Local Government Energy Audit:
Energy Audit Report

Nishuane School

Montclair Board of Education

32 Cedar Street

Montclair, New Jersey 07042

January 3, 2019

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 the Nishuane School.

The goal of a LGEA is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and put you in a position to implement the ECMs. The LGEA also sets you on the path to receive financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing the ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey School Districts in controlling energy costs and protecting our environment by offering a full spectrum of energy management options.

1.1 Facility Summary

The Nishuane School is a three-story building totaling 87,440 square feet constructed in 1908. The building has a flat roof and exterior walls are finished with brick masonry. The windows throughout the facility are double pane. Interior lighting consists mainly of T8 linear fluorescent fixtures and lighting control is provided by manual wall switches. Heating is provided by two non-condensing gas fired steam boilers and cooling is provided by window air conditioning units.

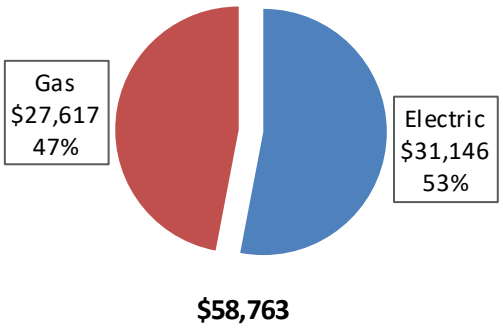
A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

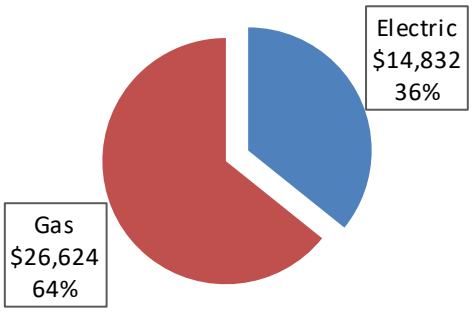
TRC evaluated nine measures. Eight measures were recommended for implementation which together represent an opportunity for the Nishuane School to reduce annual energy costs by roughly $13,415 and annual greenhouse gas emissions by 105,904 lbs CO_2e. The measures would pay for themselves in roughly 7.0 years. The breakdown of existing and potential utility costs is illustrated in Figure 1 and Figure 2, respectively. These projects represent an opportunity to reduce the Nishuane School's annual energy use by 10.7%.

Figure 1 – Previous 12 Month Utility Costs



$58,763

Figure 2 – Potential Post-Implementation Costs



$41,455

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

The evaluated measures have been listed and grouped into major categories as shown in Figure 3. Brief descriptions of the categories can be found below and descriptions of the individual opportunities can be found in Section 4. Measure without an "ECM #" in the table below has been evaluated, but are not recommended for implementation.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Natural Gas Savings (MMBtu)	Annual 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			**74,741**	**29.4**	**0.0**	**0.0**	**$10,187.54**	**$88,999.19**	**$12,230.00**	**$76,769.19**	**7.54**	**75,264**
ECM 1	Install LED Fixtures	Yes	18,852	5.5	0.0	0.0	$2,569.58	$22,808.47	$1,340.00	$21,468.47	8.35	18,984
ECM 2	Retrofit Fixtures with LED Lamps	Yes	53,955	23.8	0.0	0.0	$7,354.32	$63,609.40	$10,890.00	$52,719.40	7.17	54,332
ECM 3	Install LED Exit Signs	Yes	1,934	0.1	0.0	0.0	$263.64	$2,581.32	$0.00	$2,581.32	9.79	1,948
Lighting Control Measures			**12,879**	**5.6**	**0.0**	**0.0**	**$1,755.52**	**$14,110.00**	**$1,535.00**	**$12,575.00**	**7.16**	**12,969**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	10,575	4.6	0.0	0.0	$1,441.40	$9,910.00	$1,535.00	$8,375.00	5.81	10,649
ECM 5	Install High/Low Lighitng Controls	Yes	2,305	1.0	0.0	0.0	$314.12	$4,200.00	$0.00	$4,200.00	13.37	2,321
Motor Upgrades			**1,901**	**1.6**	**0.0**	**0.0**	**$259.16**	**$2,933.28**	**$0.00**	**$2,933.28**	**11.32**	**1,915**
ECM 6	Premium Efficiency Motors	Yes	1,901	1.6	0.0	0.0	$259.16	$2,933.28	$0.00	$2,933.28	11.32	1,915
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**44.9**	**44.9**	**$369.56**	**$122,929.93**	**$6,614.00**	**$116,315.93**	**314.74**	**5,257**
	Install High Efficiency Steam Boilers	No	0	0.0	44.9	44.9	$369.56	$122,929.93	$6,614.00	$116,315.93	314.74	5,257
Domestic Water Heating Upgrade			**0**	**0.0**	**120.7**	**120.7**	**$993.49**	**$207.93**	**$0.00**	**$207.93**	**0.21**	**14,133**
ECM 7	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	120.7	120.7	$993.49	$207.93	$0.00	$207.93	0.21	14,133
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**0.0**	**$219.70**	**$718.80**	**$0.00**	**$718.80**	**3.27**	**1,623**
ECM 8	Vending Machine Control	Yes	1,612	0.0	0.0	0.0	$219.70	$718.80	$0.00	$718.80	3.27	1,623
TOTALS FOR ALL RECOMMENDED MEASURES			**91,134**	**36.7**	**120.7**	**120.7**	**$13,415.41**	**$106,969.20**	**$13,765.00**	**$93,204.20**	**6.95**	**105,904**
TOTALS FOR ALL MEASURES			**91,134**	**36.7**	**165.6**	**165.6**	**$13,784.97**	**$229,899.13**	**$20,379.00**	**$209,520.13**	**15.20**	**111,161**

* - 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 conditions allow. 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 old standard efficiency motors with motors of the current efficiency standard (EISA 2007). Motors will be replaced with the same size motors. This measure saves energy by reducing the power used by the motors due to improved electrical efficiency.

Gas Heating (HVAC/Process) measures generally involve replacing old inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide heating equivalent to older systems, but use less energy. These measures save energy by reducing the fuel used by the heating due to improved combustion and heat transfer efficiency.

Domestic Water Heating upgrade measures generally involve replacing old inefficient domestic water heating systems with modern energy efficient systems. New domestic water heating systems can provide equivalent or greater capacity as older systems, but use less energy. These measures save energy by reducing the fuel used by the domestic water heating systems due to improved efficiency or the removal of standby losses.

Plug Load Equipment control measures generally involve installing automation that limits the power use or operation of equipment plugged into an electrical receptacle based on occupancy.

Energy Efficient Practices

TRC also identified 10 low cost (or no-cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems. Through these practices equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. Opportunities identified at the Nishuane School include:

- Reduce Air Leakage
- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- 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.

Self-Generation Measures

TRC evaluated the potential for installing self-generation sources for the Nishuane 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	77	kW DC STC
Electric Generation	91,736	kWh/yr
Displaced Cost	$7,980	/yr
Installed Cost	$200,200	

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

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, the equipment changes outlined for each ECM need to be selected and installed through project implementation. One of the first considerations is if there is capital available for project implementation. Another consideration is whether to pursue individual ECMs, a group of ECMs, or a comprehensive approach wherein all ECMs are pursued, potentially in conjunction with other facility projects or improvements.

