Local Government Energy Audit:
Energy Audit Report

West Cape May

Elementary School

West Cape May Board of Education

301 Moore Street

West Cape May, New Jersey 08204

October 15, 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 West Cape May Elementary School.

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

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist local governments and public facilities with controlling their energy costs and help protect our environment by reducing energy demand statewide.

1.1 Facility Summary

West Cape May Elementary School is a single-story 17,590-square foot public elementary school. The building contains classrooms, offices, a multi-purpose room, a kitchen, restrooms, storage, and mechanical spaces. The school was built in 1963. It was renovated and expanded in 1999. A rooftop solar array was added a few years ago, which provides most of the school's annual electric demand.

Interior lighting at West Cape May Elementary School is provided mostly by 4-foot T8 linear fluorescent fixtures. Metal halide fixtures and a few new LED spotlights provide exterior lighting. There are a few occupancy sensors to control lights in restrooms and storage spaces, though lighting in all classrooms and most other spaces is controlled only by manual switches.

The building is heated by four modular Weil-McLain non-condensing hot water boilers. Supplemental heating is provided to classrooms and offices by 9 Toshiba/Carrier ductless mini-split system heat pumps. There are also five Carrier split system air conditioning (AC) units, two Trane packaged AC rooftop units which serve the classrooms, and one 20-ton Trane packaged AC rooftop unit, which serves the multipurpose room.

A thorough description of the facility and our observations is provided in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated five energy conservation measures (ECMs). Four ECMs are recommended for implementation. Together the four ECMs represent an opportunity for West Cape May Elementary School to reduce its annual energy cost by about $2,591 and its annual greenhouse gas emissions by 26,974 lbs CO_2e. We estimate that if all recommended measures are implemented as recommended, the project would pay for itself in energy savings alone in about roughly 8.7 years. The breakdown of existing utility costs is shown in Figure 1 below. An estimate of energy savings, following implementation of the recommended measures, is shown in Figure 2. Together these measures represent an opportunity to reduce West Cape May Elementary School's annual energy use by about 6% overall.

Figure 1 – Previous 12 Month Utility Costs

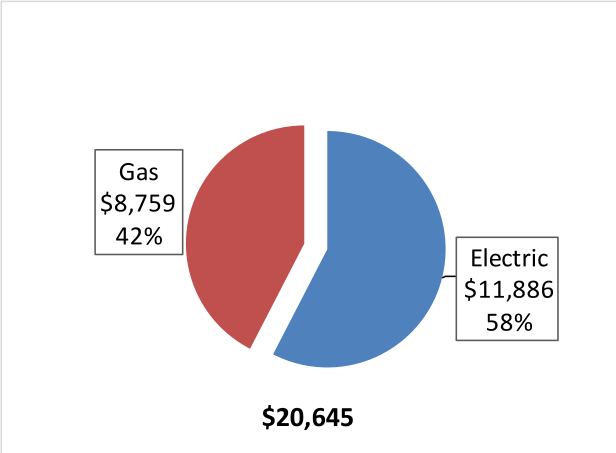
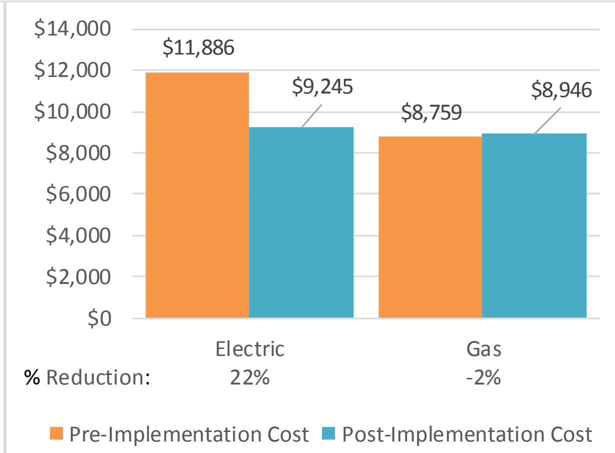


Figure 2 – Potential Post-Implementation Costs



A detailed description of West Cape May Elementary School's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3.

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			**19,701**	**5.2**	**0.0**	**$1,943.66**	**$16,801.19**	**$2,375.00**	**$14,426.19**	**7.4**	**19,838**
ECM 1	Install LED Fixtures	Yes	2,304	0.3	0.0	$348.65	$4,846.22	$120.00	$4,726.22	13.6	2,320
ECM 2	Retrofit Fixtures with LED Lamps	Yes	17,397	4.9	0.0	$1,595.01	$11,954.97	$2,255.00	$9,699.97	6.1	17,518
Lighting Control Measures			**4,006**	**1.2**	**0.0**	**$367.26**	**$7,138.00**	**$925.00**	**$6,213.00**	**16.9**	**4,034**
ECM 3	Install Occupancy Sensor Lighting Controls	Yes	4,006	1.2	0.0	$367.26	$7,138.00	$925.00	$6,213.00	16.9	4,034
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**51.3**	**$553.47**	**$34,294.70**	**$4,000.00**	**$30,294.70**	**54.7**	**6,009**
	Install High Efficiency Hot Water Boilers	No	0	0.0	51.3	$553.47	$34,294.70	$4,000.00	$30,294.70	54.7	6,009
Domestic Water Heating Upgrade			**5,106**	**1.4**	**-17.4**	**$280.22**	**$2,091.20**	**$300.00**	**$1,791.20**	**6.4**	**3,102**
ECM 4	Install Tankless Water Heater	Yes	5,106	1.4	-17.4	$280.22	$2,091.20	$300.00	$1,791.20	6.4	3,102
TOTAL - ALL EVALUATED MEASURES			**28,812**	**7.8**	**33.9**	**$3,144.62**	**$60,325.08**	**$7,600.00**	**$52,725.08**	**16.8**	**32,983**
TOTAL - ALL RECOMMENDED MEASURES			**28,812**	**7.8**	**-17.4**	**$2,591.14**	**$26,030.39**	**$3,600.00**	**$22,430.39**	**8.7**	**26,974**

* - 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).

One ECM, shown above, was not chosen for implementation. We determined that that the payback period for the "Install High Efficiency Hot Water Boilers" measure was simply too long (54.7 years) to justify the cost of the measure, based on energy savings alone.

