Local Government Energy Audit:
Energy Audit Report

Frank J. Dugan Elementary School

48 Topanemus Road

Marlboro, New Jersey 07746

Marlboro Township BoE

October 23, 2018

Final Report by:

TRC Energy Services

Disclaimer

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

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

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

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

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 Frank J. Dugan Elementary School.

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

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

Frank J. Dugan Elementary School is an 83,000 square-foot facility comprised of classrooms, office space, a cafeteria and kitchen, a nurse's station, storage, and other common areas. The building was originally built in 1988, and is in good condition. The building is occupied on weekdays between 8:20 AM and 3:00 PM, Saturdays 8:30 AM to 12:30 PM, and Sundays 12:00 PM to 9:00 PM during July and August. The building is occupied by approximately 600 students and 85 staff.

This building was built in 1988, and is 100% heated and an estimated 30% cooled. Most of the building systems are between 10 and 25 years old, and the mechanical equipment is in fair condition. The interior lighting primarily consists of fluorescent lamps, compact fluorescent lamps (CFL), and incandescent lamps, and the exterior lighting is entirely LED. Many of the motors are standard efficiency and serve systems which have potential for energy savings through variable speed drive (VFD) control. Building heating is supplied by three natural gas condensing hot water boilers and two roof top furnace units that serve the cafeteria. The building is cooled with a combination of packaged air conditioning (AC) units, window AC units, and split system AC units. 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 and recommends seven measures which together represent an opportunity for Frank J. Dugan Elementary School to reduce annual energy costs by roughly $24,278 and annual greenhouse gas emissions by 208,604 lbs. CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 7.3 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Frank J. Dugan Elementary School's annual energy use by 8%.

Figure 1 – Previous 12 Month Utility Costs

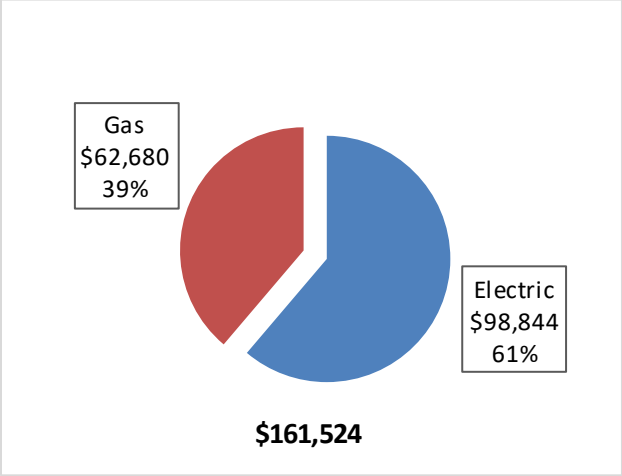
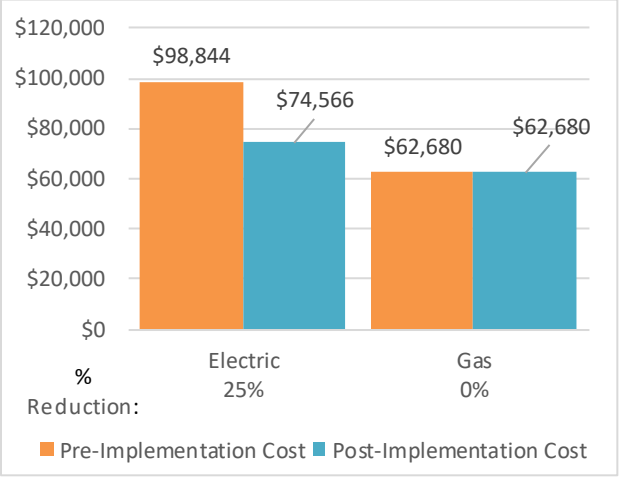


Figure 2 – Potential Post-Implementation Costs



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

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

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**117,402**	**25.3**	**0.0**	**$14,196.17**	**$66,804.98**	**$10,960.00**	**$55,844.98**	**3.9**	**118,223**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	490	0.1	0.0	$59.29	$509.00	$30.00	$479.00	8.1	494
ECM 2	Retrofit Fixtures with LED Lamps	Yes	116,912	25.2	0.0	$14,136.88	$66,295.98	$10,930.00	$55,365.98	3.9	117,729
Lighting Control Measures			**27,141**	**5.8**	**0.0**	**$3,281.85**	**$22,150.00**	**$2,315.00**	**$19,835.00**	**6.0**	**27,331**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	27,141	5.8	0.0	$3,281.85	$22,150.00	$2,315.00	$19,835.00	6.0	27,331
Motor Upgrades			**4,133**	**0.9**	**0.0**	**$499.71**	**$9,163.63**	**$0.00**	**$9,163.63**	**18.3**	**4,161**
ECM 4	Premium Efficiency Motors	Yes	4,133	0.9	0.0	$499.71	$9,163.63	$0.00	$9,163.63	18.3	4,161
Variable Frequency Drive (VFD) Measures			**50,147**	**9.4**	**0.0**	**$6,063.78**	**$49,931.69**	**$4,200.00**	**$45,731.69**	**7.5**	**50,498**
ECM 5	Install VFDs on Constant Volume (CV) HVAC	Yes	28,525	7.1	0.0	$3,449.21	$30,475.50	$4,200.00	$26,275.50	7.6	28,724
ECM 6	Install VFDs on Hot Water Pumps	Yes	21,622	2.3	0.0	$2,614.57	$19,456.19	$0.00	$19,456.19	7.4	21,774
Electric Unitary HVAC Measures			**5,001**	**2.4**	**0.0**	**$604.78**	**$50,593.70**	**$2,116.00**	**$48,477.70**	**80.2**	**5,036**
	Install High Efficiency Electric AC	No	5,001	2.4	0.0	$604.78	$50,593.70	$2,116.00	$48,477.70	80.2	5,036
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**11.8**	**$134.66**	**$2,265.73**	**$400.00**	**$1,865.73**	**13.9**	**1,387**
	Install High Efficiency Furnaces	No	0	0.0	11.8	$134.66	$2,265.73	$400.00	$1,865.73	13.9	1,387
Plug Load Equipment Control - Vending Machine			**1,954**	**0.0**	**0.0**	**$236.32**	**$460.00**	**$0.00**	**$460.00**	**1.9**	**1,968**
ECM 7	Vending Machine Control	Yes	1,954	0.0	0.0	$236.32	$460.00	$0.00	$460.00	1.9	1,968
TOTAL FOR RECOMMENDED MEASURES			**200,777**	**41.4**	**0.0**	**$24,277.83**	**$148,510.30**	**$17,475.00**	**$131,035.30**	**5.4**	**202,181**
TOTAL FOR ALL MEASURES			**205,779**	**43.8**	**11.8**	**$25,017.26**	**$201,369.73**	**$19,991.00**	**$181,378.73**	**7.3**	**208,604**

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

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

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

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

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

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

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

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

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

Energy Efficient Practices

TRC also identified nine 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 Frank J. Dugan Elementary School include:

- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Perform Routine Motor Maintenance
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

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

On-Site Generation Measures

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

Figure 4 – Photovoltaic Potential

Potential	High	
System Potential	164	kW DC STC
Electric Generation	195,385	kWh/yr
Displaced Cost	$17,000	/yr
Installed Cost	$426,400	

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

1.3 Implementation Planning

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

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

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

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

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

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

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

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

Additional information on relevant incentive programs is located in Section 8 or: www.njcleanenergy.com/ci.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Cindy Barr-Rague	Business Administration/Board Secretary	cbarr-rague@mtps.org	(732) 972-2000 Ext 2010
Michael Crivelli	Supervisor of Building & Grounds	mcrivelli@mtps.org	(732) 972-2122
Mark Cary	Head Custodian	Markrcary@gmail.com	(732) 992-8549
TRC Energy Services			
Smruti Srinivasan	Auditor	Ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On March 16, 2018, TRC performed an energy audit at Frank J. Dugan Elementary School located in Marlboro, New Jersey. TRC's team met with Mark Cary to review the facility operations and help focus our investigation on specific energy-using systems.

