Local Government Energy Audit:
Energy Audit Report

Caroline L. Reutter School

2150 Delsea Drive

Franklinville, NJ 08322

Franklin Township BOE

July 13, 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 saving are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

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

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

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

Table of Contents

Table of Figures

1 EXECUTIVE SUMMARY

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Caroline L. Reutter 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 local governments in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Caroline L. Reutter School is a 56,905 square foot, single-story building. The building is comprised of spaces such as offices, classrooms, gym, restrooms, commercial kitchen and mechanical spaces. Typical week day occupancy is 7 AM to 3 PM.

Heating is provided using a combination of condensing hot water boilers serving one section and two old furnaces serving the other parts. The school is cooled using window ACs in the offices and classrooms and packaged rooftop units in the large spaces like the library and gym. The lighting primarily consists of T8 linear lamps while smaller spaces are lit using incandescent and compact fluorescent lamps. 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 nine measures which together represent an opportunity for Caroline L. Reutter School to reduce annual energy costs by $17,464 and annual greenhouse gas emissions by 140,334 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 15.2 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 Caroline L. Reutter School's annual energy use by 15%.

Figure 1 – Previous 12 Month Utility Costs

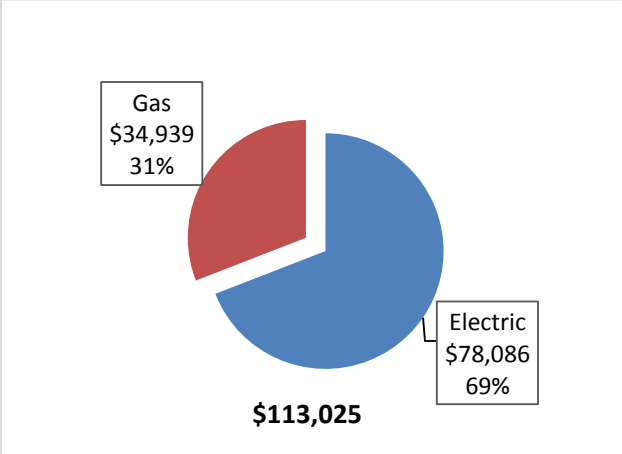
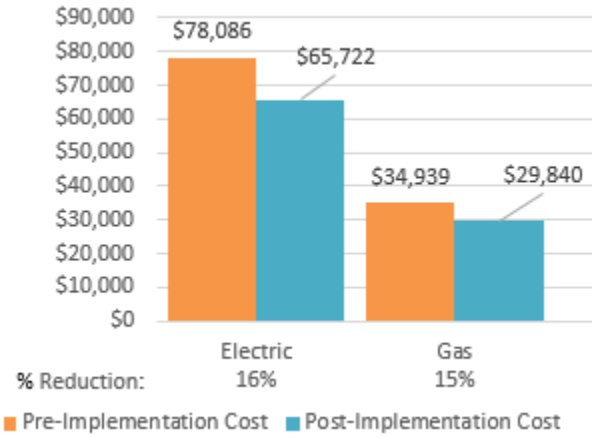


Figure 2 – Potential Post-Implementation Costs



A detailed description of Caroline L. Reutter 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			**65,797**	**19.2**	**0.0**	**$9,934.98**	**$98,995.55**	**$10,730.00**	**$88,265.55**	**8.9**	**66,257**
ECM 1	Install LED Fixtures	Yes	10,870	1.4	0.0	$1,641.28	$9,376.25	$2,400.00	$6,976.25	4.3	10,946
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	48,271	16.2	0.0	$7,288.65	$84,338.83	$7,815.00	$76,523.83	10.5	48,609
ECM 3	Retrofit Fixtures with LED Lamps	Yes	3,916	1.4	0.0	$591.30	$3,452.04	$515.00	$2,937.04	5.0	3,943
ECM 4	Install LED Exit Signs	Yes	2,740	0.2	0.0	$413.74	$1,828.44	$0.00	$1,828.44	4.4	2,759
Lighting Control Measures			**9,907**	**3.2**	**0.0**	**$1,495.92**	**$4,716.00**	**$790.00**	**$3,926.00**	**2.6**	**9,976**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	9,907	3.2	0.0	$1,495.92	$4,716.00	$790.00	$3,926.00	2.6	9,976
Variable Frequency Drive (VFD) Measures			**6,179**	**0.8**	**0.0**	**$932.97**	**$6,015.30**	**$0.00**	**$6,015.30**	**6.4**	**6,222**
ECM 6	Install VFDs on Hot Water Pumps	Yes	6,179	0.8	0.0	$932.97	$6,015.30	$0.00	$6,015.30	6.4	6,222
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**451.6**	**$4,659.34**	**$133,984.17**	**$14,400.00**	**$119,584.17**	**25.7**	**52,878**
ECM 7	Install High Efficiency Hot Water Boilers	Yes	0	0.0	451.6	$4,659.34	$133,984.17	$14,400.00	$119,584.17	25.7	52,878
Domestic Water Heating Upgrade			**0**	**0.0**	**42.7**	**$440.63**	**$50,188.87**	**$1,750.00**	**$48,438.87**	**109.9**	**5,001**
ECM 8	Install High Efficiency Gas Water Heater	Yes	0	0.0	32.6	$336.40	$50,110.00	$1,750.00	$48,360.00	143.8	3,818
ECM 9	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	10.1	$104.23	$78.87	$0.00	$78.87	0.8	1,183
TOTALS			**81,883**	**23.2**	**494.3**	**$17,463.83**	**$293,899.89**	**$27,670.00**	**$266,229.89**	**15.2**	**140,334**

* - 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.

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

Energy Efficient Practices

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

- Perform Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Use Thermostat Schedules and Temperature Resets
- Perform Boiler Maintenance
- Perform Water Heater Maintenance
- 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 Caroline L. Reutter School. 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.

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

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 8.5 for additional information on the ESIP Program.

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

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

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Thomas Rambone	Maintenance Department	trambone@franklintwpschools.org	(856) 697-0220
Jennifer Thies	Maintenance Department	jthies@franklintwpschools.org	(856) 697-0220
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On January 11, 2017, TRC performed an energy audit at Caroline L. Reutter School located in Franklinville, New Jersey. TRC's team met with George Ruczynski to review the facility operations and help focus our investigation on specific energy-using systems.

Caroline L. Reutter School is a 56,905 square foot, single-story building. The building is comprised of spaces like offices, classrooms, gym, restrooms, a commercial kitchen and mechanical spaces. A typical day in the school is from 7 AM to 3 PM.