Another measure (ECM-4, "Install Tankless Water Heater") would replace an existing electric hot water heater with a gas-fired heater. Though this would result in a slight increase in natural gas consumption (see Figure 2), it would save money overall and is recommended for implementation.

A brief description of each measure category can be found below. A more detailed description of each energy saving opportunity can be found in Section 4.

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

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

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

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

Energy Efficient Practices

TRC also identified seven 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 West Cape May Elementary School include:

- Close Doors and Windows
- Ensure Lighting Controls Are Operating Properly
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Ensure Economizers are Functioning Properly
- Clean and/or Replace HVAC Filters
- Perform Proper Boiler Maintenance
- Install Plug Load Controls

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

On-Site Generation Measures

West Cape May Elementary School has a 75-kW rooftop solar PV array which was installed in 2012. It provides about 74% of the building's annual electric demand. The solar array has significantly lowered the cost of the school's electric usage. Its combined cost for self-generated and utility purchased appears to be significantly lower than most New Jersey schools. See Section 3 for details on electric costs.

For more details on the school's on-site generation potential, please see Section 6.

1.3 Implementation Planning

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

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

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

- SmartStart
- Direct Install
- 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.

Additional information on relevant incentive programs is provided 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			
Dr. Alfred Savio	Chief School Admin/ School Business Admin	fsavio@wcm.capemayschools.com	(609) 884-4614
Stephen Sautner	Custodian	ssautner@wcm.capemayschools.com	(609) 884-4614
TRC Energy Services			
Tom Page	Auditor	tpage@TRCsolutions.com	(732) 855-0033

2.2 General Site Information

On March 30, 2017, TRC performed an energy audit at West Cape May Elementary School located in West Cape May, New Jersey. TRC's energy auditor met with Dr. Alfred Savio and school's custodian, Stephen Sautner to review the facility operations and help focus our investigation on specific energy-using systems.

West Cape May Elementary School is a single story 17,590-square foot public school. The building contains classrooms and offices, a multi-purpose room, a kitchen, restrooms, storage, and mechanical spaces. The school was built in 1963 and renovated and expanded in 1999. A rooftop solar array was added a few years ago, which provides most of the school's annual electric demand. Heating and cooling is provided to about 95% of interior space. Most of the building's mechanical equipment has been upgraded to new high efficiency units within the past five years.

2.3 Building Occupancy

West Cape May Elementary School is typically open Monday through Friday, September through June, except holidays. It is closed on weekends. It is typically occupied about 50 hours per week by approximately 125 students and staff. The building usually opens around 7:00 AM for teachers and staff. Students arrive by 8:00 AM and depart at 2:45 PM, though there is some occupancy for after school day care programs until about 4:30 PM.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
West Cape May Elementary School	Weekday	8:00am - 3:00pm
West Cape May Elementary School	Weekend	CLOSED

2.4 Building Envelope

The school is constructed of concrete masonry block (CMB) with a brick façade. Windows and doors are all double-paned glass with aluminum frames. The roof is flat and in good condition. The original section of the building is covered with a white thermoplastic membrane. The roof of the 1999 addition is covered with a black rubber membrane. Door and window seals all appeared tight. No signs of excessive air infiltration were evident.

2.5 On-Site Generation

West Cape May Elementary School has a 75-kW rooftop solar PV array which was installed in 2012. The school has a 15-yr power purchase agreement with Cambria Solar. In 2017, 91% of school's electric needs were provided by the output of their solar array.

2.6 Energy-Using Systems

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

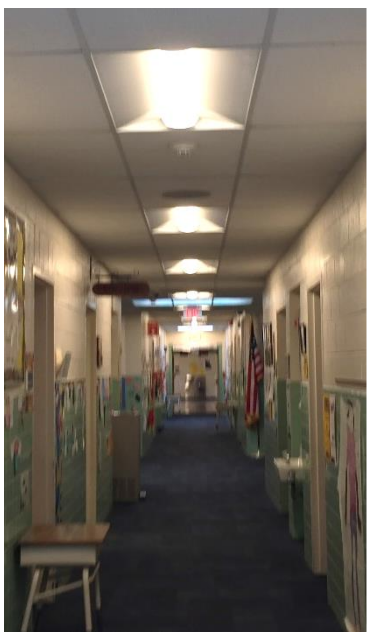
Lighting System

Interior lighting at West Cape May Elementary School is provided mostly by 4-foot T8 linear fluorescent fixtures. There are also some fixtures with compact fluorescent and incandescent bulbs.

Metal halide fixtures and a few new LED spotlights provide exterior lighting. Outdoor lighting is controlled by photocells or a time clock.

There are a few occupancy sensors to control lights in restrooms and storage spaces, though lighting control in most spaces, including all classrooms, is provided by manual switches.

The school upgraded most of its oldest lighting fixtures five years ago with assistance provided by the NJCEP Direct Install program. Fortunately, LED technology has now advanced to the point where those fixtures that were upgraded just five years ago can now be cost-effectively retrofitted with LED "tubes" designed to fit in existing fixtures to save additional kilowatt-hours. LED lighting is generally about half the wattage (or less) of most existing tubes and bulbs. Occupancy sensors are another cost-effective technology that can help save additional energy by ensuring that lights are turned off in all unoccupied spaces.




Hot Water Heating System

Nearly all of the building's interior space is heated and cooled. The building is primarily heated by four modular Weil-McLain non-condensing hot water boilers, located in the boiler room. Each unit has an input capacity of 427 MBH.

Supplementary heating to classrooms and offices is provided by nine Toshiba/Carrier ductless mini-split system heat pumps. Each mini-split unit is ceiling mounted and has a rated heating capacity of 23.2 MBH

Thermostats which control the unit ventilators are all set to 70°F, though the teachers can vary the temperature by ±2° in each classroom. At night and on weekends the school sets back the building temperature to 60 °F or 62°F.

The Weil-McLain boilers were installed in 1999. The boilers were tested in 2016 and found to have an average thermal efficiency of about 83%, which is pretty good for non-condensing boilers (though many new condensing boilers now have efficiency ratings above 95%).