Frank J. Dugan Elementary School is an 83,000 square-foot facility comprised of classrooms, office space, a cafeteria and kitchen, a nurse's station, storage, and other common areas. The building was originally built in 1988, and is in good condition. The building is occupied on weekdays between 8:20 AM and 3:00 PM, Saturdays 8:30 AM to 12:30 PM, and Sundays 12:00 PM to 9:00 PM during July and August. The building is occupied by approximately 600 students and 85 staff.

This building was built in 1988, and is 100% heated and an estimated 30% cooled. Most of the building systems are between 10 and 25 years old, and the mechanical equipment is in fair condition. The interior lighting primarily consists of fluorescent lamps, compact fluorescent lamps (CFL)s, and incandescent lamps, and the exterior lighting is entirely LED. Many of the motors are standard efficiency and serve systems which have potential for energy savings through variable speed drive (VFD) control. Building heating is supplied by three natural gas condensing hot water boilers and two roof top furnace units that serve the cafeteria. The building is cooled with a combination of packaged AC units, window AC units, and Split system AC units. A thorough description of the facility and our observations are located in Section 2.

2.3 Building Occupancy

The school building is open Monday through Saturday, and on Sunday's in July and August. The typical schedule is presented in the table below. The school is used year round. During a typical day, the facility is occupied by approximately 85 staff and 600 students.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Frank J. Dugan Elementary School	Weekday	8:20 AM - 3:00 PM
Frank J. Dugan Elementary School	Weekend	Saturdays: 8:30 AM - 12:30 PM Sundays in July & August: 12:00 PM - 9:00 PM Remaining Sundays- Not Occupied

2.4 Building Envelope

The school is constructed of concrete block with a brick facade. The building has areas with a pitched shingled roof and other areas with a flat roof rooftop. The roof is in fair condition. The building has double pane windows which are in good condition and show little sign of excessive infiltration. The exterior doors are constructed of aluminum and glass and are in good condition.

Image 1: Building Envelope

2.5 On-Site Generation

Frank J. Dugan Elementary School does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

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

Lighting System

Lighting is provided mostly by linear fluorescent T8 and T12 lamps, U-Bend fluorescent T8 lamps, and CLFs, incandescent, and exterior LED lamps. The linear fluorescent fixtures are primarily 2-, 3-, and 4-foot long luminaires. The cafeteria, kitchen, and some closet spaces are primarily lit with incandescent bulbs rated between 40-Watt and 100-Watt. The gym is lit with large fixtures with 42-Watt pin based CFLs. The interior lighting controls are primarily wall switches, but there are occupancy sensors in a few locations as well.

The building's exterior lighting is all LED lights which are primarily controlled with timers or photocells.

Image 2: Lighting System

Space Heating System

The hot water heating system consists of three P-K Mach C-200 condensing hot water boilers with 1,920 kBtuh output, two 182.25 kBtuh McQuay roof top furnace units that supply the cafeteria, and a single 100 kBtuh roof top unit. The boilers have a nominal combustion efficiency of 96%. The boilers operate in a lead/lag configuration, and both may be required to operate during cold weather. The boilers are configured with two 5 HP pumps that supply the radiators, and a 5 HP and 3 HP pump that supply the AHU's. Hot water is supplied at 185°F when the outside air temperature is below 38°F and the setpoint is reset to 120°F when the outside air is above 60°F. The two McQuay packaged units have an 81% efficiency, and one other packaged unit has an efficiency of 80%.

The heating system is controlled with the building management system, and operates with a set point of 72°F when occupied. The boilers are in good condition and well maintained. The McQuay roof top units are in good condition, and others in fair condition.

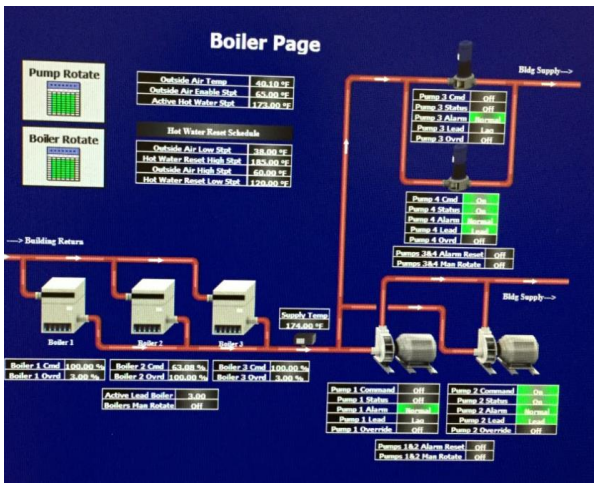


Image 3: Space Heating System

Direct Expansion Air Conditioning System (DX)

There is a variety of different equipment that provides the cooling for this building. There are seven roof top packaged units, and four vertically mounted package units which supply cooling and ventilation to the building. There are six split system AC units that cool the library, faculty room, and some classrooms, and seven window air conditioning units that cool primarily classrooms.

The packaged units are controlled with the building management system, and generally operate at 72°F when occupied. The split systems are controlled by programmable thermostats.

Image 4: Air Conditioning System

Domestic Water Heating System

The domestic water heating system for the facility consists of a single gas fired water heater with an input rating of 399 kBtuh and a nominal efficiency of 83%. The water heater has a 250-gallon storage tank. A single pump distributes the hot water to the entire site.

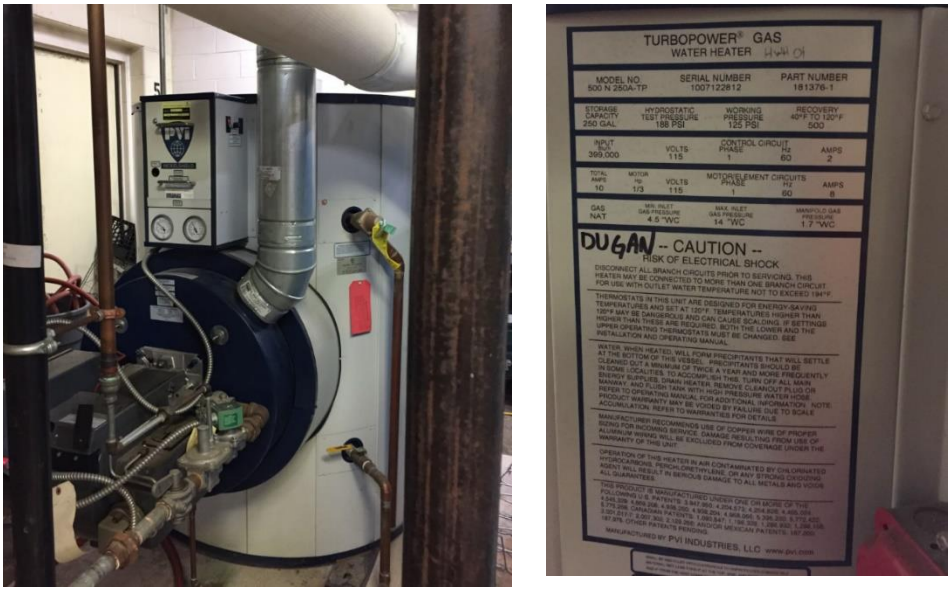


Image 5: Domestic Water System

Food Service Equipment

The facility has a full commercial kitchen that is used to prepare breakfast and lunch for the students and employees. The kitchen equipment includes a gas fired oven and kettle, and an electric food warmer. There is a Hobart conveyor dishwasher with a high temp electric heater that provides rinse water.

Image 6: Food Service Equipment

Refrigeration

The kitchen has multiple different refrigeration and freezer equipment. There is a walk-in refrigerator as well as a cooler that are used to store food prepared for school lunches. The refrigerator has a single 2-ton compressor, and the cooler has a 1.5 ton compressor. The kitchen also has a large stand up refrigerator, a standing refrigerator, two freezer chests, and two refrigerated chests.