The building was constructed in 1952. Heating is provided by a combination of condensing hot water boilers serving one section and a couple of old furnaces serving the other. Space cooling is provided by window ACs in the offices and classrooms and packaged units in the large spaces like the library and gym. The lighting consists of T8 linear tubes and smaller spaces are lit using incandescent and compact fluorescent lamps. These are inefficient and in need of replacement.

2.3 Building Occupancy

The typical schedule is presented in the table below. During a typical day, the facility is occupied by 50 staff (including teachers, administrators and maintenance) and 435 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Caroline L.Reutter School	Weekday	7AM - 3PM
Caroline L.Reutter School	Weekend	No operation

2.4 Building Envelope

The older section of the building has a concrete block construction, and the new wing has a basic construction using stuccos and dry wall. The school building has a brick façade with aluminum framed windows. Due to inclement weather on the day of the audit, the auditor onsite was unable to access the roof. Upon acquiring data from various resources, the roof appears to be in a good condition. Both sections of the building have double pane windows from the respective times of installation. Most exterior doors in the building were single pane aluminum framed glass doors. These were old and showed signs of excessive infiltration.

Image 1 Building envelope

2.5 On-Site Generation

Caroline L. Reutter School does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

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

Lighting System

Lighting at the facility is mostly provided by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFL). Most of the fixtures are 2-lamp, 3-lamp or 4-lamp, 4-foot long troffers.

A small area of the building and the majority of the office spaces are primarily lit with 26-Watt CFL lamps in recessed can ceiling fixtures or 100-Watt incandescent fixtures. Lighting control in most spaces is provided by manual switches. The building's exterior lighting consists primarily of 100-Watt or 150-Watt metal halide fixtures. The exit signs at the facility, as mentioned by the site contact are fluorescent lamp fixtures.

Image 2 Typical lighting fixtures at the facility

Hot Water (or Steam) Heating System

The hot water system consists of two condensing hot water boilers and two old furnaces serving different zones of the school to provide heat. The two gas-fired condensing hot water boilers have an input capacities of 140 Mbh and 1720 Mbh, respectively. Heating hot water is supplied at 180°F when the outside air temperature is below 50°F and modulated accordingly for lower temperatures until the outside air is 65°F. Above this temperature the boilers are shut down. These boilers have an efficiency of over 88%, less than 13 years old, and are in good condition.

The two furnaces are gas-fired with an input capacity of 3750 Mbh each and have an efficiency of 75%. Both furnaces are 40 years old and original to the building. It is recommended that these furnaces be changed to high-efficiency condensing hot water boilers. The heat from the furnace is distributed to the respective zones using supply motor of 3 hp and 5 hp through the ceiling vents.

The heating demand in the school is controlled using pneumatic systems. When the temperature in the rooms goes below the setpoint of the room, the pressure releases and opens the valve to let the hot water circulate through the coil. The blower fan in the unit vent then releases hot air into the room. When the temperature reaches the setpoint, the valve then closes.

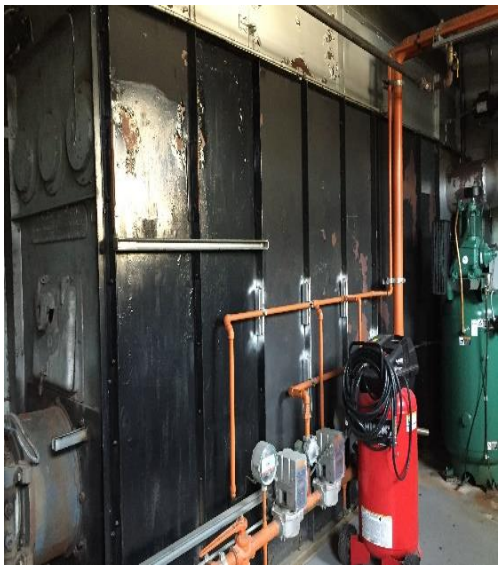



Image 3 Hot water systems at the school

Direct Expansion Air Conditioning System (DX)

Space cooling is provided by window ACs in smaller spaces such as the classrooms and certain office spaces. All window AC units are less than ten years old. Larger spaces like the gym, library, main office, etc., are provided by the packaged units. The packaged units are two 5 ton, two 10 ton, and one 25 ton and were installed in 2014. The units are controlled by individual thermostats located in the respective zones.


Image 4 Space cooling unit and controlling thermostat samples at the facility

Domestic Hot Water Heating System

The facility has three gas-fired domestic hot water heaters (Bradford White and AERCO) and one indirect hot water system (Munchkin). The Bradford White units have an input capacity of 40 MBh and the AERCO system has an input capacity 1000 MBh. These boilers have a tank capacity of 40 gallons and 20 gallons, respectively. The Munchkin system is an indirect heater that serves one big classroom.

Food Service & Laundry Equipment

The school has an all-electric kitchen that is used to prepare snacks and lunches for the students and staff. The kitchen is also used to prepare hot snacks for three fundraising events each year. Most of the cooking is done using the two convection ovens. There is a food holding cabinet and an electric steamer.

Image 5 Typical kicthen equipment

Refrigeration

The kitchen has a walk-in freezer that is used to store food prepared for school lunches. The refrigerator has a single. 10 ton air-cooled scroll compressor. The walk-in space temperature is maintained at -5°F. The kitchen also has free-standing solid door commercial refrigerators and freezers.

Building Plug Load

There are 61 computer work stations and 20 laptops throughout the facility. Ninety percent of the computers are desktop units with LCD monitors. There is no centralized PC power management software installed.

Other plug loads in the school include printers, refrigerators, projectors, microwave ovens, coffee machines, televisions, smart boards, etc. No refrigerated beverage vending machines were observed onsite.

2.7 Water-Using Systems

A sampling of restrooms found that the faucets are rated for 2.5 gallons per minute (gpm) or higher, the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 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 0 for additional information.

