WASHINGTON TOWNSHIP
GREEN BANK SCHOOL
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

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APPENDICES

1.0 INTRODUCTION & BACKGROUND

This report summarizes the energy audit performed at the Washington Township Green Bank School located at 2436 Route 563, Egg Harbor City, NJ. Constructed in 2006, the building is a 25,321 square foot, single story structure. The facility is utilized throughout the school year to facilitate Pre-K through eighth grade educational activities. During school vacations and summer months, the facility is closed with the exception of maintenance work being performed on the facility during normal business hours.

New Jersey's Clean Energy Program, funded by the New Jersey Board of Public Utilities, supports energy efficiency and sustainability for Municipal and Local Government Energy Audits. Through the support of a utility trust fund, New Jersey is able to assist state and local authorities in reducing energy consumption while increasing comfort.

1.0 EXECUTIVE SUMMARY

This report summarizes the energy audit for the the Washington Township Green Bank School. The building is a 25,321 square foot, single story structure The following areas were evaluated for energy conservation measures:

- Lighting upgrades
- Demand control ventilation

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. In general, measures which are recommended for implementation have a payback of 10 years or less. This threshold is considered a viable return on investment. Potential annual savings of $3,200 for the recommended ECMs may be realized with a payback of 3.0 years.

The ECMs identified in this report will allow for the building to reduce its energy usage and if pursued has the opportunity to qualify for the New Jersey SmartStart Buildings Program. A summary of the costs, savings, and paybacks for the recommended ECMs follows:

ECM-1 Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		#2 Oil	Total				
$	kW	kWh	Gallons	$		$	Years	Years
4,200	0.8	2,800	0	400	1.1	500	10.5	9.3

* Incentive shown is per the New Jersey Smart Start program's Prescriptive Lighting Application.

ECM-2 Demand Control Ventilation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		#2 Fuel Oil	Total				
$	kW	kWh	Gallons	$		$	Years	Years
5,300	0	1,590	910	2,800	7.0	NA	1.9	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

3.0 EXISTING CONDITIONS

3.1 Building General

The Washington Township Green Bank School, constructed in 2006, is a 25,321 square foot, single story structure. The building houses approximately 80 students and 25 staff members. The engineering drawings indicate that the facility has the capability of housing over 250 students. The facility was constructed to replace an existing school that is still remains on the grounds and may be utilized for different purposes in the future.

Typical average occupancy is approximately 100 people from 7:00 AM to 4:00 PM, Monday through Friday during the school year. The facility is occupied by maintenance staff Monday through Friday throughout the year from 7:00 AM to 4:00 PM.

The building's exterior shell appears to be in very good condition. The general school area walls consist of fiber cement siding; R-19 batt insulation, air barrier, and 5/8" sheetrock. The multi use area is functionally a gymnasium that is used also as a cafeteria and event venue. The multi-use area wall construction consists of 4" face brick, R-11 insulation, and 12" CMU concrete block. The multi- angled pitched roof is constructed of architectural shingles on top of felt paper, 5/8" sheathing and vapor barrier. Ceilings in all locations throughout the facility utilize R-30 batt insulation. Exterior windows are architectural aluminum framed double glazed hung 1/4" pane glass and are in good condition. Exterior doors are aluminum with tempered safety glass and all door seals observed were also in good condition.

3.2 Utilities

Utilities include electricity, #2 fuel oil, and potable water. Electricity is purchased from Atlantic City Electric Corporation; #2 fuel oil is delivered by contract from Pedroni Fuel Company; potable water is provided by an on-site well and filtration system.

During the period of December 2008 to November 2009, electric usage was approximately 273,960 kWh at a total cost of $51,400. Review of electricity bills during this period determined the building was charged a supply unit cost of $0.13 per kWh, demand unit cost of $7.35 per kW, and blended unit cost of $0.19 per kWh. Electrical usage was highest is the summer months due to the use of cooling equipment. During the same timeframe, the building heating produced by #2 fuel oil fired equipment required 7,850 gallons based on the annual cost of about $21,730, the blended price for #2 fuel oil was $2.77 per gallon. Fuel oil consumption is highest in the winter months for production of building heat. Water is provided by well water onsite, consumption is not recorded; therefore, is not included in the utility analysis. Utility data can be found in Appendix A.

Electricity commodity supply and delivery is presently purchased from Atlantic City Electric Corporation; the delivery component will always be the responsibility of the utility that connects the facility to the power grid; however, the supply can be purchased from a third party. The electricity commodity supply entity will require submission of one to three years of past energy bills. Contract terms can vary among suppliers. A list of approved electrical and energy commodity suppliers can be found in Appendix A. It is assumed that the fuel oil provided to the school is in conjunction with and already established school district contract through a one or multiple year contract.

3.3. HVAC Systems

Heating, ventilation and air conditioning (HVAC) are provided by 12 unit ventilators, eight heating only air handling units (AHUs) located above the ceiling and four cabinet unit heaters. Additionally, two large

AHUs, located in the mechanical area adjacent to multi-use space, satisfy the area. The units supply 23,309 CFM of air, including a maximum of 17,069 CFM of outdoor air (OA).

Heat is primarily generated by two original AO Smith 1,477 MBh output #2 fuel oil boilers with a thermal efficiency of 81%. Hot water is distributed to heating coils in unit ventilators, AHUs, and cabinet unit heaters at a maximum temperature of 180°F. Cooling is facilitated by a 125 ton Trane air cooled chiller located outdoors behind the multi-use section of the facility. Cooling water is pumped to all 12 unit ventilators and the two AHUs serving the multi-use area at a maximum temperature of 48°F.

There are 24 exhaust fans serving the general spaces, kitchen, and restrooms. Each exhaust fan is linked to operate with a corresponding AHU or unit ventilator with the exception of the restroom and kitchen exhaust hood fans that are controlled with the use of the wall switches.

3.4 Lighting/Electrical Systems

The lighting fixtures throughout the school building utilize two or three lamp efficient T-8 fluorescent lamps with electronic ballasts. All exit signs are high efficiency LED units. Exterior lighting, located at the exterior doors and the underside of the roof overhang consists of fixtures using compact fluorescent lamps. The perimeter of the building has numerous 175 watt metal halide wall pack fixtures. The facility also includes parking lot poles equipped with 400 watt metal halide lamps that are provided and owned by the utility on a tariff based set fee per month and are not metered.

Emergency power is provided by a 150 kW, diesel fired, Kohler generator located outside at the northeast corner of the building.

3.5 Control Systems

3.5.1 HVAC Controls

The building utilizes a Trane Tracer Summit control system with the capability of controlling all AHU air dampers, unit ventilators, cabinet heaters, boiler and air cooled chiller operation, AHU linked exhaust fans, as well as space temperatures throughout the facility. Existing temperature setpoints are 74°F during occupied times and 80°F during unoccupied times for cooling; and 72°F during occupied times and 50°F during unoccupied times for heating. The system appears to be programmed correctly and maintained in a way to take advantage of most energy conservation control scenarios. During the site visit, the system was observed to be running all set parameters with the exception of unit ventilator UV-4 that had malfunctioned and was bringing in 100% outdoor air at all times. Review of each of the control system's interactive screen shots demonstrated that all systems were operating as designed. Control techniques that were observed included temperature night setback and night shutdown of all connected equipment; economizer operation, for when air temperatures and humidity are appropriate to allow free cooling; and demand control ventilation (DCV) in major air handler return airstreams with the exception of the multi-use air handlers AHU-1 and AHU-2. The boilers were integrated into the control system and hot water reset is utilized allowing hot water temperature to efficiently lower the hot water loop temperature in conjunction with warmer outdoor air temperatures. The chilled water system was not operational during the site visit due to the cold weather; however, it appeared the control system was programmed to efficiently provide chilled water to the cooling coils throughout the facility. The maintenance staff was knowledgeable about the control system and how to modify it when either a parameter change is needed or equipment failure is detected. It was observed that all systems during normal operation run at a minimum outdoor air flow settings, and most setting seemed to be efficient and appropriate for the amount of people that are in the facility, with the exception of the non-functioning UV-4 unit.

3.5.2 Lighting Controls

Lighting in areas with intermittent or low occupancy, such as mechanical rooms and kitchen areas, is controlled by wall or ceiling mounted occupancy sensors. The multi-use area has six lamp ceiling mounted fixtures that were observed to be able to be energized from 2, 4, and 6 lamps through the use of a combination of wall and ceiling mounted occupancy sensors. Hallways all appear to be controlled through the use of occupancy sensors; during the site visit, lighting appeared to be de-energized until entering the space. Outdoor lighting is controlled through the use of photocell or timers to illuminate exterior lighting at dusk and turn off lighting units after dawn.

3.6 Plumbing Systems

Domestic water is provided from a well located on the property and is stored in the 1,500 gallon underground water storage tank located adjacent to the mechanical room. Water is then treated and filtered before being distributed to the facility. Domestic hot water is produced with the use of a #2 fuel oil fired 140 gallon, 140 MBh, AO Smith hot water heater located in the mechanical room. Plumbing fixtures include 13 low-flow pressure assisted toilets, 19 wall-mounted restroom sinks, three urinals, and one mop sink. The kitchen utilizes five commercial grade sinks; and four non-freeze wall hydrants located on the exterior of the building. Additionally, the kitchen floor drain is equipped with an automatic grease trap. All flush valves and faucets are considered low-flow by industry standards.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Lighting Replacements

The lighting fixtures utilize two or three lamp efficient T-8 fluorescent lamps with electronic ballasts. All exit signs are high efficiency LED units. Lighting located above the exterior doors consist of fixtures using compact fluorescent lamps. The perimeter of the building has numerous 175 watt metal halide wall packs fixtures. The facility also includes parking lot poles equipped with 400 watt metal halide lamps that are provided and owned by the utility.

All fixtures observed in the facility were high efficiency units and well controlled. The only application for energy efficiency is to replace the existing 175 watt metal halide fixtures with 100 watt induction units. Energy savings for this measure were calculated by applying the existing and proposed fixture wattages to the estimated time of operation. The difference resulted in an annual savings of about 2,800 kWh per year, in addition to a 0.8 kW reduction in demand. Supporting calculations are provided in Appendix B.

Lighting has an expected life of 20 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 56,000 kWh and $8,000.

The implementation cost and savings related to this ECM are presented in Appendix B and summarized below:

ECM-1 Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		#2 Oil	Total				
$	kW	kWh	Gallons	$		$	Years	Years
4,200	0.8	2,800	0	400	1.1	500	10.5	9.3

* Incentive shown is per the New Jersey Smart Start program's Prescriptive Lighting Application.

This measure is recommended.

4.2 ECM-2 Demand Control Ventilation

As previously discussed, the building utilizes a Trane Tracer Summit control system with the capability of controlling all AHU air dampers and unit ventilators. During the site visit the systems were observed to be running within set parameters with the exception of unit ventilator UV-4 that is not functioning correctly allowing in 100% outdoor air at all times. The malfunctioning UV-4 unit serving the 4th grade classroom brings in 1240 cfm of outdoor air functionally cooling and heating 100% of the supply air being delivered to the space. Additionally, demand control ventilation Co2 sensors were installed in major an air handler return airstreams with the exception of the multi-use air handlers AHU-1 and 2. Each AHU draws fresh air in through an OA intake and blends it with return air prior to being treated and discharged into the large multi use space. AHU-1 & AHU-2 each bring in a minimum of 1268 cfm of fresh air during occupied hours regardless of the ventilation demand determined by space occupancy.

Utilizing a demand control ventilation (DCV) system on the above systems would regulate the amount of OA induced into the space based on the CO_2 levels detected within the room or return air duct. A DCV system is based on the principle that the number of people within the space is proportional to the concentration of CO_2. This ECM evaluates providing only the required fresh air to the space, decreasing the amount of OA to be treated, and reducing the annual heating and cooling loads.