Rebates, incentives, and financing are available from the NJBPU, NJCEP, as well as some of the state's investor-owned utilities, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any project, please review the appropriate incentive program guidelines before proceeding. This is important because in most cases you will need to submit an application for the incentives before purchasing materials and beginning 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 with capital available for implementation of selected individual measures or phasing 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 design the ECM(s), select the equipment and apply for the incentive(s). Program pre-approval is required for some SmartStart incentives, so only after receiving approval may the ECM(s) be installed. The incentive values listed above in Figure 3 represent the SmartStart program and will be explained further in Section 8, as well as the other programs as mentioned below.

This facility also qualifies for the Direct Install program which, through an authorized network of participating contractors, can assist with the implementation of a group of measures versus installing individual measures or phasing implementation. This program is designed to be turnkey and will provide an incentive up to 70% of the cost of the project identified by the designated contractor.

For facilities without capital available 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 external project development, design, and implementation services as well as financing for implementing ECMs. This LGEA report is the first step for participating in ESIP and should help you determine next steps. Refer to Section 8.4 for additional information on the ESIP Program.

Additional descriptions of all relevant incentive programs are located in Section 8 or: www.njcleanenergy.com/ci.

To ensure projects are implemented such that maximum savings and incentives are achieved, bids and specifications should be reviewed by your procurement personnel and/or consultant(s) to ensure that selected equipment coincides with LGEA recommendations, as well as applicable incentive program guidelines and requirements.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Brian Fleischer	Business Administrator	bfleischer@montclair.k12.nj.us	(973) 509-4050
Designated Representative			
Kimberly Raison	Custodian		(973) 509-4237
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	(732) 855-2879

2.2 General Site Information

On November 08, 2016, TRC performed an energy audit at the Nishuane School located in Montclair, New Jersey. TRC's Auditor met with Kimberly Raison to review the facility operations and focus the investigation on specific energy-using systems.

Image 1 – Auditorium

The 87,440 square feet school building is a three-story facility comprised of classrooms, gymnasium, administration offices, nurse room, auditorium, technology room, dance rooms, kitchen, mechanical room, and storage areas. The original building was constructed in 1908 and expanded to accommodate additional classrooms and other spaces in 1917, 1923, and 2002.

2.3 Building Occupancy

The school operates on a 10-month schedule and is open Monday through Friday. The typical schedule is presented in the table below. During a typical day, the school is occupied by approximately 395 students and staff.

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Nishuane School	Weekday	8:00 AM - 3:30 PM
Nishuane School	Weekend	Closed

2.4 Building Envelope

The building has cast-in-place concrete perimeter wall footings with concrete foundation walls and a flat roof covered with a black synthetic rubber: EPDM roofing (ethylene propylene diene monomer). Exterior walls are finished with brick masonry. The windows throughout the facility are double pane glass with aluminum frames and are in acceptable condition with some units showing signs of outside air infiltration. Exterior doors are constructed of metal. Overall, the building envelope appears to be in acceptable condition.

Image 2 – Building Envelope

2.5 On-site Generation

The Nishuane School does not have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of your equipment.

Lighting System

Typical lighting throughout the school building is provided by recessed fluorescent fixtures with one or two 32-Watt T8 lamps and electronic ballasts. The auditorium is illuminated with 60-Watt screw-in incandescent lamps while the gymnasium is lit with 400-Watt metal halide lamps. Some of the storage rooms and closets are illuminated with a mixture of incandescent lamps and compact fluorescent lamps. Exit signs throughout the facility are incandescent. Lighting control is provided mainly by manual wall switches. The facility has minimal exterior lighting which consists of 150-Watt metal halide outdoor wall-mounted fixtures and 250-Watt metal halide parking lot fixtures. They are controlled with photocells.

Steam Heating System

The steam system consists of two H. B. Smith 3,959 MBh output steam boilers. The boilers are 30 years old and have an estimated combustion efficiency of 75%. They have passed their useful service life. The boilers operate in lead/lag operation with only one boiler operating at a time. Each boiler has 0.8 hp forced draft fan with discharge dampers to control the volume of combustion air. There are three constant speed 5 hp feed water pumps. The water level in the boilers is controlled by a valve. Steam is supplied to the radiators for heating at 15 psig. Space temperatures are controlled by local thermostats. The school should consider re-evaluating the building heating load and installing modular steam boilers when these boilers are replaced.

Image 3 – Steam Heating System (Boilers)

Air Conditioning (DX)

There are 26 window units and one split air conditioner (AC) are used to cool the building. Window units range in size from 0.5 to 1.25 tons and average four years of age. The unit serving room B11 is significantly less efficient than others and appears to be in poor condition. The 1.5-ton Mitsubishi split AC system is five years old and provides cooling to the server room. There is one air handler unit located in the fan room that provides constant fresh air to the hallways using a single constant speed 5 hp supply fan.

Domestic Hot Water

Domestic hot water for the school is provided by one Universal gas fired non-condensing hot water heater with an input rating of 156 MBh and a nominal efficiency of 80%. The water heater is seven years old and has 82-gallon storage tank. The water heater is in good condition.

Image 4 – Domestic Hot Water

Food Service & Refrigeration

The school houses a small non-commercial kitchen for light cooking. The kitchen appliances include gas cooking range, gas warmers, a stand-up refrigerator and freezer. The kitchen is well maintained.

Plug load & Vending Machines

There are approximately 68 computer work stations throughout the facility and they are mostly desktop units with LCD monitors. There is no centralized PC power management software installed.

There is one server closest in the facility that has cooling provided by a split AC. The facility has one refrigerated beverage vending machine located in the teacher room.

2.7 Water-Using Systems

There are several restrooms at this facility. A sampling of restrooms found that all the faucets are rated for 2.2 gallons per minute (gpm) or higher, the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 gpf. There are no restrooms with showers.

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/ft^2 and energy use/ft^2. These energy use indices are indicative of the relative energy effectiveness of this building. There are many factors that could cause the energy use of this building to vary from the "typical" energy use for other facilities identified as: School (K-12). Specific local climate conditions, daily occupancy hours of the facility, seasonal fluctuations in occupancy, daily operating hours of energy use systems, and the behavior of the occupants with regard to operating systems that impact energy use such as turning off appliances and leaving windows open. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

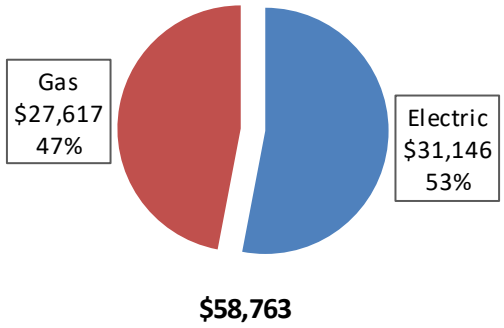
The following energy consumption and cost data is based on the last 12-month period of utility usage data that was provided for each utility. The annual consumption and cost was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Nishuane School		
Fuel	**Usage**	**Cost**
Electricity	197,890 kWh	$31,146
Natural Gas	33,552 Therms	$27,617
Total		**$58,763**

The current utility cost for this site is $58,763 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



$58,763

3.2 Electricity Usage

Electricity is provided by PSE&G. The average electric cost (combined for commodity, transmission and distribution) for the past 12 months is $0.136/kWh, which is the blended rate used throughout the analyses in this report. The monthly electricity consumption and peak demand is represented graphically in the chart below. The electricity use profile reflects lower occupancy in the summer months and confirms the school's 10-month operation.