The boilers are in good condition. One boiler was retrofitted with Intellidyne electronic fuel-use economizers in 2013. Though, when they reach the end of their rated useful life (probably sometime in the next 10 years), we recommend that the school investigate the possibility of upgrading their heating system with the latest high efficiency condensing hot water boilers. The boilers are controlled by programmable thermostats, which are setback to 60 °F or 62 °F at night and on weekends.

Direct Expansion Air Conditioning System (DX)

The school has five Carrier 5-ton split system air conditioning (AC) units and two Trane 5-ton packaged AC rooftop units which provide cooling to classrooms. The Carrier five units were installed just two years ago with assistance provided by the NJCEP SmartStart program. They are high efficiency units with seasonal energy efficiency (SEER) ratings of 14.5. The two Trane units (SEER = 12) are equipped with dual enthalpy economizers (to turn off mechanical cooling when outdoor air conditions are appropriate). They were installed in 2012 with assistance from the NJCEP Direct Install Program.

The school also has one large 20-ton Trane packaged AC rooftop unit, which serves the multipurpose room and kitchen area. It is equipped with a dual enthalpy economizer and was installed in 2013 with assistance from the NJCEP Direct Install Program. New programmable thermostats were also installed at that time.

The nine Toshiba/Carrier mini-split units (described in the heating section above) also provide an additional 1.8 tons of cooling capacity each to the spaces that they serve.

Domestic Hot Water Heating System

Domestic hot water is provided by two Bradford White hot water heaters. Both have a 50-gallon storage capacity. The first domestic hot water heater is a gas fired unit that supplies the original section of the building and was replaced four years ago. The second domestic hot water heater is electric and installed in 1999 as part of the 1999 addition.

It is generally less expensive to heat with gas rather than electric. Reducing the tank size to match hot water demand or installing a tankless on-demand hot water system can reduce water heating costs further.

Building Plug Load

The plug load for the building appears typical for a building of this size and type. The school has approximately 135 computers. They are mostly desk machines with LCD monitors.

There are also Smart boards in all the classrooms, one server, a few printers, a copy machine, other office equipment, a few microwaves and coffee makers used by school staff.

The building is equipped with a kitchen, but it does not have any walk-in coolers or other large commercial equipment, just a milk cooler. The kitchen is only used a few hours a day to reheat food for lunches.

2.7 Water-Using Systems

There building has about dozen restrooms and one kitchen. All restroom and kitchen faucets were retrofitted in 2012 with faucet aerators to meet current water conservation “low-flow” guidelines. All toilets and urinals also appeared to be low-flow devices.

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 many 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

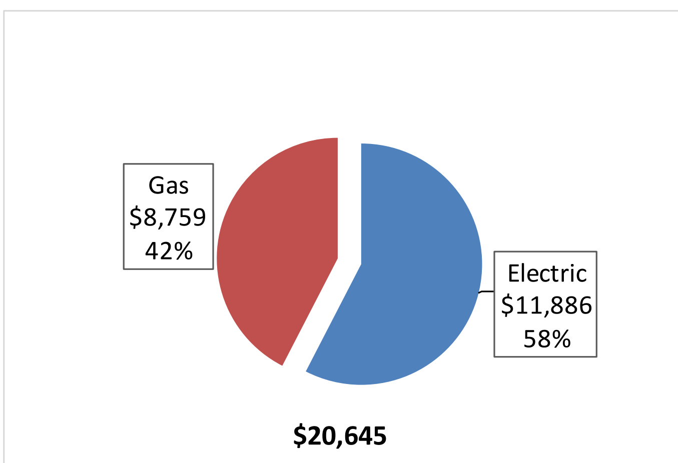
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 6 - Utility Summary

Utility Summary for West Cape May Elementary School		
Fuel	**Usage**	**Cost**
Electricity	129,641 kWh	$11,886
Natural Gas	8,121 Therms	$8,759
Total		**$20,645**

The current annual energy cost for this facility is $20,645 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by Atlantic City Electric. The average electric rate over a recent 12-month period was found to be $0.092/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 monthly electricity consumption and peak demand are shown in the chart below.

Electric usage appears typical for a building of this size and type. The highest usage month was February, which is likely caused by the supplemental heating provide by mini-split heat pumps. The school's electric rate is lower than most other New Jersey schools due to its rooftop solar array. It receives74% of its power through a solar PPA with Cambria Solar at just $0.054/kWh. So, though heating with gas alone is usually less expensive, the difference is less in this case. Monthly solar generation was estimated based on billing and semi-annual solar production and cost data.

To further reduce annual electric costs the school might want to consider whether air conditioner usage in the summer could be better controlled or limited to certain areas of the building.