3.1 Total Cost of Energy

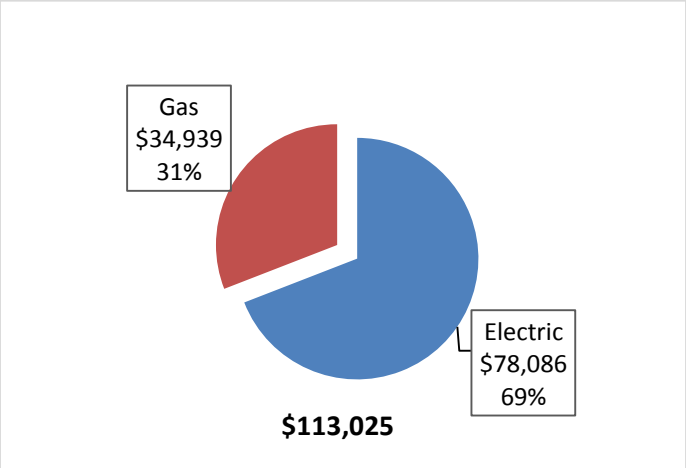
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for Caroline L. Reutter School		
Fuel	**Usage**	**Cost**
Electricity	517,143 kWh	$78,086
Natural Gas	33,866 Therms	$34,939
Total		**$113,025**

The current annual energy cost for this facility is $113,025 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by Atlantic City Electric. The average electric cost over the past 12 months was $0.151/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 First Energy Sol. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

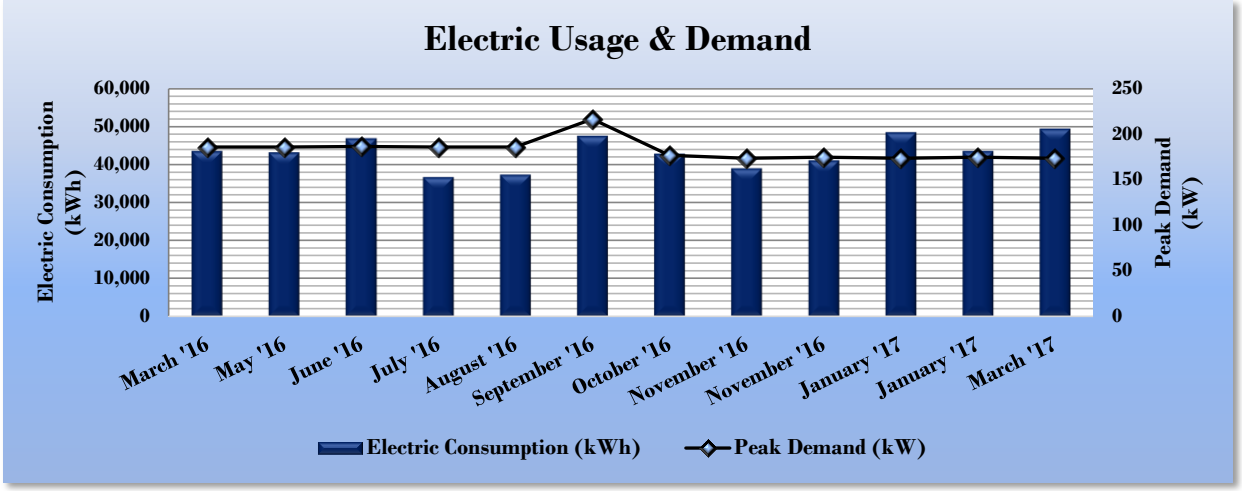


Figure 9 - Electric Usage & Demand

Electric Billing Data for Caroline L. Reutter School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
4/15/16	30	43,440	186	$1,745	$6,522
5/16/16	31	43,120	186	$1,423	$6,486
6/16/16	31	46,800	186	$1,098	$6,906
7/18/16	32	36,600	186	$1,526	$5,800
8/17/16	30	37,240	186	$1,354	$5,769
9/19/16	33	47,440	217	$1,247	$7,585
10/19/16	30	42,760	177	$1,185	$6,474
11/16/16	28	38,920	173	$1,566	$5,865
12/15/16	29	41,000	175	$1,312	$6,162
1/18/17	34	48,400	173	$1,270	$7,242
2/14/17	27	43,480	175	$1,227	$6,313
3/17/17	31	49,360	173	$1,437	$7,175
Totals	**366**	**518,560**	**216.8**	**$16,390**	**$78,300**
Annual	**365**	**517,143**	**216.8**	**$16,345**	**$78,086**

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.

Figure 10 - Natural Gas Usage

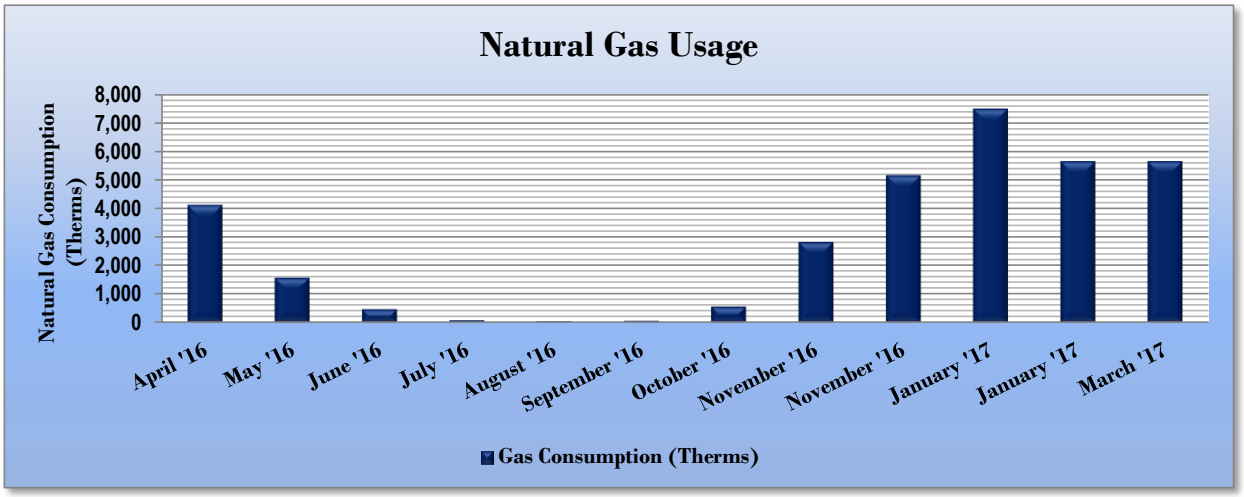


Figure 11 - Natural Gas Usage

Gas Billing Data for Caroline L. Reutter School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
4/18/16	30	4,130	$4,046
5/17/16	29	1,570	$1,527
6/17/16	31	460	$471
7/18/16	31	70	$98
8/17/16	30	30	$58
9/21/16	35	50	$80
10/19/16	28	560	$603
11/16/16	28	2,820	$3,023
12/15/16	29	5,170	$5,875
1/18/17	34	7,500	$7,608
2/15/17	28	5,660	$5,623
3/17/17	30	5,660	$5,735
Totals	**363**	**33,680**	**$34,748**
Annual	**365**	**33,866**	**$34,939**

3.4 Benchmarking

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

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

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Caroline L. Reutter School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	159.9	141.4
Site Energy Use Intensity (kBtu/ft^2)	90.5	58.2