Figure 9 - Electric Usage & Demand

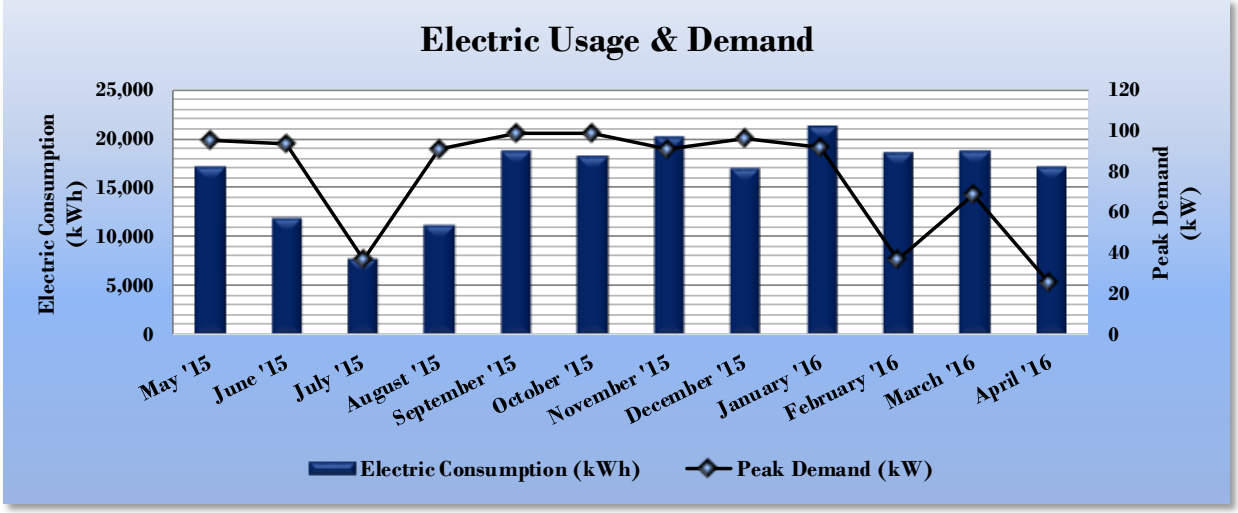


Figure 10 - Electric Usage & Demand

Electric Billing Data for Nishuane School						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
6/12/15	30	17,220	95	$413	$3,513	No
7/14/15	31	11,910	93	$405	$2,768	No
8/13/15	30	7,710	37	$160	$1,486	No
9/14/15	30	11,130	91	$432	$2,697	No
10/14/15	31	18,720	99	$431	$2,755	No
11/15/15	30	18,210	99	$431	$2,681	No
12/15/15	30	20,260	91	$398	$2,884	No
1/14/16	31	17,040	96	$418	$2,387	No
2/13/16	31	21,180	92	$402	$2,804	No
3/15/16	31	18,540	36	$159	$2,278	No
4/12/16	29	18,840	69	$414	$2,567	Yes
5/14/16	31	17,130	25	$111	$2,327	Yes
Totals	**365**	**197,890**	**98.7**	**$4,172**	**$31,146**	2
Annual	**365**	**197,890**	**98.7**	**$4,172**	**$31,146**	

3.3 Natural Gas Usage

Natural gas is provided by PSE&G. The average gas cost for the past 12 months is $0.823/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is represented graphically in the chart below. The gas use profile is typical for a facility with a significant heating load relative to other end uses.

Figure 11 - Natural Gas Usage

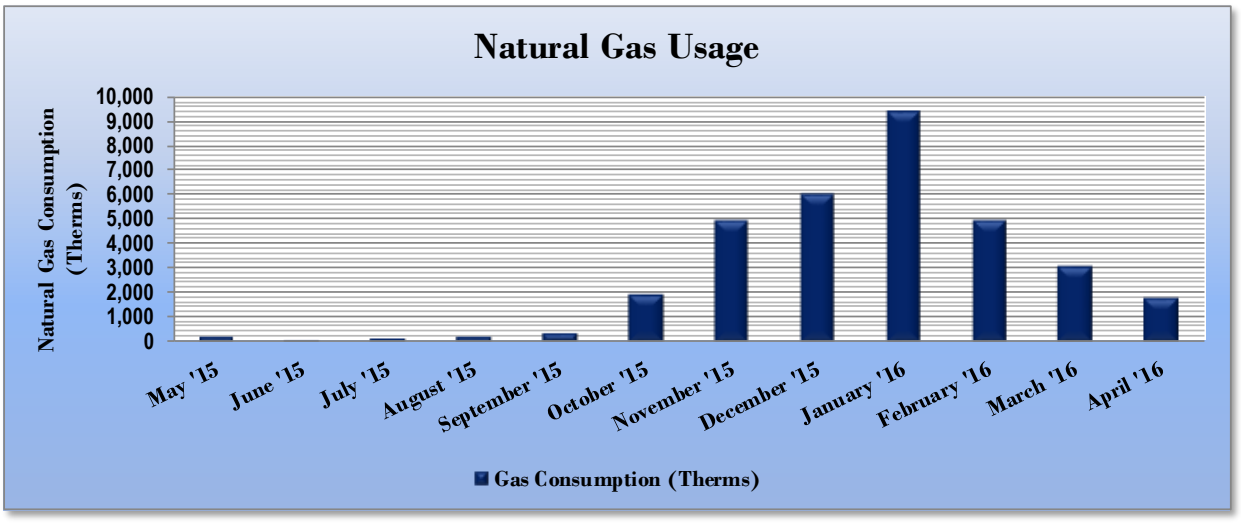


Figure 12 - Natural Gas Usage

Gas Billing Data for Nishuane School				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
6/12/15	30	218	$103	Yes
7/14/15	31	128	$104	Yes
8/13/15	30	190	$101	Yes
9/14/15	30	254	$136	Yes
10/14/15	31	388	$640	No
11/15/15	30	1,999	$2,289	No
12/15/15	30	4,960	$4,224	No
1/14/16	31	6,045	$5,283	No
2/13/16	31	9,434	$6,959	No
3/15/16	31	4,981	$4,670	No
4/12/16	29	3,134	$1,799	No
5/14/16	31	1,823	$1,308	No
Totals	**365**	**33,552**	**$27,617**	4
Annual	**365**	**33,552**	**$27,617**	

3.4 Benchmarking

This facility was benchmarked through 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 compares its performance against a yearly baseline, national medians, or similar buildings in your portfolio. Metrics used in this comparison are the Energy Use Intensity (EUI) and ENERGY STAR® score.

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 energy than similar buildings on a square foot basis or if that building performs better than the median. EUI is presented in both 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 is the raw fuel consumed to generate the energy consumed at the site, factoring in energy production and distribution losses.