Figure 8 - Electric Usage & Demand

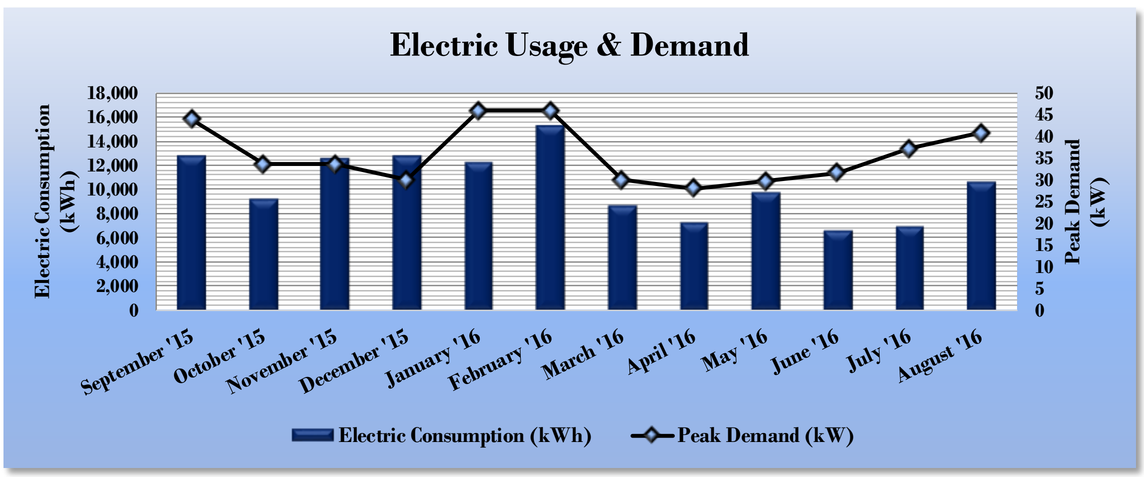


Figure 9 - Electric Usage & Demand

Electric Billing Data for West Cape May Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Total Electric Cost	TRC Estimated Usage?
10/9/15	30	12,774	44.0	$596.44	Yes
11/6/15	28	9,253	33.6	$591.81	Yes
12/8/15	32	12,592	33.6	$909.69	Yes
1/8/16	31	12,817	30.0	$1,575.68	Yes
2/5/16	28	12,291	46.0	$1,619.02	Yes
3/7/16	31	15,320	46.0	$2,090.51	Yes
4/7/16	31	8,682	30.0	$840.17	Yes
5/9/16	32	7,251	28.0	$552.20	Yes
6/8/16	30	9,778	29.6	$807.30	Yes
7/8/16	30	6,661	31.6	$651.73	Yes
8/8/16	31	6,947	37.2	$701.66	Yes
9/8/16	31	10,599	40.8	$718.54	Yes
Totals	**365**	**129,641**	**46**	**$11,886**	12
Annual	**365**	**129,641**	**46**	**$11,886**	

3.3 Natural Gas Usage

Natural gas is provided by South Jersey Gas. The average natural gas rate over a recent 12-month period was found to be $1.079/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is shown in the chart below.

Gas usage appears typical for a building of this size and type, which only uses gas for heating in the winter, plus a small amount for domestic hot water heating the rest of the year.

Figure 10 - Natural Gas Usage

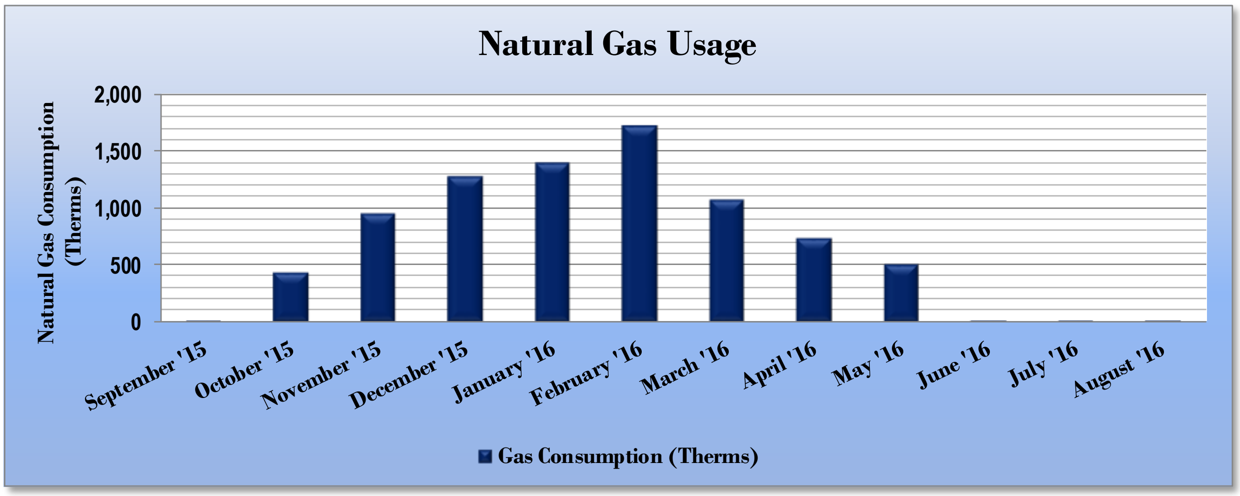


Figure 11 - Natural Gas Usage

Gas Billing Data for West Cape May Elementary School				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
10/9/15	30	2	$62	No
11/6/15	28	433	$429	Yes
12/8/15	32	959	$1,303	No
1/8/16	31	1,274	$1,224	Yes
2/5/16	28	1,403	$1,751	No
3/7/16	31	1,726	$1,643	No
4/7/16	31	1,080	$1,040	No
5/9/16	32	733	$699	No
6/8/16	30	504	$477	Yes
7/8/16	30	1	$30	No
8/8/16	31	2	$65	No
9/8/16	31	3	$36	No
Totals	**365**	**8,121**	**$8,759**	3
Annual	**365**	**8,121**	**$8,759**	

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		
	West Cape May Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity ($kBtu/ft^2$)	127.4	141.4
Site Energy Use Intensity ($kBtu/ft^2$)	71.3	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		
	West Cape May Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity ($kBtu/ft^2$)	110.9	141.4
Site Energy Use Intensity ($kBtu/ft^2$)	66.7	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 to receive an ENERGY STAR® certification. A Portfolio Manager® Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance. The ENERGY STAR® score is based on source EUI. Because the source of most of the school's electric power is solar energy, the school has an ENERGY STAR® score of 99.

