



ENERGY AUDIT – FINAL REPORT

MILLVILLE BOARD OF EDUCATION ORANGE STREET WAREHOUSE

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CEG PROJECT NO. 9C09072

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Table of Contents

I. EXECUTIVE SUMMARY 3

II. INTRODUCTION 7

III. METHOD OF ANALYSIS..... 8

IV. HISTORIC ENERGY CONSUMPTION/COST..... 10

 A. ENERGY USAGE / TARIFFS 10

 B. ENERGY USE INDEX (EUI)..... 15

 C. EPA ENERGY BENCHMARKING SYSTEM..... 17

V. FACILITY DESCRIPTION 18

VI. MAJOR EQUIPMENT LIST 20

VII. ENERGY CONSERVATION MEASURES..... 21

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES 33

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY 36

X. INSTALLATION FUNDING OPTIONS..... 36

XI. ADDITIONAL RECOMMENDATIONS 41

Appendix A – ECM Cost & Savings Breakdown

Appendix B – New Jersey Smart Start® Program Incentives

Appendix C – Portfolio Manager “Statement of Energy Performance”

Appendix D – Major Equipment List

Appendix E – Investment Grade Lighting Audit

Appendix F – Renewable / Distributed Energy Measures Calculations

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I. EXECUTIVE SUMMARY

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

Millville Board of Education
Orange Street Warehouse
701 Orange Street
Millville, NJ 08332

Municipal Contact Person: Toni Basich
Facility Contact Person: Esteban Garcia

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	\$ 16,302
Natural Gas	\$ 12,768
Total	\$ 29,070

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 $\pm 20\%$. 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	Lighting Upgrade - General	\$13,385	\$3,122	4.3	249.8%
ECM #2	De-Lamping of Office Area	\$960	\$515	1.9	704.7%
ECM #3	Exit Sign Replacement	\$240	\$163	1.5	1258.3%
ECM #4	Lighting Controls	\$825	\$461	1.8	738.2%
ECM #5	Unit Heater Replacement - Infrared	\$6,053	\$1,871	3.2	301.8%
ECM #6	Garage Door Replacement	\$8,505	\$500	17.0	47.0%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST	ANNUAL SAVINGS	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
REM #1	21.16 KW PV System	\$190,440	\$14,106	13.5	85.2%

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	Lighting Upgrade - General	6.99	19,223	0
ECM #2	De-Lamping of Office Area	1.20	3,300	0
ECM #3	Exit Sign Replacement	0.08	701	0
ECM #4	Lighting Controls	1.07	2,954	0
ECM #5	Unit Heater Replacement - Infrared	0.00	224	1,112
ECM #6	Garage Door Replacement	0.00	0	308
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	21.16 KW PV System	0	27,878	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 #1:** Lighting Upgrade - General
- **ECM #2:** De-lamping of Office Area
- **ECM #3:** Exit Sign Replacement
- **ECM #4:** Lighting Controls
- **ECM #5:** Unit Heater Replacement - Infrared

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.

II. INTRODUCTION

The comprehensive energy audit covers the 18,000 square foot Orange Street Warehouse, which includes the following spaces: offices, kitchen, bathrooms, shower, computer / copy room, storage and a warehouse.

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/ft²/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:

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

$$\text{Simple Lifetime Savings} = (\text{Yearly Savings} \times \text{ECM Lifetime})$$

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

$$\text{Lifetime Maintenance Savings} = (\text{Yearly Maintenance Savings} \times \text{ECM Lifetime})$$

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

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

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.

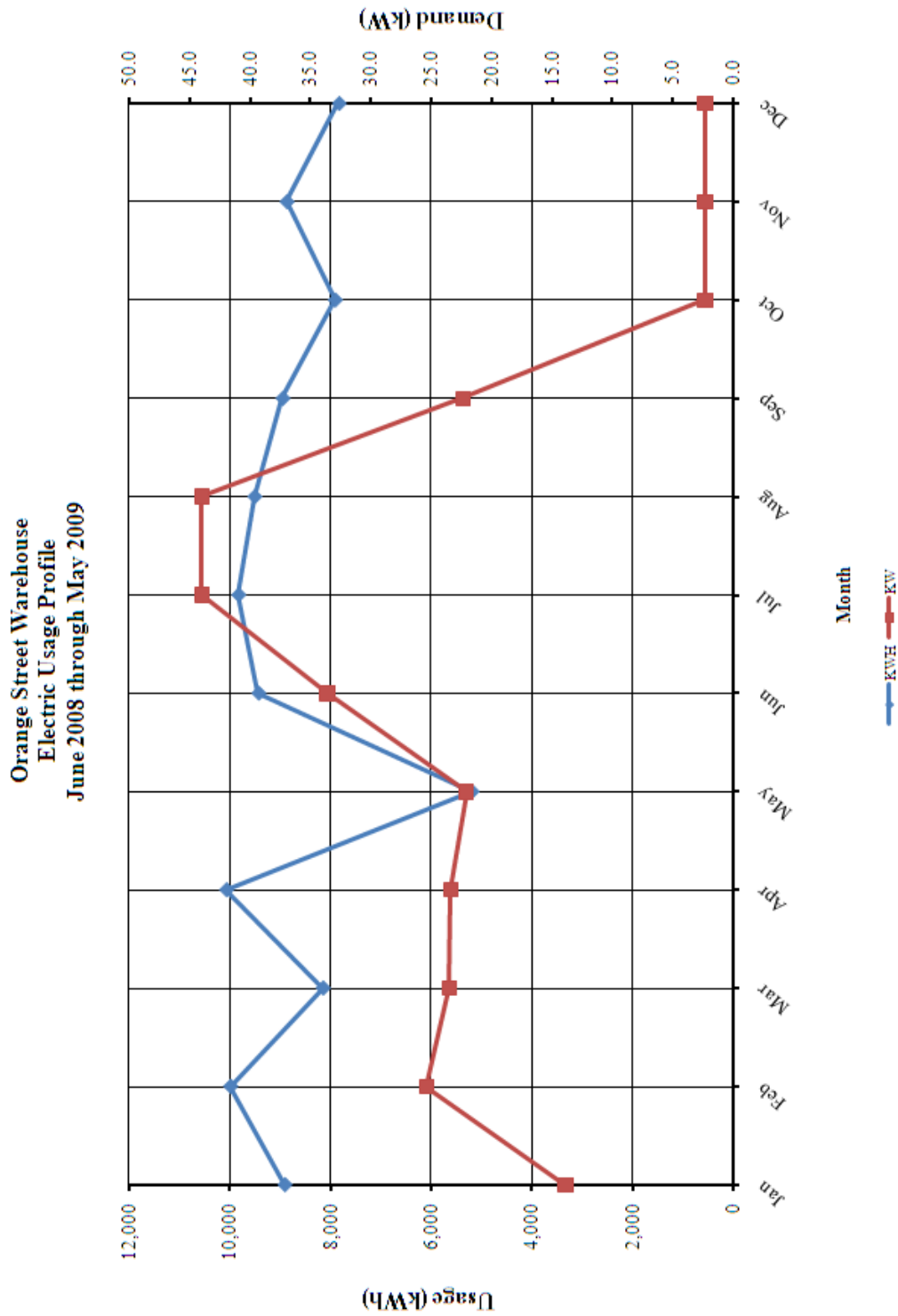
The overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history provided, the average cost for utilities at this facility is as follows:

<u>Description</u>	<u>Average</u>
Electricity	15.6¢ / kWh
Natural Gas	\$1.62 / Therm

**Table 3
Electricity Billing Data**

ELECTRIC USAGE SUMMARY			
Utility Provider: Atlantic City Electric			
Rate: Annual General Service (AGS)			
Meter No: 82812560			
Customer ID No: -			
Third Party Utility -			
TPS Meter / Acct No: -			
MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-09	8,920	13.9	\$1,264
Feb-09	10,000	25.4	\$1,485
Mar-09	8,160	23.5	\$1,225
Apr-09	10,080	23.4	\$1,487
May-09	5,200	22.1	\$656
Jun-08	9,440	33.6	\$1,764
Jul-08	9,840	44.0	\$1,817
Aug-08	9,520	44.0	\$1,758
Sep-08	8,960	22.4	\$1,576
Oct-08	7,920	2.3	\$1,049
Nov-08	8,880	2.3	\$1,179
Dec-08	7,840	2.3	\$1,043
Totals	104,760	44.0 Max	\$16,302
AVERAGE DEMAND		21.6 KW average	
AVERAGE RATE		\$0.156 \$/kWh	
Estimate Value, Utility Information Not Provided			

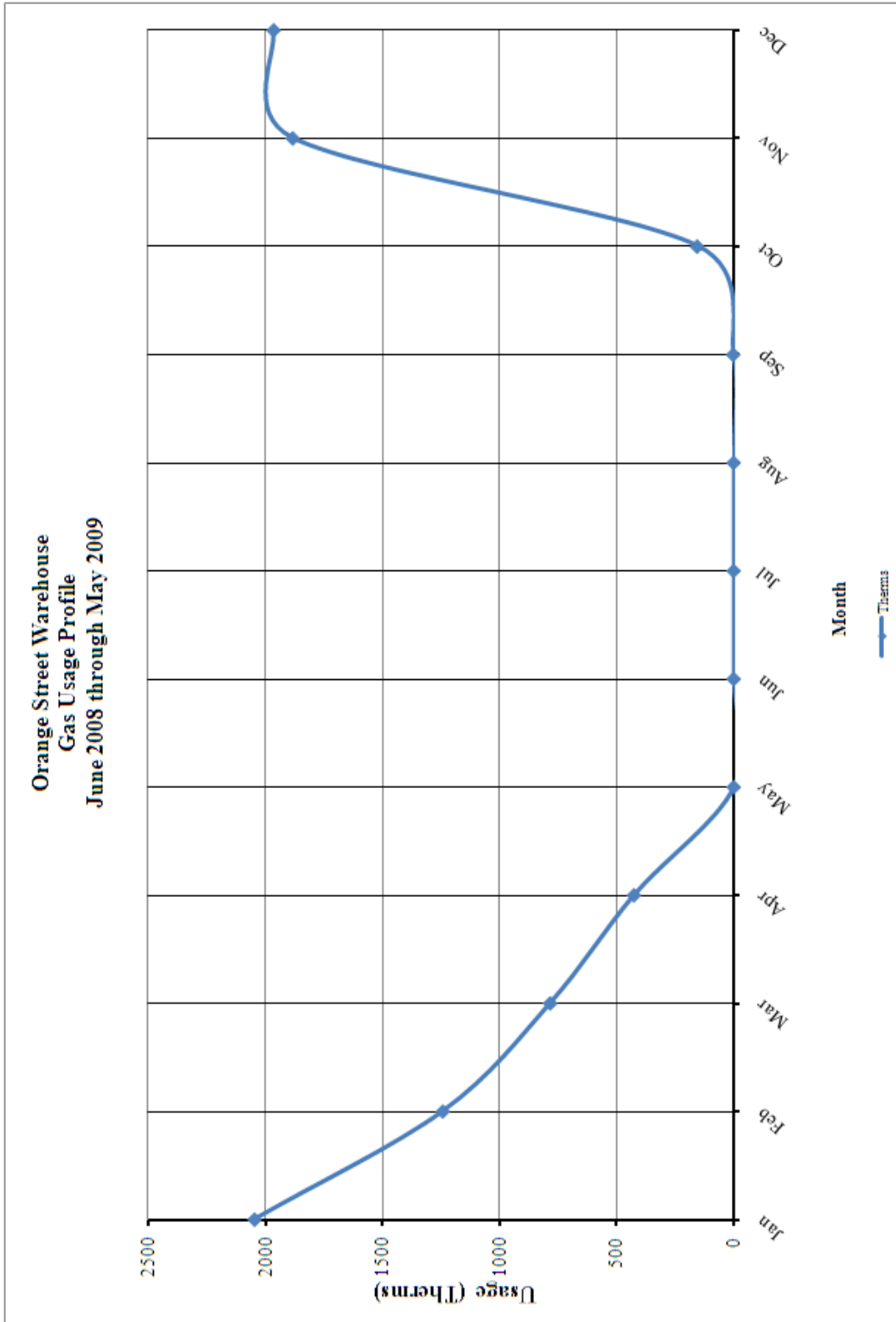
Figure 1
Electricity Usage Profile



**Table 4
Natural Gas Billing Data**

NATURAL GAS USAGE SUMMARY		
Utility Provider: South Jersey Gas		
Rate: BGSS		
Meter No: 456205		
Point of Delivery ID: -		
Third Party Utility Provider: PEPCO Energy Services, Inc.		
TPS Meter No: -		
MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Jan-09	2,047.00	\$3,064.04
Feb-09	1,243.00	\$1,909.55
Mar-09	784.00	\$1,210.58
Apr-09	426.00	\$674.46
May-09	0.00	\$18.73
Jun-08	0.00	\$18.10
Jul-08	0.00	\$18.73
Aug-08	0.00	\$19.97
Sep-08	2.00	\$21.20
Oct-08	156.00	\$235.00
Nov-08	1,884.00	\$2,804.94
Dec-08	1,965.50	\$2,772.79
TOTALS	8,507.50	\$12,768.09
AVERAGE RATE:	\$1.501	\$/THERM
Estimate Value, Utility Information Not Provided		

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:

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

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

**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	104760.0			357,651	3.340	1,194,553
NATURAL GAS		7875.7		787,567	1.047	824,583
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				1,145,218		2,019,136
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA	18,000 SQUARE FEET					
BUILDING SITE EUI	63.62 kBtu/SF/YR					
BUILDING SOURCE EUI	112.17 kBtu/SF/YR					

As a comparison, data has been gathered by the US Department of Energy (DOE) for various facilities cataloguing the standard site and source energy utilization. This data has been published in the 2003 Commercial Building Energy Consumption Survey and is noted as follows for facilities of this type:

- Service (Vehicle Repair):
77 kBtu/SF Site Energy, 150 kBtu/SF Source Energy.

Based on the information compiled for the studied facility, as compared to the national average the energy usage is approximately 25% lower than the baseline data.

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: millvilleboe
 Password: lgeaceg2009

 Security Question: What city were you born in?
 Security Answer: “millville”

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
Orange Street Warehouse	29	50

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

V. FACILITY DESCRIPTION

