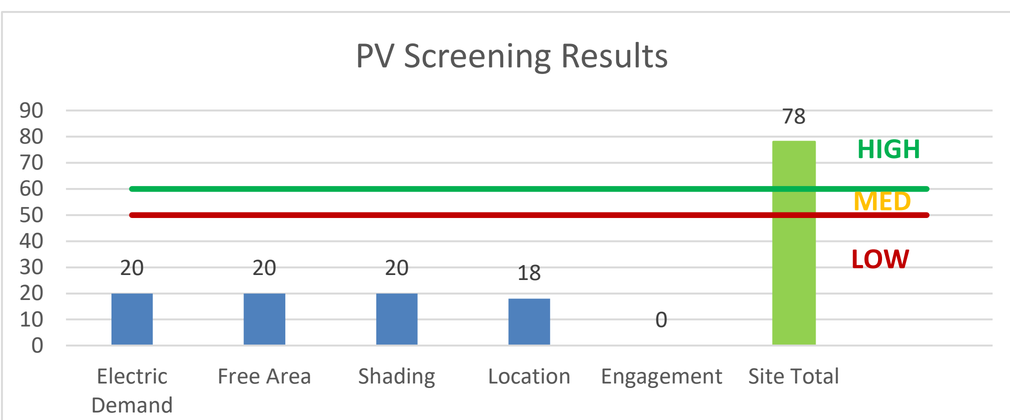
6.1 Photovoltaic

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

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

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

Figure 23 - Photovoltaic Screening



Potential	High	
System Potential	185	kW DC STC
Electric Generation	220,404	kWh/yr
Displaced Cost	$19,180	/yr
Installed Cost	$481,000	

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

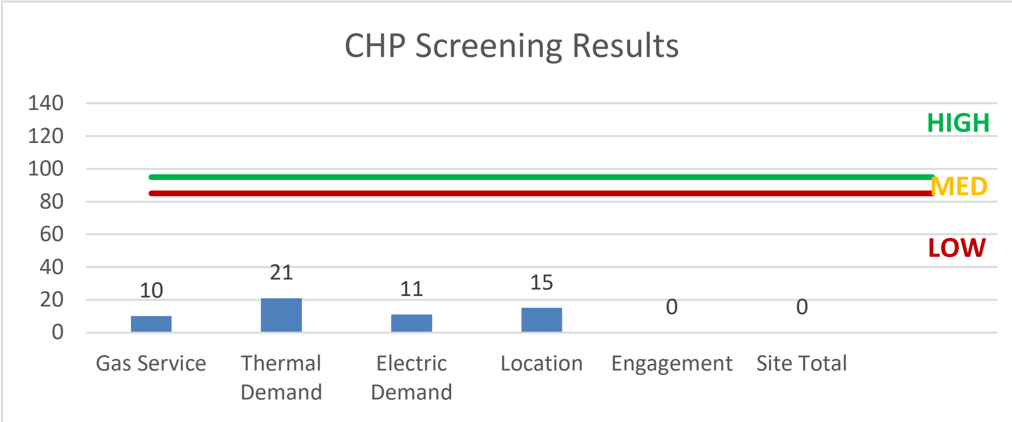
Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric 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 24 - Combined Heat and Power Screening



7 Demand Response

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

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

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

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

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

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

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

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 23 for a list of the eligible programs identified for each recommended ECM.

Figure 25 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive
ECM 1	Install LED Fixtures	x
ECM 2	Retrofit Fixtures with LED Lamps	x
ECM 3	Install LED Exit Signs	
ECM 4	Install Occupancy Sensor Lighting Controls	x
ECM 5	Install VFDs on Constant Volume (CV) HVAC	x
ECM 6	Install VFDs on Chilled Water Pumps	
ECM 7	Install VFDs on Hot Water Pumps	
ECM 8	Install High Efficiency Chillers	x
ECM 9	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.](http://www.njcleanenergy.com/ci)