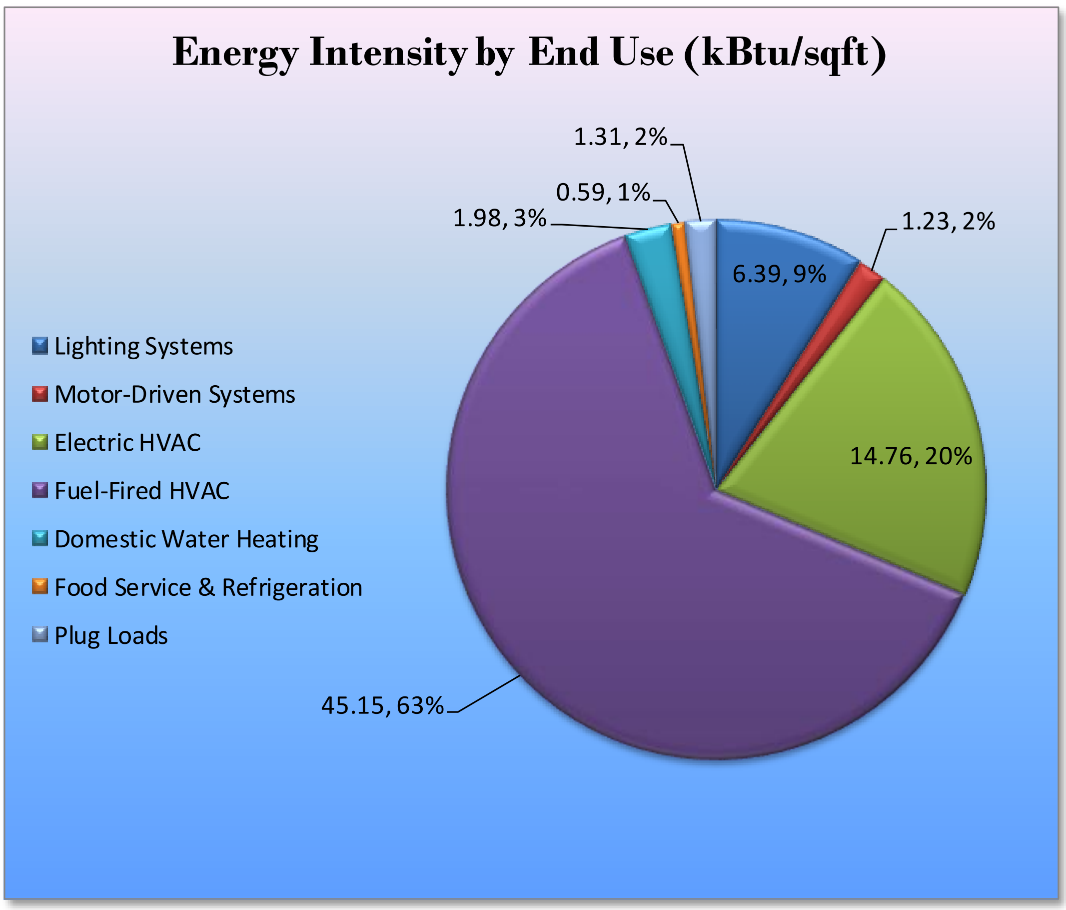
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

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 for 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 (% and kBtu/SF)



4 ENERGY CONSERVATION MEASURES

Level of Analysis

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

The following sections describe the evaluated measures.

4.1 Recommended ECMs

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

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**19,701**	**5.2**	**0.0**	**$1,943.66**	**$16,801.19**	**$2,375.00**	**$14,426.19**	**7.4**	**19,838**
ECM 1	Install LED Fixtures	2,304	0.3	0.0	$348.65	$4,846.22	$120.00	$4,726.22	13.6	2,320
ECM 2	Retrofit Fixtures with LED Lamps	17,397	4.9	0.0	$1,595.01	$11,954.97	$2,255.00	$9,699.97	6.1	17,518
Lighting Control Measures		**4,006**	**1.2**	**0.0**	**$367.26**	**$7,138.00**	**$925.00**	**$6,213.00**	**16.9**	**4,034**
ECM 3	Install Occupancy Sensor Lighting Controls	4,006	1.2	0.0	$367.26	$7,138.00	$925.00	$6,213.00	16.9	4,034
Domestic Water Heating Upgrade		**5,106**	**1.4**	**-17.4**	**$280.22**	**$2,091.20**	**$300.00**	**$1,791.20**	**6.4**	**3,102**
ECM 4	Install Tankless Water Heater	5,106	1.4	-17.4	$280.22	$2,091.20	$300.00	$1,791.20	6.4	3,102
TOTALS		**28,812**	**7.8**	**-17.4**	**$2,591.14**	**$26,030.39**	**$3,600.00**	**$22,430.39**	**8.7**	**26,974**

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

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

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**19,701**	**5.2**	**0.0**	**$1,943.66**	**$16,801.19**	**$2,375.00**	**$14,426.19**	**7.4**	**19,838**
ECM 1	Install LED Fixtures	2,304	0.3	0.0	$348.65	$4,846.22	$120.00	$4,726.22	13.6	2,320
ECM 2	Retrofit Fixtures with LED Lamps	17,397	4.9	0.0	$1,595.01	$11,954.97	$2,255.00	$9,699.97	6.1	17,518

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	47	0.0	0.0	$4.35	$69.46	$0.00	$69.46	16.0	48
Exterior	2,257	0.3	0.0	$344.30	$4,776.76	$120.00	$4,656.76	13.5	2,272

Measure Description

We recommend replacing existing fixtures containing HID lamps with new high-performance LED light fixtures. Metal halide, high pressure sodium, and other HID exterior fixtures can be retrofitted with LED lamps designed to fit those fixtures, but many customers prefer to simply replace these fixtures with modern LED fixtures. So, for the sake of this analysis we have assumed the costs and savings for full fixture replacement.

Also included in this category of lighting upgrades is one pole-mounted HID fixture that illuminates the playground area. This fixture is owned by Atlantic City Electric (ACE). The school pays about $200 per year, which is about 29 cents per kilowatt-hour to illuminate the playground. Our analysis shows that it would be cost effective for the school to erect their own light pole with a solar panel and a solar-powered lighting fixture to illuminate the playground instead. There are other options to get power to that fixture that the school may wish to explore as well.

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 typical have lifetimes which are more than twice as long as fluorescent tubes and often 10 times longer than 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	14,828	4.6	0.0	$1,359.48	$11,799.97	$2,205.00	$9,594.97	7.1	14,932
Exterior	2,569	0.3	0.0	$235.53	$155.00	$50.00	$105.00	0.4	2,587

Measure Description

We recommend retrofitting existing incandescent and fluorescent fixtures throughout the school with LED lamps and tubes. As noted in Section 2.6, the school upgraded most lighting fixtures about five years ago. We recommend that for most fixtures only the lamps or tubes be replaced. Many new LED lamps are available which are designed to fit existing fixtures and use existing ballasts.

This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

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

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 17 below.

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		**4,006**	**1.2**	**0.0**	**$367.26**	**$7,138.00**	**$925.00**	**$6,213.00**	**16.9**	**4,034**
ECM 3	Install Occupancy Sensor Lighting Controls	4,006	1.2	0.0	$367.26	$7,138.00	$925.00	$6,213.00	16.9	4,034

ECM 3: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
4,006	1.2	0.0	$367.26	$7,138.00	$925.00	$6,213.00	16.9	4,034

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in all restrooms, storage rooms, classrooms, offices areas.

