Local Government Energy Audit:
Energy Audit Report

William Mason School

5 Shawnee Trail

Montville, NJ 07045

Montville Township BOE

February 13, 2018

Final Report by:

TRC Energy Services

Disclaimer

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

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

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

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

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1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for William Mason School.

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

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

1.1 Facility Summary

William Mason School is a 37,031 square foot elementary school comprised of a single floor with a partial basement. The partial basement consists of a mechanical space and two (2) classrooms. The school contains various spaces types such as classrooms, media center, restrooms, offices, a mechanical space and gymnasium/all purpose room. The school is scheduled to operate between 8:00 AM to 3:00 PM during the weekdays. The school is open for sports and custodial activities until about 6:00 PM.

Heating in the school is provided using two (2) gas-fired condensing hot water boilers and cooling is provided using a combination of split AC units, window AC units and packaged AC units. Lighting at the William Mason School consists of T8 linear fluorescent fixtures in the hallways and classrooms. Smaller spaces such as the restrooms, boiler rooms and closets are lit using compact fluorescent lamps and incandescent lamps.

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

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated four (4) measures which together represent an opportunity for William Mason School to reduce annual energy costs by roughly $8,480 and annual greenhouse gas emissions by 62,690 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in roughly 7.2 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce William Mason School's annual energy use by 7%.

Figure 1 – Previous 12 Month Utility Costs

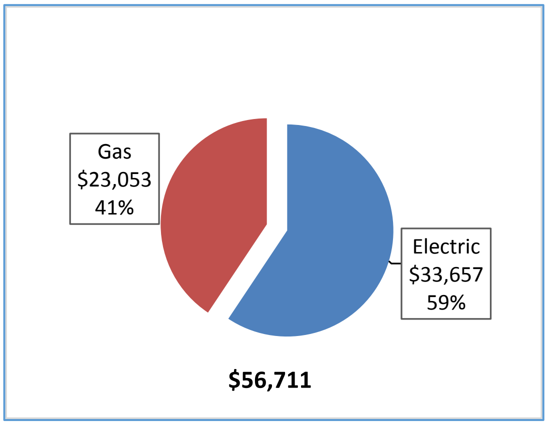
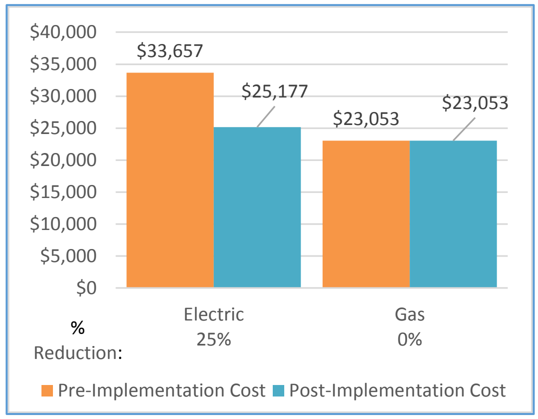


Figure 2 – Potential Post-Implementation Costs



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

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

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**40,542**	**10.3**	**0.0**	**$5,696.63**	**$28,068.28**	**$4,725.00**	**$23,343.28**	**4.1**	**40,826**
ECM 1	Install LED Fixtures	Yes	1,904	0.2	0.0	$267.53	$1,172.03	$300.00	$872.03	3.3	1,917
ECM 2	Retrofit Fixtures with LED Lamps	Yes	38,638	10.0	0.0	$5,429.10	$26,896.25	$4,425.00	$22,471.25	4.1	38,908
Lighting Control Measures			**5,344**	**1.4**	**0.0**	**$750.93**	**$5,400.00**	**$700.00**	**$4,700.00**	**6.3**	**5,382**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	5,344	1.4	0.0	$750.93	$5,400.00	$700.00	$4,700.00	6.3	5,382
Variable Frequency Drive (VFD) Measures			**10,091**	**1.3**	**0.0**	**$1,417.88**	**$11,473.01**	**$0.00**	**$11,473.01**	**8.1**	**10,161**
ECM 4	Install VFDs on Hot Water Pumps	Yes	10,091	1.3	0.0	$1,417.88	$11,473.01	$0.00	$11,473.01	8.1	10,161
Electric Unitary HVAC Measures			**4,665**	**2.8**	**0.0**	**$655.54**	**$24,687.63**	**$1,518.00**	**$23,169.63**	**35.3**	**4,698**
	Install High Efficiency Electric AC	No	4,665	2.8	0.0	$655.54	$24,687.63	$1,518.00	$23,169.63	35.3	4,698
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$226.48**	**$230.00**	**$0.00**	**$230.00**	**1.0**	**1,623**
ECM 5	Vending Machine Control	Yes	1,612	0.0	0.0	$226.48	$230.00	$0.00	$230.00	1.0	1,623
TOTAL OF ALL EVALUATED ECMS			**62,255**	**15.7**	**0.0**	**$8,747.45**	**$69,858.92**	**$6,943.00**	**$62,915.92**	**7.2**	**62,690**
TOTAL OF ALL RECOMMENDED ECMS			**57,589**	**13**	**0**	**$8,091.92**	**$45,171.29**	**$5,425.00**	**$39,746.29**	**4.9**	**57,992**

* - 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 measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

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

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

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

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

Energy Efficient Practices

TRC also identified nine (9) low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. Potential opportunities identified at William Mason School include:

- Reduce Air Leakage
- Close Doors and Windows
- Use Window Treatments/Coverings
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these Energy Efficient Practices, please refer to Section 5.

