ENERGY AUDIT – FINAL

PITMAN BOARD OF EDUCATION
W.C.K. WALLS ELEMENTARY SCHOOL
320 GRANT AVENUE
PITMAN, NJ 08071

ATTN: MICHELE ROEMER
ASSISTANT SUPERINTENDENT FOR
BUSINESS/BOARD SECRETARY

CEG PROJECT NO. 9C09067

CONCORD ENGINEERING GROUP

520 SOUTH BURNT MILL ROAD
VOORHEES, NJ 08043
TELEPHONE: (856) 427-0200
FACSIMILE: (856) 427-6529
WWW.CEG-INC.NET

CONTACT: MIKE FISCHETTE, PRINCIPAL
EMAIL: mfischette@ceg-inc.net

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I. EXECUTIVE SUMMARY

This report presents the findings of the energy audit conducted for:

Pitman Board of Education
W.C.K. Walls School
320 Grant Avenue
Pitman, NJ 08071

Municipal Contact Person: Thomas F. Schulte
Facility Contact Person: Tom Herms

This audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program. The energy audit is conducted to promote the mission of the office of Clean Energy, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

The annual energy costs at this facility are as follows:

Electricity	$ 38,092
Natural Gas	$ 27,043
Total	$ 65,135

The potential annual energy cost savings for each energy conservation measure (ECM) and renewable energy measure (REM) are shown below in Table 1. Be aware that the ECM's and REM' are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE level 2 audit. The cost and savings for each measure is ± 20%. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Table 1
Financial Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Install DDC System	$121,480	$9,314	13.0	15.0%
ECM #2	Exterior Lighting: LED Type	$8,775	$491	17.9	-16.1%
ECM #3	Exterior Lighting: CFL Type	$2,250	$257	8.8	71.3%
ECM #4	Install Compact Fluorescent Lamps	$48	$191	0.3	5868.8%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	28.3 KW PV System	$226,320	$16,872	13.4	86.4%

Notes: A. Cost takes into consideration applicable NJ Smart StartTM incentives.
B. Savings takes into consideration applicable maintenance savings.

The estimated demand and energy savings for each ECM and REM is shown below in Table 2. The descriptions in this table correspond to the ECM's and REM's listed in Table 1.

Table 2
Estimated Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	Install DDC System	0.0	22875.0	2024.0
ECM #2	Exterior Lighting: LED Type	0.0	1913.0	0.0
ECM #3	Exterior Lighting: CFL Type	0.0	1862.0	0.0
ECM #4	Install Compact Fluorescent Lamps	0.0	1386.0	0.0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	28.3 KW PV System	28.3	34573.0	0.0

Concord Engineering Group (CEG) recommends proceeding with the implementation of all ECM's that provide a calculated simple payback at or under ten (10) years. The following Energy Conservation Measures are recommended for the facility:

- **ECM #3:** Exterior Lighting: CFL Type
- **ECM #4:** Install Compact Fluorescent Lamps

In addition to the ECMs, there are maintenance and operational measures that can provide significant energy savings and provide immediate benefit. The ECMs listed above represent investments that can be made to the facility which are justified by the savings seen overtime. However, the maintenance items and small operational improvements below are typically achievable with on site staff or maintenance contractors and in turn have the potential to provide substantial operational savings compared to the costs associated. The following are recommendations which should be considered a priority in achieving an energy efficient building:

1. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
2. Maintain all weather stripping on entrance doors.
3. Clean all light fixtures to maximize light output.
4. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

Overall, the Pitman W.C.K. Wall School appears to be operating as efficient as possible with the current "heating only" equipment within the facility. Due to the educated decisions made during the major boiler replacement in regards to efficiency the hot water plant equipment is operating properly and providing energy savings for the Pitman BOE. In the future, if the Pitman BOE reviews the possibility of air-conditioning the facility, care should be taken in selecting a high energy efficient system to work in conjunction with the energy savings on the heating side.

II. INTRODUCTION

The comprehensive energy audit covers the 43,385 square foot W.C.K. Walls Elementary School, which includes the following spaces: classrooms, administration offices and a multipurpose cafeteria / gymnasium.

Electrical and natural gas utility information is collected and analyzed for one full year's energy use of the building. The utility information allows for analysis of the building's operational characteristics; calculate energy benchmarks for comparison to industry averages, estimated savings potential, and baseline usage/cost to monitor the effectiveness of implemented measures. A computer spreadsheet is used to calculate benchmarks and to graph utility information (see the utility profiles below).

The Energy Use Index (EUI) is established for the building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft^2/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTU's and dividing by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. A low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance therefore a high potential for energy savings.

Existing building architectural and engineering drawings (where available) are utilized for additional background information. The building envelope, lighting systems, HVAC equipment, and controls information gathered from building drawings allow for a more accurate and detailed review of the building. The information is compared to the energy usage profiles developed from utility data. Through the review of the architectural and engineering drawings a building profile can be defined that documents building age, type, usage, major energy consuming equipment or systems, etc.

The preliminary audit information is gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is spent and opportunities exist within a facility. The entire site is surveyed to inventory the following to gain an understanding of how each facility operates:

- Building envelope (roof, windows, etc.)
- Heating, ventilation, and air conditioning equipment (HVAC)
- Lighting systems and controls
- Facility-specific equipment

The building site visit is performed to survey all major building components and systems. The site visit includes detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs provided by the building manager are collected along with the system and components to determine a more accurate impact on energy consumption.

III. METHOD OF ANALYSIS

Post site visit work includes evaluation of the information gathered, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on HVAC, lighting and building envelope improvements. Data collected is processed using energy engineering calculations to anticipate energy usage for each of the proposed energy conservation measures (ECMs). The actual building's energy usage is entered directly from the utility bills provided by the owner. The anticipated energy usage is compared to the historical data to determine energy savings for the proposed ECMs.

It is pertinent to note, that the savings noted in this report are not additive. The savings for each recommendation is calculated as standalone energy conservation measures. Implementation of more than one ECM may in some cases affect the savings of each ECM. The savings may in some cases be relatively higher if an individual ECM is implemented in lieu of multiple recommended ECMs. For example implementing reduced operating schedules for inefficient lighting will result in a greater relative savings. Implementing reduced operating schedules for newly installed efficient lighting will result in a lower relative savings, because there is less energy to be saved. If multiple ECM's are recommended to be implemented, the combined savings is calculated and identified appropriately.

ECMs are determined by identifying the building's unique properties and deciphering the most beneficial energy saving measures available that meet the specific needs of the facility. The building construction type, function, operational schedule, existing conditions, and foreseen future plans are critical in the evaluation and final recommendations. Energy savings are calculated base on industry standard methods and engineering estimations. Energy consumption is calculated based on manufacturer's cataloged information when new equipment is proposed.

Cost savings are calculated based on the actual historical energy costs for the facility. Installation costs include labor and equipment costs to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers. The NJ Smart Start Building® program incentives savings (where applicable) are included for the appropriate ECM's and subtracted from the installed cost. Maintenance savings are calculated where applicable and added to the energy savings for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The costs and savings are applied and a simple payback, simple lifetime savings, and simple return on investment are calculated. See below for calculation methods:

ECM Calculation Equations:

$$Simple\ Payback = \left(\frac{Net\ Cost}{Yearly\ Savings} \right)$$

$$Simple\ Lifetime\ Savings = \left(Yearly\ Savings \times ECM\ Lifetime \right)$$

$$Simple\ Lifetime\ ROI = \frac{(Simple\ Lifetime\ Savings - Net\ Cost)}{Net\ Cost}$$

$$Lifetime\ Ma\,\mathrm{int}\,enance\ Savings = \left(Yearly\ Ma\,\mathrm{int}\,enance\ Savings \times ECM\ Lifetime \right)$$

$$Internal\ Rate\ of\ \mathrm{Re}\,turn = \sum_{n=0}^{N} \left(\frac{Cash\ Flow\ of\ Period}{(1 + IRR)^n} \right)$$

$$Net\ \mathrm{Pr}\,esent\ Value = \sum_{n=0}^{N} \left(\frac{Cash\ Flow\ of\ Period}{(1 + DR)^n} \right)$$

Net Present Value calculations based on Interest Rate of 3%.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

The energy usage for the facility has been tabulated and plotted in graph form as depicted within this section. Each energy source has been identified and monthly consumption and cost noted per the information provided by the Owner.