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Nishuane School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	64.5	141.4
Site Energy Use Intensity (kBtu/ft^2)	46.1	58.2

By implementing all recommended measures covered in this reporting, the project's estimated post-implementation EUI improves 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		
	Nishuane School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	51.9	141.4
Site Energy Use Intensity (kBtu/ft^2)	41.2	58.2

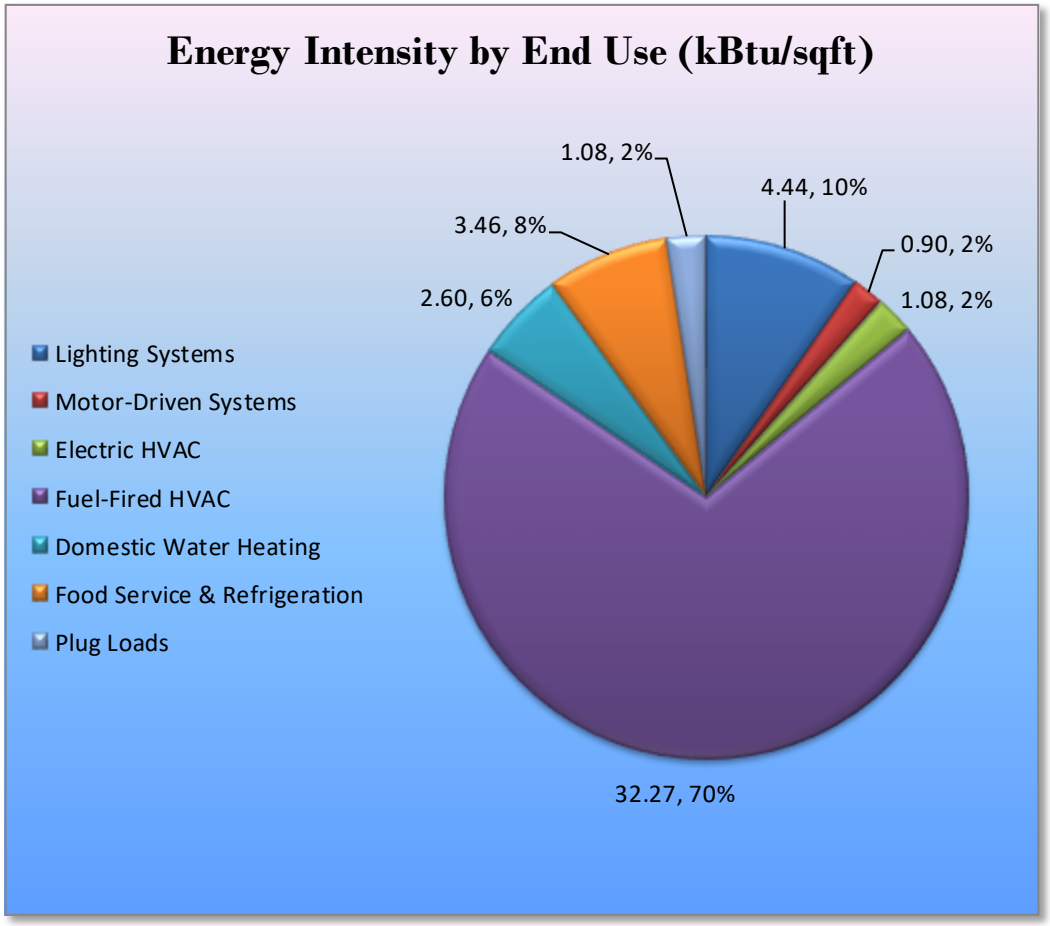
Many buildings can also receive a 1 – 100 ENERGY STAR® score. This score compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide — and may be eligible for ENERGY STAR® certification. This facility has a current score of 86.

The Portfolio Manager®, Statement of Energy Performance can be found in Appendix B: ENERGY STAR® Statement of Energy Performance.

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 and determine their proportional contribution to overall building energy usage. This visual representation of energy end uses highlights systems that may benefit most from energy efficiency projects.

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 projects, help prioritize specific measures for implementation, and set the Nishuane School on the path to receive financial incentives. 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 considered sufficient to make "Go/No-Go" decisions and to prioritize energy projects. Savings are based on the New Jersey Board of Public Utilities New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016. Further analysis or investigation may be required to calculate more accurate savings to support any custom SmartStart, Pay for Performance, or Large Energy Users incentive applications. Financial incentives for the ECMs identified in this report have been calculated based on the NJCEP prescriptive SmartStart program. Depending on your implementation strategy, the project may be eligible for more lucrative incentives through other programs as identified 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		**74,741**	**29.4**	**0.0**	**$10,187.54**	**$88,999.19**	**$12,230.00**	**$76,769.19**	**7.54**	**75,264**
ECM 1	Install LED Fixtures	18,852	5.5	0.0	$2,569.58	$22,808.47	$1,340.00	$21,468.47	8.35	18,984
ECM 2	Retrofit Fixtures with LED Lamps	53,955	23.8	0.0	$7,354.32	$63,609.40	$10,890.00	$52,719.40	7.17	54,332
ECM 3	Install LED Exit Signs	1,934	0.1	0.0	$263.64	$2,581.32	$0.00	$2,581.32	9.79	1,948
Lighting Control Measures		**12,879**	**5.6**	**0.0**	**$1,755.52**	**$14,110.00**	**$1,535.00**	**$12,575.00**	**7.16**	**12,969**
ECM 4	Install Occupancy Sensor Lighting Controls	10,575	4.6	0.0	$1,441.40	$9,910.00	$1,535.00	$8,375.00	5.81	10,649
ECM 5	Install High/Low Lighitng Controls	2,305	1.0	0.0	$314.12	$4,200.00	$0.00	$4,200.00	13.37	2,321
Motor Upgrades		**1,901**	**1.6**	**0.0**	**$259.16**	**$2,933.28**	**$0.00**	**$2,933.28**	**11.32**	**1,915**
ECM 6	Premium Efficiency Motors	1,901	1.6	0.0	$259.16	$2,933.28	$0.00	$2,933.28	11.32	1,915
Domestic Water Heating Upgrade		**0**	**0.0**	**120.7**	**$993.49**	**$207.93**	**$0.00**	**$207.93**	**0.21**	**14,133**
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	120.7	$993.49	$207.93	$0.00	$207.93	0.21	14,133
Plug Load Equipment Control - Vending Machine		**1,612**	**0.0**	**0.0**	**$219.70**	**$718.80**	**$0.00**	**$718.80**	**3.27**	**1,623**
ECM 8	Vending Machine Control	1,612	0.0	0.0	$219.70	$718.80	$0.00	$718.80	3.27	1,623
TOTALS		**91,134**	**36.7**	**120.7**	**$13,415.41**	**$106,969.20**	**$13,765.00**	**$93,204.20**	**6.95**	**105,904**

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

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

4.1.1 Lighting Upgrades

Our recommendations for lighting upgrades 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		**74,741**	**29.4**	**0.0**	**$10,187.54**	**$88,999.19**	**$12,230.00**	**$76,769.19**	**7.54**	**75,264**
ECM 1	Install LED Fixtures	18,852	5.5	0.0	$2,569.58	$22,808.47	$1,340.00	$21,468.47	8.35	18,984
ECM 2	Retrofit Fixtures with LED Lamps	53,955	23.8	0.0	$7,354.32	$63,609.40	$10,890.00	$52,719.40	7.17	54,332
ECM 3	Install LED Exit Signs	1,934	0.1	0.0	$263.64	$2,581.32	$0.00	$2,581.32	9.79	1,948

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	10,037	4.3	0.0	$1,368.09	$18,901.70	$340.00	$18,561.70	13.57	10,107
Exterior	8,815	1.1	0.0	$1,201.49	$3,906.77	$1,000.00	$2,906.77	2.42	8,876

Measure Description

This measure evaluates replacing existing fixtures containing metal halide lamps and halogen incandescent spot luminaire with new high-performance LED light fixtures. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Maintenance savings are anticipated since LED sources have burn hours which are generally more than twice that of a fluorescent source and more than 10 times incandescent sources. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

During planning and design for the installation of new fixtures, we recommend a holistic approach that considers both the technology of the lighting sources and how they are controlled.