On-Site Generation Measures

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

1.3 Implementation Planning

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

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

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

- SmartStart
- Direct Install
- Energy Savings Improvement Program (ESIP)

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

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

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

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

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
Rene Rovtar	Superintendent	rene.rovtar@montville.net	973-331-7100
TRC Energy Services			
Smruti Srinivasan	Auditor	ssrinivasan@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 13, 2017, TRC performed an energy audit at William Mason School located in Montville, New Jersey. TRC's team met with Ted Keane to review the facility operations and help focus our investigation on specific energy-using systems.

William Mason School is a 37,031 square foot facility comprised of one (1) main level with a partial basement. The partial basement consists of a mechanical space and two (2) classrooms. This is an elementary school and serves children from Pre-K to fifth grade. The school contains various spaces types such as classrooms, media center, restrooms, offices, a sub-mechanical space and gymnasium/all purpose room. The school is scheduled to operate between 8:00 AM to 3:00 PM during the weekdays. The school is open for sports and custodial activities till about 6:00 PM.

The building was constructed in 1968. Heating in the school is provided using two (2) gas-fired condensing hot water boilers and cooling is provided using a combination of split AC units, window AC units and packaged AC units. Lighting at the William Mason School consists of T8 linear tubes in the hallways and classrooms. Smaller spaces such as the restrooms, boiler rooms and closets are lit using compact fluorescent lamps and incandescent lamps.

2.3 Building Occupancy

The typical schedule is presented in the table below. This is a ten (10) month school. The school is scheduled to operate between 8:00 AM – 3:00 PM during the weekdays. The school is open for sports and custodial activities till about 6:00 PM. There is limited to no activities in the weekend. During a typical day, there facility is occupied by approximately 60 full time staff (including admin, teachers and maintenance) and 300 students.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
William Mason School	Weekday	7:55AM - 2:55PM
William Mason School	Weekend	Mostly no operation

2.4 Building Envelope

The building is constructed using concrete block and steel structure have a brick façade. The corridor section connecting two (2) sections of the building has aluminum framed glass façade. The building has a flat roof. One (1) section of the roof has an EPDM coating and the other section seems to have an asphalt layer. Due to inclement weather on the day of the audit, the auditor did not have access to the roof. Other resources were used to obtain this information. The dividing walls are concrete blocks in some spaces and sheet rocks in others. The windows in the building are double pane which are in good condition and show little sign of excessive infiltration. The entrance exterior door is glass with aluminum frame and other doors are aluminum door.

Image 1 Building envelope pictures

2.5 On-Site Generation

William Mason School does not have any on-site electric generation systems currently installed at the facility.

2.6 Energy-Using Systems

Lighting System

Lighting at the facility is provided mostly by 32-watt linear fluorescent T8 lamps with electronic ballasts as well as some compact fluorescent lamps (CFLs). Most of the fixtures are 2-lamp, 3-lamp and 4-lamp 4-foot long troffers. A few restrooms have 2-foot U-bent T8 fixtures. The boiler rooms have a few 14-watt screw-in LED lamps. In small area such as offices, restrooms (n classrooms) and boiler rooms are primarily lit with 42-watt CFL lamps in recessed can or ceiling mount fixtures.

Lighting control in spaces like the gym, office, and restrooms (in classrooms) is provided by occupancy sensors, controlled by manual wall switches. . The occupancy sensors are wall mounted. The building's exterior lighting consists of a few compact fluorescent lamps fixtures and a few metal halide 175-watt lamp fixtures controlled using timers.

Image 2 Typical lighting at the facility

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

Hot Water (or Steam) Heating System

The hot water system consists of two (2) gas-fired condensing hot water boilers with an output capacity of 1720 MBh. The boiler has a combustion efficiency of 86%. The hot water is circulated using two (2) 2hp and two (2) 3hp constant speed pumps. Hot water is supplied at 180°F when the outside air temperature is below 20°F and the set point is modulated up to 120°F until the outside air temperature reaches 68°F. The boiler shuts down when the outside air temperature rises above this temperature. The space heating is controlled using pneumatic controls. The terminal units in the classrooms include the unit vents for distributing heated air in the respective spaces.

The boilers operate in a lead/lag configuration. Both boilers may be required during very cold weather. The boilers appeared to be in good condition and well maintained.