The electric usage profile represents the actual electrical usage for the facility. Atlantic City Electric provides electricity to the facility under their Basic Generation Service (BGS) rate structure. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

The gas usage profile shows the actual natural gas energy usage for the facility. South Jersey Gas provides natural gas to the facility under the Basic Gas Supply Service (BGSS) rate structure. PEPCO Energy Services, Inc. is the third party supplier. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

The overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history provided, the average cost for utilities at this facility is as follows:

Description	Average
Electricity	13.8¢ / kWh
Natural Gas	$1.56 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Atlantic City Electric
Rate: Annual General Service (AGS)
Meter No: 57789223
Account No: 0067 5289 9986
Third Party Utility N/A
TPS Meter / Acct No: N/A

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-09	24,880	77.6	$3,364
Feb-09	27,440	76.0	$3,680
Mar-09	25,920	75.2	$3,484
Apr-09	32,800	73.6	$4,488
May-09	21,440	66.4	$2,968
Jun-09	17,640	65.6	$1,869
Jul-08	13,840	73.6	$1,975
Aug-08	11,360	36.0	$2,039
Sep-08	23,200	75.2	$3,662
Oct-08	23,520	76.8	$3,179
Nov-08	28,320	71.2	$3,763
Dec-08	26,600	75.2	$3,622
Totals	**276,960**	**77.6 Max**	**$38,092**

AVERAGE DEMAND **70.2 KW average**

AVERAGE RATE **$0.138** **$/kWh**

Note: The billing period for April, 2009 was measured from April 2, 2009 to May 20, 2009 this extended metering period accounts for the spike in electrical usage plotted for this month.

Figure 1
Electricity Usage Profile

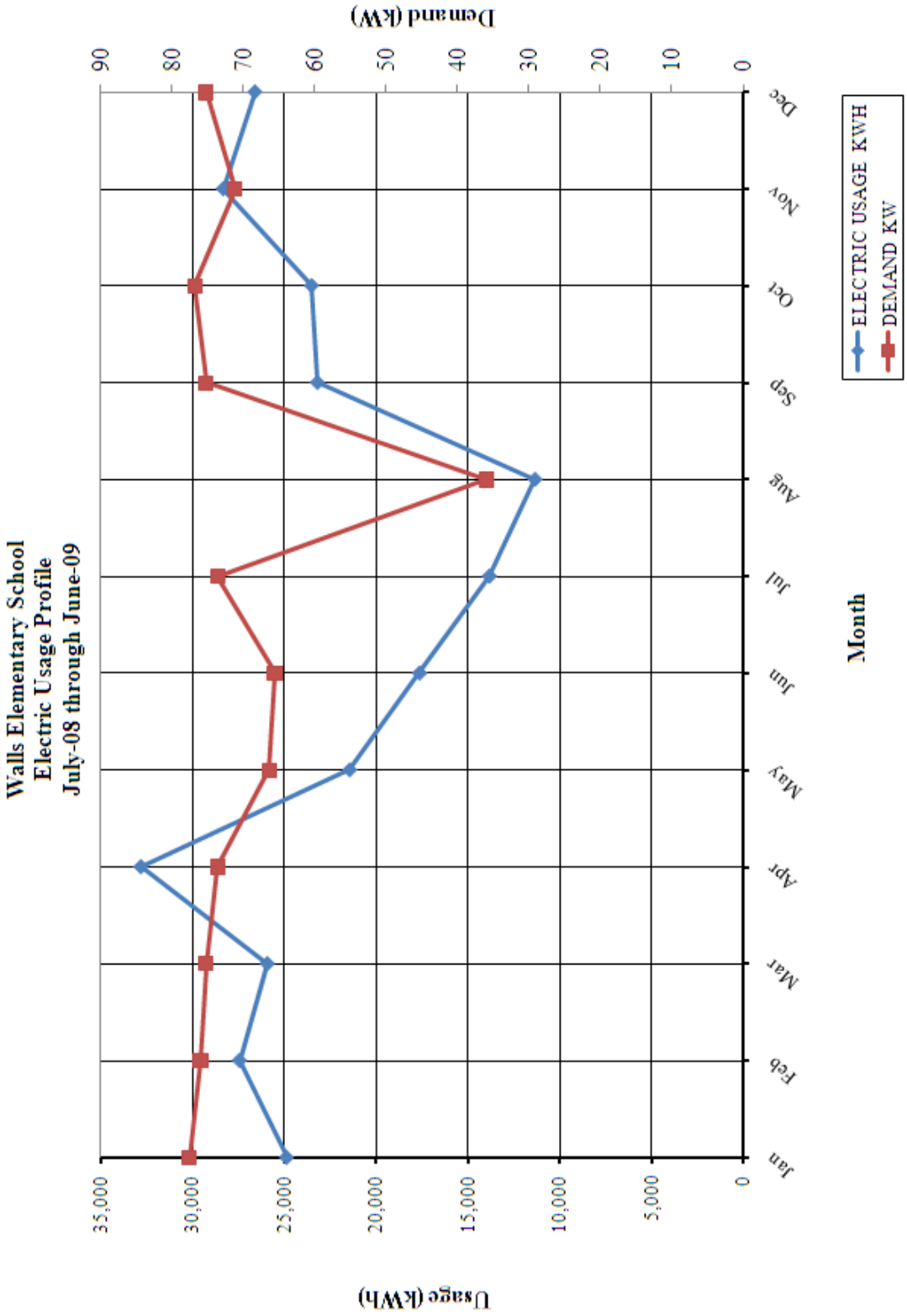
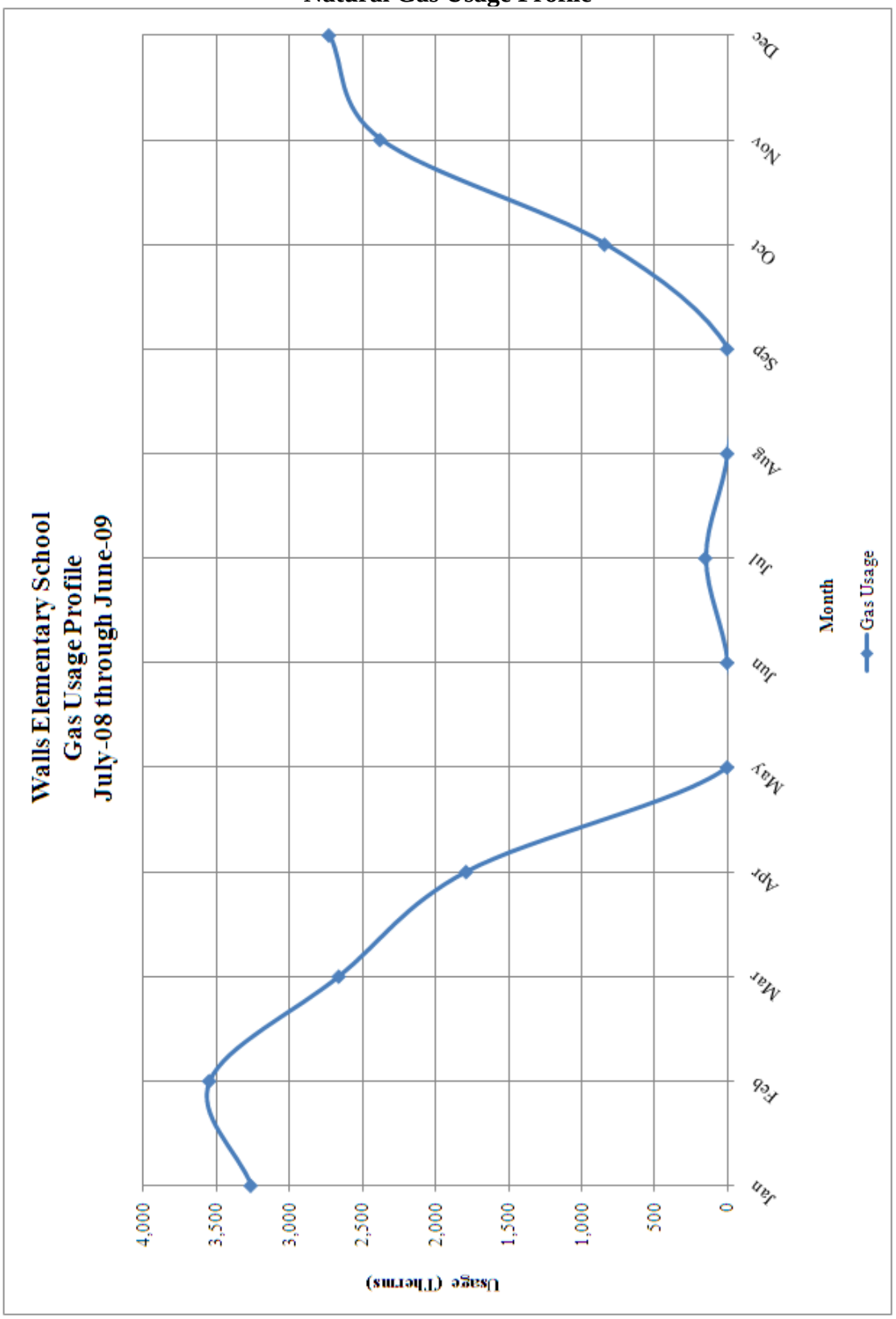


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider:	South Jersey Gas	
Rate:	Firm Transportation	
Meter No:	180409	
Point of Delivery ID:	N/A	
Third Party Utility Provider:	Pepco Energy Services	
TPS Meter No:	21635002104	
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Jan-09	3,265.47	$5,019.73
Feb-09	3,550.08	$5,575.14
Mar-09	2,662.04	$4,184.23
Apr-09	1,789.16	$2,837.05
May-09	0.00	$19.35
Jun-09	0.00	$19.97
Jul-08	149.64	$331.15
Aug-08	0.00	$18.73
Sep-08	0.00	$20.60
Oct-08	840.05	$1,220.16
Nov-08	2,379.69	$3,637.08
Dec-08	2,729.94	$4,160.27
TOTALS	**17,366.07**	**$27,043.46**
AVERAGE RATE:	**$1.56**	**$/THERM**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for one year, to British Thermal Units (BTU) and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. The ORNL website determines how a building's energy use compares with similar facilities throughout the U.S. and in a specific region or state.