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	53,955	23.8	0.0	$7,354.32	$63,609.40	$10,890.00	$52,719.40	7.17	54,332
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

This measure evaluates replacing linear fluorescent lamps with LED tube lamps and replacing incandescent and compact fluorescent lamps with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed although there is a fluorescent fixture ballast in place. Other tube lamps require that fluorescent fixture ballasts be removed or replaced with LED drivers. Screw-in/plug-in LED lamps can be used as a direct replacement for most other screw-in/plug-in lamps. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Maintenance savings are anticipated since LED sources have burn hours which are more than twice that of a fluorescent source and more than 10 times incandescent sources. LED lamps that use the existing fluorescent fixture ballast will be constrained by the remaining hours of the ballast. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

During retrofit planning and design, we recommend a holistic approach that considers both the technology of the lighting sources and how they are controlled.

ECM 3: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	1,934	0.1	0.0	$263.64	$2,581.32	$0.00	$2,581.32	9.79	1,948
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

This measure evaluates replacing incandescent lighting in exit signs with LEDs. LED sources require virtually no maintenance and LED exit signs have a life expectancy of at least 20 years. Many manufacturers can provide retrofit kits that meet fire and safety code requirements. Retrofit kits are less expensive and simpler to install than replacement signs, however, new fixtures would have a longer useful life and are therefore recommended.

A reduction in maintenance costs will be realized with the proposed retrofit because lamps will not have to be replaced as frequently.

4.1.2 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		**12,879**	**5.6**	**0.0**	**$1,755.52**	**$14,110.00**	**$1,535.00**	**$12,575.00**	**7.16**	**12,969**
ECM 4	Install Occupancy Sensor Lighting Controls	10,575	4.6	0.0	$1,441.40	$9,910.00	$1,535.00	$8,375.00	5.81	10,649
ECM 5	Install High/Low Lighitng Controls	2,305	1.0	0.0	$314.12	$4,200.00	$0.00	$4,200.00	13.37	2,321

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
10,575	4.6	0.0	$1,441.40	$9,910.00	$1,535.00	$8,375.00	5.81	10,649

Measure Description

This measure evaluates installing occupancy sensors to control light fixtures that are currently manually controlled in restrooms, storage rooms, classrooms and offices. Sensors detect occupancy using ultrasonic and/or infrared wave technologies. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Occupants will also be able to manually turn off fixtures. Energy savings result 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. Ceiling-mounted or remote-mounted sensors require the use of low voltage switching relays or a wireless signal to the switch. In general, use wall switch replacement sensors for single occupant offices and other small rooms. Install ceiling-mounted or remote mounted sensors in locations without local switching, in situations where the existing wall switches are not in the line-of-sight of the main work area, and in large spaces. We recommend a holistic design approach that considers both the technology of the lighting sources and how they are controlled.

Maintenance savings are anticipated due to reduced lamp operation, however, additional maintenance costs may be incurred because the occupancy sensors may require periodic adjustment; it is anticipated that the net effect on maintenance costs will be negligible.

ECM 5: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
2,305	1.0	0.0	$314.12	$4,200.00	$0.00	$4,200.00	13.37	2,321

Measure Description

This measure evaluates installing occupancy sensors to provide dual level lighting control for light fixtures in spaces that are infrequently occupied but require continuous or night lighting for safety or security reasons. Typical areas for such lighting control are interior corridors.

The light fixtures operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared wave technologies. The lighting systems are switched to the high-level setting when an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period.

For this application the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage should be provided to turn lights on in an area as an occupant approaches the area.

Maintenance savings are anticipated due to reduced lamp operation, however, additional maintenance costs may be incurred because the occupancy sensors may require periodic adjustment; it is anticipated that the net effect on maintenance costs will be negligible.

4.1.3 Motor Upgrades

Our recommendations for motor upgrade measures are summarized in Figure 19 below.

Figure 19 - Summary of Motor Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**1,901**	**1.6**	**0.0**	**$259.16**	**$2,933.28**	**$0.00**	**$2,933.28**	**11.32**	**1,915**
ECM 6	Premium Efficiency Motors	1,901	1.6	0.0	$259.16	$2,933.28	$0.00	$2,933.28	11.32	1,915

ECM 6: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,901	1.6	0.0	$259.16	$2,933.28	$0.00	$2,933.28	11.32	1,915

Measure Description

This measure evaluates replacing the 5 hp air handler supply fan and the three 5 hp boiler feed pump standard efficiency motors with EISA 2007 efficiency motors. The evaluation assumes existing motors will be replaced with the same size motors. It is important that the speed of each new motor match the speed of the motor it replaces as closely as possible. The base case motor efficiencies are obtained from nameplate information. Proposed case premium motor efficiencies 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 annual operating hours.

4.1.4 Domestic Water Heating Upgrade

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

Figure 20 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**120.7**	**$993.49**	**$207.93**	**$0.00**	**$207.93**	**0.21**	**14,133**
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	120.7	$993.49	$207.93	$0.00	$207.93	0.21	14,133

ECM 7: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	120.7	$993.49	$207.93	$0.00	$207.93	0.21	14,133

Measure Description

This measure evaluates the savings from installing low flow domestic water devices to reduce overall water flow in general and hot water flow in particular. Low flow faucet aerators reduce the water flow, relative to standard aerators, from the fixture.

All of the low flow devices reduce the overall water flow from the fixture which generally reduces the amount of hot water used resulting in energy and water savings.

4.1.5 Plug Load Equipment Control - Vending Machine

Our recommendations for plug load equipment control measures 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		**1,612**	**0.0**	**0.0**	**$219.70**	**$718.80**	**$0.00**	**$718.80**	**3.27**	**1,623**
ECM 8	Vending Machine Control	1,612	0.0	0.0	$219.70	$718.80	$0.00	$718.80	3.27	1,623

ECM 8: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,612	0.0	0.0	$219.70	$718.80	$0.00	$718.80	3.27	1,623

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor based controls to reduce the energy use. These controls power down the machine when the surrounding area is vacant, then monitor the surrounding temperature and power up the cooling system at regular intervals to keep the product cool. Savings are a function of the activity level around the vending machine.

4.2 ECM Evaluated but Not Recommended

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

Figure 22 – Summary of Evaluated but Not Recommended ECM

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)
Gas Heating (HVAC/Process) Replacement	**0**	**0.0**	**44.9**	**$369.56**	**$122,929.93**	**$6,614.00**	**$116,315.93**	**314.74**	**5,257**
Install High Efficiency Steam Boilers	0	0.0	44.9	$369.56	$122,929.93	$6,614.00	$116,315.93	314.74	5,257
TOTALS	**0**	**0.0**	**44.9**	**$369.56**	**$122,929.93**	**$6,614.00**	**$116,315.93**	**314.74**	**5,257**

* - 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 Steam Boilers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	44.9	$369.56	$122,929.93	$6,614.00	$116,315.93	314.74	5,257

Measure Description

This measure evaluates replacing old inefficient steam boilers with high efficiency steam boilers. Significant improvements have been made in combustion technology resulting in increases in overall boiler efficiency. Savings result from improved combustion efficiency and reduced standby losses at low loads. The school should consider re-evaluating the building heating load and installing modular steam boilers when these are replaced.