Implementation of this measure requires installation of OA controls on the two AHUs serving the multi-use area and repair of UV-4. Installing a CO_2 sensor within the return air duct and upgrades to the OA damper actuators for each unit is also required. Programming of the existing DDC system will also be necessary to control the OA damper positions based on the CO_2 readings.

DCV equipment has an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 13,650 gallons, 23,850kWh and $42,000.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-2 Demand Control Ventilation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		#2 Fuel Oil	Total				
$	kW	kWh	Gallons	$		$	Years	Years
5,300	0	1,590	910	2,800	7.0	NA	1.9	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

This measure is recommended.

5.0 PROJECT INCENTIVES

5.1 Incentives Overview

5.1.1 New Jersey Pay For Performance Program

The building will be eligible for incentives from the New Jersey Office of Clean Energy. The most significant incentives will be from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed for qualified energy conservation projects in facilities whose demand in any of the preceding 12 months exceeds 200 kW. Facilities that meet this criterion must also achieve a minimum performance target of 15% energy reduction by using the EPA Portfolio Manager benchmarking tool before and after implementation of the measure(s). If the participant is a municipal electric company customer, and a customer of a regulated gas New Jersey Utility, only gas measures will be eligible under the Program. American Recovery and Reinvestment Act (ARRA) funding, when available, may allow oil, propane and municipal electric customers to be eligible for the P4P Program. Available incentives are as follows:

Incentive #1: Energy Reduction Plan – This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP). The standard incentive pays $0.10 per square foot, up to a maximum of $50,000, not to exceed 50% of facility annual energy cost, paid after approval of application. For building audits funded by the New Jersey Board of Public Utilities, which receive an initial 75% incentive toward performance of the energy audit, facilities are only eligible for an additional $0.05 per square foot, up to a maximum of $25,000, rather than the standard incentive noted above.

Incentive #2: Installation of Recommended Measures – This incentive is based on projected energy saving and designed to pay approximately 60% of the total performance-based incentive. Base incentives deliver $0.11/kWh and $1.10/therm not to exceed 30% of total project cost.

Incentive #3: Post-Construction Benchmarking Report – This incentive is paid after acceptance of a report proving energy savings over one year utilizing the Environmental Protection Agency (EPA) Portfolio Manager benchmarking tool. Incentive #3 base incentives deliver $0.07/kWh and $0.70/therm not to exceed 20% of total project cost.

Combining incentives #2 and #3 will provide a total of $0.18/ kWh and $1.8/therm not to exceed 50% of total project cost. Additional incentives for #2 and #3 are increased by $0.005/kWh and $0.05/therm for each percentage increase above the 15% minimum target to 20%, calculated with the EPA Portfolio Manager benchmarking tool, not to exceed 50% of total project cost.

A new incentive structure is in place for projects exceeding 20% in energy savings, which doubles incentives #2 and #3 for a total of $0.36/kWh and $3.60/therm. For Incentive #1, the maximum incentive has been raised to 80% of project costs, or $2 million per gas account and $2 million per electric account. The 200 kW/month average minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations. This new incentive structure has been extended to December 31, 2010.

5.1.2 New Jersey Smart Start Program

For this program, specific incentives for energy conservation measures are calculated on an individual basis utilizing the 2010 New Jersey Smart Start incentive program. This program provides incentives dependent upon mechanical and electrical equipment. If applicable, incentives from this program are reflected in the ECM summaries and attached appendices.

If the building qualifies and enters into the New Jersey Pay for Performance Program, all energy savings will be included in the total building energy reduction, and savings will be applied towards the Pay for Performance incentive. A project is not applicable for both New Jersey incentive programs.

5.2 Building Incentives

5.2.1 New Jersey Pay For Performance Program

Under incentive #1 of the New Jersey Pay for Performance Program, the 25,321 square foot building is eligible for about $1,300 towards the development of an Energy Reduction Plan. When calculating the total amount under Incentives #2 and #3, all energy conservation measures are applicable as the amount received is based on building wide energy improvements. Since the overall energy reduction for the building is not estimated to exceed the 15% minimum, the facility is ineligible for Incentives #2 and #3 as previously discussed. See Appendix D for calculations.

5.2.2 New Jersey Smart Start Program

The Washington Township Green Bank School building is eligible an incentive available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about $500 for proposed upgrades to the lighting system.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

Geothermal heat pumps (GHP) transfer heat between the constant temperature of the earth and the building to maintain the building's interior space conditions. Below the surface of the earth throughout New Jersey the temperature remains in the low 50°F range throughout the year. This stable temperature provides a source for heat in the winter and a means to reject excess heat in the summer. With GHP systems, water is circulated between the building and the piping buried in the ground. The ground heat exchanger in a GHP system is made up of a closed or open loop pipe system. Most common is the closed loop in which high density polyethylene pipe is buried horizontally at 4-6 feet deep or vertically at 100 to 400 feet deep. These pipes are filled with an environmentally friendly antifreeze/water solution that acts as a heat exchanger. In the summer, the water picks up heat from the building and moves it to the ground. In the winter the system reverses and fluid picks up heat from the ground and moves it to the building. Heat pumps make collection and transfer of this heat to and from the building possible.

The Green Bank School building has multiple systems serving space can conditioning needs. The facility has multiple unit ventilators air handlers as well as numerous exhaust fan units. These systems are served by two #2 fuel oil AO Smith boilers for heating Trane air cooled chiller satisfies cooling load. To take advantage of a GHP system, the building would have to install a low temperature closed loop water source heat pump system to realize the benefit of the consistent temperature of the ground. This will also include the removal of the existing heating and cooling system.

This measure is not recommended due to the high cost to replace the existing HVAC systems.

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The building was evaluated for the potential to install rooftop photovoltaic (PV) solar panels for power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC current is converted to alternating current (AC) with the use of an electrical device known as an inverter. The building's roof has sufficient room to install a large solar cell array. A structural analysis would be required to determine if the roof framing could support a cell array.

The PVWATTS solar power generation model was utilized to calculate PV power generation. The New Jersey Clean Power Estimator provided by the New Jersey Clean Energy Program is presently being updated; therefore, the site recommended use of the PVWAT solar grid analyzer version 1. The closest city available in the model is Newark, New Jersey and a fixed tilt array type was utilized to calculate energy production. The PVWATT solar power generation model is provided in Appendix E.

The State of New Jersey incentives for non-residential PV applications is $1.00/watt up to 50 kW of installed PV array. Federal tax credits are also available for renewable energy projects up to 30% of installation cost. Municipalities do not pay federal taxes; therefore, would not be able to utilize the federal tax credit incentive.

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. The cost of the ACP penalty for 2009 is $689; this is the amount that must be paid per SERC by the high emission producers. The expected dollar amount that will be paid to the PV producer for 2009 is expected to be $600/SREC credit. Payments that will be received from the PV producer will change from year to year dependent upon supply and demand. Renewable Energy Consultants is a third party SREC broker that has been approved by the New Jersey Clean Energy Program. As stated above there is no definitive way to calculate an exact price that will be received by the PV producer per SREC over the next 15 years. Renewable Energy Consultants estimated an average of $487/ SERC per year and this number was utilized in the cash flow for this report.

The Green Bank School building had a maximum kW demand of 348 kW and a minimum kW of 86.4 kW from December 2008 through November 2009. The monthly average over the observed 12 month period was 180 kW. The facility's existing load would justify the use of the maximum incentive cap of 50 kW of installed PV solar array; however the numerous roof penetrations from exhaust fans and plumbing vents will limit the available roof area that PV solar panels can be installed; therefore, a 20 kW system size was selected for the calculations. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Agency) estimates of total cost of system installation. It should be noted that the cost of installation is currently $8 per watt or $8,000 per kW of installed system. This has increased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

Photovoltaic (PV) Rooftop Solar Power Generation – 20 kW System

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive*	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		#2 Oil	Total					
$	kW	kWh	Gallons	$	$	$	$	Years	Years
160,000	0	25,000	0	4,700	4,700	20,000	12,170	>25	8.3

*Incentive based on New Jersey Renewable Energy Program for non-residential applications of $1.00 per Watt of installed capacity
** Estimated Solar Renewable Energy Certificate Program (SREC) for 15 years at $487/1000 kWh

While the payback period justifies recommendation of the measure, further investigation of possible installation locations, required system maintenance, and local installation costs are suggested prior to implementation.

6.2.2 Solar Thermal Domestic Hot Water Plant

Active solar thermal systems use solar collectors to gather the sun's energy to heat water, another fluid, or air. An absorber in the collector converts the sun's energy into heat. The heat is then transferred by circulating water, antifreeze, or sometimes air to another location for immediate use or storage for later utilization. Applications for active solar thermal energy include providing hot water, heating swimming pools, space heating, and preheating air in residential and commercial buildings.

A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed on the roof of the building, oriented south, and tilted around the site's latitude, to maximize the amount of radiation collected on a yearly basis.

Several options exist for using active solar thermal systems for space heating. The most common method involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system). The most practical system for Green Bank School building would transfer the heat from the panels to thermal storage tanks and transfer solar produced thermal energy to use for domestic hot water production.

As of the writing of this report, there are no incentives available for installation of thermal solar systems. Presently there is a Federal tax credit of 30% of installation cost for the thermal applications, however Washington Township does not pay Federal taxes and, therefore, would not benefit from this program.

The implementation cost and savings related to this ECM are presented in Appendix F and summarized as follows:

Solar Thermal Domestic Hot Water Plant

Budgetary	Annual Utility Savings				Total	New Jersey Renewable	Payback	Payback
Cost	Electricity		#2 Oil	Total	Savings	Energy Incentive	(without incentive)	(with incentive)
$	kW	kWh	Gallons	$	$	$	Years	Years
27,100	0	0	250	700	700	NA	>25	NA

* No incentive is available in New Jersey at this time.

This measure is not recommended due to its long payback.

6.3 Wind

Small wind turbines use a horizontal axis propeller, or rotor, to capture the kinetic energy of the wind and convert it into rotary motion to drive a generator which usually is designed specifically for the wind turbine. The rotor consists of two or three blades, usually made from wood or fiberglass. These materials give the turbine the needed strength and flexibility, and have the added advantage of not interfering with television signals. The structural backbone of the wind turbine is the mainframe, and includes the slip-rings that connect the wind turbine, which rotates as it points into changing wind directions, and the fixed tower wiring. The tail aligns the rotor into the wind.

To avoid turbulence and capture greater wind energy, turbines are mounted on towers. Turbines should be mounted at least 30 feet above any structure or natural feature within 300 feet of the installation. Smaller turbines can utilize shorter towers. For example, a 250-watt turbine may be mounted on a 30-50 foot tower, while a 10 kW turbine will usually need a tower of 80-120 feet. Tower designs include tubular or latticed, guyed or self-supporting. Wind turbine manufacturers also provide towers.

The New Jersey Clean Energy Program for small wind installations has designated numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine installations are based on kilowatt hours saved in the first year. Systems sized under 16,000 kWh per year of production will receive a $3.20 per kWh incentive. Systems producing over 16,000 kWh will receive $51,200 for the first 16,000 kWh of production with an additional $0.50 per kWh up to a maximum cap of 750,000 kWh per year. Federal tax credits are also available for renewable energy projects up to 30% of installation cost for systems less than 100 kW. However, as noted previously, municipalities do not pay federal taxes and is, therefore, not eligible for the tax credit incentive.

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. In the Washington Township New Jersey area, the map indicates a mean annual wind speed of below 11.2 miles per hour. For the building, there are site restrictions. Parking lots, radio communication towers, trees, and local residential housing would greatly affect a tower location.

An aerial satellite image of the site and a wind speed map are included in Appendix G.

This measure is not recommended due to the low mean annual wind speed and lack of open area to install a wind turbine electrical generating system.