Image 3 Boilers, controls, and terminal units

Direct Expansion Air Conditioning System (DX)

Space cooling in the old wing classrooms are provided by split AC units of capacities 2.5 or 3 tons based on the size of the classrooms. The older wing classrooms had AC installed within the last four (4) years. The newer wing classrooms have DX coils (cooling capacity 2.5 ton or 3.5 ton) in the unit vents with condensers on the rooftop. These units are 17 years old and were installed at the time of construction of the addition. These units were evaluated for replacement. The office spaces are provided cooling using window AC units of 1 or 2 ton capacity and are approximately ten (10) years old. The new wing has a rooftop packaged unit of 5 tons. All units are controlled using thermostats in the respective zones.

Image 4 Typical space cooling and control units at the facility

Domestic Hot Water Heating System

The domestic hot water heating system for the facility consists of one (1) gas fired and one (1) electric water heater of tank capacities 50 gallons and 30 gallons respectively. The gas fired water heater (from Bradford White) has an input capacity of 40 MBh and an efficiency of 80%. The electric water heater (from

State Premier) has an input capacity of 5.5kW. These water heaters are three (3) years and ten (10) years old respectively and in good condition.

Building Plug Load

There are roughly 81 computer work stations and 15 laptops throughout the facility. Other plug loads in the classrooms and offices are printers, projectors, smart boards and Chromebook carts. There are some kitchenette equipment in the facility such as the microwave, refrigerators, coffee machine, water dispensers etc., there is no centralized PC power management software installed.

There is one (1) refrigerated vending machine in the teachers' lounge. There are no controls installed on the machine.

2.7 Water-Using Systems

A sampling of restrooms found that all of the faucets are rated for 2.2 gallons per minute (gpm) or lower, the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 (gpf) gallons per flush.

3 Site Energy Use and Costs

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

3.1 Total Cost of Energy

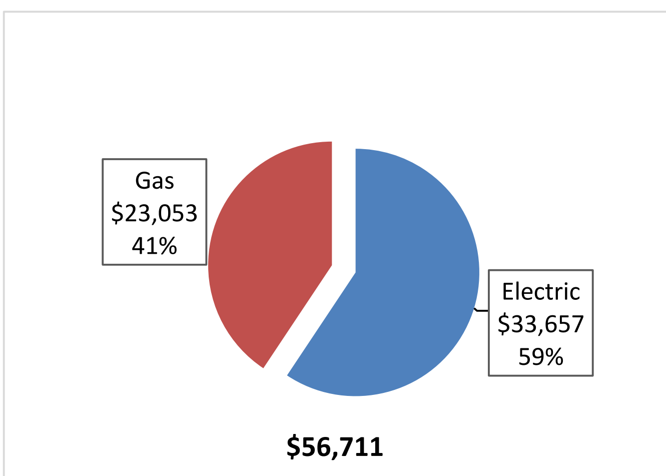
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for William Mason School		
Fuel	**Usage**	**Cost**
Electricity	239,536 kWh	$33,657
Natural Gas	21,167 Therms	$23,053
Total		**$56,711**

The current annual energy cost for this facility is $56,711 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.141/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The third party electric supply is provided by First Energy Solutions. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 8 - Electric Usage & Demand