Reasons for not Recommending

The simple payback of this measure exceeds the expected useful life of the equipment and is therefore not recommended based on energy savings alone.

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 low or no-cost efficiency strategies. By employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Reduce Air Leakage

Air leakage, or infiltration, occurs when outside air enters a building uncontrollably through cracks and openings. Properly sealing such cracks and openings can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment. This includes caulking or installing weather stripping around leaky doors and windows allowing for better control of indoor air quality through controlled ventilation.

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Perform Proper Lighting Maintenance

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

Develop a Lighting Maintenance Schedule

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

Ensure Lighting Controls Are Operating Properly

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

Perform Routine Motor Maintenance

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

Clean and/or Replace HVAC Filters

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

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

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

Plug Load Controls

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

Water Conservation

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

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

Refer to Section 4.1.4 for any low-flow ECM recommendations.

6 SELF-GENERATION MEASURES

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

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

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

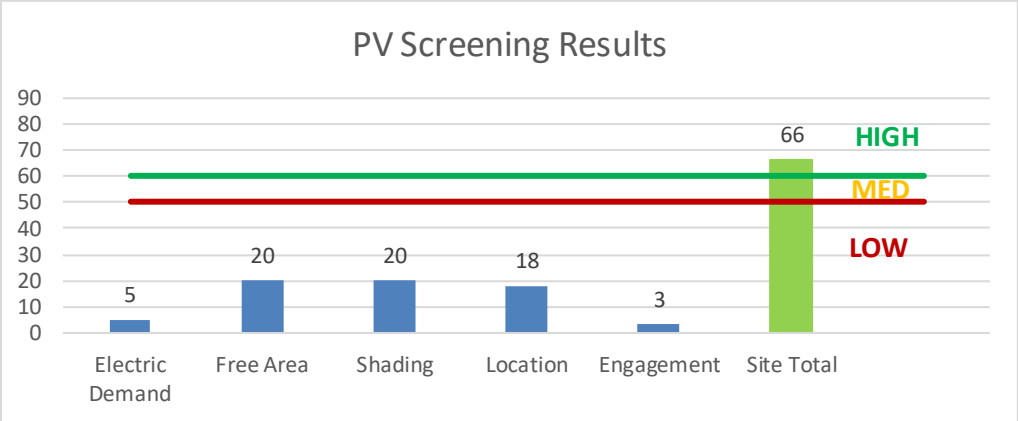
6.1 Photovoltaic

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

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

In order to be cost-effective, a solar PV array generally needs a minimum of 4,000 square feet of flat or south-facing rooftop, or other unshaded space, on which to place the PV panels. In our opinion, the facility does appear meet these minimum criteria for cost-effective PV installation.

Figure 23 - Photovoltaic Screening



Potential	High	
System Potential	77	kW DC STC
Electric Generation	91,736	kWh/yr
Displaced Cost	$7,980	/yr
Installed Cost	$200,200	

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

In non-industrial settings, combined heat and power (CHP) is the on-site generation of electricity and recovery of heat which is put to beneficial use. Common prime movers in CHP applications include reciprocating engines, microturbines, fuel cells, and (at large facilities) gas turbines. Electricity is typically interconnected to the sites local distribution system. Heat is recovered from the exhaust stream and the ancillary cooling system and interconnected to the existing hot water (or steam) distribution system.

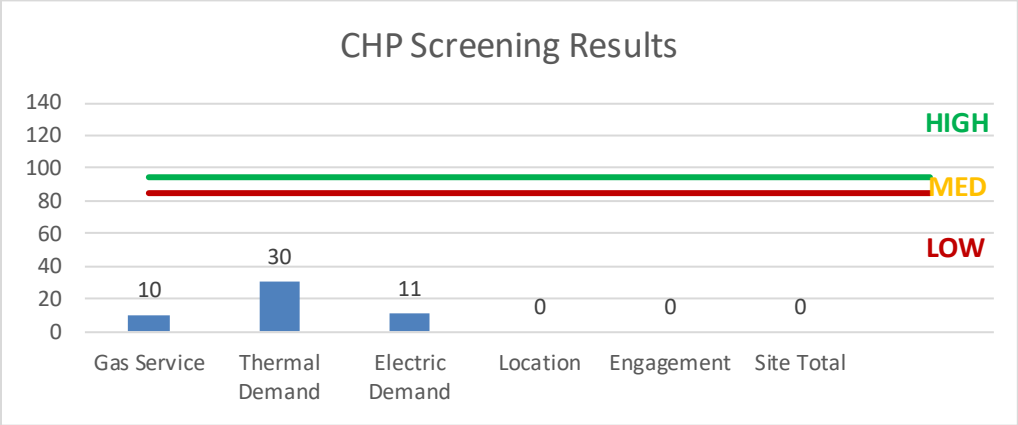
CHP systems are typically used to produce a portion of the electricity needed by a facility, with the balance of electric needs satisfied by purchase from the grid. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste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

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

Low or infrequent thermal load, and lack of space near the existing thermal generation are the most significant factors contributing to the low 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 NJ 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 consumer electric load when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. 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 locally.

By enabling grid operators to call upon Curtailment Service Providers and energy consumers 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 will receive payments whether or not their facility is called upon to curtail their load.

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 program often find it to be a valuable source of revenue for their facility(ies) because the payments can significantly offset annual utility 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 event cycle. DR program participants often have to install smart meters and 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 the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

In our opinion, the facility is not a good candidate for DR curtailment.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and others, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's 1999 Electricity Restructuring Law which requires all customers of investor-owned electric and gas utilities to pay this charge on their monthly energy bills. As a contributor to the fund you were able to participate in the LGEA program and are also eligible to utilize the equipment incentive programs. 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	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	x		x			
ECM 2	Retrofit Fixtures with LED Lamps	x		x			
ECM 3	Install LED Exit Signs			x			
ECM 4	Install Occupancy Sensor Lighting Controls	x		x			
ECM 5	Install High/Low Lighitng Controls			x			
ECM 6	Premium Efficiency Motors			x			
ECM 7	Install Low-Flow Domestic Hot Water Devices			x			
ECM 8	Vending Machine Control			x			

SmartStart is generally well suited for implementation of individual or small sets of measures, with the flexibility to install projects at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities to bundle measures and simplify participation, 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 and 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; applicants can use in-house staff or preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent comparison of available incentives.

Brief descriptions of all relevant alternative financing and incentive programs are located in the sections below. You may also check the following website for further information, including most current program availability, requirements, and incentive levels: 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.

Prescriptive Equipment Incentives 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 prescriptive path provides fixed incentives for specific energy efficiency measures whereas the custom measure path provides incentives for unique or specialized technologies that are not addressed through prescriptive offerings.

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 the lesser of 50% of the total installed incremental project cost, or a buy down to a one year payback. 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 mid-sized facilities with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and install those 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 assigned to the county where your facility is located; a complete list is provided on the Direct Install website identified below. The contractor will be paid the program incentive directly 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 mentioned above, and the remaining 30% of the cost is your responsibility to the contractor.

Since Direct Install offers a free assessment, LGEA applicants that do not meet the audit program eligibility requirements, but do meet the Direct Install requirements, may be moved directly into this program.

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 the incentive programs to help further reduce costs when compiling 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 year.

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 year.