6.4 Combined Heat and Power Generation (CHP)

Combined heat and power, cogeneration, is self-production of electricity on-site with beneficial recovery of the heat byproduct from the electrical generator. Common CHP equipment includes reciprocating engine-driven, micro turbines, steam turbines, and fuel cells. Typical CHP customers include industrial, commercial, institutional, educational institutions, and multifamily residential facilities. CHP systems that are commercially viable at the present time are sized approximately 50 kW and above, with numerous options in blocks grouped around 300 kW, 800 kW, 1,200 kW and larger. Typically, CHP systems are used to produce a portion of the electricity needed by a facility some or all of the time, with the balance of electric needs satisfied by purchase from the grid.

Any proposed CHP project will need to consider many factors, such as existing system load, use of thermal energy produced, system size, natural gas fuel availability, and proposed plant location.

The Green Bank School building has sufficient need for electrical generation and the ability to use most of the thermal byproduct during the winter. Thermal usage during the summer months is available to supplement the existing chiller system with an absorption chiller that could be installed to utilize the heat to produce chilled water. In the summer months the school is not utilized and is only cooled below unoccupied set points when an area of the building is being maintained; therefore much of the thermal energy produced by the CHP plant will be wasted.

The most viable option for a CHP plant would be a reciprocating engine natural gas-fired unit. Most CHP systems need to have the heat byproduct fully utilized through the year to make their use cost effective.

This measure is not recommended due to limited use of summertime heat and no natural gas available at the site.

6.5 Biomass Power Generation

Biomass power generation is a process in which waste organic materials are used to produce electricity or thermal energy. These materials would otherwise be sent to the landfill or expelled to the atmosphere. To participate in NJCEP's Customer On-Site Renewable Energy program, participants must install an on-site sustainable biomass or fuel cell energy generation system. Incentives for bio-power installations are available to support up to 1MW-dc of rated capacity.

*Class I organic residues are eligible for funding through the NJCEP CORE program. Class I wastes include the following renewable supply of organic material:

- Wood wastes not adulterated with chemicals, glues or adhesives

- Agricultural residues (corn stover, rice hulls or nut shells, manures, poultry litter, horse manure, etc) and/or methane gases from landfills
- Food wastes
- Municipal tree trimming and grass clipping wastes
- Paper and cardboard wastes
- Non adulterated construction wood wastes, pallets

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

- Digestion of sewage sludge
- Landfill gas facilities
- Combustion of wood wastes to steam turbine
- Gasification of wood wastes to reciprocating engine
- Gasification or pyrolysis of bio-solid wastes to generation equipment

* from NJOCE Website

This measure is not recommended because the site does not have room to store the waste organic materials, noise issues, and potential zoning issues.

6.6 Demand Response Curtailment

Presently, the Green Bank School building has electricity delivered and supplied by Atlantic City Electric Corporation. Utility curtailment is an agreement with the regional transmission organization and an approved Curtailment Service Providers (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a facility utilizing an emergency generator, therefore reducing the electrical demand on the utility grid. This program is to benefit the utility company during high demand periods and PJM offers incentives to the CSP to participate in this program. Enrolling in the program will require program participants to drop electrical load or turn on their emergency generators during high electrical demand conditions or during emergencies. Part of the program also will require that program participants reduce their required load or run their emergency generators with notice to test the system. A minimum of 100 kW of curtailable load is required to enter the program. Discussions with the EnerNoc Corporation, an approved CSP, indicate that existing emergency generators will not pass the emissions requirements to enter the program.

Presently, The Green Bank School building has a Kohler 150 kW back up generation and an average kW demand during the observed period of 180 kW per month. The bulk of the electricity usage is needed during any request to reduce electrical load.

This is not recommended because the emergency generator for the facility cannot meet air emissions standards in the State of New Jersey and the building load cannot be substantially reduced during a planned Demand Response Curtailment event.

7.0 EPA PORTFOLIO MANAGER

The United States Environmental Protection Agency (EPA) is a federal agency in charge of regulating environment waste and policy in the United States. The EPA has released the EPA Portfolio Manager for public use. The program is designed to allow property owners and managers to share, compare and improve upon their facility's energy consumption. Inputting such parameters as electricity, heating fuel, building characteristics and location into the website based program generates a naturalized energy rating score out of 100, where a building which achieves a score of 75 or higher may qualify for the EPA's Energy Star rating. Once an account is registered, monthly utility data can be entered to track the savings progress and retrieve an updated energy rating score on a monthly basis.

The school achieved an Energy Performance Score of 69 and is considered a low energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 80 kBTU/ft^2/year. However, by implementing the energy conservation measures discussed within this report, the building can expect to further reduce the Site EUI to about 75 kBTU/ft^2/year. The national average Site EUI for K-12 Schools is 97 kBTU/ft^2/year.

A full EPA Energy Star Portfolio Manager Report is located in Appendix H. The user name and password for the School's EPA Portfolio Manager Account has been provided to Lourdes LaGuardia of the Green Bank School Board of Education.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Washington Township Green Bank School, in Egg Harbor City, New Jersey identified potential ECMs for lighting retrofits and demand control ventilation. Potential annual savings of $3,200 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-1 Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		#2 Oil	Total				
$	kW	kWh	Gallons	$		$	Years	Years
4,200	0.8	2,800	0	400	1.1	500	10.5	9.3

* Incentive shown is per the New Jersey Smart Start program's Prescriptive Lighting Application.

ECM-2 Demand Control Ventilation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		#2 Fuel Oil	Total				
$	kW	kWh	Gallons	$		$	Years	Years
5,300	0	1,590	910	2,800	7.0	NA	1.9	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

APPENDIX A

Utility Usage Analysis

New Jersey BPU Energy Audit Program
CHA #20761
Washington Township Green Bank School

Pedroni Fuel Co. Acct #:11-000-262-620

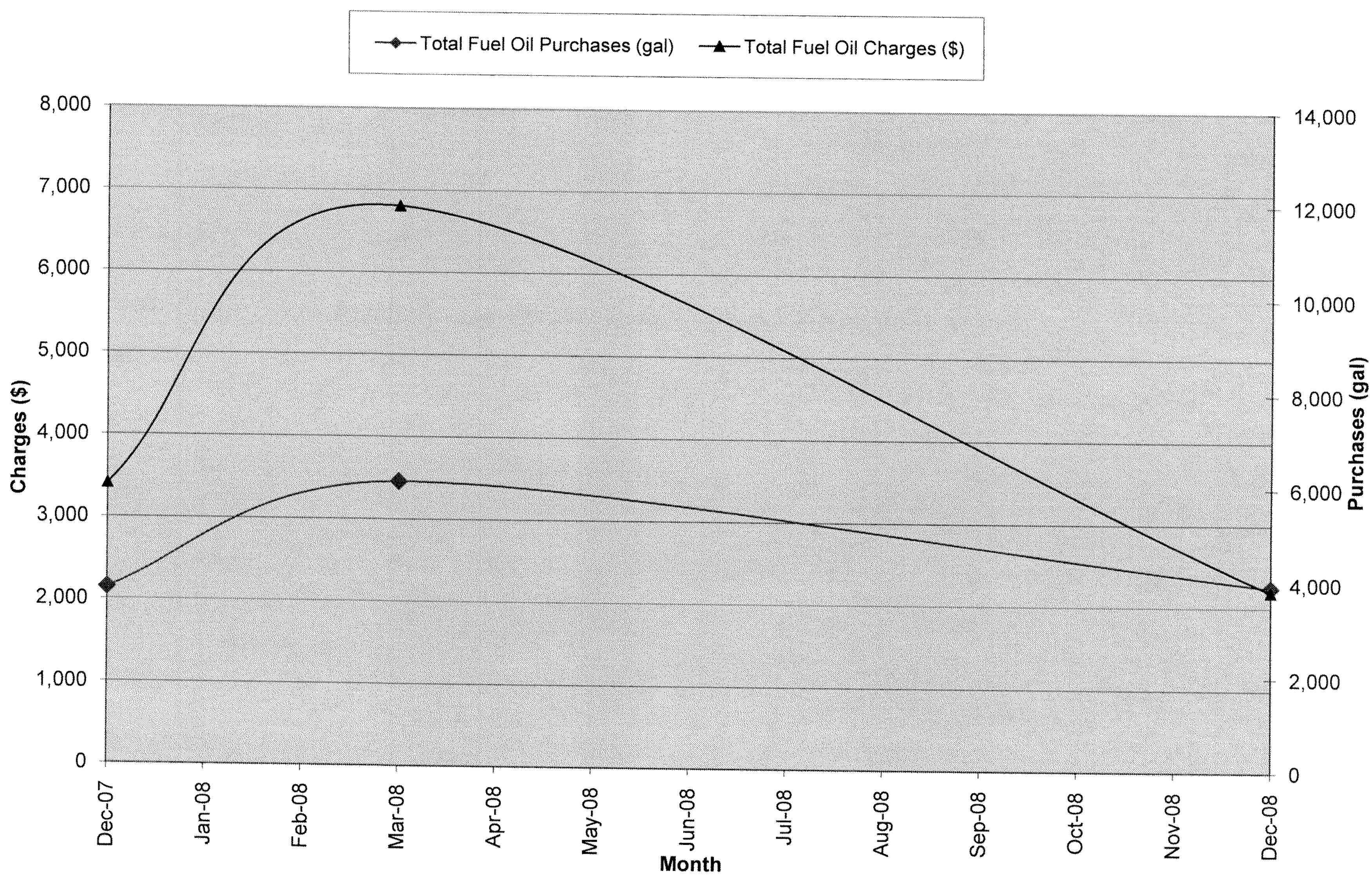
Fuel Oil

Month	Charges ($)	Total Usage (Gal)	Rate ($/Gal)
December-07	5,964	2,150	2.77
March-08	11,918	3,455	3.45
December-08	3,843	2,244	1.71
Total	$ 21,725	7,849	$2.77

Diesel

Month	Charges ($)	Total Usage (Gal)	Rate ($/Gal)
May-08	114.11	39.8	2.87
Total	$114.11	39.8	$2.87