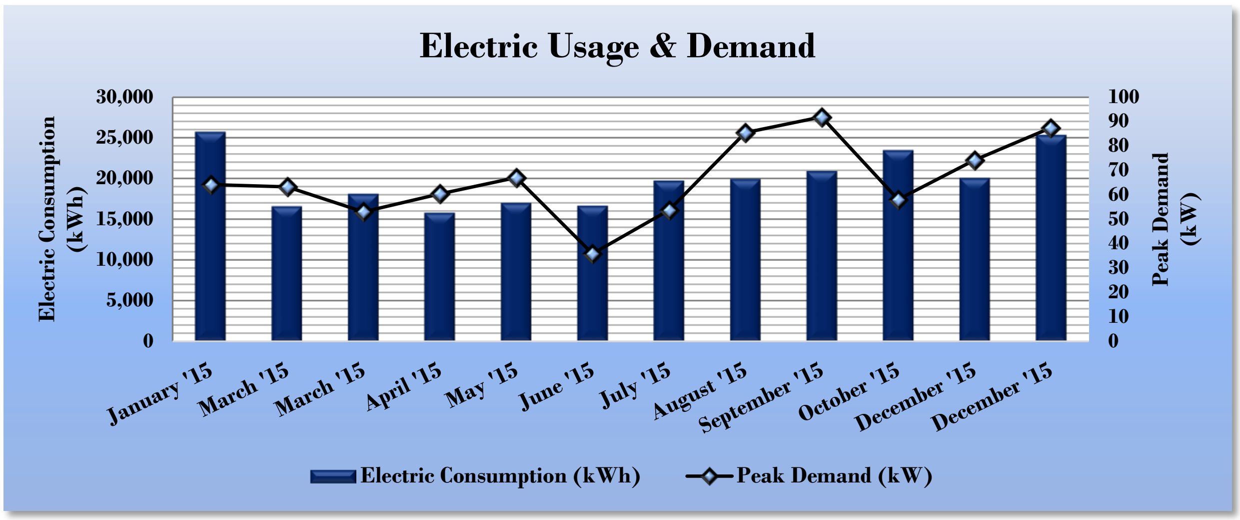


Figure 9 - Electric Usage & Demand

Electric Billing Data for William Mason School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
2/13/15	30	25,680	64	$351	$2,860
3/17/15	32	16,560	63	$344	$2,145
4/13/15	27	18,080	53	$247	$2,183
5/12/15	29	15,760	60	$283	$1,994
6/11/15	30	16,960	67	$343	$2,178
7/15/15	34	16,640	36	$215	$2,215
8/13/15	29	19,680	54	$263	$4,375
9/10/15	28	19,920	85	$453	$4,934
10/10/15	30	20,880	92	$459	$2,374
11/9/15	30	23,440	58	$270	$2,736
12/16/15	37	20,000	74	$360	$2,489
1/13/16	28	25,280	87	$434	$3,081
Totals	**364**	**238,880**	**91.9**	**$4,022**	**$33,565**
Annual	**365**	**239,536**	**91.9**	**$4,033**	**$33,657**

3.3 Natural Gas Usage

Natural gas is provided by New Jersey Natural Gas. The average gas cost for the past 12 months is $1.089/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Figure 10 - Natural Gas Usage

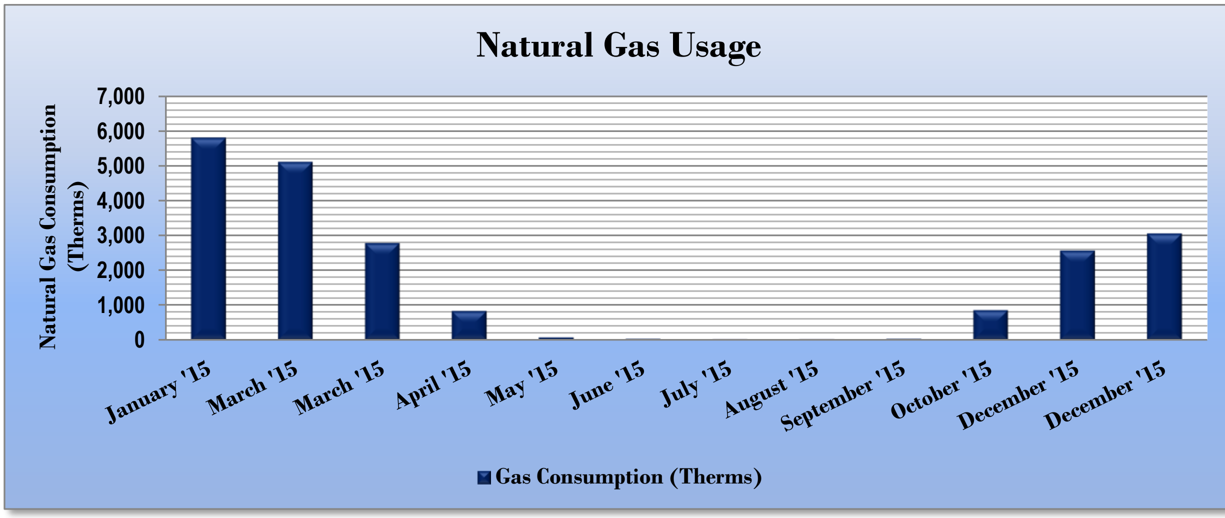


Figure 11 - Natural Gas Usage

Gas Billing Data for William Mason School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
2/13/15	30	5,799	$5,421
3/17/15	32	5,103	$4,866
4/13/15	27	2,772	$2,741
5/12/15	29	829	$1,132
6/11/15	30	70	$503
7/15/15	34	29	$469
8/13/15	29	14	$457
9/10/15	28	11	$454
10/10/15	30	25	$465
11/9/15	30	853	$1,116
12/16/15	37	2,556	$2,486
1/13/16	28	3,048	$2,880
Totals	**364**	**21,109**	**$22,990**
Annual	**365**	**21,167**	**$23,053**

3.4 Benchmarking

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

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

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	William Mason School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	129.3	141.4
Site Energy Use Intensity (kBtu/ft^2)	79.2	58.2

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

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

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	William Mason School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	113.2	141.4
Site Energy Use Intensity (kBtu/ft^2)	74.1	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. This facility has a current score of 62.