The 18,000 SF Orange Street Warehouse is a one story facility comprised of an office and a large storage warehouse utilized for the storage of food and school supplies for the district. The typical hours of operation for this facility are between 6:30 am and 4:00 pm. The office area is of typical brick face and block construction with sheetrock interior, the amount of insulation inside the wall is unknown. The warehouse consists of metal frame construction with three feet of concrete block at the base of the wall, garage walls are insulated with standard batt insulation. The windows throughout the facility are in good condition, typical windows are double pane, ¼” clear glass with aluminum frames. The roof of the office area was recently replaced and is of typical roll rubber construction with no aggregate covering. The warehouse roof is original to the building consisting of standard steel sheet construction; the roof was recoated in 1994. The facility was built in 1960 with no major additions since the original construction.

HVAC Systems

Heating is provided to the warehouse via two (2) Reznor gas fired furnaces. A detailed list of equipment capacities and efficiencies can be found in the **Major Equipment List Appendix** of this report. Electric heating units originally provided heat to the warehouse due to the absence of a gas service, these units have since been abandoned in place and their electric service has been disconnected. A small radiant electric heater provides point of use heating to an area of the warehouse front end.

The office area is heating and cooling by two (2) Ducane gas fired furnaces with remote condensing units. Each heating unit has a capacity of 125 MBH and is attached to a 5-Ton condensing unit located on the office roof. Each gas fired furnace is suspended from the ceiling of the warehouse.

A standalone blower coil unit serves the server room located in the office area. A 3-Ton remote condensing unit is located on the roof of the facility.

HVAC System Controls

Wall mounted programmable thermostats are responsible for controlling all the HVAC equipment serving the office area. One thermostat is provided for each piece of equipment. Each piece of HVAC equipment serving the warehouse is controlled by a standard non-programmable thermostat.

Domestic Hot Water

One 40 gallon Bradford White domestic hot water heater serves the office area. The unit has a heating capacity of 4.5 kW and is located in the warehouse.

Lighting

Lighting throughout the warehouse consists of high pressure sodium and metal halide high bay lighting fixtures. Typical office area lighting consists of fluorescent lay-in fixtures with T-8

lamps and electronic ballasts. Storage rooms and closets are lit with a mixture of incandescent lamps and compact fluorescent lamps. A detailed list containing all building light fixtures can be found in the **Investment Grade Lighting Audit Appendix** of this report.

During the survey for the lighting audit, it was observed that several office areas are over lit. The process of de-lamping is a viable option but removing and reorganizing the existing fixtures in a more efficient and cost effective option. The Owner should contact a lighting consultant for further review of **ECM #2**.

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: Lighting Upgrade - General

Description:

The lighting in the Millville Orange Street Warehouse is primarily made up of fluorescent fixtures with T-12 lamps and magnetic ballasts, T-8 lamps with electronic ballasts, high pressure sodium lamps, and metal halide lamps.