#2 Fuel Oil Usage - Washington Township Green Bank School

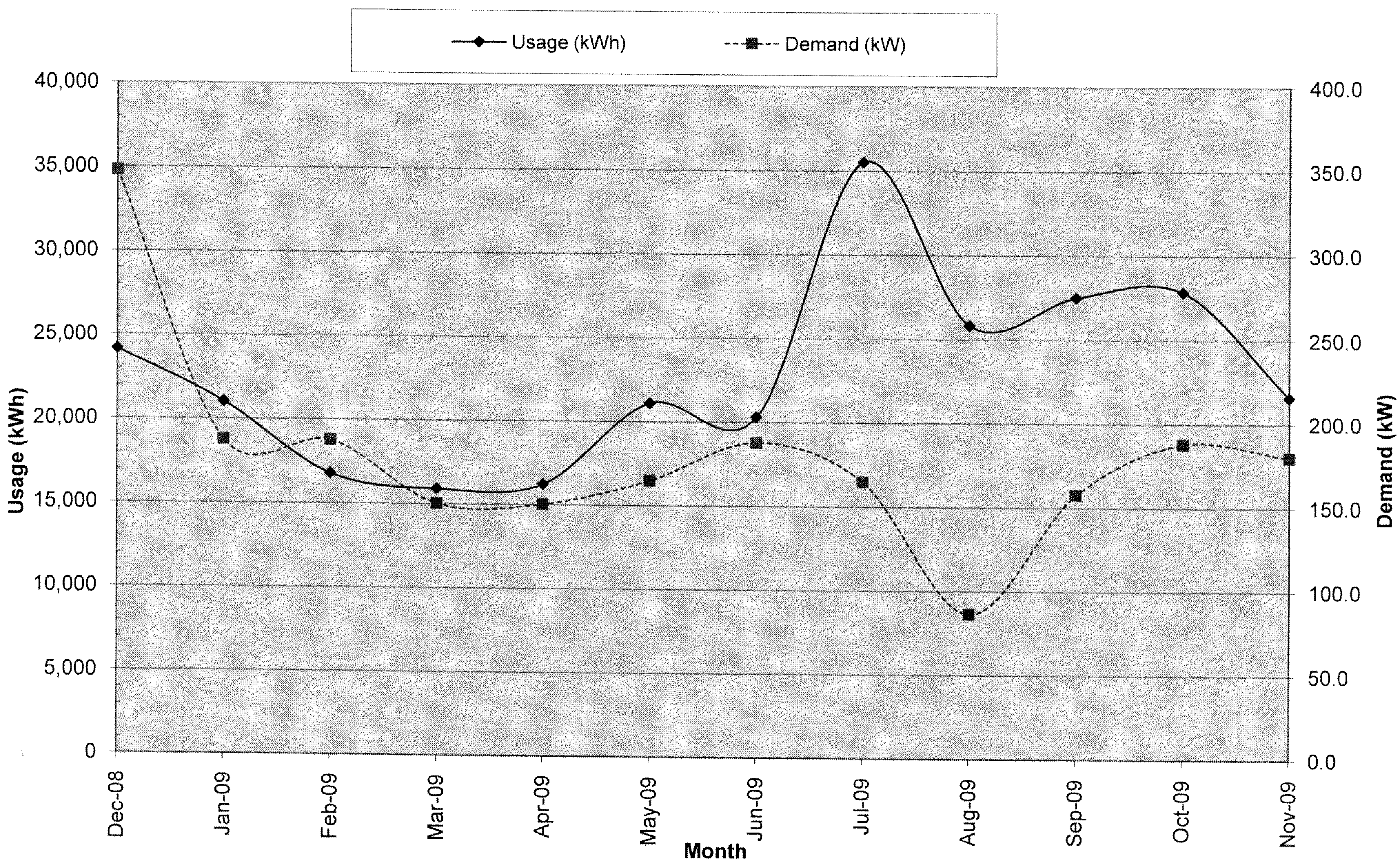


New Jersey BPU Energy Audit Program
CHA #20761
Washington TWP - Green Bank School

Account Number: 3539 3629 9992
Atlantic City Electric
Meter No.: 28311457 and 75767050 (New Meter Installed 1/23/09)

	Electricity							
				Building Usage				
	Month	Supply kWH	Delivery KW	Cost ($)	Blended Rate ($/kWH)	Unit Cost ($/kWH)	Unit Cost ($/kW)	Outdoor Lighting ($)
1	December-08	24,160	348.0	5,102.50	0.2112	0.1145	6.71	$589
2	January-09	21,040	188.0	3,860.87	0.1835	0.1156	7.60	$596
3	February-09	16,800	188.0	3,255.47	0.1938	0.1162	6.93	$596
4	March-09	15,920	150.4	3,014.48	0.1894	0.1171	7.65	$590
5	April-09	16,240	150.4	2,971.83	0.1830	0.1166	7.17	$582
6	May-09	21,120	164.8	3,574.25	0.1692	0.1152	6.93	$583
7	June-09	20,320	188.0	4,106.87	0.2021	0.1314	7.65	$591
8	July-09	35,520	164.8	6,392.88	0.1800	0.1467	7.17	$595
9	August-09	25,860	86.4	4,833.49	0.1869	0.1466	12.07	$595
10	September-09	27,520	157.6	5,270.93	0.1915	0.1477	7.65	$590
11	October-09	27,860	188.0	5,080.74	0.1824	0.1363	6.83	$589
12	November-09	21,600	180.0	3,960.38	0.1834	0.1256	6.93	$589
	Total	273,960	348.0	$ 51,425	0.1877	0.1299	7.35	$6,497

Electric Usage - Washington Township Green Bank School



Utility Washington Township Greenbank School (rev-2).xls
Electricity Chart

ELECTRIC MARKETERS LIST

The following is a listing of marketers/suppliers/brokers that have been licensed by the NJ Board of Public Utilities to sell electricity to residential, small commercial and industrial customers served by the Public Service Electric and Gas Company distribution system. **This listing is provided for informational purposes only and PSE&G makes no representations or warranties as to the competencies of the entities listed herein or to the completeness of this listing.**

American Powernet Management
867 Berkshire Blvd, Suite 101
Wyomissing, PA 19610
www.americanpowernet.com

BOC Energy Services
575 Mountain Avenue
Murray Hill, NJ 07974
www.boc-gases.com

Commerce Energy Inc.
535 Route 38, Suite 138
Cherry Hill, NJ 08002
(888) 817-8572 or
(858) 910-8099
www.commerceenergy.com

ConEdison Solutions
701 Westchester Avenue
Suite 201 West
White Plains, NY 10604
(800) 316-8011
www.ConEdSolutions.com

Constellation NewEnergy, Inc.
1199 Route 22 East
Mountainside, NJ 07092
908 228-5100
www.newenergy.com

Credit Suisse (USA), Inc.
700 College Road East
Princeton, NJ 08450
www.creditsuisse.com

Direct Energy Services, LLC
One Gateway Center, Suite 2600
Newark, NJ 07102
(973) 799-8568
www.directenergy.com

FirstEnergy Solutions
395 Ghent Road Suite 407
Akron, OH 44333
(800) 977-0500
www.fes.com

Gerdau Ameristeel Energy Co.
North Crossman Road
Sayreville, NJ 08872

Gexa Energy LLC New Jersey
20 Greenway Plaza, Suite 600
Houston, TX 77046
(866) 304-GEXA
Beth.miller@gexaenergy.com

Glacial Energy of New Jersey
2602 McKinney Avenue, Suite 220
Dallas, TX 75204
www.glacialenergy.com

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095
www.hess.com

Integrys Energy Services, Inc
99 Wood Avenue, Suite 802
Iselin, NJ 08830
www.integrysenergy.com

Liberty Power Delaware, LLC
1901 W Cypress Road, Suite 600
Fort Lauderdale, FL 33309
(866) Power-99
(866) 769-3799
www.libertypowercorp.com

Liberty Power Holdings, LLC
1901 W Cypress Creek Road, Suite 600
Fort Lauderdale, FL 33309
(866) Power-99
(866) 769-3799
www.libertypowercorp.com

Pepco Energy Services, Inc.
d/b/a Power Choice
23 S. Kinderkamack Rd Ste D
Montvale, NJ 07645
(800) 363-7499
www.pepco-services.com

PPL EnergyPlus, LLC
Energy Marketing Center
Two North Ninth Street
Allentown, PA 18101
1-866-505-8825
http://www.pplenergyplus.com/

Sempra Energy Solutions
The Mac-Cali Building
581 Main Street, 8th Floor
Woodbridge, NJ 07095
(877) 273-6772
www.SempraSolutions.com

South Jersey Energy Company
1 South Jersey Plaza, Route 54
Folsom, NJ 08037
(800) 756-3749
www.sjindustries.com

Strategic Energy, LLC
6 East Main Street, Suite 6E
Ramsey, NJ 07446
(888) 925-9115
www.sel.com

Suez Energy Resources NA
333 Thornall Street FL6
Edison, NJ 08818
866.999.8374(toll free)
www.suezenergyresources.com

UGI Energy Services, Inc.
d/b/a POWERMARK
1 Meridian Blvd. Suite 2C01
Wyomissing, PA 19610
(800) 427-8545
www.ugienergyservices.com

APPENDIX B

ECM-1 Lighting Replacements

Energy Audit of Washington Township
CHA Project No. 20761- Greenbank School
ECM-1 Lighting Replacements