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

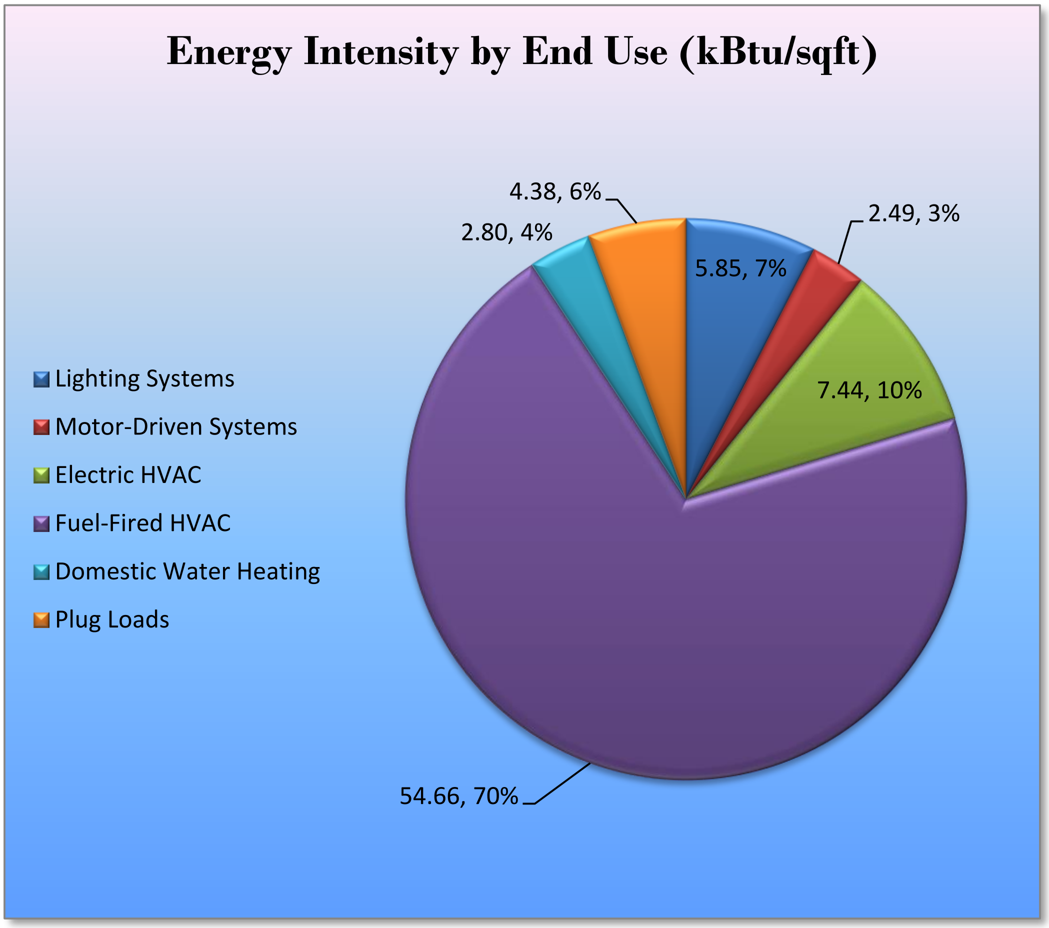
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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

3.5 Energy End-Use Breakdown

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

Figure 14 - Energy Balance (kBtu/SF, %)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**40,542**	**10.3**	**0.0**	**$5,696.63**	**$28,068.28**	**$4,725.00**	**$23,343.28**	**4.1**	**40,826**
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Lighting Control Measures			**5,344**	**1.4**	**0.0**	**$750.93**	**$5,400.00**	**$700.00**	**$4,700.00**	**6.3**	**5,382**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	5,344	1.4	0.0	$750.93	$5,400.00	$700.00	$4,700.00	6.3	5,382
Variable Frequency Drive (VFD) Measures			**10,091**	**1.3**	**0.0**	**$1,417.88**	**$11,473.01**	**$0.00**	**$11,473.01**	**8.1**	**10,161**
ECM 4	Install VFDs on Hot Water Pumps	Yes	10,091	1.3	0.0	$1,417.88	$11,473.01	$0.00	$11,473.01	8.1	10,161
Plug Load Equipment Control - Vending Machine			**1,612**	**0.0**	**0.0**	**$226.48**	**$230.00**	**$0.00**	**$230.00**	**1.0**	**1,623**
ECM 5	Vending Machine Control	Yes	1,612	0.0	0.0	$226.48	$230.00	$0.00	$230.00	1.0	1,623
TOTAL OF ALL RECOMMENDED ECMS			**57,589**	**13**	**0**	**$8,091.92**	**$45,171.29**	**$5,425.00**	**$39,746.29**	**4.9**	**57,992**

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

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

4.1.1 Lighting Upgrades

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

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			40,542	10.3	0.0	$5,696.63	$28,068.28	$4,725.00	$23,343.28	4.1	40,826
ECM 1	Install LED Fixtures	Yes	1,904	0.2	0.0	$267.53	$1,172.03	$300.00	$872.03	3.3	1,917
ECM 2	Retrofit Fixtures with LED Lamps	Yes	38,638	10.0	0.0	$5,429.10	$26,896.25	$4,425.00	$22,471.25	4.1	38,908

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

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	1,904	0.2	0.0	$267.53	$1,172.03	$300.00	$872.03	3.3	1,917

Measure Description

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

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

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	37,671	9.9	0.0	$5,293.21	$26,309.13	$4,425.00	$21,884.13	4.1	37,935
Exterior	967	0.1	0.0	$135.89	$587.12	$0.00	$587.12	4.3	974

Measure Description

We recommend retrofitting existing incandescent and linear T8 tubes with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

4.1.2 Lighting Control Measures

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**5,344**	**1.4**	**0.0**	**$750.93**	**$5,400.00**	**$700.00**	**$4,700.00**	**6.3**	**5,382**
ECM 2	Install Occupancy Sensor Lighting Controls	5,344	1.4	0.0	$750.93	$5,400.00	$700.00	$4,700.00	6.3	5,382