Source use differs from site usage when comparing a building's energy consumption with the national average. Site energy use is the energy consumed by the building at the building site only. Source energy use includes the site energy use as well as all of the losses to create and distribute the energy to the building. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, which allows for a complete assessment of energy efficiency in a building. The type of utility purchased has a substantial impact on the source energy use of a building. The EPA has determined that source energy is the most comparable unit for evaluation purposes and overall global impact. Both the site and source EUI ratings for the building are provided to understand and compare the differences in energy use.

The site and source EUI for this facility is calculated as follows:

$$Building\ \ Site\ EUI = \frac{(Electric\ Usage\ in\ kBtu + Gas\ Usage\ in\ kBtu)}{Building\ \ Square\ \ Footage}$$

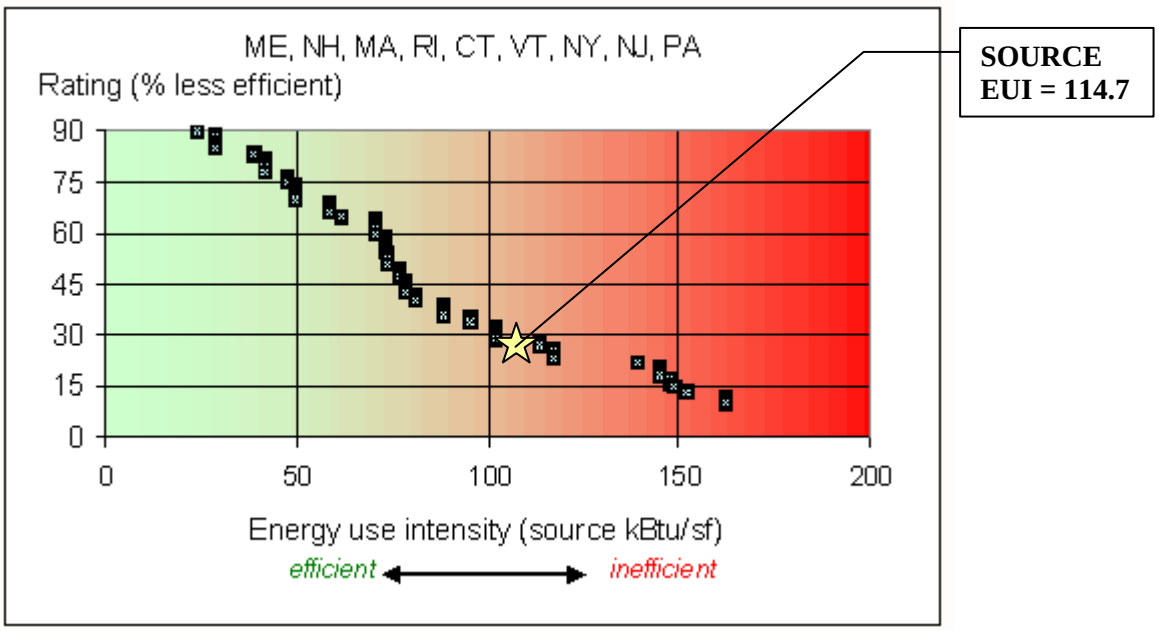
$$Building\ \ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ \ X\ \ SS\ \ Ratio + Gas\ Usage\ in\ kBtu\ \ X\ \ SS\ \ Ratio)}{Building\ \ Square\ \ Footage}$$

Table 5
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	276960.0			945,541	3.340	3,158,108
NATURAL GAS		17366.1		1,736,607	1.047	1,818,228
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				2,682,148		4,976,336
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		43,385	SQUARE FEET			
BUILDING SITE EUI		*61.82*	kBtu/SF/YR			
BUILDING SOURCE EUI		*114.70*	kBtu/SF/YR			

Figure 3 below depicts a national EUI grading for the source use of *Elementary Schools*.

Figure 3
Source Energy Use Intensity Distributions: Elementary School



C. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows tracking and assessment of energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and emphasis is being placed on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than $10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. It is vital that local government municipalities assess facility energy usage, benchmark energy usage utilizing Portfolio Manager, set priorities and goals to lessen energy usage and move forward with priorities and goals.

In accordance with the Local Government Energy Audit Program, CEG has created an ENERGY STAR account for the municipality to access and monitoring the facility's yearly energy usage as it compares to facilities of similar type. The login page for the account can be accessed at the following web address; the username and password are also listed below:

https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.login

User Name: pitmanboe
Password: lgeaceg2009

Security Question: What city were you born in?
Security Answer: "pitman"

The utility bills and other information gathered during the energy audit process are entered into the Portfolio Manager. The following is a summary of the results for the facility:

Table 6
ENERGY STAR Performance Rating

ENERGY STAR PERFORMANCE RATING		
FACILITY DESCRIPTION	**ENERGY PERFORMANCE RATING**	**NATIONAL AVERAGE**
W.C.K. Walls Elementary School	69	50

Refer to **Statement of Energy Performance Appendix** for the detailed energy summary.

V. FACILITY DESCRIPTION

The 43,385 SF Elementary School is a two story facility comprised of classrooms, administration offices and a multipurpose cafeteria / gymnasium. The school attendance is currently 280 students from kindergarten through 5th grade. The original building was built in 1926 with a 1953 classroom addition. In 1972 the all purpose room was constructed and in 1999 a library, art room and computer lab was added. This facility is utilized approximately 60 hours a week. The original building is constructed of brick exterior with a plaster and lathe finished interior surface with minimal insulation. The addition construction is CMU with brick face. The windows and doors throughout the facility are in good condition. The types vary from double, thermopane with vinyl cladding to single pane in some locations. Entrance doors have been replaced with double, thermopane glass and insulated doors. The main entrance does not have a vestibule.

HVAC Systems

The heating system consists of three hot water boilers. The original boiler is a HB Smith that is approximately 42 years old and is used as a supplemental unit to provide heating hot water to the facility. During the 1999 addition, two Lochinvar hot water boilers were installed to provide heating hot water to the system. The hot water system operating from the HB Smith boiler is a primary system and only uses one set of pumps. These pumps appeared to be operational but it was apparent by the appearance that there are some areas around the pump seals that may be leaking. The Lochinvar boiler system is designed as a primary/secondary system. Both boilers and pumps appeared to be in good condition and operational. It should noted that the pump system for the HB Smith boiler system did not have a variable frequency drives. The Lochinvar boiler pumps were noted to have variable frequency drives. The Lochinvar boilers also provide domestic hot water to the facility through the means of a shell and tube heat exchanger.

The heating and ventilation to the classrooms in the original portion of the building is provided by a central station air handling unit with main heating coil and large supply fan section. This unit supplies ventilation air throughout the facility to individual terminal reheat coils for each zone served.

The heating and ventilation to the all purpose room is provided by a Nesbitt constant volume air handling unit. The unit appears to be in good condition.

The library, art room and the computer lab are heated and ventilated with small independent air handling units that provide heating from a single hot water coil. The cooling to these spaces is provided through direct expansion from remote condensers located on the roof. At the time of the survey access to the air handling unit was not available. The space served by these units was at set point and operating correctly.

Exhaust System

Air is exhausted from the toilet rooms and common areas through typical centrifugal roof exhaust fans. These fans are manually controlled by local disconnect switches at the individual fans. It was noted that several fans were not running at the time of the survey. It was also noted that the fans appeared to be relatively newer and were in good condition.

HVAC System Controls

Currently, the HVAC systems are not controlled via a central Pneumatic or DDC control system. All equipment is controlled manually or by stand alone controllers integral to the equipment. It was noted that the thermostats in the classrooms appeared to have been replaced recently. It was not determined at the time of the survey if the thermostats were operating as the system was not running. During the survey, several members of the staff complained of severe overheating issues during the winter months. The new addition areas have stand alone programmable thermostats that appeared to be operating normally as the space temperatures were normal. A DDC control system should be reviewed for implementation at Wall School.