Image 7: Refrigeration

Building Plug Load

There are roughly 66 computer work stations and 45 printers throughout the facility. Most classrooms have a projector or Smart Board. There are multiple coffee machines, kettles, microwaves, and refrigerators throughout the classroom and office spaces.

The facility has two vending machines, one of which is a refrigerated beverage machine.

2.7 Water-Using Systems

There are 25 restrooms at this facility. A sampling of restrooms found that the faucets are rated for 2 gallons per minute (gpm) or less, and the toilets and urinals are rated at 1.6 gallons per flush (gpf) or less.


Image 8: Water Using System

3 SITE ENERGY USE AND COSTS

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

3.1 Total Cost of Energy

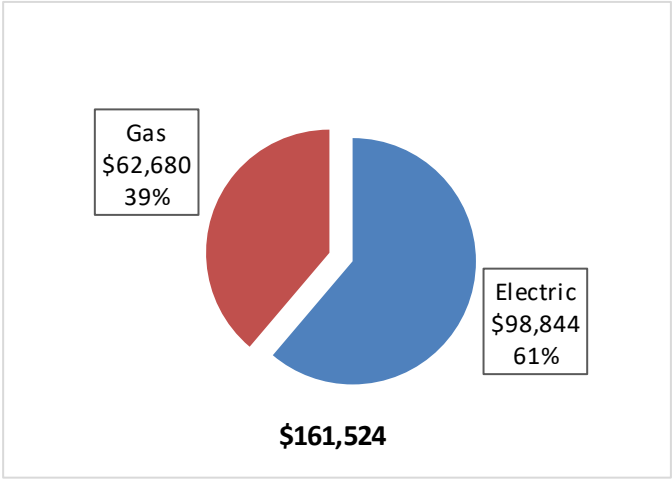
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Frank J. Dugan Elementary School		
Fuel	**Usage**	**Cost**
Electricity	817,440 kWh	$98,844
Natural Gas	55,122 Therms	$62,680
Total		**$161,524**

The current annual energy cost for this facility is $161,524 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.121/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. This facility does pay electrical demand charges for the peak demand. The monthly electricity consumption and peak demand are shown in the chart below. The electrical energy and demand profiles indicate that there is likely balance between the summer time air conditioning load (of 30% of the building during low occupancy period) and the winter time electric heating load (from electric heating, and seasonal use).

Figure 9 - Electric Usage & Demand

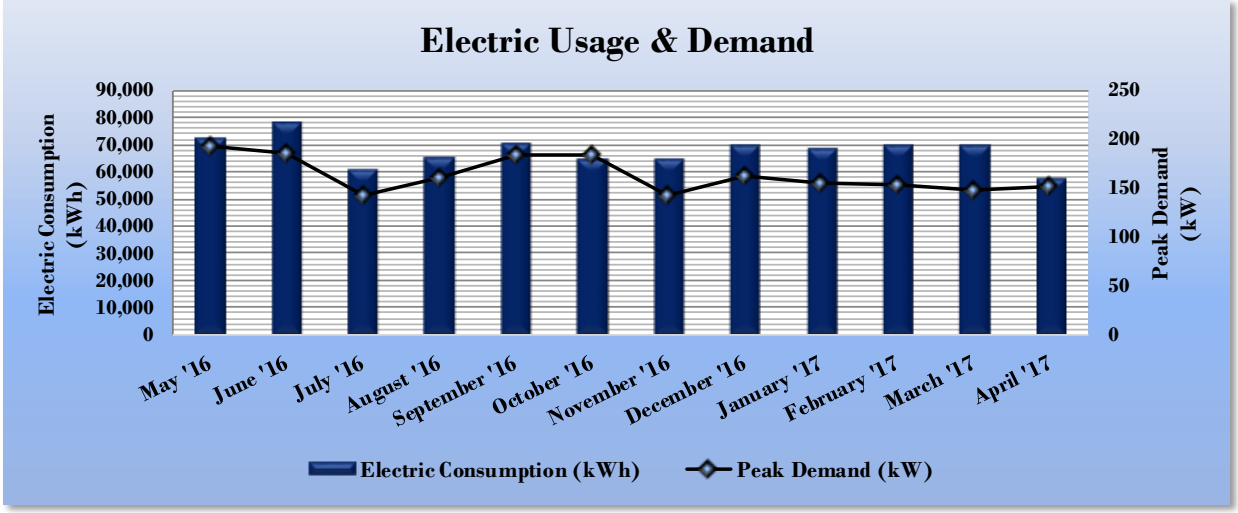


Figure 10 - Electric Usage & Demand

Electric Billing Data for Frank J. Dugan Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
5/31/16	30	72,640	194	$0	$8,588
6/30/16	30	78,400	186	$0	$9,289
7/31/16	31	61,120	142	$0	$7,241
8/31/16	31	65,760	161	$0	$7,851
9/30/16	30	70,560	184	$0	$8,588
10/31/16	31	64,960	184	$0	$7,979
11/30/16	30	64,800	143	$0	$7,750
12/31/16	31	70,240	162	$0	$8,424
1/31/17	31	68,800	156	$0	$8,404
2/28/17	28	69,920	153	$0	$8,587
3/31/17	31	70,240	149	$0	$8,594
4/30/17	30	57,760	151	$0	$7,278
Totals	**364**	**815,200**	**193.6**	**$0**	**$98,573**
Annual	**365**	**817,440**	**193.6**	**$0**	**$98,844**

3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $1.137/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below. The gas use profile is typical of a natural gas heated building with minimal HW use.

Figure 11 - Natural Gas Usage

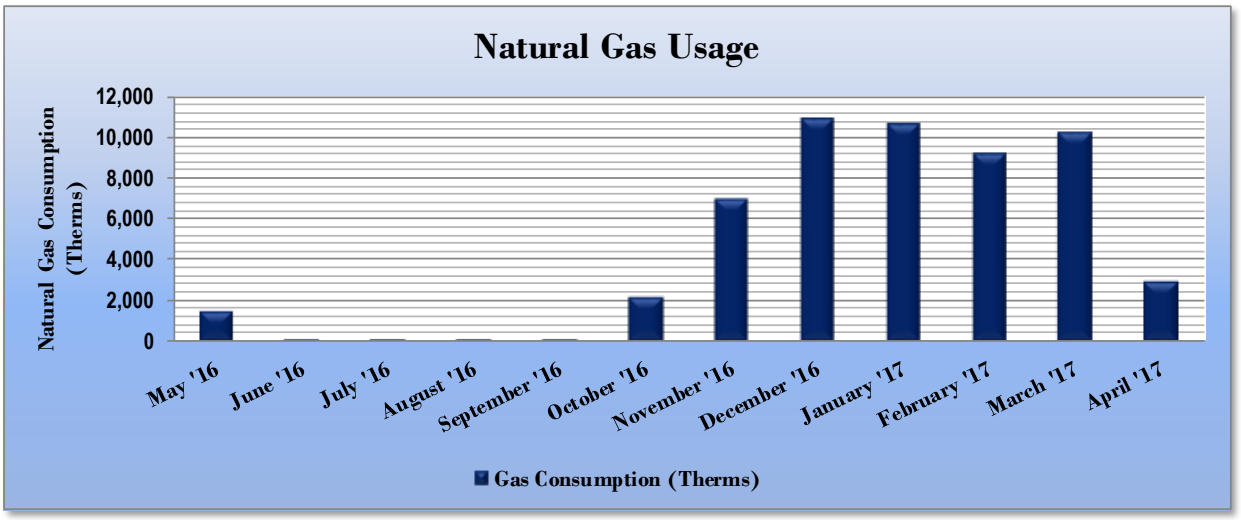


Figure 12 - Natural Gas Usage

Gas Billing Data for Frank J. Dugan Elementary School				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
6/1/16	29	1,534	$1,981	No
7/1/16	30	94	$932	No
8/2/16	32	40	$1,129	Yes
8/30/16	28	31	$885	No
9/28/16	29	107	$939	No
10/28/16	30	2,143	$2,738	No
12/2/16	35	6,985	$6,468	No
1/3/17	32	10,958	$11,279	No
2/1/17	29	10,732	$12,135	No
3/2/17	29	9,260	$10,160	No
4/3/17	32	10,309	$10,324	No
5/3/17	30	2,928	$3,709	No
Totals	**365**	**55,122**	**$62,680**	
Annual	**365**	**55,122**	**$62,680**	

3.4 Benchmarking

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

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

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Frank J. Dugan Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	175.2	141.4
Site Energy Use Intensity (kBtu/ft^2)	100.0	58.2

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

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

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Frank J. Dugan Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	149.3	141.4
Site Energy Use Intensity (kBtu/ft^2)	91.8	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 10.