Cost of Electricity: $0.130 $/kWh
$7.35 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS					
Field Code	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out incentive	Simple Payback
	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
213	Office 125	5	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.5	OCC	1500	675	5	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.5	OCC	1,500	675	-	$ -	$ -	$0		
213	Office 128	2	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.2	OCC	1500	270	2	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.2	OCC	1,500	270	-	$ -	$ -	$0		
24	Storage 129	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	500	30	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	500	30	-	$ -	$ -	$0		
213	Office 130	2	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.2	OCC	3640	655	2	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.2	OCC	3,640	655	-	$ -	$ -	$0		
24	Men's Bathroom 124	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	60	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	1,000	60	-	$ -	$ -	$0		
24	Women's Bathroom 128	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	1000	60	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	1,000	60	-	$ -	$ -	$0		
24	Water Closet 122	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	500	30	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	500	30	-	$ -	$ -	$0		
213	Nurse 127	3	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.3	OCC	1800	486	3	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.3	OCC	1,800	486	-	$ -	$ -	$0		
24	Mech 1 126	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	250	15	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	250	15	-	$ -	$ -	$0		
213	Teacher Work Room 131	3	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.3	OCC	1800	486	3	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.3	OCC	1,800	486	-	$ -	$ -	$0		
24	Cer/Work Room 120	3	1B 32 P F 2 (ELE)	F42LL	60	0.2	SW	1800	324	3	1B 32 P F 2 (ELE)	F42LL	60	0.2	SW	1,800	324	-	$ -	$ -	$0		
190	IMC-Stacks 119	16	1B 32 C F 2)	F42LL	60	1.0	C-OCC	1800	1,728	16	1B 32 C F 2)	F42LL	60	1.0	C-OCC	1,800	1,728	-	$ -	$ -	$0		
190	IMC-Instructor	6	1B 32 C F 2)	F42LL	60	0.4	C-OCC	500	180	6	1B 32 C F 2)	F42LL	60	0.4	C-OCC	500	180	-	$ -	$ -	$0		
190	6th Grade 117	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1800	1,512	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1,800	1,512	-	$ -	$ -	$0		
190	8th Grade 116	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1800	1,512	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1,800	1,512	-	$ -	$ -	$0		
190	1st Grade 132	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1800	1,512	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1,800	1,512	-	$ -	$ -	$0		
190	4th Grade 133	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1800	1,512	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1,800	1,512	-	$ -	$ -	$0		
190	7th Grade 114	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1800	1,512	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1,800	1,512	-	$ -	$ -	$0		
190	5th Grade 113	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1800	1,512	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1,800	1,512	-	$ -	$ -	$0		
190	Special Ed 112	12	1B 32 C F 2)	F42LL	60	0.7	C-OCC	1800	1,296	12	1B 32 C F 2)	F42LL	60	0.7	C-OCC	1,800	1,296	-	$ -	$ -	$0		
190	Corridor 121	3	1B 32 C F 2)	F42LL	60	0.2	SW	2600	468	3	1B 32 C F 2)	F42LL	60	0.2	SW	2,600	468	-	$ -	$ -	$0		
190	Corridor 121-Breaker	2	1B 32 C F 2)	F42LL	60	0.1	Breaker	8760	1,051	2	1B 32 C F 2)	F42LL	60	0.1	Breaker	8,760	1,051	-	$ -	$ -	$0		
X1	Corridor 121-Emergency	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	13	-	$ -	$ -	$0		
37	Corridor 121-Entrance	2	SP 26 R CF 2	CFQ26/2-L	50	0.1	SW	8760	876	2	SP 26 R CF 2	CFQ26/2-L	50	0.1	SW	8,760	876	-	$ -	$ -	$0		
37	Corridor 121-Breaker Entrance	2	SP 26 R CF 2	CFQ26/2-L	50	0.1	Breaker	8760	876	2	SP 26 R CF 2	CFQ26/2-L	50	0.1	Breaker	8,760	876	-	$ -	$ -	$0		
213	North Breaker	9	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.8	Breaker	8760	7,096	9	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.8	Breaker	8,760	7,096	-	$ -	$ -	$0		
213	Corridor 115-A	2	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.2	C-OCC	2600	468	2	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.2	C-OCC	2,600	468	-	$ -	$ -	$0		
213	Corridor 115-Breaker	1	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.1	Breaker	8760	788	1	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.1	Breaker	8,760	788	-	$ -	$ -	$0		
X1	Corridor 115-Emergency	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	13	-	$ -	$ -	$0		
212	Corridor 115-J	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	C-OCC	2600	291	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	C-OCC	2,600	291	-	$ -	$ -	$0		
213	Corridor 134-A	9	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.8	C-OCC	2600	2,106	9	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.8	C-OCC	2,600	2,106	-	$ -	$ -	$0		
212	Corridor 134-J	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	C-OCC	2600	291	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	C-OCC	2,600	291	-	$ -	$ -	$0		
X1	Corridor 134-Emergency	8	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	105	8	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	105	-	$ -	$ -	$0		
213	SGI 137	5	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.5	OCC	1800	810	5	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.5	OCC	1,800	810	-	$ -	$ -	$0		
213	Guidance/SGI 137	5	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.5	OCC	1800	810	5	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.5	OCC	1,800	810	-	$ -	$ -	$0		
190	2nd Grade 136	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1800	1,512	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1,800	1,512	-	$ -	$ -	$0		
190	3rd Grade 135	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1800	1,512	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1,800	1,512	-	$ -	$ -	$0		
24	Girls 111	7	1B 32 P F 2 (ELE)	F42LL	60	0.4	OCC	1000	420	7	1B 32 P F 2 (ELE)	F42LL	60	0.4	OCC	1,000	420	-	$ -	$ -	$0		
24	Bathroom-Breaker	5	1B 32 P F 2 (ELE)	F42LL	60	0.3	Breaker	8760	2,628	5	1B 32 P F 2 (ELE)	F42LL	60	0.3	Breaker	8,760	2,628	-	$ -	$ -	$0		
24	Boys 109	7	1B 32 P F 2 (ELE)	F42LL	60	0.4	OCC	1000	420	7	1B 32 P F 2 (ELE)	F42LL	60	0.4	OCC	1,000	420	-	$ -	$ -	$0		
24	Bathroom Entrance Corridor 110	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	2600	156	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	C-OCC	2,600	156	-	$ -	$ -	$0		
24	Jan/Storage 107	2	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	250	30	2	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	250	30	-	$ -	$ -	$0		
24	WC 108	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	250	15	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	250	15	-	$ -	$ -	$0		
24	Storage 140	4	1B 32 P F 2 (ELE)	F42LL	60	0.2	SW	250	60	4	1B 32 P F 2 (ELE)	F42LL	60	0.2	SW	250	60	-	$ -	$ -	$0		
24	Boiler Room 138	4	1B 32 P F 2 (ELE)	F42LL	60	0.2	SW	250	60	4	1B 32 P F 2 (ELE)	F42LL	60	0.2	SW	250	60	-	$ -	$ -	$0		
X1	Boiler Room 138-Emergency	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	13	-	$ -	$ -	$0		
213	South Breaker-A	11	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	1.0	Breaker	8760	8,672	11	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	1.0	Breaker	8,760	8,672	-	$ -	$ -	$0		
24	South Breaker-C	2	1B 32 P F 2 (ELE)	F42LL	60	0.1	Breaker	8760	1,051	2	1B 32 P F 2 (ELE)	F42LL	60	0.1	Breaker	8,760	1,051	-	$ -	$ -	$0		
213	Corridor 110-A	3	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.3	C-OCC	2600	702	3	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.3	C-OCC	2,600	702	-	$ -	$ -	$0		
190	Corridor 110-I	2	1B 32 C F 2)	F42LL	60	0.1	C-OCC	2600	312	2	1B 32 C F 2)	F42LL	60	0.1	C-OCC	2,600	312	-	$ -	$ -	$0		
213	Corridor 105	3	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.3	C-OCC	2600	702	3	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.3	C-OCC	2,600	702	-	$ -	$ -	$0		
190	Kindergarden	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1800	1,512	14	1B 32 C F 2)	F42LL	60	0.8	C-OCC	1,800	1,512	-	$ -	$ -	$0		
190	Art Music	24	1B 32 C F 2)	F42LL	60	1.4	C-OCC	1800	2,592	24	1B 32 C F 2)	F42LL	60	1.4	C-OCC	1,800	2,592	-	$ -	$ -	$0		
213	Kitchen	5	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.5	C-OCC	1800	810	5	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.5	C-OCC	1,800	810	-	$ -	$ -	$0		
24	Kitchen	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	1800	108	1	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	1,800	108	-	$ -	$ -	$0		
24	Storage-142	2	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	1800	216	2	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	1,800	216	-	$ -	$ -	$0		
24	Storage-143	2	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	1800	216	2	1B 32 P F 2 (ELE)	F42LL	60	0.1	SW	1,800	216	-	$ -	$ -	$0		
213	Office-144	2	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.2	OCC	1500	270	2	T 32 R F 3 (ELE) (TWO SWITCH)	F43ILL/2	90	0.2	OCC	1,500	270	-	$ -	$ -	$0		
242	Muiltiuse Room Gym/Dining Hall	24	B 55 C F 6 (2, 4 ,6 lamp Occ Controled)	F46GHL	351	8.4	C-OCC	1500	12,636	24	B 55 C F 6 (2, 4 ,6 lamp Occ Controle	F46GHL	351	8.4	C-OCC	1,500	12,636	-	$ -	$ -	$0		
24	Mech Room	3	1B 32 P F 2 (ELE)	F42LL	60	0.2	SW	1000	180	3	1B 32 P F 2 (ELE)	F42LL	60	0.2	SW	1,000	180	-	$ -	$ -	$0		
24	Mech Room	3	1B 32 P F 2 (ELE)	F42LL	60	0.2	SW	1000	180	3	1B 32 P F 2 (ELE)	F42LL	60	0.2	SW	1,000	180	-	$ -	$ -	$0		
37	Outdoor Lighting Entrance	3	SP 26 R CF 2	CFQ26/2-L	50	0.2	Photo	3640	546	3	SP 26 R CF 2	CFQ26/2-L	50	0.2	Photo	3,640	546	-	$ -	$ -	$0		
68	Outdoor Lighting	7	175 MH WALL	MH175/1	215	1.5	Photo	3640	5,478	7	IND100	NA	105	0.7	Photo	3,640	2,675	2,803	$ 432.28	$ 4,200.00	$490	9.7	8.6
37	Outdoor Lighting	9	SP 26 R CF 2	CFQ26/2-L	50	0.5	Photo	3640	1,638	9	SP 26 R CF 2	CFQ26/2-L	50	0.5	Photo	3,640	1,638	-	$ -	$ -	$0		
141	Outdoor Lighting Emergency	2	HPS 250	HPS250/1	295	0.6	Photo	3640	2,148	2	HPS 250	HPS250/1	295	0.6	Photo	3,640	2,148	-	$ -	$ -	$0		
	Total	**375**				**32.4**			**78,226**	**375**			**4,781**	**32**			**75,423**	**2,803**	**$432**	**$4,200**	**$490**		
																	Demand Savings		**0.8**	**$68**			
																	kWh Savings		**2,803**	**$364**			
																	Total savings			**$432**		**9.7**	**8.6**

APPENDIX C

ECM-2 Demand Control Ventilation

NJBPU Energy Audit Program
CHA Project No. 20761
Building: Greenbank School

ECM - 2 **Demand Control Ventilation AHU-1 &2, UV-04**

Unit	SA CFM	OA	DeRated
AHU-1	5072	1268	600
AHU-2	5072	1268	600
UV-4	1240	1240	645
Total	11384	3776	1845

	Total CFM	O.A. CFM	O.A. %
Org. scheduled CFM	11,384	3,776	33%
Derated CFM	11,384	1,845	16%
SA Enthalpy	26.4	BTU/lbma	
SA Set point, Winter	73.0	°F	
SA Set point, Summer	74.0		
Cooling System Eff.	1.00	kW/Ton	
Heating System Eff.	81%		

Description:
Outside air can be significantly reduced for most of the time that the building is occupied.
Savings will result from the avoided heating and cooling of excessive outside air.

Method:
The outdoor air introduced into the spaces is currently constant based on design occupancy conditions.
This ECM proposes the installation of CO2 sensors in the space to allow for reduced outdoor air flows when conditions allow.
An average reduction of 50% is assumed possible with the implementation of DCV
The DCV system will automatically adjust the outdoor air damper position through the EMS to reduce outdoor air flows based on indoor CO2 levels.
This ECM has been interacted with the new boiler ECMs and accounts for the reduced operating hours of the unit via EMS scheduling.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
			Existing					Proposed Demand Ventilation					Savings	
Avg. DB Bin Temp °F	OA Enthalpy Btu/lb	Occupied Bin HOURS	OA CFM	Cooling Load MBH	Heating Load MBH	Cooling kWh	Heating therms	Derated O.A. CFM	Cooling Load MBH	Heating Load MBH	Cooling kWh	Heating therms	Cooling kWh	Heating therms
102.5	49.1	0	3776	386	0	0	0	1845	188	0	0	0	0	0
97.5	42.5	2	3776	274	0	57	0	1845	134	0	28	0	29	0
92.5	39.5	19	3776	223	0	353	0	1845	109	0	172	0	180	0
87.5	36.6	36	3776	173	0	525	0	1845	85	0	257	0	269	0
82.5	34	95	3776	129	0	1020	0	1845	63	0	498	0	521	0
77.5	31.6	156	3776	88	0	1148	0	1845	43	0	561	0	587	0
72.5	29.2	208	3776	0	2	0	5	1845	0	1	0	3	0	3
67.5	27	215	3776	0	22	0	59	1845	0	11	0	29	0	30
62.5	24.5	245	3776	0	43	0	129	1845	0	21	0	63	0	66
57.5	21.4	204	3776	0	63	0	159	1845	0	31	0	78	0	82
52.5	18.7	173	3776	0	84	0	178	1845	0	41	0	87	0	91
47.5	16.2	200	3776	0	104	0	256	1845	0	51	0	125	0	131
42.5	14.4	219	3776	0	124	0	336	1845	0	61	0	164	0	172
37.5	12.6	216	3776	0	145	0	386	1845	0	71	0	189	0	197
32.5	10.7	188	3776	0	165	0	383	1845	0	81	0	187	0	196
27.5	8.6	95	3776	0	186	0	218	1845	0	91	0	106	0	111
22.5	6.8	63	3776	0	206	0	160	1845	0	101	0	78	0	82
17.5	5.5	52	3776	0	226	0	145	1845	0	111	0	71	0	74
12.5	4.1	19	3776	0	247	0	59	1845	0	121	0	29	0	30
7.5	2.6	6	3776	0	267	0	18	1845	0	131	0	9	0	9
2.5	1	2	3776	0	288	0	8	1845	0	140	0	4	0	4
-2.5	0	0	3776	0	308	0	0	1845	0	150	0	0	0	0
-7.5	-1.5	0	3776	0	328	0	0	1845	0	160	0	0	0	0
Total		2,413		1,273		3,102	2,502		622		1,516	1,222	1,586	1,279

100% Energy Cost Savings		
Heating Savings	1,279 therms	**914 Gallons**
Cooling Savings		**1,586 kWh**

Comments:

NJBPU Energy Audit Program
CHA Project No. 20812
Greenbank School

ECM - 2 Demand Control Ventilation AHU-1 &2, UV-04

Multipliers	
	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS MAT.	UNIT COSTS LABOR	UNIT COSTS EQUIP.	SUBTOTAL COSTS MAT.	SUBTOTAL COSTS LABOR	SUBTOTAL COSTS EQUIP.	TOTAL COST	REMARKS
Programming of Existing System with new Sensors	3	ea	0	500		$ -	$ 1,815	$ -	$ 1,815	
Carbon Dioxide Sensor AHU-1, AHU-2	2	ea	400	100		$ 784	$ 242	$ -	$ 1,026	
Replace damper UV-04 OA actuator	1	ea	200	50		$ 196	$ 61	$ -	$ 257	
wiring	1	ea	500	500		$ 490	$ 605	$ -	$ 1,095	
		ea				$ -	$ -	$ -	$ -	
		ea				$ -	$ -	$ -	$ -	

$ 4,193	Subtotal	
$ 419	10%	Contingency
$ 692	15%	Contractor O&P
$ -	0%	Engineering
$ 5,304	Total	

APPENDIX D

New Jersey Pay For Performance Incentive Program

NJBPU Energy Audit Program
CHA Project No. 20761
Building: Greenbank School

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per January, 2010. Building must have a minimum average electric demand of 200 kW. This minimum is waived for buildings owned by local governements or non-profit organizations.
The incentive values represented below are applicable through December 31, 2010.