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 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.](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	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.11	322	0.0	$54.25	$351.00	$60.00	5.36
Well Room	1	Incandescent : 1 Lamp	Wall Switch	60	1,625	Relamp	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	0.03	95	0.0	$16.07	$53.75	$5.00	3.03
Boiler room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.09	247	0.0	$41.59	$234.00	$40.00	4.66
Attic Space - Center	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.11	308	0.0	$51.99	$292.50	$50.00	4.66
Attic Space - Side area	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
Mech area	5	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	13	1,625	None	No	5	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	13	1,625	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Side Area 2	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.09	247	0.0	$41.59	$234.00	$40.00	4.66
Side Area 3	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.09	247	0.0	$41.59	$234.00	$40.00	4.66
Custodial room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.02	20	0.0	$3.33	$58.50	$10.00	14.58
Main office	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.25	701	0.0	$118.26	$796.50	$125.00	5.68
Storage closet	1	Compact Fluorescent: 1 Lamp - screw in	Wall Switch	13	520	Relamp	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	520	0.00	2	0.0	$0.39	$53.75	$0.00	136.69
Principal office	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.16	468	0.0	$78.84	$621.00	$95.00	6.67
Principal office restroom	1	Incandescent : 1 Lamp - screw in	Wall Switch	60	1,625	Relamp	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	0.03	95	0.0	$16.07	$53.75	$5.00	3.03
Guidance office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.11	312	0.0	$52.56	$504.00	$75.00	8.16
Conference room	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.27	779	0.0	$131.40	$855.00	$135.00	5.48
Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.11	312	0.0	$52.56	$504.00	$75.00	8.16
Nurse's office	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	9	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.19	555	0.0	$93.59	$526.50	$90.00	4.66
Nurse's office restroom	1	Incandescent : 1 Lamp - screw in	Wall Switch	60	1,625	Relamp	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	0.03	95	0.0	$16.07	$53.75	$5.00	3.03
Faculty restroom (2)	2	Incandescent : 1 Lamp - screw in	Wall Switch	60	1,625	Relamp	Yes	2	LED Screw-In Lamps: 1 Lamp - screw in	Occupancy Sensor	9	1,138	0.07	201	0.0	$33.84	$223.51	$10.00	6.31
CST Room 202	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,625	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,138	0.19	549	0.0	$92.52	$650.53	$115.00	5.79
Music room 204	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,138	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,138	0.44	879	0.0	$148.23	$1,141.60	$240.00	6.08
Music restroom	1	Compact Fluorescent: 1 Lamp - screw in	Wall Switch	13	1,625	Relamp	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	0.00	7	0.0	$1.23	$53.75	$0.00	43.74
Storage 209	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	364	0.05	50	0.0	$8.41	$233.00	$20.00	25.33
Girls restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.05	156	0.0	$26.28	$233.00	$20.00	8.10
Storage 208	2	Compact Fluorescent: 1 Lamp - screw in	Wall Switch	23	1,625	Relamp	Yes	2	LED Screw-In Lamps: 1 Lamp - screw in	Occupancy Sensor	16	1,138	0.02	44	0.0	$7.39	$223.51	$0.00	30.23

	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
Faculty restroom 211	2	Compact Fluorescent: 1 Lamp - screw in	Wall Switch	18	1,625	Relamp	Yes	2	LED Screw-In Lamps: 1 Lamp - screw in	Occupancy Sensor	13	1,138	0.01	34	0.0	$5.79	$223.51	$0.00	38.63
Copy room 215	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
215 A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.04	123	0.0	$20.80	$117.00	$20.00	4.66
Gym office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
CR 213	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,625	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,138	0.58	1,646	0.0	$277.55	$1,411.60	$275.00	4.10
CR 213 restroom	1	Compact Fluorescent: 1 Lamp - screw in	Wall Switch	13	1,625	Relamp	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	0.00	7	0.0	$1.23	$53.75	$0.00	43.74
Storage 210	1	Compact Fluorescent: 1 Lamp - screw in	Wall Switch	13	520	Relamp	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	520	0.00	2	0.0	$0.39	$53.75	$0.00	136.69
Library 219	35	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,625	Relamp	Yes	35	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,138	1.68	4,801	0.0	$809.52	$3,869.67	$770.00	3.83
219A	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.05	156	0.0	$26.28	$233.00	$20.00	8.10
Room 221	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,138	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,138	0.44	879	0.0	$148.23	$1,141.60	$240.00	6.08
Room 223	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,138	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.26	518	0.0	$87.35	$702.00	$120.00	6.66
220 OT/PT	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,138	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.26	518	0.0	$87.35	$702.00	$120.00	6.66
CR 218	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,138	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,138	0.44	879	0.0	$148.23	$1,141.60	$240.00	6.08
CR 216	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,138	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,138	0.44	879	0.0	$148.23	$1,141.60	$240.00	6.08
CR 214	12	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	1,138	Relamp	No	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,138	0.44	879	0.0	$148.23	$1,141.60	$240.00	6.08
Boys restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.08	234	0.0	$39.42	$445.50	$65.00	9.65
Cafeteria	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.33	935	0.0	$157.68	$972.00	$155.00	5.18
Exit light	1	Exit Signs: Incandescent	None	30	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	242	0.0	$40.77	$107.56	$0.00	2.64
Teachers break room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,200	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	840	0.11	230	0.0	$38.81	$504.00	$75.00	11.05
CR 103	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.66	1,870	0.0	$315.36	$1,674.00	$275.00	4.44
Restroom	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	None	Yes	1	LED Screw-In Lamps: 1 Lamp - screw in	Occupancy Sensor	9	1,138	0.00	5	0.0	$0.85	$116.00	$0.00	136.34
CR 105	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.41	1,169	0.0	$197.10	$1,147.50	$185.00	4.88
Restroom	1	Incandescent : 1 Lamp - screw in	Wall Switch	60	1,625	Relamp	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	0.03	95	0.0	$16.07	$53.75	$5.00	3.03
CR 107	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.41	1,169	0.0	$197.10	$1,147.50	$185.00	4.88
Restroom	1	Incandescent : 1 Lamp - screw in	Wall Switch	60	1,625	Relamp	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	0.03	95	0.0	$16.07	$53.75	$5.00	3.03