Domestic Hot Water

The domestic hot water system operates in conjunction with the Lochinvar heating hot water boiler system. The system receives hot water from a shell and tube heat exchanger which provides hot water to a 150-gallon hot water storage tank. It was observed at the time of the survey that the stored hot water was 120°F. The kitchen area is served domestic hot water from a 52 gallon electric water heater located in the storage room above the kitchen area. The unit was installed in 1977 and appears to be in good condition.

Lighting

Typical lighting throughout the building is fluorescent tube fixtures with T-8 lamps and electronic ballasts. Storage rooms and closets are utilizing compact fluorescents. These areas were retrofitted approximately ten years ago. Approximately two years ago all areas that were previously retrofitted received occupancy sensors. Typical exterior lighting is wall mounted high pressure sodium fixtures. Typical control of the exterior lighting is provided by mechanical timers with photo-cell sensors at the fixtures.

VI. MAJOR EQUIPMENT LIST

The equipment list is considered major energy consuming equipment and through energy conservation measures could yield substantial energy savings. The list shows the major equipment in the facility and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment in some cases if a manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the Appendix.

Refer to the **Major Equipment List Appendix** for this facility.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Install DDC System

Description:

Throughout the older part of the building there are no controls for any of the HVAC units and heating units. The use of manual control of HVAC systems is inaccurate and can be neglected due to human error. The current setup with manual control does not allow for night time setback. In addition, the absence of controllers doesn't allow the building to maintain the temperature at set-point under changing load conditions.

This energy conservation measure would install a Direct Digital Control System in the older part of the building. The Direct Digital Control System will consist of multiple controllers networked over an Ethernet system that will display data at a standard PC via a web browser to allow the School District remote control and monitoring of the HVAC equipment. With a DDC system, it is possible to develop historical records on the operating characteristics of a building; identifying trends which can lead to better performance.

Energy Savings Calculations:

Studies have shown that the installation of a full DDC system could save an estimated 10% of the total energy costs for this facility which is approximately $63,135.

Annual Savings = 10% x $63,135 = $6,314.

Assuming one-half of the total energy savings is natural gas and the other half is electric savings, this equates to 22,875 kWh and 2,024 Therms saved. We have also assumed a maintenance savings of $3,000 per year for the pneumatic devices.

The cost of a full DDC system with new field devices, thermostats, controllers, computer, software, engineering, etc. is approximately $4 per SF based on recent project cost data and a control contractor's budget pricing. For this facility, the estimated cost of a DDC system for the facility is approximately $121,480 (based on 30,370 SF).

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$121,480
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$121,480
Maintenance Savings ($/Yr):	$3,000
Energy Savings ($/Yr):	$6,314
Total Yearly Savings ($/Yr):	$9,314
Estimated ECM Lifetime (Yr):	15
Simple Payback	13.0
Simple Lifetime ROI	15.0%
Simple Lifetime Maintenance Savings	$45,000
Simple Lifetime Savings	$139,710
Internal Rate of Return (IRR)	2%
Net Present Value (NPV)	($10,290.07)

ECM #2: Upgrade Exterior Building Lighting: LED Option

Description:

The exterior building lighting fixtures consist of fifteen (15) 100-Watt high pressure sodium wall-pack fixtures. Just as an automobile's fuel efficiency is measured in miles per gallon, lamp efficiency is measured in terms of lumens per watt – the amount of light produced for each watt of electricity consumed. Presently the 100-Watt lamps are only producing 60% of their full lumen potential due to lamp depreciations while a Light Emitting Diode (LED) will produce almost the same lumen output but with less wattage.

This measure would replace the fifteen (15) existing fixtures with LED fixtures that consist of fifty-four LED lamps with a total output of 85-Watts as manufactured by Vector or equal.

Energy Savings Calculations:

It is estimated that the average nighttime hours for these fixtures is 10 hours per day x 365 days per year = 3,650 hours.

100 Watt HPS Input Wattage = 130 Watts

65 Watt LED Input Wattage = 65 Watts

Energy Cost Savings = 15 Fixtures x (130 Watts – 65 Watts) x 3,650 hrs x $0.138 / kWh = $491

Installation cost is $585 x 15 Units = $8,775

There are currently no Smart Start Incentives available for this ECM.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$8,775
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$8,775
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$491
Total Yearly Savings ($/Yr):	$491
Estimated ECM Lifetime (Yr):	15
Simple Payback	17.9
Simple Lifetime ROI	-16.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$7,365
Internal Rate of Return (IRR)	-2%
Net Present Value (NPV)	($2,913.47)

ECM #3: Exterior Building Lighting Upgrade: Compact Fluorescent Type

Description:

The exterior building lighting fixtures consist of fifteen (15) 100-Watt high pressure sodium (HPS) wall-pack fixtures. Just as an automobile's fuel efficiency is measured in miles per gallon, lamp efficiency is measured in terms of lumens per watt – the amount of light produced for each watt of electricity consumed. Presently the 100-Watt lamps are only producing 60% of their full lumen potential due to lamp depreciations while a Compact Fluorescent Lamp (CFL) will produce almost the same lumen output but with less wattage.

This measure would replace the fifteen (15) existing fixtures with CFL's that consist of two 42-Watt lamps as manufactured by Philips or equal.

Energy Savings Calculations:

It is estimated that the average nighttime hours for these fixtures is 10 hours per day x 365 days per year = 3,650 hours.

100 Watt HPS Input Wattage = 130 Watts

84 Watt Compact Fluorescent Input Wattage = 96 Watts

Energy Cost Savings = 15 Fixtures x (130 Watts – 96 Watts) x 3,650 hrs x $0.138 / kWh = $257

Installation cost is $150 x 15 Units = $2,250

There are currently no Smart Start Incentives available for this ECM.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,250
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$2,250
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$257
Total Yearly Savings ($/Yr):	$257
Estimated ECM Lifetime (Yr):	15
Simple Payback	8.8
Simple Lifetime ROI	71.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,855
Internal Rate of Return (IRR)	8%
Net Present Value (NPV)	$818.05

ECM #4: Install Compact Fluorescent Lamps

Description:

Compact fluorescent lamps (CFL's) were created to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: a 13-Watt CFL for a 40-Watt incandescent lamp, a 15-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 23-Watt CFL for a 100-Watt incandescent lamp.

The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures.

This ECM involves replacing all incandescent lamps in the facility with energy efficient compact fluorescent lamps.

Energy Savings Calculations:

There are six (6) 100-Watt incandescent lamps in the facility that can be upgraded to 23 Watt CFL units respectively. The average operating hours for these lamps is estimated to be 3,000.

Energy cost savings:

[6 units * (100W – 23W] 3,000 hours * 1 kW/1,000 W * $0.138/kWh] = $191/yr

The installed cost of six (6) 23-Watt CFL's is $48.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$48
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$48
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$191
Total Yearly Savings ($/Yr):	$191
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.3
Simple Lifetime ROI	5868.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$2,865
Internal Rate of Return (IRR)	398%
Net Present Value (NPV)	$2,232.15

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy measures (REM) for the municipality utilizing renewable technologies and concluded that there is potential for solar energy generation. The solar photovoltaic system calculation summary will be concluded as **REM#1** within this report.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof would be necessary before the installation of PV panels is considered). The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $350, this value was used in our financial calculations. This equates to $0.35 per kWh generated.

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 2,000 S.F. can be utilized for a PV system. A depiction of the area utilized is shown in **Renewable / Distributed Energy Measures Calculation Appendix**. Using this square footage it was determined that a system size of 28.3 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 34,573 KWh annually, reducing the overall utility bill by approximately 12.5% percent. A detailed financial analysis can be found in the **Renewable / Distributed Energy Measures Calculation Appendix**. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

The proposed photovoltaic array layout is designed based on the specifications for the Sun Power SPR-230 panel. This panel has a "DC" rated full load output of 230 watts, and has a total panel conversion efficiency of 18%. Although panels rated at higher wattages are available through Sun Power and other various manufacturers, in general most manufacturers who produce commercially available solar panels produce a similar panel in the 200 to 250 watt range. This provides more manufacturer options to the public entity if they wish to pursue the proposed solar recommendation without losing significant system capacity.