Total Building Area (Square Feet)	25,321
Is this audit funded by the NJ BPU (Y/N)	Yes

Bureau of Public Utilites (BPU)

Incentive #1		
Audit not funded by NJ BPU	$0.10	$/sqft
Audit is funded by NJ BPU	$0.05	$/sqft

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$51,425	$0
Existing Usage (from utility)	273,960	0
Proposed Savings	4,389	0
Existing Total MMBtus	935	
Proposed Savings MMBtus	15	
% Energy Reduction	**1.6%**	
Proposed Annual Savings	$3,478	

	≥ %15 - < 20%	
	$/kWh	$/therm
Incentive #2	$0.11	$1.10
Incentive #3	$0.07	$0.70

	≥ 20%	
	$/kWh	$/therm
Incentive #2	$0.22	$2.20
Incentive #3	$0.14	$1.40

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$1,266
Incentive #2	$0	$0	$0
Incentive #3	$0	$0	$0
Total All Incentives	**$0**	**$0**	**$1,266**

Total Project Cost	$9,504
% Incentives #1 of Utility Cost*	2.5%
% Incentives #2 & #3 of Project Cost**	0.0%
Total Eligible Incentives***	$1,266
Project Cost w/ Incentives	$8,237

Project Payback (years)	
w/o Incentives	w/ Incentives
2.7	2.4

* Maximum allowable incentive is 50% of annual utility cost if not funded by NJ BPU, and %25 if it is.
** Maximum allowable amount of Incentive #2 & #3 is 80% of total project cost.
*** Maximum allowable amount of Incentive #1 is $50,000 if not funded by NJ BPU, and $25,000 if it is.
Maximum allowable amount of Incentive #2 & #3 is $2 million per gas account and $2 million per electric account

APPENDIX E

Photovoltaic (PV) Rooftop Solar Power Generation

Washington Township Greenbank School

Cost of Electricity $0.19 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-20kW System

Budgetary	Annual Utility Savings				Estimated	Total	New Jersey Renewable	New Jersey Renewable	Payback	Payback
Cost					Maintenance Savings	Savings	* Energy Incentive	** SREC	(without incentive)	(with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$160,000	**0.0**	**25,000**	**0**	**$4,700**	**0**	**$4,700**	**$20,000**	**$12,167**	**34.0**	**8.3**

*Incentive based on New Jersey renewable energy program for non-residential applications(PV)= $1.00/W of installed PV system

** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $487/1000kwh

Estimated Solar Renewable Energy Certificate Program (SREC) payments for 15 Years from RR Renewable Energy Consultants

Year	SREC
1	600
2	600
3	600
4	500
5	500
6	500
7	500
8	500
9	500
10	500
11	400
12	400
13	400
14	400
15	400
AVG	**487**

PVWatts *** AC Energy & Cost Savings

Cautions for Interpreting the Results

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	20.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	15.4 kW
Array Type:	Fixed Tilt
Array Tilt:	39.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	18.8 ¢/kWh

Results

Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	3.61	1789	336.33
2	4.20	1864	350.43
3	4.78	2248	422.62
4	5.23	2309	434.09
5	5.44	2423	455.52
6	5.48	2266	426.01
7	5.55	2343	440.48
8	5.41	2310	434.28
9	5.23	2212	415.86
10	4.60	2068	388.78
11	3.59	1642	308.70
12	3.17	1533	288.20
Year	4.69	25006	4701.13

Output Hourly Performance Data * Output Results as Text

About the Hourly Performance Data

Saving Text from a Browser

Run PVWATTS v.1 for another US location or an International location
Run PVWATTS v.2 (US only)

Please send questions and comments regarding PVWATTS to Webmaster

Cautions for Interpreting the Results

The monthly and yearly energy production are modeled using the PV system parameters you selected and weather data that are typical or representative of long-term averages. For reference, or comparison with local information, the solar radiation values modeled for the PV array are included in the performance results.

Because weather patterns vary from year-to-year, the values in the tables are better indicators of long-term performance than performance for a particular month or year. PV performance is largely proportional to the amount of solar radiation received, which may vary from the long-term average by ± 30% for monthly values and ± 10% for yearly values. How the solar radiation might vary for your location may be evaluated by examining the tables in the *Solar Radiation Data Manual for Flat-Plate and Concentrating Collectors* (*http://rredc.nrel.gov/solar/old_data/nsrdb/redbook/*).

For these variations and the uncertainties associated with the weather data and the model used to model the PV performance, future months and years may be encountered where the actual PV performance is less than or greater than the values shown in the table. The variations may be as much as 40% for individual months and up to 20% for individual years. Compared to long-term performance over many years, the values in the table are accurate to within 10% to 12%.

If the default overall DC to AC derate factor is used, the energy values in the table will overestimate the actual energy production if nearby buildings, objects, or other PV modules and array structure shade the PV modules; if tracking mechanisms for one- and two-axis tracking systems do not keep the PV arrays at the optimum orientation with respect to the sun's position; if soiling or snow cover related losses exceed 5%; or if the system performance has degraded from new. (PV performance typically degrades 1% per year.) If any of these situations exist, an overall DC to AC derate factor should be used with PVWATTS that was calculated using system specific component derate factors for *shading*, *sun-tracking*, *soiling*, and *age*.

The PV system size is the nameplate DC power rating. The energy production values in the table are valid only for crystalline silicon PV systems.

The cost savings are determined as the product of the number of kilowatt hours (kWh) and the cost of electricity per kWh. These cost savings occur if the owner uses all the electricity produced by the PV system, or if the owner has a net-metering agreement with the utility. With net-metering, the utility bills the owner for the net electricity consumed. When electricity flows from the utility to the owner, the meter spins forward. When electricity flows from the PV system to the utility, the meter spins backwards.

If net-metering isn't available and the PV system sends surplus electricity to the utility grid, the utility generally buys the electricity from the owner at a lower price than the owner pays the utility for electricity. In this case, the cost savings shown in the table should be reduced.

Besides the cost savings shown in the table, other benefits of PV systems include greater energy independence and a reduction in fossil fuel usage and air pollution. For commercial customers, additional cost savings may come from reducing demand charges. Homeowners can often include the cost of the PV system in their home mortgage as a way of accommodating the PV system's initial cost.

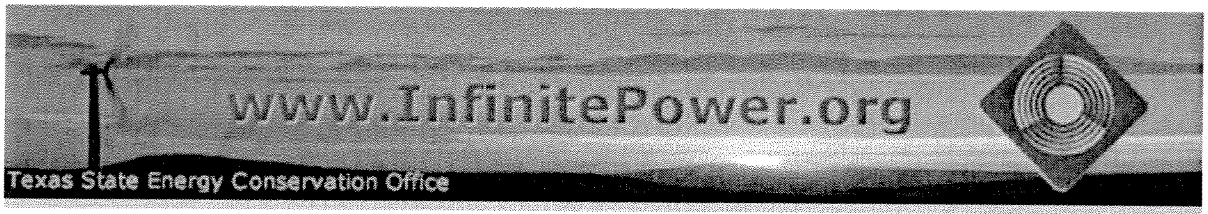
To accelerate the use of PV systems, many state and local governments offer financial incentives and programs. Go to http://www.nrel.gov/stateandlocal for more information.

Please send questions and comments to Webmaster

Return to RREDC Home Page (*http://rredc.nrel.gov/*)

APPENDIX F

Solar Thermal Domestic Hot Water Plant



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Carbon Pollution Calculator
Electric Power Pollution Calculator
PV System Economics
Solar Water Heating
What's a Watt?

Solar Water Heating Calculator

Water heating is a major energy consumer. Although the energy consumed daily is often less than for air conditioning or heating, it is required year round, making it a good application of solar energy. Use this calculator to explore the energy usage of your water heater, and to estimate whether a solar water heater could save you money.

Water Heater Characteristics			
Physical		**Thermal**	
? Diameter (feet)	3	? Water Inlet Temperature (Degrees F)	50
? Capacity (gallons)	140	? Ambient Temperature (Degrees F)	68
? Surface Area (calculated - sq ft)	39.09	? Hot Water Temperature (Degrees F)	125
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	125
Energy Use			
3207	? Heat Delivered in Hot Water (BTU/hr)		
0	? Heat loss through insulation (BTU/hr)		

Gas vs. Electric Water Heating		
Gas		**Electric**
0.8	? Overall Efficiency	0.98
0.8	? Conversion Efficiency	0.98
4009 BTU/hr	? Power Into Water Heater	3272 BTU/hr
Cost		
$ 1.98 /Therm	? Utility Rates	$ 0.188 /kWh
$ 695.353(	? Yearly Water Heating Cost	$ 1578.18:
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
55.6757: years for gas	? Payback Time for Solar System	24.5309 years for electric

NJBPU Energy Audits
CHA #20761
Washington Township - Greenbank School

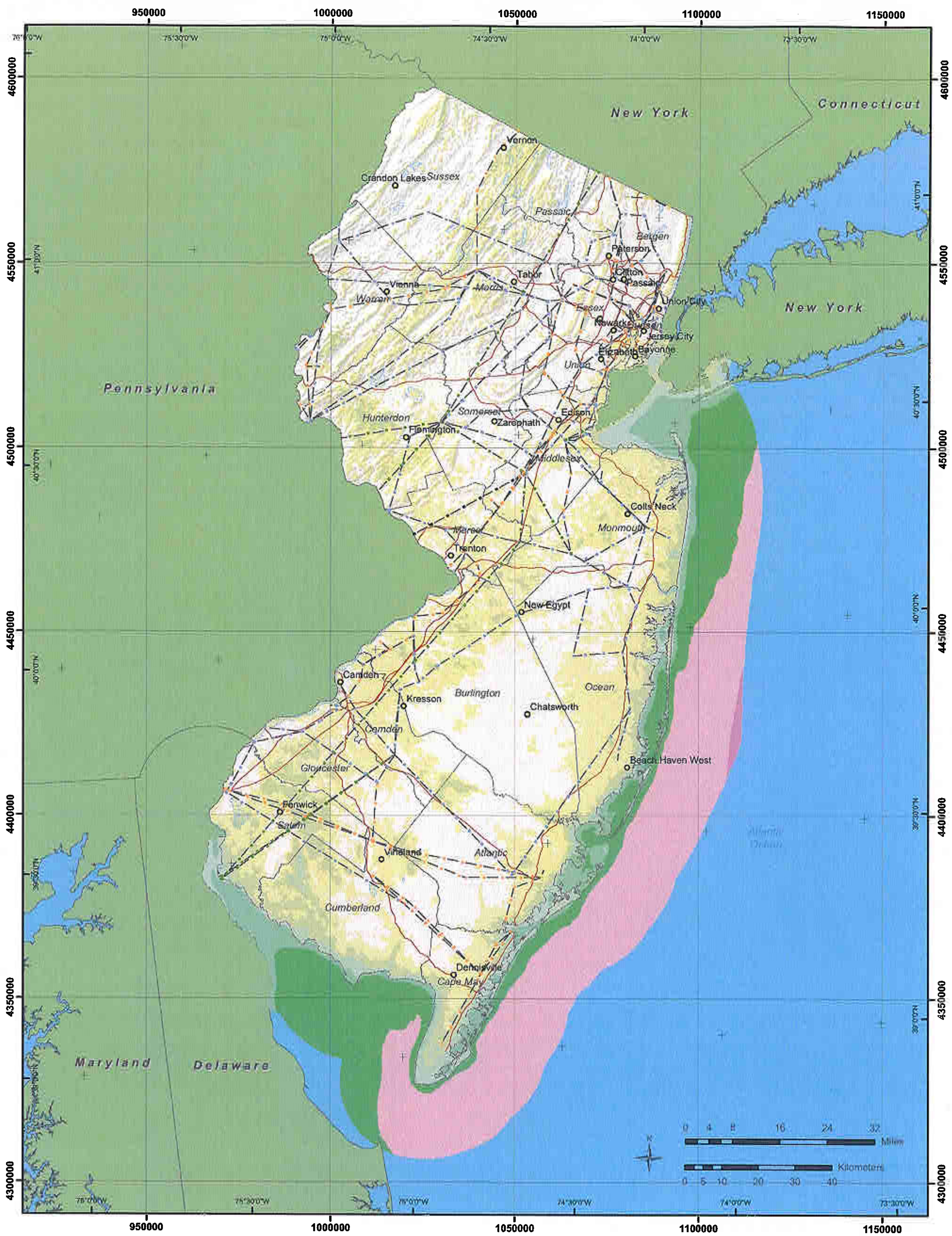
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Synergy Solar Thermal System	2	ea			$ 3,600	$ -	$ -	$ 7,848	$ 7,848	
Piping modifications	1	ls	$ 2,000	$ 3,500		$ 1,960	$ 4,235	$ -	$ 6,195	
Electrical modifications	1	ls	$ 1,000	$ 1,000		$ 980	$ 1,210	$ -	$ 2,190	
65 GallonStorage Tanks	2	ea	$ 200	$ 250		$ 400	$ 500	$ -	$ 900	
10 Gallon Drip Tank	2	ea	$ 100	$ 78		$ 200	$ 156	$ -	$ 356	
						$ -	$ -	$ -	$ -	