During the school's last lighting upgrade many fixtures were replaced, but lighting sensors were installed in only a few rooms. We recommend that occupancy sensors be added to most rooms - especially in all classroom and office spaces, to turn lights off automatically whenever rooms are unoccupied. Many schools have shown significant additional savings by installing occupancy sensors in classrooms and other spaces where occupancy might vary throughout the day.

Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls that 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 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 18 below.

Figure 18-Summary of Domestic Hot Water Heating System 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)
Domestic Water Heating Upgrade		**5,106**	**1.4**	**-17.4**	**$280.22**	**$2,091.20**	**$300.00**	**$1,791.20**	**6.4**	**3,102**
ECM 4	Install Tankless Water Heater	5,106	1.4	-17.4	$280.22	$2,091.20	$300.00	$1,791.20	6.4	3,102

ECM 4: Install Tankless Hot Water Heater

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,106	1.4	-17.4	$280.22	$2,091.20	$300.00	$1,791.20	6.4	3,102

Measure Description

We recommend replacing the existing electric storage hot water heater, which supplies the newer wing of the school, with a gas-fired tankless hot water heater. Tankless water heaters (a.k.a. "on-demand water heaters") only heat water when hot water is needed. Water is heated as it flows through the pipe to the hot water tap. Energy savings from a tankless water heater are based from eliminating heat losses associated with maintaining unnecessary standby hot water capacity.

It is cheaper to heat with gas than with electric. The school does not have a high hot water demand, so a tankless on-demand heating system might be the most cost-effective option for providing hot water to the space. On-demand systems cost more but they save more energy as well. We estimate that installing a gas-fired storage hot water heater instead would have roughly the same payback period, because the cost would be less but the savings would be decreased too. Tankless systems eliminate standby heat losses. There are electric tankless systems, as well, but the gas-fired tankless option appears to have the best overall savings and payback.

4.2 ECM Evaluated, But Not Recommended

The measure below have 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.

Install High Efficiency Hot Water Boilers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	51.3	$553.47	$34,294.70	$4,000.00	$30,294.70	54.7	6,009

Measure Description

We evaluated the cost and savings associated with replacing the school's main hot water boilers, which are 83% efficient non-condensing models, with new high efficiency condensing hot water boilers (with an efficiency rating of 91%). Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. Energy savings result from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers that can achieve over 90% efficiency under the proper conditions. Some new condensing boiler systems have efficiencies greater than 96%. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases above 90% as the return water temperature drops below 130°F. Further investigation would be necessary to determine whether the school's heating system can be operated at lower temperatures to make condensing hot water boilers a cost-effective option.

Reasons for not Recommending

We considered recommending that the school replace its main non-condensing boilers with a new high efficiency condensing boiler system, but we found that the estimated payback period was simply too long to justify early replacement. In other words, the energy savings alone did not justify the added expense of early replacement. The current boilers are in good condition, but they are 18 years old, and more efficient boiler technology is now available. When the school is ready to replace its main boilers, we recommend that a high-efficiency condensing boiler system (with an efficiency rating >90%) be considered to replace the current system.

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.

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.

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.

In several restroom and storage areas, we noted that occupancy sensors had been installed (likely during the last light upgrade 5 years ago), but the sensors did not appear to be working properly. Existing occupancy sensors should be tested and repaired if found to be non-functioning. If problems are found with lights turning off unexpectedly, then sensors should be replaced (or moved) so that the system functions as intended.

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.

New programmable thermostats were installed within the past five years, along with air conditioning and heat pump installations. However, electric usage is high during the summer, when the building is least occupied. So, the school may want to consider adding additional controls to ensure that units are turned off when the areas that they are serving are unoccupied.

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

New rooftop air conditioning systems installed in 2012 and 2013 included dual enthalpy economizers. These should be periodically checked to ensure that they are operating correctly to maximize unit energy efficiency.

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.

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.

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

West Cape May Elementary School has a 75-kW rooftop solar PV array which was installed in 2012. The school has a 15-yr power purchase agreement (PPA) with Cambria Solar. In 2016, 74% of school's electric needs were provided by the output of their solar array.

The solar PPA appears to have significantly lowered the school's average electric rates. The school pays just 5.5 cents per kWh for power generated onsite, which is much lower than the rate paid to Atlantic City Electric. During summer months, the school's electric bill sometimes shows a credit.

Since the school already receives most of its power from on-site generation and still has a decade left in its 15-yr PPA, no additional analysis was deemed to be necessary for this site.

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

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 the 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.

In our opinion, this building does not appear to have a sufficient electric load to be eligible for participation in a DR program.

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

Figure 19 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings
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 Tankless Water Heater			X	

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities. It requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants.

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

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

8.1 SmartStart

Overview

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

Equipment with Prescriptive Incentives Currently Available:

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

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

Incentives

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

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

How to Participate

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

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

8.2 Direct Install

Overview

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

Incentives

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

How to Participate

To participate in the Direct Install program you will need to contact the participating contractor who serves the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the DI 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.](www.njcleanenergy.com/DI)