The array system capacity was sized on available roof space on the existing facility. Estimated solar array generation was then calculated based on the National Renewable Energy Laboratory

PVWatts Version 1.0 Calculator. In order to calculate the array generation an appropriate location with solar data on file must be selected. In addition the system DC rated kilowatt (kW) capacity must be inputted, a DC to AC de-rate factor, panel tilt angle, and array azimuth angle. The DC to AC de-rate factor is based on the panel nameplate DC rating, inverter and transformer efficiencies (95%), mismatch factor (98%), diodes and connections (100%), dc and ac wiring(98%, 99%), soiling, (95%), system availability (95%), shading (if applicable), and age(new/100%). The overall DC to AC de-rate factor has been calculated at an overall rating of 81%. The PVWatts Calculator program then calculates estimated system generation based on average monthly solar irradiance and user provided inputs. The monthly energy generation and offset electric costs from the PVWatts calculator is shown in the **Renewable/Distributed Energy Measures Calculation Appendix**.

The proposed solar array is qualified by the New Jersey Board of Public Utilities Net Metering Guidelines as a Class I Renewable Energy Source. These guidelines allow onsite customer generation using renewable energy sources such as solar and wind with a capacity of 2 megawatts (MW) or less. This limits a customer system design capacity to being a net user and not a net generator of electricity on an annual basis. Although these guidelines state that if a customer does net generate (produce more electricity than they use), the customer will be credited those kilowatt-hours generated to be carried over for future usage on a month to month basis. Then, on an annual basis if the customer is a net generator the customer will then be compensated by the utility the average annual PJM Grid LMP price per kilowatt-hour for the over generation. Due to the aforementioned legislation, the customer is at limited risk if they generate more than they use at times throughout the year. With the inefficiency of today's energy storage systems, such as batteries, the added cost of storage systems is not warranted and was not considered in the proposed design.

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with 95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront via one of the methods noted in the Installation Funding Options section below. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

Table 7
Financial Summary – Photovoltaic System

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM			
PAYMENT TYPE	**SIMPLE PAYBACK**	**SIMPLE ROI**	**INTERNAL RATE OF RETURN**
Direct Purchase	13.4 Years	86.4%	6.0%

*The solar energy measure is shown for reference in the executive summary Renewable Energy Measure (REM) table

Given the large amount of capital required by the BOE to invest in a solar system through a Direct Purchase CEG does not recommend the BOE pursue this route. It would be more advantageous for the BOE to solicit Power Purchase Agreement (PPA) Providers who will own, operate, and maintain the system for a period of 15 years. During this time the PPA Provider would sell all of the electric generated by Solar Arrays to the BOE at a reduced rate compared to their existing electric rate.

In addition to the Solar Analysis, CEG also conducted a review of the applicability of wind energy for the facility. Wind energy production is another option available through the Renewable Energy Incentive Program. Wind turbines of various types can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. Based on CEG's review of the applicability of wind energy for the facility, it was determined that the average wind speed is not adequate, and the kilowatt demand for the building is below the threshold (200 kW) for purchase of a commercial wind turbine. Therefore, wind energy is not a viable option to implement.

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

Load Profile analysis was performed to determine the seasonal energy usage of the facility. Irregularities in the load profile will indicate potential problems within the facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facility's energy consumption data was gathered in table format and plotted in graph form to create the load profile. Refer to The Electric and Natural Gas Usage Profiles included within this report to reference the respective electricity and natural gas usage load profiles.

Electricity:

The Electric Usage Profile demonstrates a typical profile of a school facility. There is an increase at the start of the school year (September) and continues to increase steadily until March and begins to decline until June and thereafter. There is one sharp decline in usage in the month of August. This can be associated with the minimal use of the school during the summer months. Some areas of the building are equipped with rooftop units that utilize electric DX cooling to provide air-conditioning to their respective areas of the facility. A facility wide central air system is absent from this school. A flatter load profile of this type will allow for more competitive energy prices when shopping for alternative suppliers.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical natural gas (heat load) profile. The summer months (July – September) demonstrate extremely low consumption (complimenting the winter heating load). There is an increase in winter consumption (November – March). The increased winter load is caused by heating demand. In this facility the heat is supplied by natural gas fired hot water boilers located in the basement of the facility. These are the main contributors to the natural gas winter load profile. Also, domestic hot water is supplied by a natural gas fired hot water heaters. A base-load shaping (flat) will secure more competitive energy prices when procuring energy through an alternative energy source.

Tariff Analysis:

Electricity:

This facility receives electrical service through Atlantic City Electric (ACE) on an AGS (Annual General Service – 3 Phase) rate. Service classification AGS is available for general service purposes on secondary voltages not included under Service Classifications RS, RT, RGT or GST. This facility's rate is a three phase service at secondary voltages. For electric supply (generation), the customer uses the service of Atlantic City Electric. This facility uses the Delivery Service of the utility (ACE). This delivery service includes the following charges: Delivery Service Charges, Distribution Demand Charges, Reactive Demand Charges, distribution Rates, Non-Utility Generation Charges, Societal Benefits Charges, Regulatory

Assets Recovery Charges, Transition Bond Charges, Market Transition Charge Tax, Transmission Demand Charge, Regional Greenhouse Gas Initiative Recovery Charge, and Infrastructure Investment Surcharge.

Natural Gas:

This facility receives natural gas delivery service from the South Jersey Gas Company (SJG) on the Firm Transportation utility rate schedule. Customer may either purchase "gas supply" from a Third Party Supplier (TPS) or from South Jersey's Gas Basic Gas Supply Service default service as detailed in the rate schedule. The Pitman BOE has elected to utilize the Third Party Supply Services of PEPCO Energy Services to provide their natural gas commodity service.

The "delivery charges" under this tariff include the following: Customer Charge, Delivery Charge, BSC Volume Charge and Commodity Charge under this rate structure. The customer can elect to have its Supply (Commodity Charge) serviced through the utility or by a Third Party Supplier (TPS). Note: Should the TPS not deliver, then the customer will receive replacement service from the utility under an emergency sales rate schedule which carries an extremely high penalty cost of service, and is automatically delivered.

"TPS Supply Charges" are the charges for supply made by a Third Party company that makes delivery of supply to the local utility (City-Gate). Once delivered to the utility then the utility delivers the supply to the end-use customer. The delivery made by the utility, are the "delivery charges". The type of service provided by the utility tariff is said to be "firm transportation". Much like the telecom wires being deregulated, so were the natural gas pipelines. Various types of services are available within the pipeline. "Firm Service" is the highest reliability. "Firm Service" would be the last to be interrupted. Since this service is "firm" the utility would tell the TPS how much natural gas to delivery each month on behalf of the end-user.

Imbalances can occur when Third Party Suppliers are used to supply natural gas and when full delivery is not made and when a new supplier is contracted or the customer returns to the utility. It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used, otherwise, under delivery can occur, jeopardizing economics and scheduling.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within the BOE. Potential improvement is observed in both electric and natural gas costs. The average price per kWh (kilowatt hour) for all electricity based on a 1-year historical average price is $.111 / kWh (this is the average "price to compare" for energy supplied by Atlantic City Electric Company and for data supplied by Pitman BOE). The average price per decatherm for natural gas (as provided by PEPCO Energy Services as administered by the ACES agreement) is $10.94 / Dth (Dth, is the common unit of measure). This price is also the "price to compare".

The "price to compare" is the utility net price that would compare to an alternative suppliers offer. In electricity, this price would not include the utilities "wires" charges such as Transmission and Distribution. With regards to natural gas this would not include the utilities

"distribution" charges to the customers burner tip. The delivered product is said to be at the utilities City-Gate. From there the utility is in control of the delivery.

The BOE is able to have its electric or natural gas needs supplied via an alternative supply source TPS (Third Party Supplier). This supplier will make arrangements with producers, suppliers or hedge the product. TPS's are registered and licensed with the states Board of Public Utilities.

The Pitman BOE has gone a step further. The BOE has signed an agreement with the ACES (Alliance for Competitive Energy Services) which is an aggregator of energy for schools. The New Jersey School Board (NJSBA) is the acting lead agency, which can adopt a resolution to renew this agreement. PEPCO Energy Services has been contracted with the ACES/NJSBA agreement for natural gas service. CEG will *not* recommend a renewal of this agreement.

CEG does not recommend renewal of this agreement for contractual and economic reasons. It is our understanding that contracts cannot extend for (5) five years for schools. Additionally, CEG has observed that the BOE can see improvement in its energy costs if it were to arrange for supply from a Third Party Supplier on its own. CEG recommends the use of an "energy advisor" when making arrangements for its own "energy procurement program".

Furthermore the ACES (Alliance for Competitive Energy Services) agreement has a term through 2014. CEG is not in possession of the original ACES agreement only the resolution. CEG is aware that The Pitman BOE procures natural gas through the ACES agreement and it is possible that they also procure electricity through this agreement. If so CEG would also recommend that they not extend this agreement. If at all possible, CEG recommends terminating this agreement.

CEG does not recommend the use of the ACES agreement as it does not meet the needs of the schools. Schools, BOE and Local Governments are stricken by budgets. The ACES strategy does compliment the budget process. The budget needs to be created at the same time as the energy procurement.