$17,489	Subtotal
$ 2,623	15% Contingency
$ 2,623	15% Contractor O&P
$ 4,372	25% Engineering
$27,108	**Total**

APPENDIX G

Wind



Wind Resource of New Jersey *Mean Annual Wind Speed at 30 Meters*

Features

- City
- Interstate Highway
- County Boundary
- Water Body

Generalized Transmission Line

Category

- Under 100 kV
- 100 kV-161 kV
- 230 kV-287 kV
- 345 kV
- 500 kV
- 735 kV +
- Step-Up
- DC Line

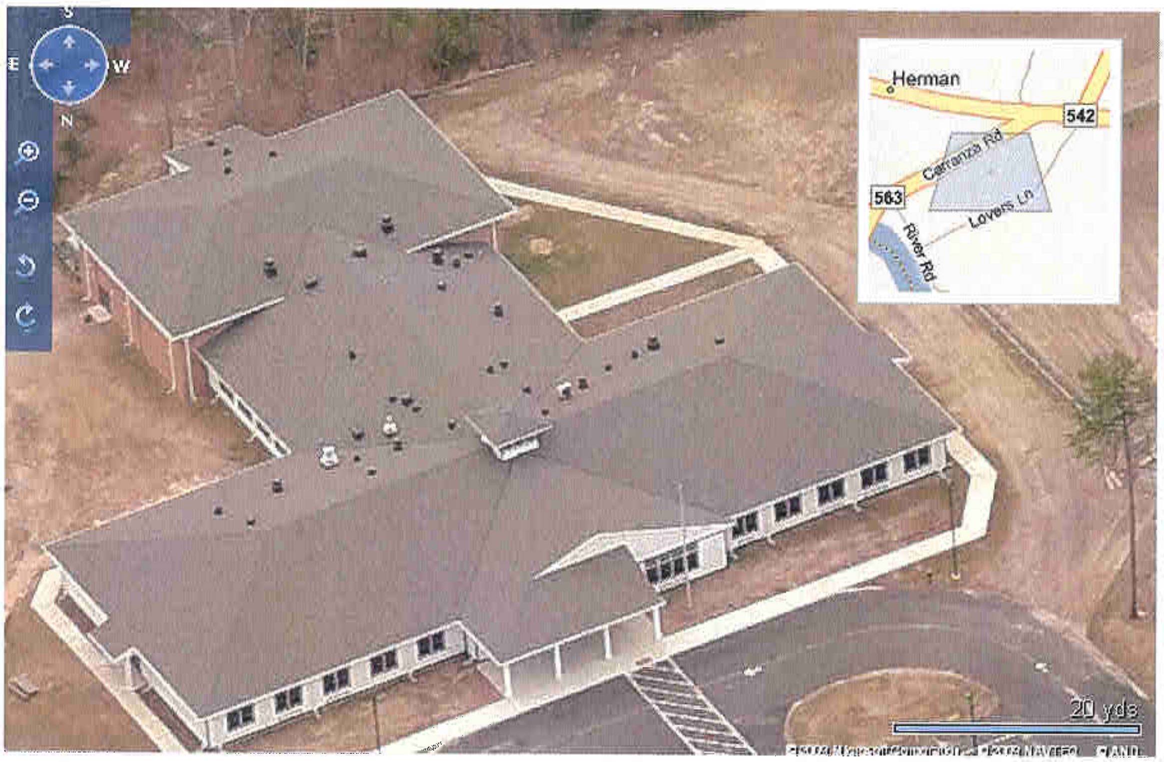
Mean Speed at 30 m

mph	m/s
< 10.1	< 4.5
10.1 - 11.2	4.5 - 5.0
11.2 - 12.3	5.0 - 5.5
12.3 - 13.4	5.5 - 6.0
13.4 - 14.5	6.0 - 6.5
14.5 - 15.7	6.5 - 7.0
15.7 - 16.8	7.0 - 7.5
16.8 - 17.9	7.5 - 8.0
17.9 - 19.0	8.0 - 8.5
> 19.0	> 8.5

AWS Truewind

Projection: Tranverse Mercator, UTM Zone 17 WGS84
Spatial Resolution of Wind Resource Data: 200m
This map was created by AWS Truewind using the MesoMap system and historical weather data. Although it is believed to represent an accurate overall picture of the wind energy resource, estimates at any location should be confirmed by measurement.

The transmission line information was obtained by AWS Truewind from the Global Energy Decisions Velocity Suite. AWS does not warrant the accuracy of the transmission line information.


S
E
W
N
Herman
542
Carranza Rd
563
Lovers Ln
River Rd
20 yds


N
W
E
S
Herman
542
Carranza Rd
563
Lovers Ln
River Rd
40 yds

APPENDIX H

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Green Bank School

Building ID: 2284982
For 12-month Period Ending: November 30, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: April 20, 2010

Facility
Green Bank School
2436 Route 563
Egg Harbor City, NJ 08215

Facility Owner
Washington Township BOE
2436 Route 563
Egg Harbor City, NJ 08215

Primary Contact for this Facility
Lourdes LaGuardia
2436 Route 563
Egg Harbor City, NJ 08215

Year Built: 2006
Gross Floor Area (ft²): 25,321

Energy Performance Rating[2] (1-100) 69

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	934,704
Fuel Oil (No. 2) (kBtu)	1,101,619
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	2,036,323
Energy Intensity[5]	
Site (kBtu/ft²/yr)	80
Source (kBtu/ft²/yr)	167
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	223
Electric Distribution Utility	
Pepco - Atlantic City Electric Co	
National Average Comparison	
National Average Site EUI	97
National Average Source EUI	201
% Difference from National Average Source EUI	-17%
Building Type	K-12 School

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
N/A

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Green Bank School	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	K-12 School	Is this an accurate description of the space in question?		☐
Location	2436 Route 563, Egg Harbor City, NJ 08215	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐

School (K-12 School)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	25,321 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Open Weekends?	No	Is this building normally open at all on the weekends? This includes activities beyond the work conducted by maintenance, cleaning, and security personnel. Weekend activity could include any time when the space is used for classes, performances or other school or community activities. If the building is open on the weekend as part of the standard schedule during one or more seasons, the building should select ?yes? for open weekends. The ?yes? response should apply whether the building is open for one or both of the weekend days.		☐
Number of PCs	120	Is this the number of personal computers in the K12 School?		☐
Number of walk-in refrigeration/freezer units	1	Is this the total number of commercial walk-in type freezers and coolers? These units are typically found in storage and receiving areas.		☐
Presence of cooking facilities	Yes	Does this school have a dedicated space in which food is prepared and served to students? If the school has space in which food for students is only kept warm and/or served to students, or has only a galley that is used by teachers and staff then the answer is "no".		☐
Percent Cooled	70 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Months	N/A(Optional)	Is this school in operation for at least 8 months of the year?		☐

High School?	No	Is this building a high school (teaching grades 10, 11, and/or 12)? If the building teaches to high school students at all, the user should check 'yes' to 'high school'. For example, if the school teaches to grades K-12 (elementary/middle and high school), the user should check 'yes' to 'high school'.		☐

ENERGY STAR® Data Checklist
for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Pepco - Atlantic City Electric Co

Fuel Type: Electricity

Meter: Atlantic City Electric (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
11/01/2009	11/30/2009	21,600.00
10/01/2009	10/31/2009	27,860.00
09/01/2009	09/30/2009	27,520.00
08/01/2009	08/31/2009	25,860.00
07/01/2009	07/31/2009	35,520.00
06/01/2009	06/30/2009	20,320.00
05/01/2009	05/31/2009	21,120.00
04/01/2009	04/30/2009	16,240.00
03/01/2009	03/31/2009	15,920.00
02/01/2009	02/28/2009	16,800.00
01/01/2009	01/31/2009	21,040.00
12/01/2008	12/31/2008	24,146.00
Atlantic City Electric Consumption (kWh (thousand Watt-hours))		**273,946.00**
Atlantic City Electric Consumption (kBtu (thousand Btu))		**934,703.75**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**934,703.75**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Fuel Oil (No. 2)

Meter: Pedroni Fuel Co. (Gallons)
Space(s): Entire Facility

Start Date	End Date	Energy Use (Gallons)
11/01/2009	11/30/2009	2,244.00
10/01/2009	10/31/2009	0.00
09/01/2009	09/30/2009	0.00
08/01/2009	08/31/2009	0.00
07/01/2009	07/31/2009	0.00
06/01/2009	06/30/2009	0.00
05/01/2009	05/31/2009	0.00
04/01/2009	04/30/2009	0.00
03/01/2009	03/31/2009	3,455.00
02/01/2009	02/28/2009	0.00

01/01/2009	01/31/2009	0.00
12/01/2008	12/31/2008	2,244.00
Pedroni Fuel Co. Consumption (Gallons)		**7,943.00**
Pedroni Fuel Co. Consumption (kBtu (thousand Btu))		**1,101,618.64**
Total Fuel Oil (No. 2) Consumption (kBtu (thousand Btu))		**1,101,618.64**
Is this the total Fuel Oil (No. 2) consumption at this building including all Fuel Oil (No. 2) meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same as the PE that signed and stamped the SEP.)

Name: ______________________________ Date: ___________

Signature: ______________________________

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Green Bank School
2436 Route 563
Egg Harbor City, NJ 08215

Facility Owner
Washington Township BOE
2436 Route 563
Egg Harbor City, NJ 08215

Primary Contact for this Facility
Lourdes LaGuardia
2436 Route 563
Egg Harbor City, NJ 08215

General Information

Green Bank School	
Gross Floor Area Excluding Parking: (ft²)	25,321
Year Built	2006
For 12-month Evaluation Period Ending Date:	November 30, 2009

Facility Space Use Summary

School	
Space Type	K-12 School
Gross Floor Area(ft2)	25,321
Open Weekends?	No
Number of PCs	120
Number of walk-in refrigeration/freezer units	1
Presence of cooking facilities	Yes
Percent Cooled	70
Percent Heated	100
Months°	N/A
High School?	No
School District°	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 11/30/2009)	**Baseline** (Ending Date 11/30/2008)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	69	100	75	N/A	50
Energy Intensity					
Site (kBtu/ft2)	80	31	76	N/A	97
Source (kBtu/ft2)	167	31	157	N/A	201
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/ft2/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	223	57	210	N/A	268
$kgCO_2e$/ft2/year	9	2	8	N/A	11

More than 50% of your building is defined as K-12 School. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

Notes:
o - This attribute is optional.
d - A default value has been supplied by Portfolio Manager.