This ECM includes replacement of the existing fixtures containing T12 lamps and magnetic ballasts with fixtures containing T8 lamps and electronic ballasts. The new energy efficient, T8 fixtures will provide adequate lighting and will save the owner on electrical costs due to the better performance of the lamp and ballasts. This ECM will also provide maintenance savings through the reduced number of lamps replaced per year. The expected lamp life of a T8 lamp is approximately 30,000 burn-hours, in comparison to the existing T12 lamps which is approximately 20,000 burn-hours. The facility will need 33% less lamps replaced per year.

This ECM also includes replacement of all metal halide and high pressure sodium lamps to T5 high output Cooper F-Bay fixtures. The T-5 HO lamps are rated for 30,000 hours versus the 24,000 hours for the high pressure sodium lamps and the 20,000 hours for the metal halides so there would be a savings in replacement cost and labor.

Energy Savings Calculations:

The **Grade Lighting Audit ECM#1- General Appendix** outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start[®] Program Incentives are calculated as follows:

From the **Smart Start Incentive Appendix**, the replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-2 lamp) = \$25 per fixture; T-5 or T-8 (3-4 lamp) = \$30 per fixture.

$$\text{Smart Start}^{\circledR} \text{ Incentive} = (\# \text{ of } 1 - 2 \text{ lamp fixtures} \times \$ 25) + (\# \text{ of } 3 - 4 \text{ lamp fixtures} \times \$ 30)$$

$$\text{Smart Start}^{\circledR} \text{ Incentive} = (31 \times \$ 30) = \underline{\$930}$$

From the **Smart Start Incentive Appendix**, the replacement of a HID fixture to a T-5 or T-8 fixture warrants the following incentive: 250-399 Watt HID or T12 = \$50 per fixture; 400-999 Watt HID or T12 = \$100 per fixture.

$$\text{Smart Start}^{\circledR} \text{ Incentive} = (\# \text{ of } 250 - 399 \text{ Watt fixtures} \times \$ 50) + (\# \text{ of } 400 - 499 \text{ Watt fixtures} \times \$ 100)$$

$$\text{Smart Start}^{\circledR} \text{ Incentive} = (33 \times \$ 25) + (3 \times \$100) = \underline{\$1,125}$$

Maintenance Savings are calculated as follows:

$$\text{Maintenance Savings} = (\# \text{ of lamps} \times \% \text{ reduction} \times \$ \text{ per lamp})$$

$$\text{Maintenance Savings} = (93 \times 33\% \text{ reduction} \times \$ 4.00) = \underline{\$123}$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$15,440
NJ Smart Start Equipment Incentive (\$):	\$2,055
Net Installation Cost (\$):	\$13,385
Maintenance Savings (\$/Yr):	\$123
Energy Savings (\$/Yr):	\$2,999
Total Yearly Savings (\$/Yr):	\$3,122
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.3
Simple Lifetime ROI	249.8%
Simple Lifetime Maintenance Savings	\$1,845
Simple Lifetime Savings	\$46,826
Internal Rate of Return (IRR)	22%
Net Present Value (NPV)	\$23,881.77

ECM #2: De-Lamping of Office Area

Description:

The lighting of the small office area consists of fluorescent light fixtures installed in four lamp configuration. The light level in the office space is excessive and can be a result of an exorbitant number of lamps in the fixture, the light output of the lamps, and the spacing of the fixtures. Consequently, correction for over-lighting could be made by removing lamps or changing the location and number of fixtures. It is, however, much easier to reduce the number of lamps per fixture than it is to change the spacing of the fixtures. Lamp reduction per fixture may require some minimal wiring changes, but it does not involve structural changes.

A de-lamping operation can be conducted with two general approaches, the simplest (but not necessarily the most effective) approach is to de-lamp the same percentage of lamps in all areas that are considered to have more light than is necessary. The other approach would be to measure light levels throughout the working space and de-lamp the appropriate number of lamps in only those areas that have light levels higher than acceptable working levels. Then, for example, if a 50% reduction in the number of lamps is desired, either half of the lamps in each fixture can be removed or half of the fixtures can be disconnected. Which of these two practices is used will depend on the spacing of the fixtures. If the active fixtures are too far apart, the resulting variation in the light levels will be too great. If a complete fixture is to be removed, it is not adequate to simply remove the lamps because the ballast will continue to draw power even when lamps are not installed. Therefore a complete disconnection (and/or removal) of the fixture is recommended. If some of the lamps in each fixture are to be removed, some re-wiring will be necessary. Ballasts must be reconnected to the remaining lamps. Thus, some ballasts can be removed with the lamps.

According to the 2006 International Energy Conservation Code, table 805.5.2, it states that the average interior lighting power for an office area is 1.1 Watts per square foot. The current interior lighting power for the 36 by 22 foot office area is 3.03 watts per square foot. Therefore the lighting in this area is in excess and is a great candidate for de-lamping.

Energy Savings Calculations:

Existing Wattage of 4 – lamp T12 fixtures = 160 Watts

of fixtures in office area = 15 fixtures

$$\begin{aligned}\text{Energy Savings} &= [(\text{Existing Wattage} - \text{New Wattage}) \times (\# \text{ of fixtures})] \times \text{yearly usage} \times \$ / \text{kWh} \\ &= [(.160 \text{ kW} - .080 \text{ kW}) \times (15 \text{ fixtures})] \times (2750 \text{ hours}) \times (\$.156 / \text{kWh}) \\ &= \underline{\$515/\text{yr}}\end{aligned}$$

The approximate cost for the commissioning of this job is \$960.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$960
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$960
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$515
Total Yearly Savings (\$/Yr):	\$515
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.9
Simple Lifetime ROI	704.7%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$7,725
Internal Rate of Return (IRR)	54%
Net Present Value (NPV)	\$5,188.04

ECM #3: Exit Sign Replacement: LED Type

Description:

LED stands for light-emitting-diode. LED's are very small light sources that people most readily associate with electronic equipment. LED exit signs have been made in a variety of shapes and sizes and there are also retrofit kits that allow you to simply modify your existing exit signs to accommodate the LED technology. The benefits of LED are twofold. First, you are installing an exit sign that will last for 20-30 years without maintenance. This results in tremendous maintenance savings because the incandescent or fluorescent lamps that you are currently using need to be replaced at a rate of 1-5 times per year. Lamp costs (\$2-\$7 each) and labor costs (\$8-\$20 per lamp) add up rapidly. The second benefit of LED is that it only uses 5 Watts of power per fixture. In comparison, your existing signs use approximately 20 Watts per fixture. It is highly recommended that sample installations of the LED exit signs be conducted to confirm that they are compatible with your electrical system.