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

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

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Caroline L. Reutter School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	135.3	141.4
Site Energy Use Intensity (kBtu/ft^2)	76.9	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 40. A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

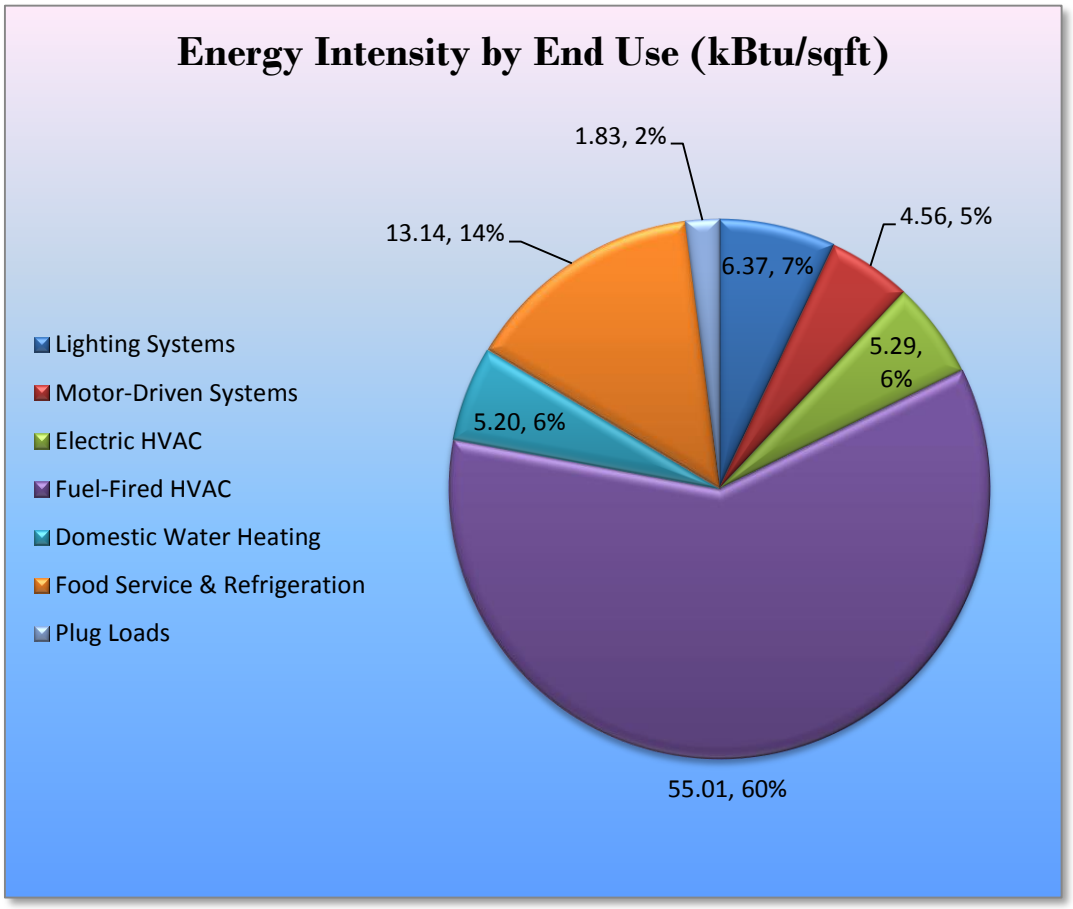
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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

3.5 Energy End-Use Breakdown

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

Figure 14 - Energy Balance (kBtu/SqFt)



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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**65,797**	**19.2**	**0.0**	**$9,934.98**	**$98,995.55**	**$10,730.00**	**$88,265.55**	**8.9**	**66,257**
ECM 1	Install LED Fixtures	10,870	1.4	0.0	$1,641.28	$9,376.25	$2,400.00	$6,976.25	4.3	10,946
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	48,271	16.2	0.0	$7,288.65	$84,338.83	$7,815.00	$76,523.83	10.5	48,609
ECM 3	Retrofit Fixtures with LED Lamps	3,916	1.4	0.0	$591.30	$3,452.04	$515.00	$2,937.04	5.0	3,943
ECM 4	Install LED Exit Signs	2,740	0.2	0.0	$413.74	$1,828.44	$0.00	$1,828.44	4.4	2,759
Lighting Control Measures		**9,907**	**3.2**	**0.0**	**$1,495.92**	**$4,716.00**	**$790.00**	**$3,926.00**	**2.6**	**9,976**
ECM 5	Install Occupancy Sensor Lighting Controls	9,907	3.2	0.0	$1,495.92	$4,716.00	$790.00	$3,926.00	2.6	9,976
Variable Frequency Drive (VFD) Measures		**6,179**	**0.8**	**0.0**	**$932.97**	**$6,015.30**	**$0.00**	**$6,015.30**	**6.4**	**6,222**
ECM 6	Install VFDs on Hot Water Pumps	6,179	0.8	0.0	$932.97	$6,015.30	$0.00	$6,015.30	6.4	6,222
Gas Heating (HVAC/Process) Replacement		**0**	**0.0**	**451.6**	**$4,659.34**	**$133,984.17**	**$14,400.00**	**$119,584.17**	**25.7**	**52,878**
ECM 7	Install High Efficiency Hot Water Boilers	0	0.0	451.6	$4,659.34	$133,984.17	$14,400.00	$119,584.17	25.7	52,878
Domestic Water Heating Upgrade		**0**	**0.0**	**42.7**	**$440.63**	**$50,188.87**	**$1,750.00**	**$48,438.87**	**109.9**	**5,001**
ECM 8	Install High Efficiency Gas Water Heater	0	0.0	32.6	$336.40	$50,110.00	$1,750.00	$48,360.00	143.8	3,818
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	10.1	$104.23	$78.87	$0.00	$78.87	0.8	1,183
TOTALS		**81,883**	**23.2**	**494.3**	**$17,463.83**	**$293,899.89**	**$27,670.00**	**$266,229.89**	**15.2**	**140,334**

* - 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

Recommended upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**65,797**	**19.2**	**0.0**	**$9,934.98**	**$98,995.55**	**$10,730.00**	**$88,265.55**	**8.9**	**66,257**
ECM 1	Install LED Fixtures	10,870	1.4	0.0	$1,641.28	$9,376.25	$2,400.00	$6,976.25	4.3	10,946
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	48,271	16.2	0.0	$7,288.65	$84,338.83	$7,815.00	$76,523.83	10.5	48,609
ECM 3	Retrofit Fixtures with LED Lamps	3,916	1.4	0.0	$591.30	$3,452.04	$515.00	$2,937.04	5.0	3,943
ECM 4	Install LED Exit Signs	2,740	0.2	0.0	$413.74	$1,828.44	$0.00	$1,828.44	4.4	2,759