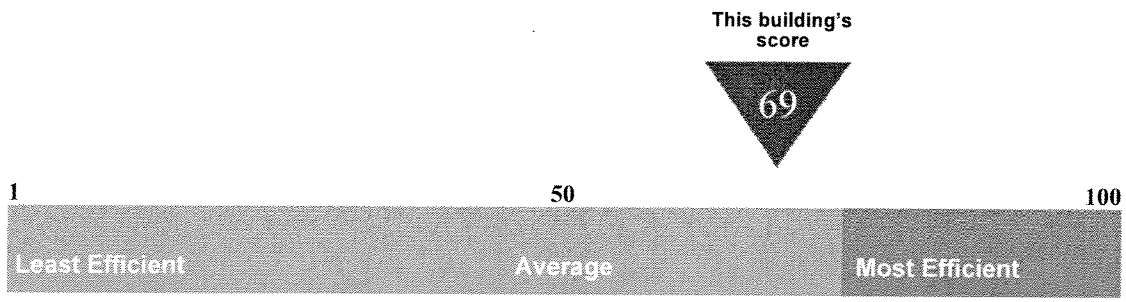
Statement of Energy Performance

2009

Green Bank School
2436 Route 563
Egg Harbor City, NJ 08215

Portfolio Manager Building ID: 2284982

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 167 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending November 2009

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 04/20/2010

APPENDIX I

Equipment Inventory

NJBPU Energy Audit Program
CHA Project No. 20761
Building: Greenbank School

HVAC Systems

Type	No.	Area Served	Manufacturer	# units	Mod#	Ser#	Controlled By	Notes	Exhausted By	Info	Equipment Condition	Age of Equipment	CFM	MIN CFM	MBH	MBH Out	Cooling Coil Total MBH	Cooling Coil Nominal MBH	Heating Coil Capacity MBH	EER	Heating Element (kW)	HP	kW	kW % On
Exhaust Fan	EF-1	MEN 124	PENN	1	ZEPHYR Z5HRA	N/A	Light Switch	N/A			Excellent	5 years	75									0.06	0.08	0.060322
Exhaust Fan	EF-2	WOM 123	PENN	1	ZEPHYR Z5HTD	N/A	Light Switch	N/A			Excellent	5 years	75									0.06	0.08	0.060322
Exhaust Fan	EF-4	JAN/STOR 107	PENN	1	ZEPHYR Z5HTD	N/A	Light Switch	N/A			Excellent	5 years	50									0.06	0.08	0.060322
Exhaust Fan	EF-5	WC 108	PENN	1	ZEPHYR Z5HTD	N/A	Light Switch	N/A			Excellent	5 years	75									0.06	0.08	0.060322
Exhaust Fan	EF-6	UV-1 THRU UV-4	PENN	1	DX14B	N/A	Building System	N/A			Excellent	5 years	2580									0.5	0.67	0.502681
Exhaust Fan	EF-7	BC-3, BC-4, AC-2, STOR 129 & 140	PENN	1	DX11B	N/A	Building System	N/A			Excellent	5 years	1060									0.25	0.34	0.25134
Exhaust Fan	EF-8	UV-6 THRU UV-12	PENN	1	DX16B	N/A	Building System	N/A			Excellent	5 years	3465									0.75	1.01	0.754021
Exhaust Fan	EF-9	BC-2, UV-5, STOR 142& 143	PENN	1	DX12B	N/A	Building System	N/A			Excellent	5 years	1780									0.25	0.34	0.25134
Exhaust Fan	EF-10	WC 122	PENN	1	ZEPHYR Z5HRA	N/A	Light Switch	N/A			Excellent	5 years	75									0.06	0.08	0.060322
Exhaust Fan	EF-11	MULTIPURPOSE 100	PENN	1	DX18B	N/A	Building System	N/A			Excellent	5 years	4812									1.5	2.01	1.508043
Exhaust Fan	EF-12	MULTIPURPOSE 100	PENN	1	DX18B	N/A	Building System	N/A			Excellent	5 years	4812									1.5	2.01	1.508043
Exhaust Fan	EF-13	KITCHEN HOOD	PENN	1	FX12BH	N/A	Light Switch	N/A			Excellent	5 years	1400									0.25	0.34	0.25134
Exhaust Fan	EF-14	KITCHEN 101	PENN	1	ZEPHYR Z5HTD	N/A	Building System	N/A			Excellent	5 years	420									0.25	0.34	0.25134
Exhaust Fan	EF-15	JAN 102	PENN	1	DX08R	N/A	Building System	N/A			Excellent	5 years	50									0.06	0.08	0.060322
Exhaust Fan	EF-16, EF-18, EF-22	ATTIC	PENN	3	DX08R	N/A	Building System	N/A			Excellent	5 years	510									0.12309	0.17	0.37125
Exhaust Fan	EF-17, EF-19, EF-20, EF-21, EF-23, EF-24	ATTIC	PENN	6	DX06R	N/A	Building System	N/A			Excellent	5 years	595									0.23752	0.32	0.716381
Unit Ventilator	UV-1	1st Grade	TRANE	1	VUVC125	N/A		N/A	EF-6		Excellent	5 years	1250	645			43.89		1116.10			0.25	0.34	0.100536
Unit Ventilator	UV-2	3rd Grade	TRANE	1	VUVC125	N/A		N/A	EF-6		Excellent	5 years	1250	645			43.89		116.1			0.25	0.34	0.100536
Unit Ventilator	UV-3	4th Grade	TRANE	1	VUVC125	N/A		N/A	EF-6		Excellent	5 years	1250	645			39.55		116.10			0.25	0.34	0.100536
Unit Ventilator	UV-4	2nd Grade	TRANE	1	VUVC125	N/A		N/A	EF-6		Excellent	5 years	1250	645			39.55		116.10			0.25	0.34	0.100536
Unit Ventilator	UV-5	Kindergarten	TRANE	1	VUVC150	N/A		N/A	EF-9		Excellent	5 years	1500	720			37.99		123.80			0.25	0.34	0.100536
Unit Ventilator	UV-6	Special Ed	TRANE	1	VUVC100	N/A		N/A	EF-8		Excellent	5 years	1000	450			28.91		85.50			0.166667	0.22	0.067024
Unit Ventilator	UV-7	5th Grade	TRANE	1	VUVC125	N/A		N/A	EF-8		Excellent	5 years	1250	600			39.55		116.10			0.25	0.34	0.100536
Unit Ventilator	UV-8	7th Grade	TRANE	1	VUVC125	N/A		N/A	EF-8		Excellent	5 years	1250	600			39.55		116.10			0.25	0.34	0.100536
Unit Ventilator	UV-9	8th Grade	TRANE	1	VUVC125	N/A		N/A	EF-8		Excellent	5 years	1250	600			39.55		116			0.25	0.335121	0.100536
Unit Ventilator	UV-10	6th Grade	TRANE	1	VUVC125	N/A		N/A	EF-8		Excellent	5 years	1250	600			43.89		116.1			0.25	0.335121	0.100536
Unit Ventilator	UV-11	Instructional	TRANE	1	VUVC170	N/A		N/A	EF-8		Excellent	5 years	750	315			23.49		69.5			0.166667	0.223414	0.067024
Unit Ventilator	UV-12	Media Center	TRANE	1	VUVC150	N/A		N/A	EF-8		Excellent	5 years	1500	300			37.99		123.8			0.25	0.335121	0.100536
Air Handling	AHU-1	Cafenasium	TRANE	1	LPCAF14D	N/A		N/A	EF-8		Excellent	5 years	5072	5072			326.91		423.54			3	4.021448	1.206434
Air Handling	AHU-2	Cafenasium	TRANE	1	LPCAF14D	N/A		N/A	EF-11		Excellent	5 years	5072	5072			326.91		423.54			3	4.021448	1.206434
Air Cooled Water Chiller	WC-1		TRANE	1	RTAA 125	N/A		N/A	EF-12		Excellent	5 years			1500					9.8			0.00	
Air Conditioner	AC-1	CER/Work Room	EMI	1	CHP-24D	N/A	See Schedule CU-1				Excellent	5 years	800	100				24					0.00	0
Air Conditioner	AC-2	Nurse's Suite	EMI	1	CAC-14	N/A	See Schedule CU-2				Excellent	5 years	615	60				13.7					0.00	0
Boiler	BRL-1		AO Smith	1	28A-SLW07	N/A	Oil: 17.5 GPH, Lead Line				Excellent	5 years			1477								0.00	0
Boiler	BRL-2		AO Smith	1	28A-SLW07	N/A	Oil:17.4 GPH, Lead Line				Excellent	5 years			1477								0.00	0
Hot Water Heater	HW-1		AO Smith	1	COE150140	SF06112623		140 Gal			Excellent	5 years			140								0.00	0
Pump	P-1	Hot Water	B&G	1	90-41T	N/A		Lead Line			Excellent	5 years										2	2.680965	0.80429
Pump	P-2	Hot Water	B&G	1	90-41T	N/A		Lead Line			Excellent	5 years										2	2.680965	0.80429
Pump	P-3	Chilled Water	B&G	1	5x5x12B	N/A		Lead Line			Excellent	5 years										25	33.51206	
Pump	P-4	Chilled Water	B&G	1	5x5x12B	N/A		Lead Line			Excellent	5 years										25	33.51206	
Fuel Oil Pump	P-5	Fuel Oil	Bradley Sciocchetti	1	2DD03A103-014LRX	N/A		N/A			Excellent	5 years										0.25	0.34	
Fuel Oil Pump	P-6	Fuel Oil	Bradley Sciocchetti	1	2DD03A103-014LRX	N/A		N/A			Excellent	5 years										0.25	0.34	
Dom Water Recirc Pump	PP-1	Domestic Water	B & G	1	ILR20BF	N/A		N/A			Excellent	5 years										0.05	0.07	
Dom Water Recirc Pump	PP-2	Domestic Water	B & G	1	ILR20BF	N/A		N/A			Excellent	5 years										0.05	0.07	
Well Booster Pump	PP-3	Well Booster	NECO	1	N/A	N/A		N/A			Excellent	5 years										5	6.70	
Well Booster Pump	PP-4	Well Booster	NECO	1	N/A	N/A		N/A			Excellent	5 years										5	6.70	
Well Pump	PP-5	Well Pump	Goulds	1	N/A	N/A		N/A			Excellent	6 years										15	20.11	
Booster Heater	BH-1	Kitchen	Jackson	1	JPX 300H	N/A		N/A			Excellent	5 years									6.2			
Hot Counter	HC-1	Kitchen	Garland	1	MCO-ES-10/S	N/A		N/A			Excellent	5 years									10.4			
6 Burner & Oven	BO-1	Kitchen	Garland	1	36E	N/A		N/A			Excellent	5 years									21.5			
Refrigerator	RE-1	Kitchen	Continental	1	DLZRF-SA	N/A		N/A			Excellent	5 years									7.5			
Refrigerator	RE-2	Kitchen	Superior	1	TS-Z3	N/A		N/A			Excellent	5 years									0.006178			
Freezer	FR-1	Kitchen	Bally	1	3678-4-P-A	DX9508621-81		N/A			Excellent	5 years									0.0156			
Hot Table	HT-1	Kitchen	American Permanent Ware Company	1	HFW-4D	060JD04891		N/A			Excellent	5 years									4.8			
Emergency Generator	EG-1		Kohler	1	150REOZJB	N/A		N/A			Excellent	5 years									150			12.13991
													26309	17069										