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

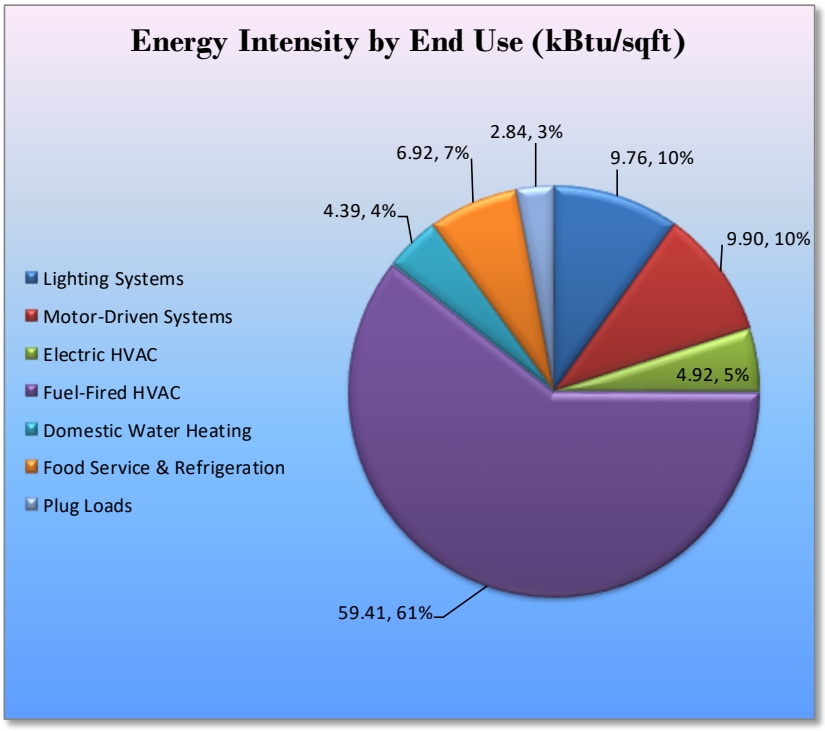
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1

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

3.5 Energy End-Use Breakdown

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

Figure 15 - Energy Balance (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 16 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**117,402**	**25.3**	**0.0**	**$14,196.17**	**$66,804.98**	**$10,960.00**	**$55,844.98**	**3.9**	**118,223**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	490	0.1	0.0	$59.29	$509.00	$30.00	$479.00	8.1	494
ECM 2	Retrofit Fixtures with LED Lamps	116,912	25.2	0.0	$14,136.88	$66,295.98	$10,930.00	$55,365.98	3.9	117,729
Lighting Control Measures		**27,141**	**5.8**	**0.0**	**$3,281.85**	**$22,150.00**	**$2,315.00**	**$19,835.00**	**6.0**	**27,331**
ECM 3	Install Occupancy Sensor Lighting Controls	27,141	5.8	0.0	$3,281.85	$22,150.00	$2,315.00	$19,835.00	6.0	27,331
Motor Upgrades		**4,133**	**0.9**	**0.0**	**$499.71**	**$9,163.63**	**$0.00**	**$9,163.63**	**18.3**	**4,161**
ECM 4	Premium Efficiency Motors	4,133	0.9	0.0	$499.71	$9,163.63	$0.00	$9,163.63	18.3	4,161
Variable Frequency Drive (VFD) Measures		**50,147**	**9.4**	**0.0**	**$6,063.78**	**$49,931.69**	**$4,200.00**	**$45,731.69**	**7.5**	**50,498**
ECM 5	Install VFDs on Constant Volume (CV) HVAC	28,525	7.1	0.0	$3,449.21	$30,475.50	$4,200.00	$26,275.50	7.6	28,724
ECM 6	Install VFDs on Hot Water Pumps	21,622	2.3	0.0	$2,614.57	$19,456.19	$0.00	$19,456.19	7.4	21,774
Plug Load Equipment Control - Vending Machine		**1,954**	**0.0**	**0.0**	**$236.32**	**$460.00**	**$0.00**	**$460.00**	**1.9**	**1,968**
ECM 7	Vending Machine Control	1,954	0.0	0.0	$236.32	$460.00	$0.00	$460.00	1.9	1,968
TOTALS		**200,777**	**41.4**	**0.0**	**$24,277.83**	**$148,510.30**	**$17,475.00**	**$131,035.30**	**5.4**	**202,181**

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

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

4.2 Lighting Upgrades

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

Figure 17 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**117,402**	**25.3**	**0.0**	**$14,196.17**	**$66,804.98**	**$10,960.00**	**$55,844.98**	**3.9**	**118,223**
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	490	0.1	0.0	$59.29	$509.00	$30.00	$479.00	8.1	494
ECM 2	Retrofit Fixtures with LED Lamps	116,912	25.2	0.0	$14,136.88	$66,295.98	$10,930.00	$55,365.98	3.9	117,729

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: 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	490	0.1	0.0	$59.29	$509.00	$30.00	$479.00	8.1	494
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

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

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	116,912	25.2	0.0	$14,136.88	$66,295.98	$10,930.00	$55,365.98	3.9	117,729
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

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

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tube and more than 10 times longer than many incandescent lamps.

4.3 Lighting Control Measures

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

Figure 18 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**27,141**	**5.8**	**0.0**	**$3,281.85**	**$22,150.00**	**$2,315.00**	**$19,835.00**	**6.0**	**27,331**
ECM 3	Install Occupancy Sensor Lighting Controls	27,141	5.8	0.0	$3,281.85	$22,150.00	$2,315.00	$19,835.00	6.0	27,331

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

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
27,141	5.8	0.0	$3,281.85	$22,150.00	$2,315.00	$19,835.00	6.0	27,331

Measure Description

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

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

4.4 Motor Upgrades

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

Figure 19-Summary of Motor Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**4,133**	**0.9**	**0.0**	**$499.71**	**$9,163.63**	**$0.00**	**$9,163.63**	**18.3**	**4,161**
ECM 4	Premium Efficiency Motors	4,133	0.9	0.0	$499.71	$9,163.63	$0.00	$9,163.63	18.3	4,161

ECM 4: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
4,133	0.9	0.0	$499.71	$9,163.63	$0.00	$9,163.63	18.3	4,161

Measure Description

We recommend replacing standard efficiency motors with NEMA Premium® efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours. The overall savings from motor replacements are relatively small, but this measure is meant to be implemented in conjunction with variable frequency drive (VFD) installations recommended below. VFD's require inverter rated motors, and it is highly likely that replacement motors will be needed to meet this requirement. Project cost effectiveness should be considered on the basis the two types of measures taken together.