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	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	10,870	1.4	0.0	$1,641.28	$9,376.25	$2,400.00	$6,976.25	4.3	10,946

Measure Description

We recommend replacing existing fixtures containing HID (on the exterior) lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

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

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	48,271	16.2	0.0	$7,288.65	$84,338.83	$7,815.00	$76,523.83	10.5	48,609
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing T8 fluorescent fixtures by removing fluorescent tubes and ballasts and replacing them with LEDs and LED drivers (if necessary), which are designed to be used retrofitted into fluorescent fixtures. The measure uses the existing fixture housing but replaces the rest of the components with more efficient lighting technology. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	3,916	1.4	0.0	$591.30	$3,452.04	$515.00	$2,937.04	5.0	3,943
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

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

ECM 4: Install LED EXIT Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	2,740	0.2	0.0	$413.74	$1,828.44	$0.00	$1,828.44	4.4	2,759
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

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**9,907**	**3.2**	**0.0**	**$1,495.92**	**$4,716.00**	**$790.00**	**$3,926.00**	**2.6**	**9,976**
ECM 5	Install Occupancy Sensor Lighting Controls	9,907	3.2	0.0	$1,495.92	$4,716.00	$790.00	$3,926.00	2.6	9,976

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

ECM 5: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
9,907	3.2	0.0	$1,495.92	$4,716.00	$790.00	$3,926.00	2.6	9,976

Measure Description

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

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

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 18 below.

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**6,179**	**0.8**	**0.0**	**$932.97**	**$6,015.30**	**$0.00**	**$6,015.30**	**6.4**	**6,222**
ECM 6	Install VFDs on Hot Water Pumps	6,179	0.8	0.0	$932.97	$6,015.30	$0.00	$6,015.30	6.4	6,222

ECM 6: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
6,179	0.8	0.0	$932.97	$6,015.30	$0.00	$6,015.30	6.4	6,222

Measure Description

We recommend installing variable frequency drives (VFD) to control the 3 hp hot water pumps serving the condensing boilers. 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 Gas-Fired Heating System Replacements

Our recommendations for gas-fired heating system replacements are summarized in Figure 19 below.

Figure 19 - Summary of Gas-Fired Heating Replacement ECMs

	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)
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**451.6**	**$4,659.34**	**$133,984.17**	**$14,400.00**	**$119,584.17**	**25.7**	**52,878**
ECM 7	Install High Efficiency Hot Water Boilers	Yes	0	0.0	451.6	$4,659.34	$133,984.17	$14,400.00	$119,584.17	25.7	52,878

ECM 7: 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	451.6	$4,659.34	$133,984.17	$14,400.00	$119,584.17	25.7	52,878

Measure Description

We recommend replacing the two old, inefficient furnaces at the school 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.

4.1.5 Domestic Hot Water Heating System Upgrades

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

Figure 20 - Summary of Domestic Water Heating ECMs

	Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**42.7**	**$440.63**	**$50,188.87**	**$1,750.00**	**$48,438.87**	**109.9**	**5,001**
ECM 8	Install High Efficiency Gas Water Heater	0	0.0	32.6	$336.40	$50,110.00	$1,750.00	$48,360.00	143.8	3,818
ECM 9	Install Low-Flow Domestic Hot Water Devices	0	0.0	10.1	$104.23	$78.87	$0.00	$78.87	0.8	1,183

ECM 8: Install High Efficiency Gas Water Heater

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	32.6	$336.40	$50,110.00	$1,750.00	$48,360.00	143.8	3,818

Measure Description

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

ECM 9: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	10.1	$104.23	$78.87	$0.00	$78.87	0.8	1,183

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand in certain areas of the school such as office spaces, staff restrooms, art room etc. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow showerheads can reduce hot water usage, relative to standard showerheads and aerators, which saves energy. Pre-rinse spray valves often used in commercial and institutional kitchens are designed to remove food waste from dishes prior to dishwashing. Replacing standard pre-rinse spray valves with low flow PRSVs will reduce hot water usage and save energy.

Low-flow devices reduce the overall water flow from the fixture, while still providing adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

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.

Perform Lighting Maintenance

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

Develop a Lighting Maintenance Schedule

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

Use 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.

Perform 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 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.

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).

Refer to Section 4.1.5 for any low-flow ECM recommendations.

6 On-Site Generation Measures

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

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

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

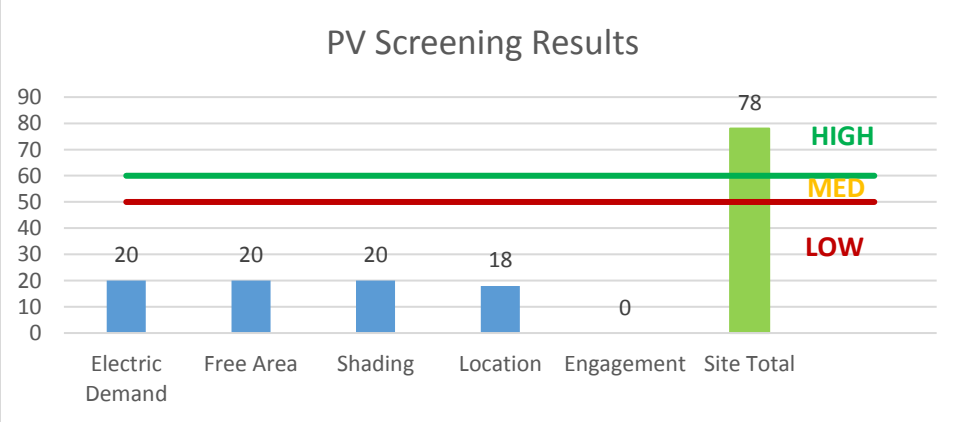
6.1 Photovoltaic

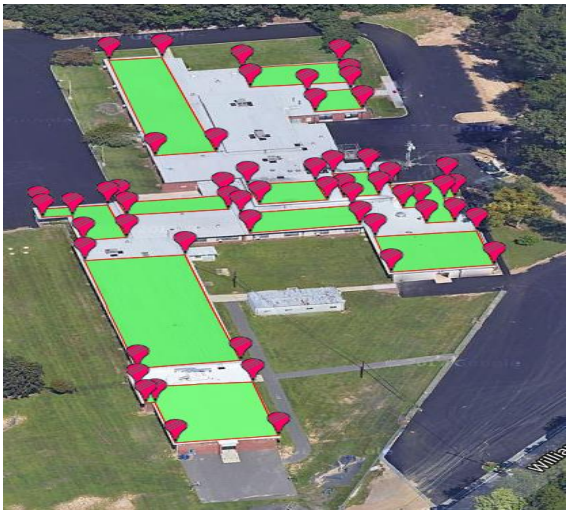
Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical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

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

In order to be cost-effective, a solar PV array needs certain minimum criteria, such as flat or south-facing rooftop or other unshaded space on which to place the PV panels. In our opinion, the facility appears to be a good candidate for a cost-effective PV installation.