8.3 Energy Savings Improvement Program

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

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

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

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

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

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

9 Energy Purchasing and Procurement Strategies

9.1 Retail Electric Supply Options

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

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

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

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

9.2 Retail Natural Gas Supply Options

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

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

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

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

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Rm	4	Compact Fluorescent: 17W CFL Bulbs	Wall Switch	13	1,250	Relamp	No	4	LED Screw-In Lamps: 9W LED Bulbs	Wall Switch	9	1,250	0.01	23	0.0	$2.11	$62.00	$20.00	19.92
Main Corridor Right	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,500	None	No	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,500	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Main Corridor Right	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,500	None	No	2	LED - Linear Tubes: (2) 2' Lamps	Wall Switch	17	2,500	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Classroom 11	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.38	1,208	0.0	$110.80	$1,359.00	$210.00	10.37
Classroom 11	7	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,800	None	Yes	7	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.04	126	0.0	$11.56	$270.00	$35.00	20.33
Classroom 12	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.44	1,381	0.0	$126.63	$1,476.00	$230.00	9.84
Classroom 12	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,800	None	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.01	18	0.0	$1.65	$0.00	$35.00	-21.20
Classroom 13	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.44	1,381	0.0	$126.63	$1,476.00	$230.00	9.84
Classroom 13	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,800	None	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.01	18	0.0	$1.65	$0.00	$35.00	-21.20
Classroom 10	16	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	16	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.44	1,381	0.0	$126.63	$1,476.00	$230.00	9.84
Classroom 10	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,800	None	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.01	18	0.0	$1.65	$0.00	$35.00	-21.20
Entrance (End of Hall)	1	Compact Fluorescent: 18W 4-pin plug-in CFLs	Wall Switch	18	2,500	Relamp	No	1	LED Screw-In Lamps: 11W LED PL Lamp (4-pin)	Wall Switch	11	2,500	0.00	20	0.0	$1.85	$23.00	$0.00	12.47
Break Rm 9	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.05	173	0.0	$15.83	$233.00	$40.00	12.19
Board Secretary Rm 14	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.05	173	0.0	$15.83	$233.00	$40.00	12.19
Superintendent Office	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.05	173	0.0	$15.83	$233.00	$40.00	12.19
Boys' Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.11	345	0.0	$31.66	$504.00	$75.00	13.55
Nurse's Office	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,800	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,260	0.19	608	0.0	$55.72	$650.53	$115.00	9.61
Library	8	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,500	Relamp	Yes	8	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,750	0.22	959	0.0	$87.93	$1,008.00	$150.00	9.76
Girls' Rm	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.11	345	0.0	$31.66	$504.00	$75.00	13.55
Storage Rm 17	3	Compact Fluorescent: 13W CFL Bulbs	Occupancy Sensor	13	875	Relamp	No	3	LED Screw-In Lamps: 9W LED Bulbs	Occupancy Sensor	9	875	0.01	12	0.0	$1.11	$46.50	$15.00	28.45
Nurse Restroom (Rm 15)	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Occupancy Sensor	62	875	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Occupancy Sensor	33	875	0.02	29	0.0	$2.68	$63.20	$0.00	23.62
Faculty Restroom (Rm 7)	2	Incandescent: 60W Incadescent Bulbs	Occupancy Sensor	60	1,750	Relamp	No	2	LED Screw-In Lamps: 13W LED Bulbs	Occupancy Sensor	9	1,750	0.07	205	0.0	$18.82	$31.00	$10.00	1.12
Front Entrance Alcove	1	Incandescent: 60W Incadescent Bulbs	Wall Switch	60	2,500	Relamp	No	1	LED Screw-In Lamps: 13W LED Bulbs	Wall Switch	9	2,500	0.03	147	0.0	$13.44	$15.50	$5.00	0.78
Storage Closet	1	Compact Fluorescent: 13W CFL Bulbs	Wall Switch	13	1,250	Relamp	No	1	LED Screw-In Lamps: 9W LED Blbs	Wall Switch	9	1,250	0.00	6	0.0	$0.53	$15.50	$5.00	19.92
Pre-K (Rm 3)	18	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	18	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.49	1,554	0.0	$142.45	$1,593.00	$250.00	9.43

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Classroom 18	14	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	14	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.38	1,208	0.0	$110.80	$1,359.00	$210.00	10.37
Connecting Passageway	1	Incandescent: 60W Incadescent Bulbs	Wall Switch	60	2,500	Relamp	No	1	LED Screw-In Lamps: 13W LED Bulbs	Wall Switch	9	2,500	0.03	147	0.0	$13.44	$15.50	$5.00	0.78
Mop Closet (Rm 22)	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,250	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,250	0.02	47	0.0	$4.35	$58.50	$10.00	11.15
Men's Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.03	86	0.0	$7.91	$174.50	$10.00	20.79
Women's Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,800	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.03	86	0.0	$7.91	$174.50	$10.00	20.79
Girls' Rm	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,800	Relamp	Yes	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,260	0.10	304	0.0	$27.86	$460.27	$75.00	13.83
Girls' Rm	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	1,800	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,260	0.01	44	0.0	$4.00	$48.20	$45.00	0.80
Boys' Rm	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,500	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,750	0.03	120	0.0	$10.99	$174.50	$30.00	13.15
Boys' Rm	1	Linear Fluorescent - T8: 2' T8 (17W) - 2L	Wall Switch	33	2,500	Relamp	Yes	1	LED - Linear Tubes: (2) 2' Lamps	Occupancy Sensor	17	1,750	0.01	61	0.0	$5.56	$48.20	$30.00	3.27
Corridor (New Addition)	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,500	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,500	0.11	474	0.0	$43.49	$292.50	$50.00	5.58
Corridor (New Addition)	1	Compact Fluorescent: 2x13W CFL (Recessed Cans)	Wall Switch	26	2,500	Fixture Replacement	No	1	LED - Fixtures: Downlight Recessed	Wall Switch	10	2,500	0.01	47	0.0	$4.35	$69.46	$0.00	15.97
Maint. Rm 19	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	1,250	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	875	0.03	60	0.0	$5.50	$58.50	$30.00	5.19
Maint. Rm 19	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,250	Relamp	Yes	1	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	875	0.05	106	0.0	$9.67	$211.13	$40.00	17.69
Computer Lab (Rm 2)	12	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	1,800	None	Yes	12	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,260	0.07	216	0.0	$19.81	$270.00	$35.00	11.86
Classroom 1	9	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,800	Relamp	Yes	9	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,260	0.43	1,367	0.0	$125.37	$1,126.20	$215.00	7.27
Multipurpose Room	12	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Wall Switch	120	2,500	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,750	0.62	2,739	0.0	$251.15	$1,681.60	$310.00	5.46
Multipurpose Room	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,500	None	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,750	0.02	100	0.0	$9.17	$0.00	$35.00	-3.82
Gym Storage Rm	4	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Wall Switch	120	1,250	Relamp	Yes	4	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	875	0.21	457	0.0	$41.86	$496.53	$100.00	9.47
Kitchen	4	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	1,250	Relamp	No	4	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,250	0.15	322	0.0	$29.52	$380.53	$80.00	10.18
Stage	3	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Wall Switch	120	1,250	Relamp	No	3	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	1,250	0.12	267	0.0	$24.51	$285.40	$60.00	9.19
Entrance (New Addition)	1	Incandescent: 60W Incadescent Bulbs	Wall Switch	60	2,500	Relamp	No	1	LED Screw-In Lamps: 13W LED Bulbs	Wall Switch	9	2,500	0.03	147	0.0	$13.44	$15.50	$5.00	0.78
Pre-K (Rm 3) Storage	2	Compact Fluorescent: 13W CFL Bulbs	Occupancy Sensor	13	875	Relamp	No	2	LED Screw-In Lamps: 9W LED Bulbs	Occupancy Sensor	9	875	0.01	8	0.0	$0.74	$31.00	$10.00	28.45
Pre-K (Rm 3) Restroom	2	Compact Fluorescent: 13W CFL Bulbs	Wall Switch	13	1,800	Relamp	No	2	LED Screw-In Lamps: 9W LED Bulbs	Wall Switch	9	1,800	0.01	17	0.0	$1.52	$31.00	$10.00	13.83
Classroom 1 Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	875	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	875	0.01	18	0.0	$1.61	$35.90	$5.00	19.14
Classroom 1 Storage	2	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Occupancy Sensor	114	875	Relamp	No	2	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	875	0.07	113	0.0	$10.33	$190.27	$40.00	14.54