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

ECM 2: 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)
5,344	1.4	0.0	$750.93	$5,400.00	$700.00	$4,700.00	6.3	5,382

Measure Description

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

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

4.1.3 Variable Frequency Drive Measures

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

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**10,091**	**1.3**	**0.0**	**$1,417.88**	**$11,473.01**	**$0.00**	**$11,473.01**	**8.1**	**10,161**
ECM 3	Install VFDs on Hot Water Pumps	10,091	1.3	0.0	$1,417.88	$11,473.01	$0.00	$11,473.01	8.1	10,161

ECM 3: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
10,091	1.3	0.0	$1,417.88	$11,473.01	$0.00	$11,473.01	8.1	10,161

Measure Description

We recommend installing a variable frequency drives (VFD) to control the two (2) 2hp and two (2) 3hp hot water pumps distributing the boiler water. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings results from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the estimated amount of time that the system will operate at reduced load.

4.1.4 Plug Load Equipment Control - Vending Machines

ECM 4: 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	$226.48	$230.00	$0.00	$230.00	1.0	1,623

Measure Description

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

4.2 ECMs Evaluated But Not Recommended

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

Figure 19 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures		**4,665**	**2.8**	**0.0**	**$655.54**	**$24,687.63**	**$1,518.00**	**$23,169.63**	**35.3**	**4,698**
	Install High Efficiency Electric AC	4,665	2.8	0.0	$655.54	$24,687.63	$1,518.00	$23,169.63	35.3	4,698
TOTALS		**4,665**	**2.8**	**0.0**	**$655.54**	**$24,687.63**	**$1,518.00**	**$23,169.63**	**35.3**	**4,698**

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

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

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
4,665	2.8	0.0	$655.54	$24,687.63	$1,518.00	$23,169.63	35.3	4,698

Measure Description

We evaluated replacing standard efficiency packaged air conditioning units (split systems – one (1) 2.5 ton and four (4) 3.5 ton units) with high efficiency packaged air conditioning units on the newer wing classrooms that have DX coils on the unit vents and the condensers on the rooftop. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Reasons for not Recommending

Although the units are old enough to be evaluated for replacement, the payback (35.3 years) on this is more than the useful life of the units themselves as an individual measure. However, when these are installed with all of the other recommended measures, (see Figure 3) then the payback was calculated to be 7.2 years.

5 Energy Efficient Practices

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

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.

Use Window Treatments/Coverings

A substantial amount of heat gain can occur through uncovered or untreated windows, especially older single pane windows and east or west-facing windows. Treatments such as high-reflectivity films or covering windows with shades or shutters can reduce solar heat gain and, consequently, cooling load and can reduce internal heat loss and the associated heating load.

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.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Perform Proper Boiler Maintenance

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

Perform Proper Water Heater Maintenance

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

Plug Load Controls

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

Water Conservation

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

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

6 On-Site Generation Measures

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

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

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

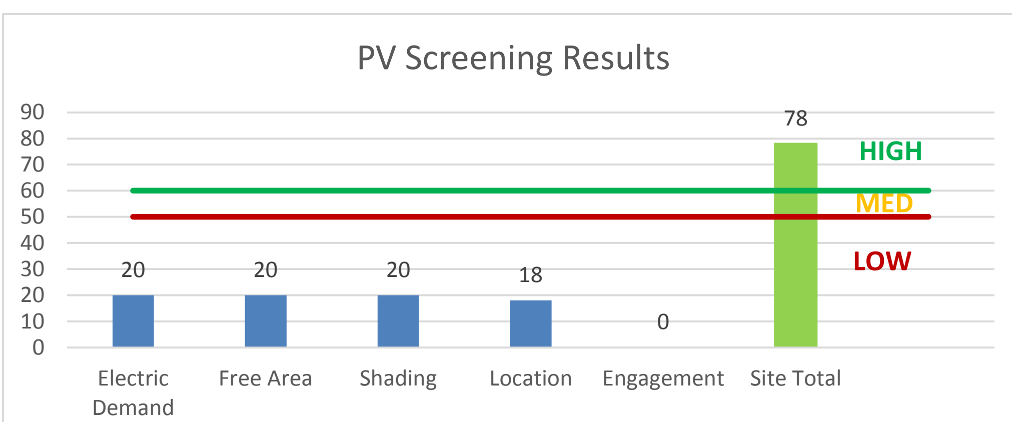
6.1 Photovoltaic

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

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

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

Figure 19 - Photovoltaic Screening



Potential	High	
System Potential	50	kW DC STC
Electric Generation	59,569	kWh/yr
Displaced Cost	$5,180	/yr
Installed Cost	$130,000	

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

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

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

6.2 Combined Heat and Power

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

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

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

Lack of gas service, low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

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

7 DEMAND RESPONSE

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

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

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

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

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

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

8 Project Funding / Incentives

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 20 for a list of the eligible programs identified for each recommended ECM.