This measure consists of installing new LED exit sign fixtures in order to provide the Owner with a limited-maintenance, energy efficient signage system.

Energy Savings Calculations:

Existing exit sign energy costs: 4 units x 20 watts/unit x 8,760 hrs/yr x \$0.168/kWh = \$118

New LED exit sign energy costs: 4 units x 5 watts/unit x 8,760 hrs x \$0.168/kWh = \$29

Net energy savings = \$118 - \$29 = \$89

Installed cost of new LED exit signs = \$80 x 4 = \$320

NJ Smart Start[®] Program Incentives are calculated as follows:

From the **NJ Smart Start Incentive Appendix**, the replacement of an incandescent exit sign warrants the following incentive: LED Exit Sign = \$20 per fixture.

Smart Start[®] Incentive = (# of exit signs × \$ 20) = (4 × \$20) = \$80

Maintenance Savings are calculated as follows:

Maintenance Savings = (# of lamps × \$ per lamp) + Installation Labor

Maintenance Savings = (4 × \$4.50) + (4 × \$14) = \$74

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$320
NJ Smart Start Equipment Incentive (\$):	\$80
Net Installation Cost (\$):	\$240
Maintenance Savings (\$/Yr):	\$74
Energy Savings (\$/Yr):	\$89
Total Yearly Savings (\$/Yr):	\$163
Estimated ECM Lifetime (Yr):	20
Simple Payback	1.5
Simple Lifetime ROI	1258.3%
Simple Lifetime Maintenance Savings	\$1,480
Simple Lifetime Savings	\$3,260
Internal Rate of Return (IRR)	68%
Net Present Value (NPV)	\$2,185.03

ECM #4: Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. Many times this is due to the idea that it is better to keep the lights on rather than to continuously switch them on and off. The on/off dilemma was studied and it was found that the best option is to turn the lights off whenever possible. Although this does reduce the lamp life, the energy savings far outweigh the lamp replacement costs. The cutoff for when to turn the lights off is around two minutes. If the lights can be off for only a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is all it would take. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G of the referenced standard, states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. CEG recommends the installation of dual technology occupancy sensors in all areas of the facility except the warehouse area (1,000 SF).

Energy Savings Calculations:

From the **Investment Grade Lighting Audit Appendix** of this report, we calculated the lighting power density (Watts/ft²) of the existing offices, locker rooms, storage rooms, etc. to be 3.58 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

$$\text{Savings} = 10\% \times 3.58 \text{ Watts/SF} \times 3,000 \text{ SF} \times 2750 \text{ hrs/yr.} = 2954 \text{ kWh} \times \$0.156/\text{kWh}$$

$$\text{Savings} = \$461 / \text{yr}$$

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is \$75/unit including material and labor. The SmartStart Buildings® incentive is \$20 per control which equates to an installed cost of \$55/unit. Total number of rooms to be retrofitted is 15. Total cost to install sensors is \$55/unit x 15 units = \$825.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$1,125
NJ Smart Start Equipment Incentive (\$):	\$300
Net Installation Cost (\$):	\$825
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$461
Total Yearly Savings (\$/Yr):	\$461
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.8
Simple Lifetime ROI	738.2%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$6,915
Internal Rate of Return (IRR)	56%
Net Present Value (NPV)	\$4,678.39

ECM #5: Shop Replacement - Infrared Heaters

Description:

The interior spaces of the Orange Street Warehouse are heated by two (2) Reznor gas-fired units. These units are controlled by standard honeywell programmable thermostats. These units do not provide adequate heating because of the high ceilings and losses through garage doors when open.

Our team recommends replacing the existing unit heaters with low intensity infrared (IR) tube heaters. When compared to convective heating systems, IR heaters provide more efficient heating in large areas and warehouses for two reasons: they only heat people and objects (not air); they can be conveniently located and directed to provide heat to only a smaller section occupied by workers.

Energy Savings Calculations:

Based on the existing unit heater data, thermostat settings and natural gas bills, the total energy consumed by these heating units is approximately 5,559.3 Therms/Year. The total rated heat capacity of the IR tubes is 80% of the current load or $0.8 \times 5,559.3 \text{ Therms} = 4,447 \text{ Therms/Year}$. The total amount of IR heaters and their size can be estimated based on the current heat load and building layout. In general, a building 200 feet wide or less will require two rows of tubes. Heat output of each 20-foot section is approximately 60,000 Btu/hr.

Estimated Fan Energy Savings:

Natural Gas Equipment List - Estimated Annual Usage per unit						
Concord Engineering Group						
Orange Street Warehouse						
Manufacturer	Qty.	Model #	Serial #	Input (MBh)	% of Total Input	Estimated Annual Therms
Ducane	1	CMPA125C5	2493680041	125	14.71%	1,158.19
Ducane	1	CMP125U5	2486900037	125	14.71%	1,158.19
Reznor	1	F300	-	300	35.29%	2,779.65
Reznor	1	F300	-	300	35.29%	2,779.65
Total Input MBH				850	1.00	7,875.67
Total Input Therms				8.5		
Total Gas Consumption Therms / yr.				7875.67		

Each of the Reznor gas-fired unit heaters have a 1/4 HP fan that runs each time the unit calls for heating. Assuming that these motors are 80% efficient and the total run hours is 1,280, this equates to an electrical savings of