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Library Restroom	2	Compact Fluorescent: 13W CFL Bulbs	Occupancy Sensor	13	875	Relamp	No	2	LED Screw-In Lamps: 9W LED Bulbs	Occupancy Sensor	9	875	0.01	8	0.0	$0.74	$31.00	$10.00	28.45
Storage Rm 5	1	Compact Fluorescent: 18W CFL Bulbs	Occupancy Sensor	18	875	Relamp	No	1	LED Screw-In Lamps: 9W LED Bulbs	Occupancy Sensor	9	875	0.01	9	0.0	$0.83	$15.50	$5.00	12.65
Exit Signs	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
Perimeter Exterior	10	Incandescent: 60W Incadescent Bulbs	Wall Switch	60	4,380	Relamp	No	10	LED Screw-In Lamps: 13W LED Bulbs	Wall Switch	9	4,380	0.33	2,569	0.0	$235.53	$155.00	$50.00	0.45
Perimeter Exterior	4	Metal Halide: (1) 70W Lamp	None	95	4,380	Fixture Replacement	No	4	LED - Fixtures: Wall-Wash Lights	None	20	4,380	0.20	1,511	0.0	$138.54	$956.76	$120.00	6.04
Perimeter Exterior	4	LED - Fixtures: Outdoor Porch Wall Mount	None	15	4,380	None	No	4	LED - Fixtures: Outdoor Porch Wall Mount	None	15	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Playground Floodlight	1	High-Pressure Sodium: (1) 150W Lamp	None	188	4,380	Fixture Replacement	No	1	LED - Fixtures: Large Pole/Arm-Mounted Area/Roadway Fixture	None	40	4,380	0.10	745	0.0	$68.35	$3,820.00	$0.00	55.89

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
Roof	Original Building	4	Exhaust Fan	0.3	69.0%	No	2,745	No	69.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Original Building	4	Exhaust Fan	0.3	69.0%	No	2,745	No	69.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	New Addition	4	Exhaust Fan	0.3	82.0%	No	2,745	No	82.0%	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
Ground	Classrooms	5	Split-System AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Classrooms	2	Packaged AC	5.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Multipurpose Rm	1	Packaged AC	20.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Ceiling	Classrooms & Offices	9	Ductless Mini-Split HP	1.78	23.20	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	Whole School (B1, B2, B4)	3	Non-Condensing Hot Water Boiler	359.53	Yes	3	Condensing Hot Water Boiler	359.53	91.00%	Et	0.00	0	35.6	$384.04	$25,890.14	$3,000.00	59.60
Boiler Room	Whole School (B3)	1	Non-Condensing Hot Water Boiler	350.14	Yes	1	Condensing Hot Water Boiler	350.14	91.00%	Et	0.00	0	15.7	$169.43	$8,404.56	$1,000.00	43.70

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 Rm	Original Building	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Mop Closet	Addition	1	Storage Tank Water Heater (≤ 50 Gal)	Yes	1	Tankless Water Heater	Natural Gas	95.00%	EF	1.35	5,106	-17.4	$280.22	$2,091.20	$300.00	6.39

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
Break Rm	1	Stand-Up Refrigerator, Solid Door (16 - 30 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Refrigerator Chest	No	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
WCM ES	2	Microwave Ovens	1,000.0	No
WCM ES	3	Coffee Makers	800.0	No
WCM ES	1	Toaster Oven	1,000.0	No
WCM ES	1	Copy Machines	240.0	Yes
WCM ES	2	Electric Range	400.0	No
WCM ES	1	Server	360.0	No
WCM ES	2	Sm Printers	80.0	Yes
WCM ES	2	TVs (27" CRT)	150.0	No
WCM ES	7	Smart Boards	316.0	No
WCM ES	135	Computers & Monitors	150.0	Yes

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

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ENERGY STAR® Score[1]

West Cape May Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 17,590
Built: 1963

For Year Ending: May 31, 2016
Date Generated: December 04, 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
West Cape May Elementary School
301 Moore Street
West Cape May, New Jersey 08204

Property Owner
West Cape May Board of Education
301 Moore Street
West Cape May, NJ 33206
(____)____-______

Primary Contact
Dr. Alfred Savio
301 Moore Street
West Cape May, NJ 08204
609-884-4614
fsavio@wcm.capemayschools.com

Property ID: 6158193

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
70.4 kBtu/ft²

Source EUI
87.4 kBtu/ft²

Annual Energy by Fuel

Electric - Grid (kBtu)	121,146 (10%)
Natural Gas (kBtu)	798,042 (64%)
Electric - Solar (kBtu)	318,688 (26%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	172
National Median Source EUI (kBtu/ft²)	213.5
% Diff from National Median Source EUI	-59%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	56

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)