Furthermore, the fixed price contract and the subsequent "blend and extend" strategy does not benefit the BOE. In order for an end-user to benefit from energy procurement: they must be able to protect the budget (through budget creation at the time of procurement), management of commodity (through active on-going involvement in the process), and by applying the "managed approach" to the procurement plan so that if prices fall the end-user can take advantage of that drop.

Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. The BOE could see improvement in its energy costs if it were to take advantage of these current market prices quickly, before energy increases. Based on annual historical consumption of this facility and current electric rates, the BOE could see an improvement in its electric costs of up to 19% or up to $47,000 annually. (Note: Savings were calculated using Average Annual Consumption and a variance to a Fixed Average One-Year commodity contract). CEG recommends aggregating the entire electric load to gain the most

optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a "managed approach".

CEG's secondary recommendation coincides with the natural gas costs. Based on the current market, The BOE could improve its natural gas costs by up to 27% or up to $35,000 annually. CEG recommends that the BOE receive further advisement on these prices through an energy advisor. Through the use of an "energy advisor" the BOE should be able to procure natural gas on its own and create an "energy procurement program".

CEG also recommends that The BOE not renew its energy supply contract with the ACES aggregation and PEPCO Energy Solutions. The ACES agreement has demonstrated that the price is above market and the BOE has no way of adjusting the price should prices fall.

CEG further recommends that The BOE create an energy program through a "managed approach". The "managed approach" will take into account creating an "energy budget" that is in line with The BOE's budget year and risk tolerance. Risk tolerance is the appetite that The BOE has for risk. Based on the reduced state and local government budgets and the general aversion for risk, the local government is required to manage this risk.

CEG also recommends that The BOE schedule a meeting with the current utility providers to review their utility charges and current tariff structures for electricity and natural gas. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), the municipality can learn more about the competitive supply process. The BOE can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu. They should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the information for ongoing demand-side management projects. Furthermore, special attention should be given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with the utility representative. The BOE should ask the utility representative about alternative billing options, such as consolidated billing when utilizing the service of a Third Party Supplier. Finally, if the supplier for energy (natural gas) is changed, closely monitor balancing, particularly when the contract is close to termination. This could be performed with the aid of an "energy advisor".

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the facility owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and par for the costs using the value of energy savings that result from the improvements. The "Energy Savings Improvement Program (ESIP)" law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.

ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.

iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as "power purchase agreements." These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party's work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

CEG recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

XI. ADDITIONAL RECOMMENDATIONS

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

D. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Pitman Board of Education - W.C.K. Walls Elementary School

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Install DDC System	$121,480	$0	$0	$121,480	$6,314	$3,000	$9,314	15	$139,710	$45,000	15.0%	13.0	1.80%	($10,290.07)
ECM #2	Exterior Lighting: LED Type	$8,775	$0	$0	$8,775	$491	$0	$491	15	$7,365	$0	-16.1%	17.9	-2.11%	($2,913.47)
ECM #3	Exterior Lighting: CFL Type	$2,250	$0	$0	$2,250	$257	$0	$257	15	$3,855	$0	71.3%	8.8	7.63%	$818.05
ECM #4	Install Compact Fluorescent Lamps	$48	$0	$0	$48	$191	$0	$191	15	$2,865	$0	5868.8%	0.3	397.92%	$2,232.15
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	28.3 KW PV System	$226,320	$0	$0	$226,320	$4,771	$12,101	$16,872	25	$421,800	$302,525	86.4%	13.4	5.50%	$67,474.63

Notes: 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
2) The variable DR in the NPV equation stands for Discount Rate
3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

Concord Engineering Group, Inc.

520 BURNT MILL ROAD
VOORHEES, NEW JERSEY 08043
PHONE: (856) 427-0200
FAX: (856) 427-6508

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of January, 2009:

Electric Chillers

Water-Cooled Chillers	$12 - $170 per ton
Air-Cooled Chillers	$8 - $52 per ton

Gas Cooling

Gas Absorption Chillers	$185 - $400 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $93 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

Gas Fired Boilers < 300 MBH	$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$300 - $400 per unit

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per hp
Compressors	$5,250 to $12,500 per drive

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	$50 per unit
Gas-Fired Water Heaters >50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 - $30 per fixture, (depending on quantity)
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start	$25 per fixture
LED Exit Signs	$10 - $20 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $284 per fixture

Lighting Controls – Occupancy Sensors

Wall Mounted	$20 per control
Remote Mounted	$35 per control
Daylight Dimmers	$25 per fixture
Occupancy Controlled hi-low Fluorescent Controls	$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	$75 per fixture controlled
Daylight Dimming	$75 per fixture controlled

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive

STATEMENT OF ENERGY PERFORMANCE
W.C.K. Walls Elementary School

Building ID: 1940894
For 12-month Period Ending: June 30, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: November 23, 2009

Facility
W.C.K. Walls Elementary School
320 Grant Avenue
Pitman, NJ 08071

Facility Owner
Concord Engineering Group
520 South Burnt Mill Rd.
Voorhees, NJ 08043

Primary Contact for this Facility
Michele Roemer
420 Hudson Avenue
Pitman, NJ 08071

Year Built: 1926
Gross Floor Area (ft²): 43,385

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	945,397
Natural Gas (kBtu)[4]	1,736,607
Total Energy (kBtu)	2,682,004

Energy Intensity[5]

Site (kBtu/ft²/yr)	62
Source (kBtu/ft²/yr)	115

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	236

Electric Distribution Utility
Atlantic City Electric Co

National Average Comparison

National Average Site EUI	74
National Average Source EUI	138
% 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
Raymond Johnson
520 South Burnt Mill Rd.
Voorhees, NJ 08043

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	W.C.K. Walls Elementary 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	320 Grant Avenue, Pitman, NJ 08071	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		☐
Walls School (K-12 School)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	43,385 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	77	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	30 %	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: Atlantic City Electric Co

Fuel Type: Electricity

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

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
06/01/2009	06/30/2009	17,640.00
05/01/2009	05/31/2009	21,440.00
04/01/2009	04/30/2009	32,800.00
03/01/2009	03/31/2009	25,920.00
02/01/2009	02/28/2009	27,440.00
01/01/2009	01/31/2009	24,880.00
12/01/2008	12/31/2008	26,720.00
11/01/2008	11/30/2008	28,320.00
10/01/2008	10/31/2008	23,520.00
09/01/2008	09/30/2008	23,200.00
08/01/2008	08/31/2008	11,360.00
07/01/2008	07/31/2008	13,840.00
Electric Meter Consumption (kWh (thousand Watt-hours))		**277,080.00**
Electric Meter Consumption (kBtu (thousand Btu))		**945,396.96**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**945,396.96**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Natural Gas Meter (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
06/01/2009	06/30/2009	0.00
05/01/2009	05/31/2009	0.00
04/01/2009	04/30/2009	1,789.16
03/01/2009	03/31/2009	2,662.04
02/01/2009	02/28/2009	3,550.08
01/01/2009	01/31/2009	3,265.47
12/01/2008	12/31/2008	2,729.94
11/01/2008	11/30/2008	2,379.69
10/01/2008	10/31/2008	840.05
09/01/2008	09/30/2008	0.00

08/01/2008	08/31/2008	0.00
07/01/2008	07/31/2008	149.64
Natural Gas Meter Consumption (therms)		**17,366.07**
Natural Gas Meter Consumption (kBtu (thousand Btu))		**1,736,607.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**1,736,607.00**
Is this the total Natural Gas consumption at this building including all Natural Gas 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
W.C.K. Walls Elementary School
320 Grant Avenue
Pitman, NJ 08071

Facility Owner
Concord Engineering Group
520 South Burnt Mill Rd.
Voorhees, NJ 08043

Primary Contact for this Facility
Michele Roemer
420 Hudson Avenue
Pitman, NJ 08071

General Information

W.C.K. Walls Elementary School	
Gross Floor Area Excluding Parking: (ft^2)	43,385
Year Built	1926
For 12-month Evaluation Period Ending Date:	June 30, 2009

Facility Space Use Summary

Walls School	
Space Type	K-12 School
Gross Floor Area(ft^2)	43,385
Open Weekends?	No
Number of PCs	77
Number of walk-in refrigeration/freezer units	1
Presence of cooking facilities	Yes
Percent Cooled	30
Percent Heated	100
Months°	N/A
High School?	No
School District°	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 06/30/2009)	**Baseline** (Ending Date 06/30/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	69	69	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	62	62	58	N/A	74
Source (kBtu/ft^2)	115	115	108	N/A	138
Energy Cost					
$/year	$ 65,132.00	$ 65,132.00	$ 61,339.13	N/A	$ 78,438.65
$/$ft^2$/year	$ 1.50	$ 1.50	$ 1.41	N/A	$ 1.81
Greenhouse Gas Emissions					
$MtCO_2e$/year	236	236	222	N/A	284
$kgCO_2e/ft^2$/year	5	5	5	N/A	6

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.