Existing 1/4 HP Motor Operating Cost =

{0.746 Watt/HP x Motor HP x Load Factor x Hours of Operation x Cost of Electricity} ÷ Motor Efficiency

= [0.746 x 0.25 x 0.75 x 1,280 x 0.156] ÷ 0.80 = \$34.91 / Year

Based on three (2) existing units, this equates to 2 x \$34.91 = \$70/Year Savings

Natural Gas Energy Savings:

20% savings x 5,559 Therms/Yr x \$1.62/Therm = \$1,801/Year

Total Energy Savings = Fan Energy Savings + Natural Gas Savings

= \$70 + \$1,801 = \$1,871 per year

The total implementation cost including material and labor is estimated at approximately \$6,053. It is pertinent to note, the labor cost includes installation of the infra-red heaters and required modifications of the existing natural gas piping.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$6,053
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$6,053
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$1,871
Total Yearly Savings (\$/Yr):	\$1,871
Estimated ECM Lifetime (Yr):	13
Simple Payback	3.2
Simple Lifetime ROI	301.8%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$24,323
Internal Rate of Return (IRR)	30%
Net Present Value (NPV)	\$13,845.00

ECM #6: Warehouse Garage Door Replacement

Description:

The three (3) 14'x12' garage doors currently have aluminum frames. This style of door allows excess heat loss and gain resulting in cooler interior surfaces during the heating season and warmer interior surfaces during the cooling season. In addition, these doors are a source of cold air infiltration into the facility during the winter months. Based on CEG research, high-performance garage doors can provide many benefits including:

- Improved comfort by reducing radiant heat exchange
- Improved indoor air quality by reducing air leakage that can bring dirt, dust, and other impurities into the building
- Lower utility bills since these garage doors are better insulated and more air-tight
- Fewer condensation problems since these garage doors stay warmer in the heating season resulting in a drier surface

This energy conservation measure would replace four (3) existing garage doors with high performance expanded polyurethane insulated garage doors as manufactured by, Clopay (model 3720) or equivalent.

Energy Savings Calculations:

General Data:

For Millville, NJ; Cumberland County the following is the Degree Days for November 2008 through October 2009:

Heating Degree Days (65°F Base) = 5,238 HDD recorded at the Millville Airport

Total garage door area to be retrofitted = (3) 14'H x 12'L Windows; approximately 504 SF

Energy Calculation:

Existing Single Pane Garage Doors; $R_{\text{exist}} = 1.5 \text{ (hr - ft}^2 \text{ - } ^\circ\text{F)/Btu}$

New Polyurethane Insulated Garage Doors Thermal Value; $R_{\text{new}} = 17.2 \text{ (hr - ft}^2 \text{ - } ^\circ\text{F)/Btu}$

$$\text{Annual Energy Savings} = 24 \times \text{System Efficiency} \times \text{Garage Door Area} \times \left(\frac{1}{R_{\text{Existing}}} - \frac{1}{R_{\text{New}}} \right) \times \text{HDD}$$

$$\text{Annual Energy Savings} = 24 \times 80\% \times 504 \text{ SF} \times \left(\frac{1}{1.5} - \frac{1}{17.2} \right) \times 5,238 = 30,844 \text{ kBtu / yr}$$

Conversion to Natural Gas = (30,844 kBtu * 1000 Btu per kBtu) / 100,000 Btu per Therm = 308 Therms of Natural Gas

Annual Energy Cost Savings = 308 Therms of Nat. Gas x \$1.62/Therm = \$500

Incentives for this ECM are not currently available and maintenance savings could not be adequately calculated because information was not available to baseline the savings.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$8,505
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$8,505
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$500
Total Yearly Savings (\$/Yr):	\$500
Estimated ECM Lifetime (Yr):	25
Simple Payback	17.0
Simple Lifetime ROI	47.0%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	\$12,500
Internal Rate of Return (IRR)	3%
Net Present Value (NPV)	\$201.57

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 technologies for the Millville Board of Education, to evaluate if there is any potential for solar or wind energy generation.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which can 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). Parking lots can also be utilized for the installation of a solar array. A truss system can be installed that is high enough to park a vehicle under the array, this way no parking lot area is lost. 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 facility and believes a roof mounted system is best suited. A depiction of the proposed area layouts is shown in **Renewable / Distributed Energy Measures Calculation, Appendix**. Based on measurements of the roof it was determined that a system size of 21.16 kilowatts could be installed. The total system has an estimated kilowatt hour production of 27,878 KWh annually, reducing the overall electric consumption by approximately 26.7%. A detailed financial analysis can be found in **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.

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.

Direct purchase involves the BOE paying for 100% of the total project cost upfront via one of the methods noted in the Installation Funding Options section below. Calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following is the payback period:

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM				
PAYMENT TYPE	SIMPLE PAYBACK	SIMPLE ROI	NET PRESENT VALUE	INTERNAL RATE OF RETURN
Direct Purchase	13.5 Years	85.2%	\$55,190	6.0 %

*The solar energy measure is shown for reference in the executive summary REM table as REM#1.

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. CEG's review of the applicability of wind energy for the facility found; the low average wind speed and proximity to residential neighborhoods make facility a poor candidate for wind energy production.

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:

This facility is comprised of an office and a large storage warehouse utilized for the storage of food and school supplies for the district. The typical hours of operation for this facility are between 6:30 am and 4:00 pm. The facility was built in 1960 with no major additions since the original construction.

The Electric Usage Profile demonstrates a fairly flat (consistent) load consumption profile throughout the year; this is typical for a warehouse/office type facility. There is some consumption drop off March and May with a fairly steady but elevated profile throughout the balance of the year. The summer (May-September) demonstrates an increase and a steady load use through this period. Typically cooling load is the reason here. Cooling in the office area is supplied by two (2) Ducane gas fired furnaces with remote condensing units. Each heating unit has a capacity of 125 MBH and is attached to a 5-Ton condensing unit located on the office roof. Each gas fired furnace is suspended from the ceiling of the warehouse.