4.5 Variable Frequency Drive Measures

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

Figure 20 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**50,147**	**9.4**	**0.0**	**$6,063.78**	**$49,931.69**	**$4,200.00**	**$45,731.69**	**7.5**	**50,498**
ECM 5	Install VFDs on Constant Volume (CV) HVAC	28,525	7.1	0.0	$3,449.21	$30,475.50	$4,200.00	$26,275.50	7.6	28,724
ECM 6	Install VFDs on Hot Water Pumps	21,622	2.3	0.0	$2,614.57	$19,456.19	$0.00	$19,456.19	7.4	21,774

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

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
28,525	7.1	0.0	$3,449.21	$30,475.50	$4,200.00	$26,275.50	7.6	28,724

Measure Description

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

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)
21,622	2.3	0.0	$2,614.57	$19,456.19	$0.00	$19,456.19	7.4	21,774

Measure Description

We recommend installing a variable frequency drives (VFD) to control a hot water pumps. This measure requires that most of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.6 Plug Load Equipment Control - Vending Machines

Our recommendations for plug load equipment controls are summarized in Figure 21 below.

Figure 21-Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**1,954**	**0.0**	**0.0**	**$236.32**	**$460.00**	**$0.00**	**$460.00**	**1.9**	**1,968**
ECM 7	Vending Machine Control	1,954	0.0	0.0	$236.32	$460.00	$0.00	$460.00	1.9	1,968

ECM 7: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,954	0.0	0.0	$236.32	$460.00	$0.00	$460.00	1.9	1,968

Measure Description

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

4.7 ECMs Evaluated But Not Recommended

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

Figure 22 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**5,001**	**2.4**	**0.0**	**$604.78**	**$50,593.70**	**$2,116.00**	**$48,477.70**	**80.2**	**5,036**
Install High Efficiency Electric AC	5,001	2.4	0.0	$604.78	$50,593.70	$2,116.00	$48,477.70	80.2	5,036
Gas Heating (HVAC/Process) Replacement	**0**	**0.0**	**11.8**	**$134.66**	**$2,265.73**	**$400.00**	**$1,865.73**	**13.9**	**1,387**
Install High Efficiency Furnaces	0	0.0	11.8	$134.66	$2,265.73	$400.00	$1,865.73	13.9	1,387
TOTALS	**5,001**	**2.4**	**11.8**	**$739.44**	**$52,859.43**	**$2,516.00**	**$50,343.43**	**68.1**	**6,423**

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

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

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,001	2.4	0.0	$604.78	$50,593.70	$2,116.00	$48,477.70	80.2	5,036

Measure Description

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

Reasons for not Recommending

The six older DX air conditioning units were individually analyzed to see whether replacement was recommended. Due to the high cost of larger units, and the minimal energy savings for the smaller units, none are recommended for replacement at this time.

Install High Efficiency Furnaces

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	11.8	$134.66	$2,265.73	$400.00	$1,865.73	13.9	1,387

Measure Description

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

Reasons for not Recommending

The replacement of the 100 kBtuh furnace on one packaged unit was evaluated. The furnace replacement itself has a reasonable payback period, but when the replacement of the entire packaged unit was factored in, the payback period was too high. Therefore, this would not be a cost-effective project at this time.

5 ENERGY EFFICIENT PRACTICES

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

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

Perform Routine Motor Maintenance

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

Clean Evaporator/Condenser Coils on AC Systems

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

Clean and/or Replace HVAC Filters

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

Perform Regular 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 Regular Water Heater Maintenance

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

Plug Load Controls

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

Water Conservation

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

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gpf and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

6 On-Site Generation Measures

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

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

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

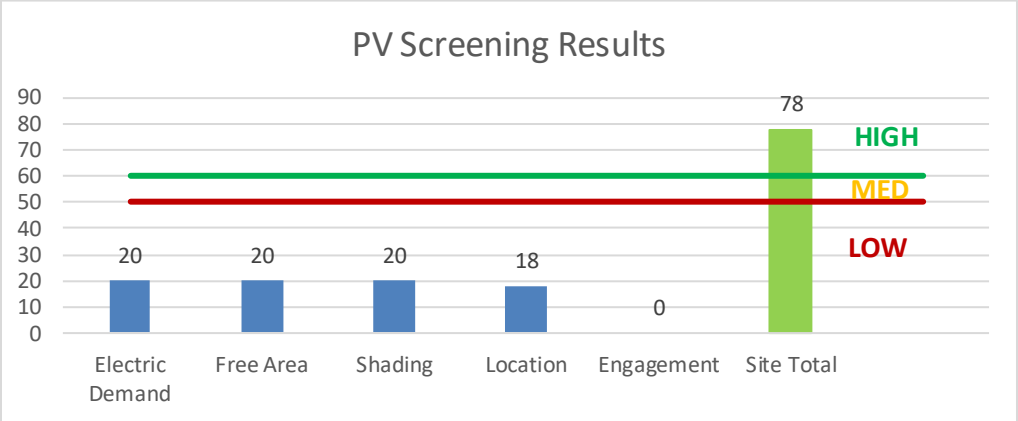
6.1 Photovoltaic

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

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

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. A PV array located on the roof of the school may be feasible. If Frank J. Dugan Elementary School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted.

Figure 23 - Photovoltaic Screening



Potential	High	
System Potential	164	kW DC STC
Electric Generation	195,385	kWh/yr
Displaced Cost	$17,000	/yr
Installed Cost	$426,400	

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

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

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

6.2 Combined Heat and Power

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

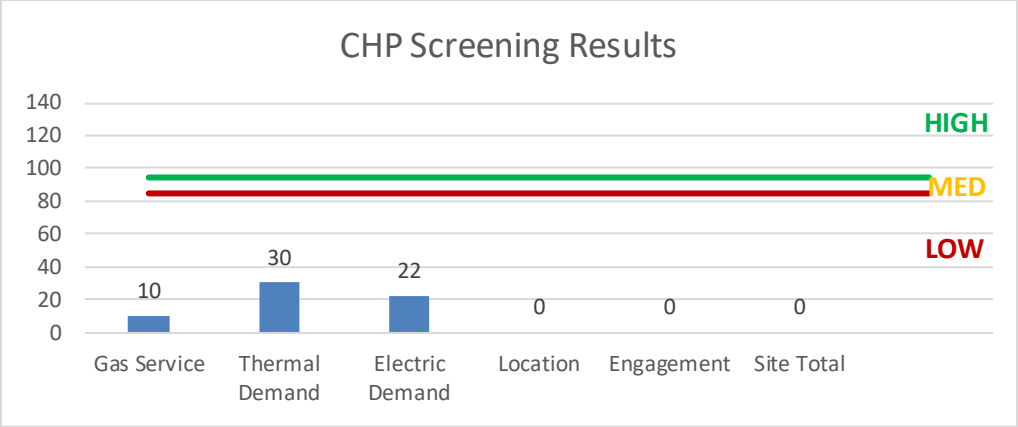
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

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

The low and infrequent thermal load is the most significant factor contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

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

Figure 24 - Combined Heat and Power Screening



7 DEMAND RESPONSE

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

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

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

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

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

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

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

In our opinion this building is not a good candidate for a Demand Response measure.

8 PROJECT FUNDING / INCENTIVES

The NJCEP provides 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 25 for a list of the eligible programs identified for each recommended ECM.