Figure 21 - Photovoltaic Screening





Potential	High	
System Potential	120	kW DC STC
Electric Generation	142,965	kWh/yr
Displaced Cost	$12,440	/yr
Installed Cost	$312,000	

Solar projects must register their projects in the SREC Registration Program 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 8.4 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.

Lack of gas service, 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/.

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

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	Pay For Performance Existing Buildings
ECM 1	Install LED Fixtures	x	x
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x	x
ECM 3	Retrofit Fixtures with LED Lamps	x	x
ECM 4	Install LED Exit Signs		x
ECM 5	Install Occupancy Sensor Lighting Controls	x	x
ECM 6	Install VFDs on Hot Water Pumps	x	x
ECM 7	Install High Efficiency Hot Water Boilers	x	x
ECM 8	Install High Efficiency Gas Water Heater		x
ECM 9	Install Low-Flow Domestic Hot Water Devices	x	x

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 Direct Install

Overview

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

Incentives

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

How to Participate

To participate in the Direct Install program you will need to contact the participating contractor who operates in the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since Direct Install offers a free assessment of eligible measures, Direct Install is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

The utility data provided to us (2016-2017 data period) contains only 1 month of peak demand >200kW. We suggest that the customer checks the website www.njcleanenergy.com/DI for possibilities (to make an exception and still qualify for the Direct Install) and updates regarding the same in FY2018.

8.3 Pay for Performance - Existing Buildings

Overview

The Pay for Performance–Existing Buildings (P4P EB) program is designed for larger customers with a peak demand over 200 kW in any of the preceding 12 months. Under this program the minimum installed scope of work must include at least two unique measures resulting in at least 15% energy savings, where lighting cannot make up the majority of the savings. P4P is a generally a good option for medium to large sized facilities looking to implement as many measures as possible under a single project in order to achieve deep energy savings. This program has an added benefit of evaluating a broad spectrum of measures that may not otherwise qualify under other programs. Many facilities pursuing an Energy Savings Improvement Program (ESIP) loan also utilize the P4P program.

Incentives

Incentives are calculated based on estimated and achieved energy savings ranging from $0.18-$0.22/kWh and $1.80-$2.50/therm, capped at the lesser of 50% total project cost, or $1 million per electric account and $1 million per natural gas account, per fiscal year, not to exceed $2 million per project. An incentive of $0.15/square foot is also available to offset the cost of developing the Energy Reduction Plan (see below) contingent on the project moving forward with measure installation.

How to Participate

To participate in the P4B EB program you will need to contact one of the pre-approved consultants and contractors ("Partners"). Under direct contract to you, the Partner will help further evaluate the measures identified in this report through development of the Energy Reduction Plan (ERP), assist you in implementing selected measures, and verify actual savings one year after the installation. At each of these three milestones your Partner will also facilitate securing program incentives.

Approval of the final scope of work is required by the program prior to installation completion. Although installation can be accomplished by a contractor of your choice (some P4P Partners are also contractors) or by internal personnel, the Partner must remain involved to ensure compliance with the program guidelines and requirements.

Detailed program descriptions, instructions for applying, applications and list of Partners can be found at: www.njcleanenergy.com/P4P.

8.4 SREC Registration Program

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

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

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows 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

8.5 Energy Savings Improvement Program

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

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

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

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

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

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

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 32,31,30	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,760	Relamp & Reballast	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,232	0.19	594	0.0	$89.73	$763.33	$100.00	7.39
Room 32,31,30	10	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,760	Relamp & Reballast	Yes	10	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,232	0.14	427	0.0	$64.48	$1,186.00	$120.00	16.53
Room 29	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Furnace Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$20.17	$234.00	$20.00	10.61
Room 20	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
CR 28	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Girls' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	780	Relamp & Reballast	No	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	780	0.11	151	0.0	$22.75	$485.50	$60.00	18.70
Boys' restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	780	Relamp & Reballast	No	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	780	0.11	151	0.0	$22.75	$485.50	$60.00	18.70
CR 27	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
CR 21	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
CR 26	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
CR 22	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
CR 24	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
CR 23	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Hallway	19	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp & Reballast	No	19	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.20	671	0.0	$101.35	$2,033.00	$190.00	18.18
Computer Room - 49	21	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp & Reballast	Yes	21	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.86	2,659	0.0	$401.44	$2,877.50	$335.00	6.33
Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,920	Relamp & Reballast	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,920	0.22	729	0.0	$110.02	$1,170.00	$100.00	9.73
Staff bath	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	780	Relamp & Reballast	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	546	0.05	65	0.0	$9.85	$233.00	$30.00	20.62
Room 50	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp & Reballast	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.49	1,519	0.0	$229.39	$1,694.00	$200.00	6.51
Room 55	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp & Reballast	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.49	1,519	0.0	$229.39	$1,694.00	$200.00	6.51
Room 53	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp & Reballast	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.25	760	0.0	$114.70	$905.00	$110.00	6.93
Room 52	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp & Reballast	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.25	760	0.0	$114.70	$905.00	$110.00	6.93
Guidance office	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp & Reballast	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.08	253	0.0	$38.23	$379.00	$50.00	8.61
Conference room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp & Reballast	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.25	760	0.0	$114.70	$905.00	$110.00	6.93
Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	208	Relamp & Reballast	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	208	0.13	47	0.0	$7.15	$526.00	$60.00	65.16