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
2nd Floor Main Hallway	25	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,320	Relamp	Yes	25	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	924	1.20	2,786	0.0	$379.68	$3,178.33	$500.00	7.05
2nd Floor Main Hallway	4	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	322	0.0	$43.94	$430.22	$0.00	9.79
Room 201	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.66	1,519	0.0	$207.08	$1,944.00	$310.00	7.89
Room 202	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 202	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 203A	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.16	380	0.0	$51.77	$467.00	$80.00	7.48
Girls Bathroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.04	100	0.0	$13.66	$117.00	$20.00	7.10
Bathroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.04	100	0.0	$13.66	$117.00	$20.00	7.10
Room 203	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 203	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 204	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.52	1,203	0.0	$163.93	$1,227.50	$210.00	6.21
Room 204	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 205	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 205	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 206	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 206	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 207	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 207	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 208	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.41	950	0.0	$129.42	$993.50	$170.00	6.36
Room 208	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 209	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	15	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.41	950	0.0	$129.42	$993.50	$170.00	6.36
Room 209	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 210	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 210	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 211	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.66	1,519	0.0	$207.08	$1,674.00	$275.00	6.76

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 211A	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,320	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,320	0.07	170	0.0	$23.17	$190.27	$40.00	6.48
Room 212	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 213	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 214	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 215	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.44	1,013	0.0	$138.05	$1,052.00	$180.00	6.32
Room 215	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 216	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 217	6	Linear Fluorescent - T5: 4' T5 (28W) - 1L	Wall Switch	30	1,320	Relamp	Yes	6	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	924	0.08	181	0.0	$24.64	$331.40	$50.00	11.42
Auditorium	4	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	322	0.0	$43.94	$430.22	$0.00	9.79
Auditorium	38	Incandescent: 60W A Lamp	Wall Switch	60	1,320	Relamp	No	38	LED Screw-In Lamps: Downlight Solid State Retrofit	Wall Switch	9	1,320	1.27	2,942	0.0	$400.99	$2,042.61	$380.00	4.15
Stage	105	Compact Fluorescent: 32W CFL	Wall Switch	32	1,320	Fixture Replacement	No	105	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	22	1,320	0.66	1,530	0.0	$208.57	$6,683.36	$0.00	32.04
Stage	6	Halogen Incandescent: 575W Flood Light	Wall Switch	575	1,320	Fixture Replacement	No	6	LED - Fixtures: Architectural Flood/Spot Luminaire	Wall Switch	85	1,320	1.93	4,463	0.0	$608.32	$7,349.71	$300.00	11.59
1st Floor Room 101	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 100	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.16	380	0.0	$51.77	$467.00	$80.00	7.48
Room 102	25	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	25	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.68	1,583	0.0	$215.70	$2,002.50	$320.00	7.80
Room 102	2	Compact Fluorescent: 23W CFL	Wall Switch	23	1,320	Relamp	No	2	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	16	1,320	0.01	21	0.0	$2.86	$127.30	$0.00	44.58
Hallway	25	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,320	Relamp	Yes	25	LED - Linear Tubes: (4) 4' Lamps	High/Low Control	58	924	1.20	2,786	0.0	$379.68	$3,178.33	$500.00	7.05
Hallway	4	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	322	0.0	$43.94	$430.22	$0.00	9.79
Closet	1	Compact Fluorescent: 23W CFL	Wall Switch	23	180	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	16	180	0.00	1	0.0	$0.19	$63.65	$0.00	326.94
Main Office	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.46	1,076	0.0	$146.68	$1,110.50	$190.00	6.28
Main Office	3	Compact Fluorescent: 23W CFL	Wall Switch	23	1,320	Relamp	No	3	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	16	1,320	0.01	31	0.0	$4.28	$190.95	$0.00	44.58
Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.02	50	0.0	$6.83	$58.50	$10.00	7.10
Nurse Room	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.46	1,076	0.0	$146.68	$1,110.50	$190.00	6.28
Data Center	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.04	100	0.0	$13.66	$117.00	$20.00	7.10
Room 104	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 104	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 105	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 105	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 106	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room 107	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	1,320	Relamp	Yes	2	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	924	0.08	190	0.0	$25.88	$266.40	$50.00	8.36
Room 108	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.57	1,329	0.0	$181.19	$1,498.50	$245.00	6.92
Room 108	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Closet	1	Compact Fluorescent: 23W CFL	Wall Switch	23	180	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	16	180	0.00	1	0.0	$0.19	$63.65	$0.00	326.94
Boys Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.02	50	0.0	$6.83	$58.50	$10.00	7.10
Room 109	24	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	24	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.66	1,519	0.0	$207.08	$1,674.00	$275.00	6.76
Girls Bathroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.04	100	0.0	$13.66	$117.00	$20.00	7.10
Teacher Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.11	253	0.0	$34.51	$350.00	$60.00	8.40
Room 110	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.44	1,013	0.0	$138.05	$1,052.00	$180.00	6.32
Room 111	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.44	1,013	0.0	$138.05	$1,052.00	$180.00	6.32
Room 111	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53
Room 112	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Gym Office	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.14	317	0.0	$43.14	$408.50	$70.00	7.85
Gymnasium	8	Metal Halide: (1) 400W Lamp	Wall Switch	458	1,320	Fixture Replacement	Yes	8	LED - Fixtures: Downlight Pendant	Occupancy Sensor	125	924	1.94	4,499	0.0	$613.28	$6,628.64	$320.00	10.29
Gymnasium	2	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	161	0.0	$21.97	$215.11	$0.00	9.79
Ground Floor Custodian Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.01	27	0.0	$3.62	$35.90	$5.00	8.53
Custodian	7	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	540	Relamp	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	378	0.19	181	0.0	$24.71	$525.50	$90.00	17.63
Custodian	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	540	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	540	0.04	35	0.0	$4.74	$95.13	$20.00	15.85
Custodian	3	Incandescent: 60W A Lamp	Wall Switch	60	540	Relamp	Yes	3	LED Screw-In Lamps: Downlight Solid State Retrofit	Occupancy Sensor	9	378	0.11	100	0.0	$13.64	$277.26	$50.00	16.67
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	180	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	180	0.04	14	0.0	$1.86	$117.00	$20.00	52.09
Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	180	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	180	0.02	7	0.0	$0.99	$71.80	$10.00	62.58