A standalone blower coil unit serves the server room located in the office area. A 3-Ton remote condensing unit is located on the roof of the facility.

Electric heating units originally provided heat to the warehouse due to the absence of a gas service, these units have since been abandoned in place and their electric service has been disconnected. A small radiant electric heater provides point of use heating to an area of the warehouse front end.

This facility receives its electric delivery service via Atlantic City Electric (ACE) on a MGS rate schedule. This facility receives its electric commodity service from South Jersey Energy Company through the ACES agreement. A flat (base-load) shaping is important because it will yield more competitive pricing when shopping for alternative energy supply.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical heating load profile, with increasing consumption in the winter months (October – March) and a dramatic drop in consumption in the

summer months (May – September). Heating is the obvious reason for the winter consumption and in this facility heating is provided to the warehouse via two (2) Reznor gas fired furnaces.

The office area is heating by two (2) Ducane gas fired furnaces. Each heating unit has a capacity of 125 MBH and is attached to. Each gas fired furnace is suspended from the ceiling of the warehouse.

One 40 gallon Bradford White domestic hot water heater serves the office area. The unit has a heating capacity of 4.5 kW and is located in the warehouse.

Natural gas delivery service in this facility is provided by South Jersey Gas Company on a GSG rate schedule. The natural gas commodity service is provided by PEPCO Energy Services through the ACES agreement. A flat load profile will always allow for the most competitive price available when shopping for alternative energy supplies.

Tariff Analysis:

Electricity:

This facility receives electrical Delivery Service from Atlantic City Electric on an MGS (Monthly General Service) utility rate. This facility receives electric Supply service from South Jersey Energy Company through the ACES agreement.

The MGS rate is available at any point of Company's system where facilities of adequate character and capacity exist for the entire electric service requirements of any customer delivered at one point and metered at or compensated to the voltage of delivery. This schedule is not available to residential customers. This service includes the following charges: Delivery Service Charges, Distribution Demand Charges, Reactive Demand Charges, 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.

This facility receives electrical supply service through the ACES agreement (Alliance for Competitive Energy Services). ACES, is an alliance composed of the NJSBA and the NJASBO and is administered by Gable Associates. CEG believes that if the BOE wants to procure alternative energy, they must through the ACES agreement. CEG will make a recommendation that is counter to this agreement. The term of the ACES agreement is the first meter read date on or after April 30, 2009 until the last meter read date, May, 2011.

The ACES agreement provides for NJSBA to adopt a resolution for renewal for no more than a (5) consecutive year term. CEG will recommend against such renewal and believes that a 5 – year term may not be allowed under local government law.

Natural Gas:

This facility is serviced by South Jersey Gas Company (SJG) on its firm delivery rate, General Service Gas (GSG) from the utility and BGSS (Basic Generation Supply Service) when not being served by a Third Party Supplier (TPS). Currently The BOE is procuring natural gas from a Third Party Supplier (TPS), PEPCO Energy Services. This Delivery Rate has the following charges: Customer Charge, Delivery Charge, BSC Volume Charge and Commodity Charge under this rate structure. The BGSS Supply rates are designed to recover SJG's cost of gas applicable to customers who purchase gas from SJG. The company earns no profit from BGSS. BGSS consists of two (2) pricing mechanisms: Residential and Commercial customers that use less than 5,000 therms annually and Commercial and Industrial customers that consume at least 5,000 therms annually.

Imbalances occur when Third Party Suppliers (TPS) are used to supply natural gas and full-delivery is not made, and when a new supplier is contracted or the customer returns to the utility. Note: It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used, otherwise, imbalances can occur, jeopardizing economics and scheduling. If the supplier does not deliver they can be placed on a very costly rate. A customer can automatically be put on an alternative supply rate by the utility.

A "firm account" refers to the type of interstate pipeline service that the utility has subscribed for and delivered on behalf of the customer. Much like the telecom industry, the pipeline space (capacity) has been deregulated. The pipeline capacity is broken down into reliability of service. "Firm service" is the highest level of reliability and is the last, in pecking order, for interruption.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within the scope of this project. Therefore, CEG recommends aggregating all energy loads. CEG's observations are seen in both the electric and natural gas costs. The average "price to compare" per kWh (kilowatt hour) for all buildings is \$.1058/ kWh (kWh is the common unit of electric measure). The average "price to compare" per decatherm for natural gas is \$10.90 /dth (dth is the common unit of measure). These Weighted Average Prices are as supplied via Third Party Suppliers (TPS) for electricity (South Jersey Energy Company) and for natural gas (PEPCO Energy services), as administered through the ACES (Alliance for Competitive Energy Services) and the lead agency, The New Jersey School Boards Association, with administration from Gable Associates.

Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. The BOE could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on last year's historical consumption (January – December 2009) and current electric rates, the BOE could see an improvement of up to 15 % or up to \$150,000 in its electric costs annually. (Note: Savings were calculated using an Average Annual Consumption of 9,776,921 kWh and an Average fixed one-year commodity contract). CEG recommends aggregating the entire electric load to gain the

most optimal energy costs. CEG recommends that the BOE seek an energy advisor to maximize energy savings and to apply a “managed approach” to procuring energy.

CEG’s secondary recommendation coincides with the BOE’s natural gas costs. Based on the current market, (which is very competitive), the BOE could see a savings of over 20% or up to \$90,000 annually in its natural gas expenditures. Again, CEG recommends the use of any energy advisor to review alternative energy sourcing strategies and to install a “managed approach” to energy procurement.

CEG also recommends that The BOE not renew its energy supply contract with the ACES aggregation and PEPCO Energy Services, and the ACES agreement with South Jersey Energy and its fixed price contract. The fixed priced contract does not accomplish the needs of the BOE. The BOE needs budget protection and CEG has shown that these energy prices are not competitive to the market. The ACES agreement has demonstrated that the price is much 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 a customer 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 recommends the BOE schedule a meeting with their 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), they will learn more about the competitive supply process. They can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, the BOE should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if the BOE frequently changes its supplier for energy, CEG recommends it closely monitor balancing, particularly when the contract is close to termination.