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	14	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp & Reballast	No	14	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.15	495	0.0	$74.68	$1,498.00	$140.00	18.18
Room 33	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.19	591	0.0	$89.21	$935.00	$90.00	9.47
Art Room 19	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp & Reballast	Yes	15	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,232	0.62	1,899	0.0	$286.74	$2,088.50	$245.00	6.43
Art Room 19	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.02	67	0.0	$10.09	$117.00	$10.00	10.61
Women's restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	780	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Occupancy Sensor	93	780	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Child study team	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Gym	6	Linear Fluorescent - T8: 4' T8 (32W) - 6L	Wall Switch	176	1,760	Relamp & Reballast	No	6	LED - Linear Tubes: (6) 4' Lamps	Wall Switch	87	1,760	0.35	1,081	0.0	$163.20	$1,319.00	$180.00	6.98
Room 9	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Supply room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	520	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	520	0.04	39	0.0	$5.96	$234.00	$20.00	35.91
Room 17	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Room 16	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Store Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	208	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	208	0.09	32	0.0	$4.77	$468.00	$40.00	89.77
Room 11	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Hallway	7	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp & Reballast	No	7	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.07	247	0.0	$37.34	$749.00	$70.00	18.18
Room 32,31,30	1	Incandescent: Ceiling mount fixture - 1 lamp	Wall Switch	30	1,760	None	No	1	Incandescent: Ceiling mount fixture - 1 lamp	Wall Switch	30	1,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 32,31,30	1	Incandescent: Recessed fixture - 1 lamp	Wall Switch	30	1,760	None	No	1	Incandescent: Recessed fixture - 1 lamp	Wall Switch	30	1,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Furnace Room	3	Incandescent: Ceiling mount fixture - 1 lamp	Wall Switch	100	1,760	Relamp	No	3	LED Screw-In Lamps: Ceiling mount fixture - 1 lamp	Wall Switch	14	1,760	0.17	522	0.0	$78.85	$293.56	$15.00	3.53
Boys' restroom	1	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	26	780	None	No	1	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	26	780	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Girls' restroom	1	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	26	780	None	No	1	Compact Fluorescent: Recessed fixture - 1 lamp	Wall Switch	26	780	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Supply room	4	Incandescent: Ceiling mount fixture - 1 lamp	Wall Switch	100	208	Relamp	No	4	LED Screw-In Lamps: Ceiling mount fixture - 1 lamp	Wall Switch	14	208	0.23	82	0.0	$12.42	$391.41	$20.00	29.89
Child study team	1	Incandescent: Recessed fixture - 1 lamp	Wall Switch	100	1,760	None	No	1	Incandescent: Recessed fixture - 1 lamp	Wall Switch	100	1,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Bathroom	1	Incandescent: Recessed fixture - 1 lamp	Wall Switch	100	780	None	No	1	Incandescent: Recessed fixture - 1 lamp	Wall Switch	100	780	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	6	Exit Signs: Fluorescent	None	22	8,760	Fixture Replacement	No	6	LED Exit Signs: 2 W Lamp	None	6	8,760	0.06	967	0.0	$146.03	$645.33	$0.00	4.42
Gym	4	Exit Signs: Fluorescent	None	22	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.04	645	0.0	$97.35	$430.22	$0.00	4.42
Room 12	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 13	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Girls' restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	780	Relamp & Reballast	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	546	0.16	224	0.0	$33.89	$796.00	$95.00	20.69
Boys' restroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	780	Relamp & Reballast	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	546	0.16	224	0.0	$33.89	$796.00	$95.00	20.69
Custodian closet	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	208	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	208	0.01	4	0.0	$0.58	$107.00	$10.00	167.85
Room 14	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Room 15	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Ladies Lavotory	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	780	None	No	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	780	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ladies Lavotory	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	780	None	No	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	780	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Men's Lavatory	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	780	None	No	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	780	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Men's Lavatory	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	780	None	No	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	780	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Hallway	19	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp	No	19	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.20	671	0.0	$101.35	$915.80	$190.00	7.16
Room 7 - Kitchen	15	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp	No	15	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,760	0.49	1,503	0.0	$226.92	$1,128.00	$225.00	3.98
Kitchen office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$20.17	$117.00	$20.00	4.81
Dishwasher room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$20.17	$117.00	$20.00	4.81
Dishwasher room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,760	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Cafeteria	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp & Reballast	No	24	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,760	0.78	2,405	0.0	$363.07	$3,156.00	$360.00	7.70
Supply room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	208	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	208	0.04	16	0.0	$2.38	$234.00	$20.00	89.77
Room 5	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.05	169	0.0	$25.49	$350.00	$40.00	12.16
Stage	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,760	Relamp & Reballast	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	1,760	0.13	401	0.0	$60.51	$526.00	$60.00	7.70
Nurse office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$20.17	$234.00	$20.00	10.61
Room 37	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$20.17	$234.00	$20.00	10.61
Nurse office	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.11	334	0.0	$50.43	$585.00	$50.00	10.61
Supply room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	208	None	No	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	208	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Library	36	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	No	36	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.78	2,405	0.0	$363.07	$4,212.00	$360.00	10.61
Library	6	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,760	Relamp & Reballast	No	6	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,760	0.07	213	0.0	$32.09	$588.00	$30.00	17.39

	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
Library Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$20.17	$234.00	$20.00	10.61
Library lavatory	1	Linear Fluorescent - T8: 2' T8 (17W) - 1L	Wall Switch	22	1,760	Relamp & Reballast	No	1	LED - Linear Tubes: (1) 2' Lamp	Wall Switch	9	1,760	0.01	27	0.0	$4.13	$93.50	$5.00	21.45
Room 42	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Room 43	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Room 44	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Boys' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.04	59	0.0	$8.94	$234.00	$20.00	23.94
Girls' restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	780	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	780	0.04	59	0.0	$8.94	$234.00	$20.00	23.94
CR 1	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
CR 2	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
CR 3	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,232	0.49	1,519	0.0	$229.39	$2,222.00	$200.00	8.81
Boiler Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.09	267	0.0	$40.34	$468.00	$40.00	10.61
Custodian closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,760	Relamp & Reballast	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,760	0.04	134	0.0	$20.17	$234.00	$20.00	10.61
Hallway	7	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,920	Relamp & Reballast	No	7	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	1,920	0.07	247	0.0	$37.34	$749.00	$70.00	18.18
Furnace Room	4	Incandescent: Ceiling mount fixture - 1 lamp	Wall Switch	100	1,760	Relamp	No	4	LED Screw-In Lamps: Ceiling mount fixture - 1 lamp	Wall Switch	14	1,760	0.23	696	0.0	$105.13	$391.41	$20.00	3.53
Nurse's office	1	Incandescent: Ceiling mount fixture - 1 lamp	Wall Switch	100	1,760	Relamp	No	1	LED Screw-In Lamps: Ceiling mount fixture - 1 lamp	Wall Switch	14	1,760	0.06	174	0.0	$26.28	$97.85	$5.00	3.53
Hallway	2	Exit Signs: Fluorescent	None	22	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	322	0.0	$48.68	$215.11	$0.00	4.42
Kitchen	1	Exit Signs: Fluorescent	None	22	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	161	0.0	$24.34	$107.56	$0.00	4.42
Cafeteria	2	Exit Signs: Fluorescent	None	22	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	322	0.0	$48.68	$215.11	$0.00	4.42
Hallway	2	Exit Signs: Fluorescent	None	22	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	322	0.0	$48.68	$215.11	$0.00	4.42
Exterior lights	10	Metal Halide: (1) 100W Lamp	Wall Switch	128	4,380	Fixture Replacement	No	10	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	48	4,380	0.52	4,030	0.0	$608.45	$3,906.77	$1,000.00	4.78
Exterior lights	14	Metal Halide: (1) 150W Lamp	Wall Switch	190	4,380	Fixture Replacement	No	14	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	93	4,380	0.89	6,840	0.0	$1,032.84	$5,469.48	$1,400.00	3.94