Figure 20 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install
ECM 1	Install LED Fixtures	x		x
ECM 2	Retrofit Fixtures with LED Lamps	x		x
ECM 3	Install Occupancy Sensor Lighting Controls		x	x
ECM 4	Install VFDs on Hot Water Pumps	x		x
ECM 5	Vending Machine Control			

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

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 Direct Install

Overview

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

Incentives

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

How to Participate

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

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

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

8.3 SREC Registration Program

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

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

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

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

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

8.4 Energy Savings Improvement Program

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

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

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

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

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

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

9 Energy Purchasing and Procurement Strategies

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hallway	31	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	31	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.67	2,588	0.0	$363.67	$1,813.50	$310.00	4.13
Gym	8	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,200	Relamp	No	8	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,200	0.29	1,133	0.0	$159.26	$761.07	$160.00	3.77
Stairwell	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	8,760	Relamp	No	3	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	8,760	0.06	997	0.0	$140.13	$175.50	$30.00	1.04
Stairwell	4	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	8,760	Relamp	No	4	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	8,760	0.08	1,169	0.0	$164.20	$252.80	$0.00	1.54
CR basement	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	No	4	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,200	0.13	501	0.0	$70.39	$300.80	$60.00	3.42
Hallway	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,200	0.26	1,002	0.0	$140.77	$601.60	$120.00	3.42
Boys' RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	880	Relamp	No	2	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	880	0.06	100	0.0	$14.08	$150.40	$30.00	8.55
Girls' RR	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	880	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	616	0.12	190	0.0	$26.68	$495.60	$80.00	15.58
Room 18	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,540	0.49	1,899	0.0	$266.83	$1,172.40	$215.00	3.59
Room 15	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,540	0.49	1,899	0.0	$266.83	$1,172.40	$215.00	3.59
Office	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	8	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.17	668	0.0	$93.85	$468.00	$80.00	4.13
Principal's office	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.09	334	0.0	$46.92	$234.00	$40.00	4.13
Girls' RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.04	67	0.0	$9.38	$117.00	$20.00	10.34
Boys' RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.04	67	0.0	$9.38	$117.00	$20.00	10.34
CR 2	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$177.89	$972.00	$155.00	4.59
CR 1	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$177.89	$972.00	$155.00	4.59
CR 2B	13	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	13	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.36	1,372	0.0	$192.71	$1,030.50	$165.00	4.49
CR 3	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$177.89	$972.00	$155.00	4.59
CR 5	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$177.89	$972.00	$155.00	4.59
Faculty Lounge	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.09	334	0.0	$46.92	$234.00	$40.00	4.13
Faculty RR	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.09	134	0.0	$18.77	$234.00	$40.00	10.34
Library	32	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	32	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.69	2,672	0.0	$375.40	$1,872.00	$320.00	4.13
CR 6	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	0.33	1,266	0.0	$177.89	$972.00	$155.00	4.59
Custodian	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	208	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	208	0.04	16	0.0	$2.22	$117.00	$20.00	43.73
Electrical Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,200	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,200	0.07	283	0.0	$39.82	$190.27	$40.00	3.77

	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
Book Room	12	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.26	1,002	0.0	$140.77	$702.00	$120.00	4.13
CR 7,10,9,12,11	60	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	60	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	1.64	6,330	0.0	$889.44	$4,860.00	$775.00	4.59
Boys' RR	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.02	33	0.0	$4.69	$58.50	$10.00	10.34
Gym office	1	Compact Fluorescent: 1 Lamp	Occupancy Sensor	42	1,540	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Occupancy Sensor	8	1,540	0.02	60	0.0	$8.46	$53.75	$0.00	6.35
Boiler Room	2	Compact Fluorescent: 1 Lamp	Wall Switch	42	2,200	Relamp	No	2	LED Screw-In Lamps: 1 lamp	Wall Switch	8	2,200	0.04	172	0.0	$24.17	$107.51	$0.00	4.45
Boiler Room	1	LED Screw-In Lamps: 1 Lamp	Wall Switch	14	2,200	None	No	1	LED Screw-In Lamps: 1 Lamp	Wall Switch	14	2,200	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Nurse's office Lav	1	Compact Fluorescent: 3 Lamps	Wall Switch	78	880	Relamp	No	1	LED Screw-In Lamps: 3 lamps	Wall Switch	11	880	0.04	68	0.0	$9.53	$161.26	$0.00	16.93
CR 1,2,2B - Lav	3	Compact Fluorescent: 3 Lamps	Occupancy Sensor	78	880	Relamp	No	3	LED Screw-In Lamps: 3 lamps	Occupancy Sensor	11	880	0.13	203	0.0	$28.58	$483.78	$0.00	16.93
Closet	1	Incandescent: 1 Lamp	Wall Switch	100	52	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Wall Switch	14	52	0.06	5	0.0	$0.72	$53.75	$5.00	67.47
CR 3 - Lav	1	Incandescent: 1 Lamp	Occupancy Sensor	60	880	Relamp	No	1	LED Screw-In Lamps: 1 lamp	Occupancy Sensor	8	880	0.03	53	0.0	$7.39	$53.75	$5.00	6.59
CR 14,3,28,29,30,31	72	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	Yes	72	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,540	1.97	7,596	0.0	$1,067.33	$5,832.00	$930.00	4.59
Hallway	26	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	26	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.56	2,171	0.0	$305.01	$1,521.00	$260.00	4.13
Hallway	4	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,200	Relamp	No	4	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,200	0.04	162	0.0	$22.75	$192.80	$40.00	6.72
Girls' RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.04	67	0.0	$9.38	$117.00	$20.00	10.34
Boys' RR	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	880	0.04	67	0.0	$9.38	$117.00	$20.00	10.34
Girls' RR	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	880	0.02	29	0.0	$4.12	$63.20	$0.00	15.33
Boys' RR	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	880	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	880	0.02	29	0.0	$4.12	$63.20	$0.00	15.33
Custodian	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,200	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,200	0.04	167	0.0	$23.46	$117.00	$20.00	4.13
Faculty RR	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	880	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	880	0.02	29	0.0	$4.12	$63.20	$0.00	15.33
Room 32	8	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,200	Relamp	No	8	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,200	0.26	1,002	0.0	$140.77	$601.60	$120.00	3.42
Electrical Closet	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	208	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	208	0.04	16	0.0	$2.22	$117.00	$20.00	43.73
All school	14	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	14	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Exterior	6	Compact Fluorescent: 1 Lamp	Wall Switch	40	4,380	Relamp	No	6	LED Screw-In Lamps: 1 lamp	Wall Switch	8	4,380	0.13	967	0.0	$135.89	$587.12	$0.00	4.32