	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
CR 109	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.41	1,169	0.0	$197.10	$1,147.50	$185.00	4.88
CR 114	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.41	1,169	0.0	$197.10	$1,147.50	$185.00	4.88
CR 111	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.41	1,169	0.0	$197.10	$1,147.50	$185.00	4.88
CR 116	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,138	0.41	1,169	0.0	$197.10	$1,147.50	$185.00	4.88
CR 118	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,625	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.25	701	0.0	$118.26	$721.20	$125.00	5.04
CR 118	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,625	0.02	54	0.0	$9.14	$63.20	$0.00	6.92
CR 120	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,625	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.25	701	0.0	$118.26	$721.20	$125.00	5.04
CR 120	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,625	0.02	54	0.0	$9.14	$63.20	$0.00	6.92
Restroom 115	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
Custpodial closet 117	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.02	20	0.0	$3.33	$58.50	$10.00	14.58
Storage 119	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	364	0.05	50	0.0	$8.41	$233.00	$20.00	25.33
Mechanical room 113	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.09	247	0.0	$41.59	$234.00	$40.00	4.66
Motor lab	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,138	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.39	777	0.0	$131.02	$902.40	$180.00	5.51
CR 123	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,138	Relamp	No	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.45	907	0.0	$152.86	$1,052.80	$210.00	5.51
CR 123 restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
Classroom 123 storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
CR 125	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,138	Relamp	No	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.45	907	0.0	$152.86	$1,052.80	$210.00	5.51
CR 125 restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
Classroom 125 storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
CR 127	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,138	Relamp	No	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.45	907	0.0	$152.86	$1,052.80	$210.00	5.51
CR 127 restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
Classroom 127 storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
CR 128	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,138	Relamp	No	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.45	907	0.0	$152.86	$1,052.80	$210.00	5.51
CR 128 restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
Classroom 128 storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66