Figure 25 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	Direct Install
ECM 1	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	x	x
ECM 2	Retrofit Fixtures with LED Lamps	x	x
ECM 3	Install Occupancy Sensor Lighting Controls	x	x
ECM 4	Premium Efficiency Motors		x
ECM 5	Install VFDs on Constant Volume (CV) HVAC	x	x
ECM 6	Install VFDs on Hot Water Pumps		x
ECM 7	Vending Machine Control		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 retrofit incentives have been applied in this report. Custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

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

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

8.2 Direct Install

Overview

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

Incentives

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

How to Participate

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

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

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

8.3 SREC Registration Program

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

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

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

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

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

8.4 Energy Savings Improvement Program

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

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

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

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

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

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

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 of 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
Main Office Suite	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,855	0.07	309	0.0	$37.40	$459.60	$35.00	11.35
Main Office Suite	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.43	2,013	0.0	$243.46	$856.20	$215.00	2.63
VP Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.10	447	0.0	$54.10	$306.27	$60.00	4.55
Conference Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.19	895	0.0	$108.20	$650.53	$115.00	4.95
Kitchenette	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.10	447	0.0	$54.10	$306.27	$60.00	4.55
Main Office Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.05	254	0.0	$30.74	$233.00	$20.00	6.93
Main Office Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Principal's Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.10	447	0.0	$54.10	$306.27	$60.00	4.55
Secure Waiting Area	2	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	None	No	2	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Secure Vestibule	2	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	None	No	2	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Storage	4	LED - Fixtures: Ambient - 2' - Direct Fixture	Wall Switch	75	2,650	None	Yes	4	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,855	0.06	274	0.0	$33.17	$270.00	$0.00	8.14
Vestibule 20	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.02	88	0.0	$10.69	$63.20	$0.00	5.91
Outside Vestibule 20	3	LED Screw-In Lamps: Canopy Lights	Wall Switch	14	4,380	None	No	3	LED Screw-In Lamps: Canopy Lights	Wall Switch	14	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outside Vestibule 20	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	30	4,380	None	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	30	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 4 Hallway	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	3	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.06	265	0.0	$32.06	$189.60	$0.00	5.91
Outside Vestibule 19	4	LED Screw-In Lamps: Canopy Lights	Wall Switch	14	4,380	None	No	4	LED Screw-In Lamps: Canopy Lights	Wall Switch	14	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outside Vestibule 19	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	30	4,380	None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	30	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Parking Lot Pole- 1 Fixture	26	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	70	4,380	None	No	26	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	70	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Parking Lot Pole- 2 Fixtures	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	140	4,380	None	No	7	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	140	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Generator Closet in Boiler Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,650	0.04	201	0.0	$24.32	$117.00	$20.00	3.99
Generator Closet in Boiler Room	2	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	2,650	Relamp & Reballast	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,650	0.04	192	0.0	$23.22	$196.00	$10.00	8.01
Vestibule 7	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.04	177	0.0	$21.38	$126.40	$0.00	5.91
Outside Vestibule 7	10	LED Screw-In Lamps: Canopy Lights	Wall Switch	14	4,380	None	No	10	LED Screw-In Lamps: Canopy Lights	Wall Switch	14	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outside Vestibule 7	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	30	2,650	None	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	30	2,650	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outside Vestibule 5	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	50	2,650	None	No	1	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Wall Switch	50	2,650	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	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
Cafeteria	48	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	48	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	1.97	9,151	0.0	$1,106.50	$4,419.60	$825.00	3.25
Cafeteria	20	Incandescent: Recessed- 100 W Lamp	Wall Switch	100	2,650	Relamp	Yes	20	LED Screw-In Lamps: LED A19 Bulb	Occupancy Sensor	15	1,855	1.17	5,456	0.0	$659.68	$1,345.06	$135.00	1.83
Kitchen	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,650	0.07	341	0.0	$41.28	$190.27	$40.00	3.64
Kitchen	13	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	No	13	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,650	0.48	2,219	0.0	$268.30	$1,236.73	$260.00	3.64
Kitchen Hood	5	Incandescent: 75 W Lamp	Wall Switch	75	2,650	Relamp	No	5	LED Screw-In Lamps: LED A19 Bulb	Wall Switch	13	2,650	0.20	945	0.0	$114.25	$268.77	$25.00	2.13
Kitchen Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.05	254	0.0	$30.74	$233.00	$20.00	6.93
Kitchen Hall Inside	2	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	2	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.04	177	0.0	$21.38	$126.40	$0.00	5.91
Kitchen Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,650	0.02	101	0.0	$12.16	$58.50	$10.00	3.99
Kitchen Electrical Closet	1	Linear Fluorescent - T12: 4' T12 (40W) - 2L	Wall Switch	88	2,650	Relamp & Reballast	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,650	0.04	180	0.0	$21.74	$117.00	$10.00	4.92
Kitchen Locker Room	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.02	88	0.0	$10.69	$63.20	$0.00	5.91
Kitchen Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Kitchen Stage	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	10	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,650	0.22	1,006	0.0	$121.62	$585.00	$100.00	3.99
Kitchen Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.11	508	0.0	$61.47	$350.00	$40.00	5.04
Kitchen Storage	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.11	508	0.0	$61.47	$234.00	$40.00	3.16
Main Hallway	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	18	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.87	4,027	0.0	$486.91	$2,112.40	$360.00	3.60
Main L Room Hall	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,855	0.08	356	0.0	$43.01	$389.60	$0.00	9.06
Main Room 44	14	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	14	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.67	3,132	0.0	$378.71	$1,601.87	$315.00	3.40
Main Room 43	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.43	2,013	0.0	$243.46	$1,126.20	$215.00	3.74
Main Room Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,650	0.04	171	0.0	$20.64	$95.13	$20.00	3.64
Vestibule 1	6	LED - Fixtures: Ambient - 2' - Direct Fixture	Wall Switch	75	2,650	None	No	6	LED - Fixtures: Ambient - 2' - Direct Fixture	Wall Switch	75	2,650	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 1 Hallway	8	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	8	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,855	0.20	948	0.0	$114.69	$705.60	$0.00	6.15
CR 1	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
CR 3	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
CR 4	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Guidance Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.12	572	0.0	$69.16	$341.60	$65.00	4.00

	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
Support Staff Hall	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,650	0.04	171	0.0	$20.64	$95.13	$20.00	3.64
Support Staff Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.19	895	0.0	$108.20	$650.53	$115.00	4.95
Support Staff Office	6	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	6	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.29	1,342	0.0	$162.30	$570.80	$155.00	2.56
Nurse's Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.05	224	0.0	$27.05	$365.13	$55.00	11.46
Nurse's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.19	895	0.0	$108.20	$380.53	$115.00	2.45
Nurse Examination Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.10	447	0.0	$54.10	$306.27	$60.00	4.55
Nurse Resting Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.03	127	0.0	$15.37	$258.50	$10.00	16.17
Nurse Resting Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.03	127	0.0	$15.37	$58.50	$10.00	3.16
Outside Exit 13	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	30	1,019	None	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	30	1,019	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Read Room 28	5	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	5	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.21	953	0.0	$115.26	$646.00	$110.00	4.65
Read Room Hall	3	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	3	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,855	0.08	356	0.0	$43.01	$389.60	$0.00	9.06
Vestibule 12	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.02	88	0.0	$10.69	$63.20	$0.00	5.91
Outside Vestibule 12	2	LED Screw-In Lamps: Canopy Lights	Daylight Dimming	14	1,019	None	No	2	LED Screw-In Lamps: Canopy Lights	Daylight Dimming	14	1,019	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Outside Vestibule 12	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	30	1,019	None	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	30	1,019	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
CR 20	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
CR 21	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
CR 22	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
CR 23	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
CR 24	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
CR 25	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
CR 26	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
CR 27	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
CR 20-27 Hall	7	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	7	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,855	0.18	830	0.0	$100.35	$642.40	$0.00	6.40
Vestibule 11	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.02	88	0.0	$10.69	$63.20	$0.00	5.91
Outside Vestibule 11	6	LED Screw-In Lamps: Canopy Lights	Daylight Dimming	14	1,019	None	No	6	LED Screw-In Lamps: Canopy Lights	Daylight Dimming	14	1,019	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