	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
Art Room	36	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	36	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.98	2,279	0.0	$310.61	$2,338.00	$400.00	6.24
Dance Room	29	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	29	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.79	1,836	0.0	$250.22	$1,928.50	$330.00	6.39
Adult Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.02	50	0.0	$6.83	$58.50	$10.00	7.10
Dance Room Office	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.33	760	0.0	$103.54	$818.00	$140.00	6.55
Hallway	8	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	8	LED Exit Signs: 2 W Lamp	None	6	8,760	0.04	645	0.0	$87.88	$860.44	$0.00	9.79
Hallway	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	26	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	924	0.71	1,646	0.0	$224.33	$2,321.00	$260.00	9.19
Hallway	13	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	Yes	13	LED - Linear Tubes: (1) 4' Lamp	High/Low Control	15	924	0.19	431	0.0	$58.77	$866.70	$65.00	13.64
Hallway	1	Incandescent: 60W A Lamp	Wall Switch	60	1,320	Relamp	No	1	LED Screw-In Lamps: Downlight Solid State Retrofit	Wall Switch	9	1,320	0.03	77	0.0	$10.55	$53.75	$10.00	4.15
Book Room	2	Compact Fluorescent: 23W CFL	Wall Switch	23	1,320	Relamp	No	2	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	16	1,320	0.01	21	0.0	$2.86	$127.30	$0.00	44.58
Book Room	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.22	506	0.0	$69.03	$584.00	$100.00	7.01
Storage	1	Compact Fluorescent: 23W CFL	Wall Switch	23	180	Relamp	No	1	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	16	180	0.00	1	0.0	$0.19	$63.65	$0.00	326.94
Room B6	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.57	1,329	0.0	$181.19	$1,498.50	$245.00	6.92
Room B5	21	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	21	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.57	1,329	0.0	$181.19	$1,498.50	$245.00	6.92
Room B11A	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Room B11	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.49	1,139	0.0	$155.31	$1,169.00	$200.00	6.24
Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	180	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	180	0.04	14	0.0	$1.86	$117.00	$20.00	52.09
Storage	5	Compact Fluorescent: 23W CFL	Wall Switch	23	180	Relamp	No	5	LED - Fixtures: Downlight Solid State Retrofit	Wall Switch	16	180	0.02	7	0.0	$0.97	$318.25	$0.00	326.94
Technology Room	32	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	32	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.87	2,026	0.0	$276.10	$2,412.00	$390.00	7.32
Bathroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.02	50	0.0	$6.83	$58.50	$10.00	7.10
Boys Bathroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.11	253	0.0	$34.51	$504.00	$75.00	12.43
Girls Bathroom	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.11	253	0.0	$34.51	$504.00	$75.00	12.43
Cafeteria	20	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,320	Relamp	No	20	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,320	0.43	1,002	0.0	$136.56	$1,170.00	$200.00	7.10
Room B12	19	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	1,320	Relamp	No	19	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,320	0.41	952	0.0	$129.73	$1,111.50	$190.00	7.10
Room B13	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	924	0.38	886	0.0	$120.79	$935.00	$160.00	6.42
Kitchen	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,320	0.13	301	0.0	$40.97	$351.00	$60.00	7.10

	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
Compressor Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	180	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	180	0.02	7	0.0	$0.93	$58.50	$10.00	52.09
Boiler Room	15	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	540	Relamp	No	15	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	540	0.32	307	0.0	$41.90	$877.50	$150.00	17.36
Boiler Room	2	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	161	0.0	$21.97	$215.11	$0.00	9.79
Fan Room	2	Incandescent: 60W A Lamp	Wall Switch	60	1,320	Relamp	No	2	LED Screw-In Lamps: Downlight Solid State Retrofit	Wall Switch	9	1,320	0.07	155	0.0	$21.10	$107.51	$20.00	4.15
School Stairwells	42	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,320	Relamp	Yes	42	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	924	1.15	2,659	0.0	$362.38	$3,857.00	$420.00	9.48
Elevator Room	1	Incandescent: 60W A Lamp	Wall Switch	60	180	Relamp	No	1	LED Screw-In Lamps: Downlight Solid State Retrofit	Wall Switch	9	180	0.03	11	0.0	$1.44	$53.75	$10.00	30.41
Parking Lot pole Lighting	4	Metal Halide: (1) 250W Lamp	Daylight Dimming	295	4,380	Fixture Replacement	No	4	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	75	4,380	0.58	4,433	0.0	$604.18	$1,562.71	$400.00	1.92
Perimeter Light	6	Metal Halide: (1) 150W Lamp	Daylight Dimming	190	4,380	Fixture Replacement	No	6	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	45	4,380	0.57	4,382	0.0	$597.31	$2,344.06	$600.00	2.92
Boys Bathroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	1,320	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	1,320	0.02	53	0.0	$7.24	$71.80	$10.00	8.53

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	Air Compressor	1	Air Compressor	1.5	82.0%	No	540	No	82.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Boiler	1	Combustion Air Fan	0.8	79.0%	No	650	No	79.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Boilers	3	Boiler Feed Water Pump	5.0	80.5%	No	780	Yes	86.5%	No		0.71	564	0.0	$76.88	$2,132.91	$0.00	27.74
Elevator Room	Elevator Room	1	Other	20.0	91.0%	No	650	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Fan Roon	Fan Roon	1	Supply Fan	5.0	69.0%	No	1,440	Yes	89.5%	No		0.92	1,337	0.0	$182.27	$800.37	$0.00	4.39
Boiler Room	Boiler	1	Combustion Air Fan	0.8	79.0%	No	200	No	79.0%	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
Room 201	Room 201	1	Window AC	1.26		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Room 217	1	Split-System AC	1.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 203A	Room 203A	1	Window AC	0.67		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 213	Room 213	1	Window AC	0.58		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main office	Main office	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main office	Main office	1	Window AC	1.26		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Nurse Office	Nurse Office	1	Window AC	0.66		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Nurse Office	Nurse Office	1	Window AC	1.17		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 104	Room 104	2	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 106	Room 106	2	Window AC	1.26		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 107-Library	Room 107-Library	3	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Teacher Room	Teacher Room	1	Window AC	1.26		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 110	Room 110	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 111, 112	Room 111, 112	2	Window AC	1.23		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 112	Room 112	1	Window AC	1.23		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Dance Room	Dance Room	1	Window AC	1.23		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room B6,B12	Room B6,B12	2	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Tech Room	Tech Room	1	Window AC	1.83		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room B11A	Room B11A	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room B11	Room B11	1	Window AC	1.25		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	School	2	Forced Draft Steam Boiler	3,307.00	Yes	2	Forced Draft Steam Boiler	3,307.00	82.40%	Et	0.00	0	44.9	$369.56	$122,929.93	$6,614.00	314.74

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	School	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	3	Faucet Aerator (Kitchen)	3.00	2.20	0.00	0	8.6	$70.96	$21.51	$0.00	0.30
School	26	Faucet Aerator (Lavatory)	2.20	1.00	0.00	0	112.1	$922.53	$186.42	$0.00	0.20

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Stand-Up Refrigerator, Glass Door (>50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Stand-Up Refrigerator, Solid Door (≤15 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Yes	No	0.00	0	0.0	$0.00	$2,878.43	$300.00	0.00
Kitchen	1	Gas Rack Oven (Double)	Yes	No	0.00	0	0.0	$0.00	$9,290.04	$2,000.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
School	68	Desktop Computer with LCD Monitor	205.0	Yes
School	4	Copy Machine	850.0	Yes
School	3	Printer	460.0	Yes
School	5	Microwave	1,000.0	No
Teacher Room	1	Refrigerator	250.0	No
Teacher Room	1	Refrigerator	250.0	No
Custodian Room	1	Refrigerator	250.0	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
Teacher Room	1	Refrigerated	Yes	0.00	1,612	0.0	$219.70	$718.80	$0.00	3.27

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

86

ENERGY STAR® Score[1]

Nishuane Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 87,440
Built: 1908

For Year Ending: April 30, 2016
Date Generated: December 20, 2017

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

Property & Contact Information

Property Address	Property Owner	Primary Contact
Nishuane Elementary School 32 Cedar Avenue Montclair, New Jersey 07042	Montclair Board of Education 22 Valley Road Montclair, NJ 07042 (973) 509-4050	Steve DiGeronimo 22 Valley Road Montclair, NJ 07042 (973) 509-4050 bfleischer@montclair.k12.nj.us

Property ID: 5730319

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
44.4 kBtu/ft²

Source EUI
62.7 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	672,347 (17%)
Natural Gas (kBtu)	3,207,913 (83%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	65.4
National Median Source EUI (kBtu/ft²)	92.4
% Diff from National Median Source EUI	-32%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	245

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)