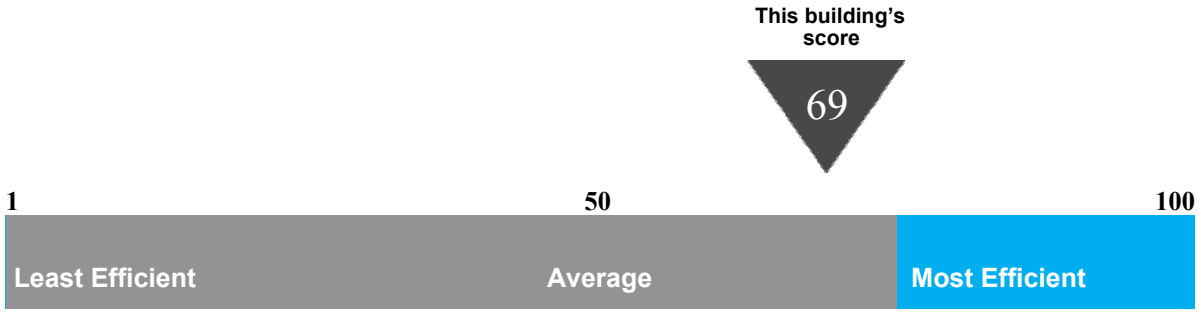
Statement of Energy Performance

2009

W.C.K. Walls Elementary School
320 Grant Avenue
Pitman, NJ 08071

Portfolio Manager Building ID: 1940894

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 115 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending June 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: 11/23/2009

MAJOR EQUIPMENT LIST

Concord Engineering Group

"Pitman Board of Education - WCK Wall School"

Boiler

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Estimated Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Boiler Room	Entire School	HB Smith	1	350 Mills	-	3057	2415	65%	natural gas	42	25	(17)	Supplemental Unit
Boiler Room	Entire School	Lochinvar	2	CBN-745	F984148	745	603	80%	natural gas	10	25	15	

Boiler - Burner

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire School	Ray Burner Co.	1	PCPSF	289644	1.1 - 2.5	-	natural gas	42	25	(17)

Boiler - Pumps

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Frame Size	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Entire School	Taco	2	S55JXDYD	-	1/3 hp	1725	-	-	-	115	1	11	20	9
Boiler Room	Entire School	Taco	2	see photo	-	7.5 hp	1755	137 gpm	111	213T	208/230-460	3	11	20	9
Boiler Room	Entire School	B & G ??	1	Unknown	-	-	-	-	-	-	208/230-460	3	15	20	5

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Capacity	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Storage Area	Kitchen	State	1	CV 52 2RS7	L77423187	-	-	52	1500 watts	Electric	32	10	(22)

DHW - Pumps

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	Volts	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Boiler Room	Restrooms	Emerson	1	SA55J	-	1/12hp	115	60	12	10	(2)
Boiler Room	Restrooms	Grundos	1	UP15-42SF	-	-	115	60	12	10	(2)

Air Handling Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Capacity	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Above Ceiling	Comp Room	Lennox	2	-	-	DX	3 Ton	Unknown	-	-	-	-	230/460	3	60	3	20	17
	Media Center	Lennow	1	-	-	DX	5 Ton	Unknown	-	-	-	-	230/460	3	60	3	20	17
Boiler Room	Supply Fan	Buckeye	1	-	-	-	-	-	-	-	-	-	230/460	3	60	83	20	(63)

AC Condensers

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Coil	Cooling Eff. (SEER)	Cooling Capacity	Refrigerant	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Roof	Computer Room	Lennox	1	HS29-072-3Y	5606D10143	DX R-22	11.5	6 ton	R-22	208/230	3	3	15	12	Could not access either AHU
Roof	Media	Lennox	1	13ACD-060	5806G17319	DX R-22	11.5	5 ton	R-22	208/230	1	3	15	12	

Investment Grade Lighting Audit

CEG Job #: 9C09067
Project: W.C.K. Walls School
Address: 320 Grant Ave.
Pitman NJ 08071
Building SF: 43,385

"Pitman Board of Education - W.C.K. Walls Elementary School"

KWH COST: $0.138

EXISTING LIGHTINC										PROPOSED LIGHTING										SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
1.11	Boiler Room	400	7	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	0.40	159.6	$22.02	7	0	No Change Required (NCR)	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
3.11	Mech. Room over Kitchen	400	3	1	1 Lamp w/Industrial Reflector, A19 100w	100	0.30	120.0	$16.56	3	1	23 Watt Compact Fluorescent	23	0.07	27.6	$3.81	$8.00	$24.00	0.23	92.4	$12.75	1.88
5	Art Room	3000	25	2	4' Uplight, 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Indirect	57	1.43	4,275.0	$589.95	25	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	Music Office	3000	4	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.45	1,344.0	$185.47	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.14	All Purpose Room	3000	39	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., No Lens	57	2.22	6,669.0	$920.32	39	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
6.21	Girl's Lav./AP Room	3000	1	2	2x2 2 Lamp 17w T8 Elect. Ballast, Recessed, Prismatic	34	0.03	102.0	$14.08	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
7		3000	1	2	6"x24 Wall Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.03	102.0	$14.08	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
6.21	Boy's Lav./AP Room	3000	1	2	2x2 2 Lamp 17w T8 Elect. Ballast, Recessed, Prismatic	34	0.03	102.0	$14.08	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
7		3000	1	2	6"x24 Wall Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.03	102.0	$14.08	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	Kitchen	3000	2	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.22	672.0	$92.74	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
3	AP Storage	400	1	1	1 Lamp w/Industrial Reflector, A19 100w	100	0.10	40.0	$5.52	1	1	23 Watt Compact Fluorescent	23	0.02	9.2	$1.27	$8.00	$8.00	0.08	30.8	$4.25	1.88
2.21		400	1	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.11	44.8	$6.18	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
5	Media Center	3000	30	2	4' Uplight, 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Indirect	57	1.71	5,130.0	$707.94	30	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.11	Media Storage	400	4	4	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	112	0.45	179.2	$24.73	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
5	Computer Lab	3000	20	2	4' Uplight, 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Indirect	57	1.14	3,420.0	$471.96	20	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	AP Corridor	3000	8	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.90	2,688.0	$370.94	8	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
4		3000	5	1	HID Down Light, Surface Mnt., 175w MH	213	1.07	3,195.0	$440.91	5	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21		3000	4	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.45	1,344.0	$185.47	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

2.11	Stairway #1	3000	2	4	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	112	0.22	672.0	$92.74	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8		3000	1	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.03	102.0	$14.08	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	3rd Floor Hall	3000	1	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.11	336.0	$46.37	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.11		3000	3	4	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	112	0.34	1,008.0	$139.10	3	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.31		3000	2	4	2x4 4 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic	112	0.22	672.0	$92.74	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11	Classroom 207	3000	21	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	1.20	3,591.0	$495.56	21	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11	Classroom 206	3000	21	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	1.20	3,591.0	$495.56	21	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11	Classroom 205	3000	21	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	1.20	3,591.0	$495.56	21	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
9	2nd Floor Girl's Lav.	3000	2	2	1x2 2 Lamp 17w T8 Elect. Ballast, Surface Mnt., Prismatic	34	0.07	204.0	$28.15	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.31	Classroom 203	3000	6	4	2x4 4 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic	112	0.67	2,016.0	$278.21	6	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
10	203 Bathroom	3000	1	2	Wall Mnt Vanity Light., 2 Lamp Incand. A19 40w, White Cover	80	0.08	240.0	$33.12	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11	2nd Floor Boy's Lav.	3000	1	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	0.06	171.0	$23.60	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11	Classroom 201	3000	21	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	1.20	3,591.0	$495.56	21	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.11	Stairway #2	3000	4	4	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	112	0.45	1,344.0	$185.47	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11	Classroom 104	3000	21	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	1.20	3,591.0	$495.56	21	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.11	Classroom 103	3000	3	4	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	112	0.34	1,008.0	$139.10	3	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11	Classroom 105	3000	21	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	1.20	3,591.0	$495.56	21	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11	Classroom 106	3000	24	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	1.37	4,104.0	$566.35	24	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
7	Nurse's Office	3000	2	2	6"x24 Wall Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.07	204.0	$28.15	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11		3000	3	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	0.17	513.0	$70.79	3	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11	Classroom 101	3000	21	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	1.20	3,591.0	$495.56	21	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