	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
Outside Vestibule 11	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	50	1,019	None	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	50	1,019	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 40 Hallway	9	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	9	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,855	0.23	1,067	0.0	$129.03	$768.80	$0.00	5.96
Room 40	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	8	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.33	1,525	0.0	$184.42	$871.60	$155.00	3.89
Room 40	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.03	127	0.0	$15.37	$58.50	$45.00	0.88
Room 40 Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Electrical Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,650	0.02	101	0.0	$12.16	$58.50	$10.00	3.99
Room 41	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.41	1,906	0.0	$230.52	$1,022.00	$185.00	3.63
Room 41	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.03	127	0.0	$15.37	$58.50	$45.00	0.88
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,650	0.04	171	0.0	$20.64	$95.13	$20.00	3.64
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,650	0.04	171	0.0	$20.64	$95.13	$20.00	3.64
Faculty Lounge	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	8	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.38	1,790	0.0	$216.41	$1,031.07	$195.00	3.86
Faculty Kitchenette	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.02	88	0.0	$10.69	$63.20	$0.00	5.91
Faculty Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Faculty Restroom	2	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	Yes	2	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,855	0.03	129	0.0	$15.55	$366.40	$55.00	20.02
Media Center	30	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	30	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	1.44	6,711	0.0	$811.52	$3,394.00	$670.00	3.36
Media Center	41	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	41	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	1.12	5,211	0.0	$630.09	$2,938.50	$480.00	3.90
Media Center Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.19	895	0.0	$108.20	$650.53	$115.00	4.95
Media Center Office	6	LED - Fixtures: Ambient - 2' - Direct Fixture	Wall Switch	75	2,650	None	No	6	LED - Fixtures: Ambient - 2' - Direct Fixture	Wall Switch	75	2,650	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Faculty Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Storage	1	Incandescent: 60 W Lamp	Wall Switch	60	2,650	Relamp	No	1	LED Screw-In Lamps: LED A19 Bulb	Wall Switch	9	2,650	0.03	155	0.0	$18.80	$53.75	$5.00	2.59
Storage	2	Linear Fluorescent - T12: 4' T12 (40W) - 1L	Wall Switch	46	2,650	Relamp & Reballast	Yes	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,855	0.05	219	0.0	$26.42	$312.00	$10.00	11.43
Faculty Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Storage	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,650	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,650	0.01	53	0.0	$6.45	$35.90	$5.00	4.79
Closet by Room 34	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,650	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,650	0.01	53	0.0	$6.45	$35.90	$5.00	4.79
Girls Restroom	10	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.27	1,271	0.0	$153.68	$855.00	$135.00	4.69

	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
Boys Restroom	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.25	1,144	0.0	$138.31	$796.50	$125.00	4.85
Gym	24	Compact Fluorescent: Ceiling Mat: 8 x 42 W Lamps	Wall Switch	336	2,650	Relamp	Yes	24	LED Screw-In Lamps: G24Q Pin Based LED bulb	Occupancy Sensor	96	1,855	4.23	19,662	0.0	$2,377.51	$5,340.00	$70.00	2.22
Gym Office	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.02	88	0.0	$10.69	$63.20	$0.00	5.91
Gym Office	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,650	0.02	101	0.0	$12.16	$58.50	$10.00	3.99
Gym Storage	3	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	3	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.14	671	0.0	$81.15	$555.40	$60.00	6.10
Gym Hallway	18	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,650	Relamp	Yes	18	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,855	0.87	4,027	0.0	$486.91	$2,112.40	$360.00	3.60
Custodial Office	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.38	1,779	0.0	$215.15	$1,089.00	$175.00	4.25
Custodial Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.05	254	0.0	$30.74	$117.00	$55.00	2.02
Custodians Restroom	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Boiler Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,650	0.13	603	0.0	$72.97	$351.00	$60.00	3.99
Attic	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,650	0.09	402	0.0	$48.65	$234.00	$40.00	3.99
1st Grade Hallway	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	11	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,855	0.28	1,304	0.0	$157.70	$1,095.20	$0.00	6.94
Girls Restroom	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.14	635	0.0	$76.84	$562.50	$85.00	6.21
Boys Restroom	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.14	635	0.0	$76.84	$562.50	$85.00	6.21
Classroom 5	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 6	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 7	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 8	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 9	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 14 Hallway	5	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	5	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,855	0.13	593	0.0	$71.68	$516.00	$0.00	7.20
Classroom 14 Hallway	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,650	0.02	101	0.0	$12.16	$58.50	$10.00	3.99
Classroom 14 Hallway	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Classroom 10	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.49	2,288	0.0	$276.62	$1,172.40	$215.00	3.46
Classroom 10 RR	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Classroom 11	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.49	2,288	0.0	$276.62	$1,172.40	$215.00	3.46

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 11 RR	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Classroom 12	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.49	2,288	0.0	$276.62	$1,172.40	$215.00	3.46
Classroom 12 RR	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Classroom 13	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.49	2,288	0.0	$276.62	$1,172.40	$215.00	3.46
Classroom 13 RR	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Classroom 14	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.49	2,288	0.0	$276.62	$1,172.40	$215.00	3.46
Classroom 14 RR	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Classroom 15	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.49	2,288	0.0	$276.62	$1,172.40	$215.00	3.46
Classroom 15 RR	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Classroom 16	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.16	763	0.0	$92.21	$416.80	$80.00	3.65
Classroom 16 RR	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Door 19	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.02	88	0.0	$10.69	$63.20	$0.00	5.91
Door 15	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.02	88	0.0	$10.69	$63.20	$0.00	5.91
Elec. Room	1	Incandescent: 40 W Incandescent	Wall Switch	40	2,650	Relamp	No	1	LED Screw-In Lamps: LED A19 Bulb	Wall Switch	6	2,650	0.02	104	0.0	$12.53	$53.75	$5.00	3.89
Door 15 Courtyard	3	LED Screw-In Lamps: Canopy Lights	Daylight Dimming	14	1,019	None	No	3	LED Screw-In Lamps: Canopy Lights	Daylight Dimming	14	1,019	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Door 15 Courtyard	8	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	30	1,019	None	No	8	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	30	1,019	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Center Hallway	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	11	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,855	0.28	1,304	0.0	$157.70	$1,095.20	$0.00	6.94
Classroom 17	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 19	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 18- Art Room	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.57	2,669	0.0	$322.73	$1,322.80	$245.00	3.34
Art Room Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.05	254	0.0	$30.74	$233.00	$20.00	6.93
3rd Grade Hall	11	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	11	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	1,855	0.28	1,304	0.0	$157.70	$1,095.20	$0.00	6.94
Boys Restroom	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.14	635	0.0	$76.84	$562.50	$85.00	6.21
Girls Restroom	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.14	635	0.0	$76.84	$562.50	$85.00	6.21
Room 28	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.11	508	0.0	$61.47	$350.00	$60.00	4.72