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	Boiler	2	Heating Hot Water Pump	3.0	89.5%	No	2,745	No	89.5%	Yes	2	0.75	5,972	0.0	$839.09	$6,015.30	$0.00	7.17
Boiler room	Boiler	2	Heating Hot Water Pump	2.0	86.5%	No	2,745	No	86.5%	Yes	2	0.52	4,119	0.0	$578.79	$5,457.71	$0.00	9.43
Classrooms	Unit ventilators	14	Supply Fan	0.3	77.0%	No	2,745	No	77.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	HVV Reznor unit for new hallway	1	Supply Fan	3.0	88.5%	No	2,745	No	88.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	AHU - new wing	1	Supply Fan	1.5	86.5%	No	2,745	No	86.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Exhaust fans - hallways and restrooms	6	Supply Fan	0.3	60.0%	No	2,745	No	60.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

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
Classrooms	Classrooms	10	Split-System AC	3.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classrooms	Classrooms	9	Split-System AC	2.50		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	Offices	3	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Office	Offices	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Faculty office	Faculty office	1	Window AC	1.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	New wing classrooms	1	Split-System AC	2.50		Yes	1	Split-System AC	2.50		16.00		No	0.42	707	0.0	$99.32	$3,740.55	$230.00	35.34
Rooftop	New wing classrooms	4	Split-System AC	3.50		Yes	4	Split-System AC	3.50		16.00		No	2.35	3,959	0.0	$556.21	$20,947.08	$1,288.00	35.34
Rooftop	New wing	1	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler	All school	2	Condensing Hot Water Boiler	1,720.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

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

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
William Mason School	81	Computer	150.0	Yes
William Mason School	15	Laptop	45.0	Yes
William Mason School	10	Printer - Small	20.0	Yes
William Mason School	5	Printer - Medium	40.0	Yes
William Mason School	3	Printer - Larger	200.0	Yes
William Mason School	20	Projector	200.0	Yes
William Mason School	5	Microwave	1,000.0	No
William Mason School	2	Refrigerator - Medium	153.0	No
William Mason School	2	Refrigerator - Large	172.0	Yes
William Mason School	1	Refrigerator - double door	218.0	Yes
William Mason School	6	Coffee machine	900.0	Yes
William Mason School	19	Television - CRT	120.0	No
William Mason School	1	Television - LCD	100.0	No
William Mason School	1	Space Heater	1,500.0	Yes
William Mason School	1	Water Dispenser	500.0	Yes
William Mason School	2	Standing Fan	100.0	No
William Mason School	20	Smart board	5.0	Yes
William Mason School	6	Chrome Book Cart	40.0	Yes

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Faculty room	1	Refrigerated	Yes	0.00	1,612	0.0	$226.48	$230.00	$0.00	1.02

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

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ENERGY STAR® Score[1]

William Mason School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 37,031
Built: 1968

For Year Ending: February 29, 2016
Date Generated: September 05, 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
William Mason School 5 Shawnee Trail Montville, New Jersey 07045 **Property ID**: 5944673	________________ , (____)____-______	____ ________ , (____)____-______ ________________

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
73.3 kBtu/ft²

Source EUI
122.8 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	1,899,281 (70%)
Electric - Grid (kBtu)	813,376 (30%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	81.2
National Median Source EUI (kBtu/ft²)	136.1
% Diff from National Median Source EUI	-10%
Annual Emissions	
Greenhouse Gas Emissions (Metric Tons CO2e/year)	191

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)