	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
CR 126	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,138	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.39	777	0.0	$131.02	$902.40	$180.00	5.51
CR 126	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,625	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.08	234	0.0	$39.42	$150.40	$65.00	2.17
CR 126 restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
Classroom 126 storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
CR 124	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	1,138	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.39	777	0.0	$131.02	$902.40	$180.00	5.51
CR 124	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,625	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.08	234	0.0	$39.42	$150.40	$65.00	2.17
CR 124 restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.02	62	0.0	$10.40	$58.50	$10.00	4.66
Classroom 124 storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.02	20	0.0	$3.33	$58.50	$10.00	14.58
CR 122	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,625	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,138	0.49	1,403	0.0	$236.52	$1,172.40	$215.00	4.05
Girls restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,625	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,138	0.14	411	0.0	$69.39	$555.40	$95.00	6.64
Boys restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,625	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,138	0.14	411	0.0	$69.39	$555.40	$95.00	6.64
Kitchen restroom	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	None	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen restroom	1	Compact Fluorescent: 1 Lamp - screw in	Wall Switch	18	1,625	Relamp	No	1	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	13	1,625	0.00	10	0.0	$1.70	$53.75	$0.00	31.59
Wash Area	3	Linear Fluorescent - T8: 2' T8 (17W) - 4L	Wall Switch	63	1,625	Relamp	No	3	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	1,625	0.06	163	0.0	$27.41	$229.60	$60.00	6.19
Servimg Area	8	Linear Fluorescent - T8: 2' T8 (17W) - 4L	Wall Switch	63	1,625	Relamp	No	8	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	1,625	0.15	434	0.0	$73.11	$612.27	$160.00	6.19
Kitchen hood	6	Incandescent : 1 Lamp - screw in	Wall Switch	60	1,625	Relamp	No	6	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	9	1,625	0.20	572	0.0	$96.42	$322.52	$30.00	3.03
Wash Area	5	Metal Halide: (1) 70W Lamp	Wall Switch	95	1,625	Fixture Replacement	No	5	LED - Fixtures: Ceiling Mount	Wall Switch	29	1,625	0.22	621	0.0	$104.77	$1,127.00	$50.00	10.28
Servimg Area	6	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	12	1,625	None	No	6	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	12	1,625	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cooking area	4	Linear Fluorescent - T8: 2' T8 (17W) - 4L	Wall Switch	63	1,625	Relamp	No	4	LED - Linear Tubes: (4) 2' Lamps	Wall Switch	34	1,625	0.08	217	0.0	$36.55	$306.13	$80.00	6.19
Kitchen storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	520	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	520	0.04	33	0.0	$5.65	$95.13	$20.00	13.31
Freezer	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.04	123	0.0	$20.80	$117.00	$20.00	4.66
Main entry	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	1,625	0.08	217	0.0	$36.55	$252.80	$0.00	6.92
Display cabinet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,625	0.04	123	0.0	$20.80	$117.00	$20.00	4.66
Bcom hall	19	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	19	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	1,138	0.48	1,381	0.0	$232.90	$3,000.80	$0.00	12.88
White hall	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,138	0.46	1,325	0.0	$223.38	$2,794.50	$170.00	11.75

	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
White hall	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,138	0.27	779	0.0	$131.40	$1,385.00	$100.00	9.78
White hall	6	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	1,625	Relamp	Yes	6	LED - Linear Tubes: (2) U-Lamp	High/Low Control	33	1,138	0.15	436	0.0	$73.55	$579.20	$0.00	7.88
Exterior light - Wall pack	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	58	4,380	None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	58	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Entry canopy fixtures	4	Compact Fluorescent: 1 Lamp - screw in	Wall Switch	18	4,380	Relamp	No	4	LED Screw-In Lamps: 1 Lamp - screw in	Wall Switch	13	4,380	0.01	109	0.0	$18.35	$215.01	$0.00	11.72
Ground lights	2	Metal Halide: (1) 100W Lamp	Wall Switch	128	4,380	Fixture Replacement	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	38	4,380	0.12	903	0.0	$152.20	$781.35	$200.00	3.82
Parking lots	6	High-Pressure Sodium: (1) 250W Lamp	Wall Switch	295	4,380	Fixture Replacement	No	6	LED - Fixtures: Outdoor Pole/Arm-Mounted Area/Roadway Fixture	Wall Switch	89	4,380	0.81	6,241	0.0	$1,052.33	$11,717.96	$600.00	10.57
All school	16	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	16	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room	Heat Distribution	2	Heating Hot Water Pump	1.5	86.5%	No	1,150	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room	Heat Distribution	2	Heating Hot Water Pump	3.0	89.5%	No	1,150	No	89.5%	Yes	2	0.75	2,502	0.0	$421.86	$6,015.30	$0.00	14.26
Boiler room	DHW	1	Other	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	DHW	1	Other	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 2	Heat Distribution	2	Heating Hot Water Pump	1.0	85.5%	No	1,150	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mech room	Chiller	1	Chilled Water Pump	7.5	88.5%	No	3,391	No	88.5%	Yes	1	0.95	9,326	0.0	$1,572.48	$3,606.80	$0.00	2.29
Unknown	AHU 1	1	Return Fan	15.0	92.4%	No	3,391	No	92.4%	Yes	1	1.96	7,392	0.0	$1,246.43	$5,194.45	$1,200.00	3.20
Unknown	AHU 1	1	Supply Fan	25.0	93.6%	No	4,067	No	93.6%	Yes	1	3.23	14,586	0.0	$2,459.58	$8,002.70	$2,000.00	2.44
Chiller	fan motors	10	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
AHUs	VAV boxes	12	Supply Fan	0.3	60.0%	Yes	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
AHUs	Whole Building	5	Exhaust Fan	0.3	68.0%	Yes	2,745	No	68.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Main office	Main office	1	Split-System AC	0.75		Yes	1	Split-System AC	0.75		14.00		No	0.24	205	0.0	$34.63	$1,122.17	$69.00	30.41
Principals office	Principals office	1	Split-System AC	0.75		Yes	1	Split-System AC	0.75		14.00		No	0.24	205	0.0	$34.63	$1,122.17	$69.00	30.41
Guidance office	Guidance office	1	Window AC	0.67		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Conference room	Conference room	1	Window AC	1.19		Yes	1	Window AC	1.19		12.00		No	0.10	84	0.0	$14.20	$1,295.62	$0.00	91.25
Office	Office	1	Window AC	0.67		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Music Room	Music Room	1	Window AC	2.38		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 213	CR 213	1	Window AC	2.08		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 221	Room 221	1	Window AC	2.08		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 223	Room 223	1	Window AC	2.08		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Teachers lounge	Teachers lounge	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 103	CR 103	1	Window AC	2.08		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 107	CR 107	1	Window AC	2.08		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 114	CR 114	1	Window AC	2.38		Yes	1	Window AC	2.80		12.00		No	0.37	318	0.0	$53.61	$3,048.53	$0.00	56.86
CR 116	CR 116	1	Window AC	2.08		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Nurse's office	Nurse's office	1	Window AC	1.19		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Media center	Media center	2	Packaged AC	5.00		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
Grounds	New section	1	Air-Cooled Screw Chiller	100.00	Yes	1	Air-Cooled Centrifugal Chiller	Variable	100.00	1.24	0.74	33.01	45,328	0.0	$7,643.25	$85,318.42	$9,000.00	9.99