1.11	Classroom 107	3000	21	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	1.20	3,591.0	$495.56	21	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.31	1st Floor Corridor	3000	4	4	2x4 4 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic	112	0.45	1,344.0	$185.47	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21		3000	3	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.34	1,008.0	$139.10	3	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11	IT Area	3000	2	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	0.11	342.0	$47.20	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.31	Principal's Office	3000	2	4	2x4 4 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic	112	0.22	672.0	$92.74	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.31	Office/Conference Room	3000	4	4	2x4 4 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic	112	0.45	1,344.0	$185.47	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8	Office Restroom	400	1	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.03	13.6	$1.88	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
6.11	Lower Level Corridor	3000	4	2	2x2 2 Lamp 17w T8 Elect. Ballast, Surface Mnt., Prismatic	34	0.14	408.0	$56.30	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.11		3000	10	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	0.57	1,710.0	$235.98	10	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21		3000	2	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.22	672.0	$92.74	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8	Custodial Closet	400	1	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.03	13.6	$1.88	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.31	Teacher's Lounge	3000	4	2	1x4 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic Lens	57	0.23	684.0	$94.39	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8	Lounge Restroom	400	1	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.03	13.6	$1.88	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.31	Kindergarten	3000	19	2	1x4 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic Lens	57	1.08	3,249.0	$448.36	19	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
12		3000	1	1	1x1 Dwn Light,1 Lamp Incand. A19 100w, Recessed, Drop Opal Lens	100	0.10	300.0	$41.40	1	1	23 Watt Compact Fluorescent	23	0.02	69	$9.52	$8.00	$8.00	0.08	231	$31.88	0.25
8	Bathroom	3000	1	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.03	102.0	$14.08	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
11	Storage	400	3	1	Porcelain Socket, 1 25w CFL	28	0.08	33.6	$4.64	3	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
12	Vestibule	3000	1	1	1x1 Dwn Light,1 Lamp Incand. A19 100w, Recessed, Drop Opal Lens	100	0.10	300.0	$41.40	1	1	23 Watt Compact Fluorescent	23	0.02	69	$9.52	$8.00	$8.00	0.08	231	$31.88	0.25
1.31	Classroom 12	3000	18	2	1x4 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic Lens	57	1.03	3,078.0	$424.76	18	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8		3000	2	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.07	204.0	$28.15	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.31	Classroom 14	3000	18	2	1x4 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic Lens	57	1.03	3,078.0	$424.76	18	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

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8	Classroom 14	3000	2	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.07	204.0	$28.15	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.31	Classroom 16	3000	18	2	1x4 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic Lens	57	1.03	3,078.0	$424.76	18	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8		3000	2	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.07	204.0	$28.15	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.31	Classroom 15	3000	18	2	1x4 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic Lens	57	1.03	3,078.0	$424.76	18	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8		3000	2	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.07	204.0	$28.15	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.31	Classroom 13	3000	18	2	1x4 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic Lens	57	1.03	3,078.0	$424.76	18	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8		3000	2	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.07	204.0	$28.15	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.31	Classroom 11	3000	18	2	1x4 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic Lens	57	1.03	3,078.0	$424.76	18	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
11		3000	1	1	Porcelain Socket, 1 25w CFL	28	0.03	84.0	$11.59	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.11	Boy's Lav./Lower Level	3000	3	4	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	112	0.34	1,008.0	$139.10	3	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	Basement Corridor	3000	7	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.78	2,352.0	$324.58	7	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1.31		3000	4	2	1x4 2 Lamp 32w T8 Elect. Ballast, Pendant Mnt., Prismatic Lens	57	0.23	684.0	$94.39	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	Classroom 6	3000	4	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.45	1,344.0	$185.47	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	Classroom 5	3000	4	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.45	1,344.0	$185.47	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	Classroom 4	3000	4	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.45	1,344.0	$185.47	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	Classroom 3	3000	4	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.45	1,344.0	$185.47	4	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	Classroom 2	3000	2	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.22	672.0	$92.74	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.21	Classroom 1	3000	3	4	2x4 4 Lamp 32w T8 Elect. Ballast, Recessed, Prismatic	112	0.34	1,008.0	$139.10	3	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
8	Elevator Machine Room	400	1	2	6"x24 Ceiling Mnt., 2 17w T8 Elect. Ballast, White Cover	34	0.03	13.6	$1.88	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.11	Girl's Lav./Basement	3000	5	4	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	112	0.56	1,680.0	$231.84	5	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
2.11	Storage	400	1	4	2x4 4 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic	112	0.11	44.8	$6.18	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

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1.11	Storage	400	1	2	1x4 2 Lamp 32w T8 Elect. Ballast, Surface Mnt., Prismatic Lens	57	0.06	22.8	$3.15	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
13	Exterior	3000	2	1	1x1 Surface Mnt., 25w CFL, Prismatic Lens	28	0.06	168.0	$23.18	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
14		3000	7	1	100w HPS Flood	125	0.88	2,625.0	$362.25	7	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
15		3000	2	1	Recessed Dwn Light, 1 25w CFL	28	0.06	168.0	$23.18	2	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
16		3000	8	1	100w HPS Wallpack	125	1.00	3,000.0	$414.00	8	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
17		3000	1	1	50w HPS Wallpack	72	0.07	216.0	$29.81	1	0	NCR	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		625	218			42.13	121,830	$16,812.57	625	4			0.14	175	$24.12		$48.00	0.46	585	$80.76	0.59

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.
2. Lamp totals only include T-12 tube replacement calculations

Project Name: **Pitman BOE - W.C.K. Walls Elementary School**
Location: **Pitman, NJ 08071**
Description: **Photovoltaic System - Direct Purchase**

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$226,320
Annual kWh Production	34,573
Annual Energy Cost Reduction	$4,771
Annual SREC Revenue	$12,101
First Cost Premium	**$226,320**
Simple Payback:	**13.4** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.138**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Net Cash Flow	Cumulative Cash Flow
0	$226,320	0	0	0	$0	(226,320)	0
1	$0	34,573	$4,771	$0	$12,101	$16,872	($209,448)
2	$0	34,400	$4,914	$0	$12,040	$16,954	($192,494)
3	$0	34,228	$5,062	$0	$11,980	$17,041	($175,453)
4	$0	34,057	$5,213	$0	$11,920	$17,133	($158,319)
5	$0	33,887	$5,370	$349	$11,860	$16,881	($141,438)
6	$0	33,717	$5,531	$347	$11,801	$16,985	($124,453)
7	$0	33,549	$5,697	$346	$11,742	$17,093	($107,360)
8	$0	33,381	$5,868	$344	$11,683	$17,207	($90,153)
9	$0	33,214	$6,044	$342	$11,625	$17,327	($72,826)
10	$0	33,048	$6,225	$340	$11,567	$17,452	($55,374)
11	$0	32,883	$6,412	$339	$11,509	$17,582	($37,792)
12	$0	32,718	$6,604	$337	$11,451	$17,719	($20,073)
13	$0	32,555	$6,802	$335	$11,394	$17,861	($2,212)
14	$0	32,392	$7,006	$334	$11,337	$18,010	$15,798
15	$0	32,230	$7,217	$332	$11,280	$18,165	$33,963
16	$0	32,069	$7,433	$330	$11,224	$18,327	$52,290
17	$0	31,908	$7,656	$329	$11,168	$18,495	$70,786
18	$0	31,749	$7,886	$327	$11,112	$18,671	$89,456
19	$0	31,590	$8,122	$325	$11,057	$18,854	$108,310
20	$0	31,432	$8,366	$324	$11,001	$19,044	$127,354
21	$1	31,275	$8,617	$322	$10,946	$19,241	$146,595
22	$2	31,119	$8,876	$321	$10,892	$19,447	$166,042
23	$3	30,963	$9,142	$319	$10,837	$19,660	$185,702
24	$4	30,808	$9,416	$317	$10,783	$19,882	$205,583
25	$5	30,654	$9,699	$316	$10,729	$20,112	$225,695
	Totals:	659,580	$128,201	$5,380	$230,853	$452,015	$353,674
				Net Present Value (NPV)		**$225,720**	
				Internal Rate of Return (IRR)		**6.0%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
W.C.K. Walls Elementary School	2000	Sunpower SPR230	123	14.7	1,809	28.3	34,573	4,059	15.64

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	28.3 kW
DC to AC Derate Factor:	0.810
AC Rating:	22.9 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	13.8 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	2.58	1838	253.64
2	3.33	2171	299.60
3	4.31	3032	418.42
4	5.20	3453	476.51
5	5.85	3944	544.27
6	6.14	3839	529.78
7	6.06	3878	535.16
8	5.54	3564	491.83
9	4.85	3064	422.83
10	3.76	2502	345.28
11	2.65	1753	241.91
12	2.23	1535	211.83
Year	4.38	34573	4771.07

.= Proposed PV Layout

Notes:

1. Estimated kWH based on the National Renewable Energy Laboratory PVWatts Version 1 Calculator Program.