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
Closet	Room 49 - Boiler, boiler room	2	Heating Hot Water Pump	0.2	77.0%	Yes	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Furnace room	Furnace	2	Heating Hot Water Pump	3.0	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Furnace room	Air Compressor	1	Air Compressor	5.0	89.5%	No	4,957	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Furnace room	Furnace	2	Supply Fan	5.0	88.5%	No	2,745	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Furnace room	Furnace	1	Other	0.3	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Furnace room	DHW	1	Other	0.1	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Aerco boiler	1	Heating Hot Water Pump	3.0	86.5%	No	2,745	No	86.5%	Yes	1	0.39	3,089	0.0	$466.48	$3,007.65	$0.00	6.45
Boiler Room	AERCO DHW	1	Heating Hot Water Pump	3.0	86.5%	No	2,745	No	86.5%	Yes	1	0.39	3,089	0.0	$466.48	$3,007.65	$0.00	6.45
Boiler Room	Air Compressor	2	Air Compressor	1.0	85.5%	No	4,957	No	85.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
AHU	All school	3	Supply Fan	5.0	88.5%	No	2,745	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof top	Restrooms, Kitchen	20	Exhaust Fan	0.3	77.0%	No	2,745	No	77.0%	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
Library, Classroom 33,20,28,27,21,26,22,24,23,17,16,11,12,13,14,15,42,43,44,2,3	Library, Classroom 33,20,28,27,21,26,22,24,23,17,16,11,12,13,14,15,42,43,44,2,3	23	Window AC	2.10		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 32	Room 32	2	Window AC	1.18		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 30	Room 30	1	Window AC	0.44		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Child study room	Child Study room	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 5, Library Storage	Room 5, Library storage	1	Window AC	0.44		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Nurse's office, Room 1	Nurse's office, Room 1	1	Window AC	1.15		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU#1 and RTU#4 - Rooftop	Main office and Library	2	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU2A and RTU 2B	Caroline L. Reutter School	2	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
RTU 3	Caroline L. Reutter School	1	Packaged AC	25.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Closet	Room 49	1	Condensing Hot Water Boiler	140.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Furnace room	Caroline L. Reutter school	2	Furnace	3,750.00	Yes	2	Condensing Hot Water Boiler	3,600.00	93.00%	Ec	0.00	0	451.6	$4,659.34	$133,984.17	$14,400.00	25.67
Boiler Room	New wing	1	Condensing Hot Water Boiler	1,720.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

Low-Flow Device 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
Furnace Room	Lavatories	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Kitchen	1	Storage Tank Water Heater (≤ 50 Gal)	Yes	1	Storage Tank Water Heater (> 50 Gal)	Natural Gas	95.00%	Et	0.00	0	32.6	$336.40	$50,110.00	$1,750.00	143.76
DHW room	Single section	1	Indirect System	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Furnace Room	Lavatories	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 32 -	1	Faucet Aerator (Lavatory)	3.00	1.00	0.00	0	2.1	$21.27	$7.17	$0.00	0.34
Staff bath,Child study lavatory, Gym Bath, Library lavatory	4	Faucet Aerator (Lavatory)	2.50	1.00	0.00	0	6.2	$63.81	$28.68	$0.00	0.45
Art room, Kitchen	6	Faucet Aerator (Kitchen)	2.50	2.20	0.00	0	1.9	$19.14	$43.02	$0.00	2.25

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Medium Temp Freezer (0F to 30F)	No	No	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	1	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	Stand-Up Freezer, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Glass Door (16 - 30 cu. ft.)	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	Insulated Food Holding Cabinet (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Electric Convection Oven (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Electric Convection Oven (Half Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Electric Steamer	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Dishwasher Inventory & Recommendations

	Existing Conditions					Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Dishwasher Type	Water Heater Fuel Type	Booster Heater Fuel Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Payback w/ Incentives in Years
Kitchen	1	Single Tank Conveyor (High Temp)	Natural Gas	N/A	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Caroline L. Reutter School	61	Computer	75.0	Yes
Caroline L. Reutter School	20	Laptop	40.0	Yes
Caroline L. Reutter School	3	Printer - Small	20.0	Yes
Caroline L. Reutter School	8	Printer - medium	200.0	Yes
Caroline L. Reutter School	3	Printer - Large	600.0	Yes
Caroline L. Reutter School	30	Projector	200.0	Yes
Caroline L. Reutter School	2	Microwave	1,000.0	No
Caroline L. Reutter School	1	Refrigerator - medium	156.0	No
Caroline L. Reutter School	1	Refrigerator - large	172.0	Yes
Caroline L. Reutter School	1	Coffee machine	900.0	Yes
Caroline L. Reutter School	1	Toaster	850.0	No
Caroline L. Reutter School	1	Toaster oven	1,200.0	No
Caroline L. Reutter School	1	Washer	900.0	Yes
Caroline L. Reutter School	1	Dryer	5,000.0	Yes
Caroline L. Reutter School	1	TV - CRT	120.0	No
Caroline L. Reutter School	1	TV - LED	100.0	Yes
Caroline L. Reutter School	1	Water dispenser	12.5	Yes
Caroline L. Reutter School	30	Smart board	5.0	Yes
Caroline L. Reutter School	27	Ceiling fan	60.0	No

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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40

ENERGY STAR® Score[1]

Caroline L. Reutter School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 56,905
Built: 1952

For Year Ending: March 31, 2017
Date Generated: July 28, 2017

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Caroline L. Reutter School 2150 Delsea Drive Franklinville, New Jersey 08322	_____ , (___)___-_____	___ _____ , (___)___-_____ _____

Property ID: 5929910

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
89.5 kBtu/ft²

Source EUI
158.7 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	3,325,949 (65%)
Electric - Grid (kBtu)	1,764,682 (35%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	82.7
National Median Source EUI (kBtu/ft²)	146.7
% Diff from National Median Source EUI	8%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	379

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)