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 1	Boiler room 1	1	Non-Condensing Hot Water Boiler	4,200.00	Yes	1	Non-Condensing Hot Water Boiler	4,200.00	90.00%	Ec	0.00	0	107.3	$1,107.52	$71,968.35	$0.00	64.98
Boiler room 2	Boiler room 2	1	Non-Condensing Hot Water Boiler	2,855.20	Yes	1	Non-Condensing Hot Water Boiler	2,855.20	90.00%	Ec	0.00	0	73.0	$752.90	$49,660.94	$3,711.76	61.03

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler room 1	One half building	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler room 2	Other half building	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	Cooler (35F to 55F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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	1	Refrigerator Chest	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Gas Steamer	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Combination Oven/Steam Cooker (<15 Pans)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Gas Convection Oven (Half Size)	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

Location	Existing Conditions			
	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
John C Milanesi Elementary School	3	Photo copier	400.0	Yes
John C Milanesi Elementary School	50	Desktop computer	145.0	Yes
John C Milanesi Elementary School	8	Desk printer	60.0	Yes
John C Milanesi Elementary School	1	LCD Tv	100.0	Yes
John C Milanesi Elementary School	13	Laptop	70.0	Yes
John C Milanesi Elementary School	3	Refrigerator	216.0	Yes
John C Milanesi Elementary School	2	Mini fridge	70.0	Yes
John C Milanesi Elementary School	17	Projector	200.0	Yes
John C Milanesi Elementary School	17	Smart board	5.0	Yes
John C Milanesi Elementary School	1	Chest freezer	20.0	Yes
John C Milanesi Elementary School	1	Chest refrigerator	40.0	Yes
John C Milanesi Elementary School	1	Toaster oven	1,200.0	Yes
John C Milanesi Elementary School	2	Microwave	900.0	Yes
John C Milanesi Elementary School	1	Coffee machine	400.0	Yes
John C Milanesi Elementary School	1	Water cooler	500.0	Yes
John C Milanesi Elementary School	5	CRT TV	120.0	Yes
John C Milanesi Elementary School	31	Chrome books	30.0	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
Teachers lounge	1	Refrigerated	Yes	0.00	1,612	0.0	$271.79	$230.00	$0.00	0.85

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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15

ENERGY STAR® Score[1]

John C. Milanesi Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 39,817
Built: 1958

For Year Ending: April 30, 2017
Date Generated: June 11, 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
John C. Milanesi Elementary School 880 Harding Highway Buena, New Jersey 08310	Buena Regional School District 914 Main Avenue Richland, NJ 08350 (856) 697-0800	Joe Biluck, Jr. 914 Main Avenue Richland, NJ 08350 (856) 697-0800 jbiluck@buena.k12.nj.us

Property ID: 6358235

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
92.1 kBtu/ft²

Source EUI
173.6 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	2,201,376 (60%)
Electric - Grid (kBtu)	1,465,454 (40%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	65.9
National Median Source EUI (kBtu/ft²)	124.3
% Diff from National Median Source EUI	40%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	280

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)