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 29- Speech	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.25	1,144	0.0	$138.31	$721.20	$125.00	4.31
Room 31	3	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	None	No	3	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 30	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.16	763	0.0	$92.21	$416.80	$80.00	3.65
Room 30 Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,855	0.05	254	0.0	$30.74	$233.00	$20.00	6.93
Electric Closet	1	Incandescent: 60 W Incandescent	Wall Switch	60	2,039	Relamp	No	1	LED Screw-In Lamps: LED A19 Bulb	Wall Switch	9	2,039	0.03	120	0.0	$14.46	$53.75	$5.00	3.37
Room 32	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.16	763	0.0	$92.21	$416.80	$80.00	3.65
Room 32 Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,650	0.02	101	0.0	$12.16	$58.50	$10.00	3.99
Classroom 31	9	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	None	No	9	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 31 RR	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Classroom 33	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 35	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 37	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 38	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 39	9	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	9	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.37	1,716	0.0	$207.47	$946.80	$170.00	3.74
Classroom 34	11	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,650	Relamp	Yes	11	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,855	0.45	2,097	0.0	$253.57	$1,097.20	$200.00	3.54
Classroom 34 RR	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,650	Relamp	No	1	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,650	0.01	49	0.0	$5.90	$48.20	$10.00	6.48
Classroom 36	9	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	None	No	9	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 36 B	3	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	None	No	3	LED - Fixtures: Ambient - 2' - Direct Fixture	Occupancy Sensor	75	1,427	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Door 13	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,650	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,650	0.02	88	0.0	$10.69	$63.20	$0.00	5.91
Various	28	Exit Signs: LED - 2 W Lamp	None	6	11,388	None	No	28	Exit Signs: LED - 2 W Lamp	None	6	11,388	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Radiators	1	Heating Hot Water Pump	5.0	87.5%	No	3,294	Yes	89.5%	Yes	2	0.68	6,184	0.0	$747.71	$6,378.77	$0.00	8.53
Boiler Room	AHU's	1	Heating Hot Water Pump	5.0	87.5%	No	3,294	Yes	89.5%	Yes	2	0.68	6,184	0.0	$747.71	$6,378.77	$0.00	8.53
Boiler Room	AHU's	1	Heating Hot Water Pump	3.0	86.5%	No	3,294	No	86.5%	Yes	2	0.39	3,707	0.0	$448.28	$5,264.92	$0.00	11.74
Boiler Room	Radiators	1	Heating Hot Water Pump	5.0	85.5%	No	3,294	Yes	89.5%	Yes	1	0.73	6,405	0.0	$774.51	$4,076.22	$0.00	5.26
Attic	HV1- Gym	1	Supply Fan	5.0	84.0%	No	3,294	Yes	89.5%	Yes	1	0.81	3,078	0.0	$372.16	$4,076.22	$400.00	9.88
Attic	HV2- Gym	1	Supply Fan	5.0	84.0%	No	3,294	Yes	89.5%	Yes	1	0.81	3,078	0.0	$372.16	$4,076.22	$400.00	9.88
Attic	AHU2- Library	1	Supply Fan	5.0	87.5%	No	3,294	Yes	89.5%	Yes	1	0.72	2,683	0.0	$324.41	$4,076.22	$400.00	11.33
Attic	HV8	1	Supply Fan	7.5	89.5%	No	4,069	Yes	91.0%	Yes	1	1.05	4,786	0.0	$578.77	$4,738.24	$600.00	7.15
Attic	Ref 6	1	Return Fan	5.0	87.5%	No	3,294	Yes	89.5%	Yes	1	0.72	2,683	0.0	$324.41	$4,076.22	$400.00	11.33
Attic	HV5	1	Supply Fan	7.5	89.5%	No	4,069	Yes	91.0%	Yes	1	1.05	4,786	0.0	$578.77	$4,738.24	$600.00	7.15
Attic	Ref 3	1	Return Fan	5.0	87.5%	No	3,294	No	87.5%	Yes	1	0.69	2,528	0.0	$305.63	$3,275.85	$400.00	9.41
Attic	HV3	1	Supply Fan	7.5	89.5%	No	4,069	No	89.5%	Yes	1	1.01	4,579	0.0	$553.67	$3,606.80	$600.00	5.43
Attic	Ref 1	1	Return Fan	5.0	87.5%	No	3,294	No	87.5%	Yes	1	0.69	2,528	0.0	$305.63	$3,275.85	$400.00	9.41
Attic	UVI	1	Supply Fan	2.0	84.0%	No	3,294	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Attic	Ref 2	1	Return Fan	0.5	60.0%	No	3,294	Yes	78.2%	No		0.08	357	0.0	$43.22	$352.26	$0.00	8.15
Attic	HV7	1	Supply Fan	2.0	84.0%	No	3,294	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Attic	Ref 5	1	Return Fan	0.5	60.0%	No	3,294	Yes	78.2%	No		0.08	357	0.0	$43.22	$352.26	$0.00	8.15
Attic	HV1	1	Supply Fan	2.0	84.0%	No	3,294	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Attic	Ref	1	Return Fan	0.5	60.0%	No	3,294	Yes	78.2%	No		0.08	357	0.0	$43.22	$352.26	$0.00	8.15
Boiler Room	All Building	1	Heating Hot Water Pump	0.3	60.0%	No	3,294	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classrooms	All Building	40	Supply Fan	0.3	60.0%	No	3,294	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	2	Supply Fan	3.0	89.5%	No	3,294	No	89.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	various	1	Supply Fan	1.5	84.0%	No	3,294	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	2	Supply Fan	1.5	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Main Office	1	Supply Fan	1.5	84.0%	No	2,745	No	84.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Media Center	1	Supply Fan	0.1	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Room 31	2	Supply Fan	0.8	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Room 36	2	Supply Fan	0.8	60.0%	No	2,745	No	60.0%	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
Roof	Cafeteria	2	Packaged AC	10.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	2	Packaged AC	5.00		Yes	2	Packaged AC	5.00		14.00		No	0.44	923	0.0	$111.62	$22,689.60	$920.00	195.04
Roof	Main Office	1	Packaged AC	5.00		Yes	1	Packaged AC	5.00		14.00		No	0.22	462	0.0	$55.81	$11,344.80	$460.00	195.04
Roof	Media Center	1	Packaged AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Faculty Lounge	1	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Room 40	1	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Room 41	1	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 15, 16	Rooms: 16, 35, 21, 3, 4, 15	4	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 29	Room 29	1	Window AC	0.67		Yes	1	Window AC	0.67		12.00		No	0.10	210	0.0	$25.34	$725.84	$0.00	28.65
Room 31	Room 31, 36B	2	Packaged AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 36	CR 36 & 31	2	Packaged AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 20	Classroom 20	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 27	Classroom 27	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Library Office	Library Office	1	Split-System AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Library Closet	Library Closet	1	Split-System AC	3.00		Yes	1	Split-System AC	3.00		14.00		No	0.13	277	0.0	$33.49	$4,488.66	$276.00	125.81
Room 2	Room 2	1	Split-System AC	0.75		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	various	1	Packaged AC	5.00		Yes	1	Packaged AC	5.00		14.00		No	1.50	3,130	0.0	$378.53	$11,344.80	$460.00	28.76

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	All School, AHU's, HV's	3	Condensing Hot Water Boiler	1,920.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Cafeteria	2	Furnace	182.25	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	various	1	Furnace	100.00	Yes	1	Furnace	100.00	95.00%	AFUE	0.00	0	11.8	$134.66	$2,265.73	$400.00	13.86

DHW Inventory & Recommendations

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

Walk-In Cooler/Freezer Inventory & Recommendations

	Existing Conditions		Proposed Conditions			Energy Impact & Financial Analysis						
Location	Cooler/ Freezer Quantity	Case Type/Temperature	Install EC Evaporator Fan Motors?	Install Electric Defrost Control?	Install Evaporator Fan Control?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Medium Temp Freezer (0F to 30F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Cooler (35F to 55F)	No	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Freezer Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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	4	Gas Convection Oven (Half Size)	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Gas Steamer	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Electric Combination Oven/Steam Cooker (>28 Pans)	No	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	Multi-Tank Conveyor (High Temp)	Electric	None	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?
Various	66	Computers	100.0	No
Various	39	Small Printer/ Copier	50.0	No
Various	3	Medium Printer/ Copier	250.0	No
Various	3	Large Printer/ Copier	515.0	No
Various	43	Projector	300.0	No
Various	4	Microwave	1,000.0	No
Various	2	Large Refrigerator	600.0	No
Various	2	Coffee Machine	400.0	No
Various	43	Wall Fan	100.0	No
Various	29	Kettle	200.0	No
Various	45	Smart Board	316.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Cafeteria	1	Refrigerated	Yes	0.00	1,612	0.0	$194.90	$230.00	$0.00	1.18
Cafeteria	1	Non-Refrigerated	Yes	0.00	343	0.0	$41.42	$230.00	$0.00	5.55

Appendix B: ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

ENERGY STAR® Statement of Energy Performance

10

ENERGY STAR® Score[1]

Frank J. Dugan Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 83,000
Built: 1988

For Year Ending: April 30, 2017
Date Generated: April 06, 2018

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Frank J. Dugan Elementary School 48 Topanemus Road Marlboro, New Jersey 07746	Marlboro Township Board of Education 1980 Township Drive Marlboro, NJ 07746 (732) 972-2000	Cindy Barr-Rague 1980 Township Drive Marlboro, NJ 07746 (732) 972-2000 Ext. 2010 cbarr-rague@mtps.org

Property ID: 6277932

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
99.9 kBtu/ft²

Source EUI
174.9 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	5,508,456 (66%)
Electric - Grid (kBtu)	2,781,462 (34%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	66
National Median Source EUI (kBtu/ft²)	115.6
% Diff from National Median Source EUI	51%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	601

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)