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 pay 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

Orange Street Warehouse

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY														
ECM NO.	DESCRIPTION	INSTALLATION COST			YEARLY SAVINGS			ECM LIFETIME (Yr)	LIFETIME ENERGY SAVINGS (Yearly Saving * ECM Lifetime) (\$)	LIFETIME MAINTENANCE SAVINGS (Yearly Maint Saving * ECM Lifetime) (\$)	LIFETIME ROI (Lifetime Savings, Net Cost) / (Net Cost) (%)	SIMPLE PAYBACK (Net cost / Yearly Savings) (Yr)	INTERNAL RATE OF RETURN $\sum_{t=0}^N \frac{C_t}{(1+r)^t}$ (%)	NET PRESENT VALUE (NPV)
		MATERIAL (\$)	LABOR (\$)	REBATES INCENTIVES (\$)	NET INSTALLATION COST (\$)	ENERGY (\$/Yr)	MAINT. / SBEC (\$/Yr)							
ECM #1	Lighting Upgrade - General	\$15,440	\$0	\$2,055	\$13,385	\$2,999	\$125	\$1,122	\$46,826	\$1,845	289.8%	4.3	22.16%	\$23,881.77
ECM #2	De-Lamping of Office Area	\$0	\$960	\$0	\$960	\$515	\$0	\$515	\$7,725	\$0	704.7%	1.9	53.56%	\$5,188.04
ECM #3	Exit Sign Replacement	\$320	\$0	\$80	\$240	\$89	\$74	\$163	\$3,260	\$1,480	1258.3%	1.5	67.91%	\$2,185.03
ECM #4	Lighting Controls	\$1,125	\$0	\$300	\$825	\$461	\$0	\$461	\$6,915	\$0	738.2%	1.8	55.81%	\$4,678.39
ECM #5	Unit Heater Replacement - Infrared	\$6,053	\$0	\$0	\$6,053	\$1,871	\$0	\$1,871	\$28,323	\$0	301.8%	3.2	29.88%	\$13,845.00
ECM #6	Gauge Door Replacement	\$8,505	\$0	\$0	\$8,505	\$500	\$0	\$500	\$12,500	\$0	47.0%	17.0	3.21%	\$201.57
RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY		\$190,440	\$0	\$0	\$190,440	\$4,349	\$9,757	\$14,106	\$352,680	\$343,925	85.2%	13.5	5.4%	\$55,189.86

Notes: 1) The variable C_t is the formula for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
 2) The variable DR is 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 C_t 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	
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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
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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
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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

Orange Street Warehouse

Building ID: 1874989
For 12-month Period Ending: May 31, 2009¹
Date SEP becomes ineligible: N/A

Date SEP Generated: October 12, 2009

Facility
 Orange Street Warehouse
 701 Orange St.
 Millville, NJ 08332

Facility Owner
 Millville Board of Education
 110 N. Third Street
 Millville, NJ 08332

Primary Contact for this Facility
 Toni Basich
 110 N. Third Street
 Millville, NJ 08332

Year Built: 1960
Gross Floor Area (ft²): 18,000

Energy Performance Rating² (1-100) 29

Site Energy Use Summary³

Electricity - Grid Purchase(kBtu)	357,441
Natural Gas (kBtu) ⁴	850,800
Total Energy (kBtu)	1,208,241

Energy Intensity⁵

Site (kBtu/ft ² /yr)	67
Source (kBtu/ft ² /yr)	116

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	100
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Electric Distribution Utility

Atlantic City Electric Co

National Average Comparison

National Average Site EUI	50
National Average Source EUI	86
% Difference from National Average Source EUI	35%
Building Type	Warehouse (Unrefrigerated)

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 Standards⁶ 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 08332

Notes:

- 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.
- 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.
- Values represent energy consumption, annualized to a 12-month period.
- 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.
- Values represent energy intensity, annualized to a 12-month period.
- 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	<input checked="" type="checkbox"/>
Building Name	Orange Street Warehouse	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		<input type="checkbox"/>
Type	Warehouse (Unrefrigerated)	Is this an accurate description of the space in question?		<input type="checkbox"/>
Location	701 Orange St., Millville, NJ 08332	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		<input type="checkbox"/>
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		<input type="checkbox"/>
Warehouse (Warehouse (Unrefrigerated))				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
Gross Floor Area	18,000 Sq. Ft.	Is this the total gross floor area as measured between the principal exterior surfaces of the enclosing fixed walls and including all supporting functions? The total gross floor area should include offices, lobbies, rest rooms, equipment storage areas, mechanical rooms, employee break rooms, cafeterias, elevators, stairwells, all space occupied by refrigeration/freezer units, and all areas that are entirely refrigerated. Existing atriums or areas with high ceilings should only include the base floor area that they occupy. The total gross floor area should not include outside loading bays or docks.		<input type="checkbox"/>
Workers on Main Shift	6	Does this number represent the average number of workers that are present during the primary shift (that is, the shift with the most workers)? Note: this is not the total number of staff employed at the property. For example, if there are three daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		<input type="checkbox"/>
Weekly operating hours	40 Hours	Is this the total number of hours per week that this warehouse space is in operation, excluding hours when the facility is occupied by maintenance, security, or other support personnel? Note: the average warehouse space operates 60 hours per week.		<input type="checkbox"/>
Percent Cooled	20 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		<input type="checkbox"/>
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		<input type="checkbox"/>
Number of walk-in refrigeration/freezer units	1	Does this count include all large walk-in refrigeration or freezer units at the warehouse?		<input type="checkbox"/>
Distribution Center	No (Optional)	Is this building considered a distribution center?		<input type="checkbox"/>

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))
05/01/2009	05/31/2009	5,200.00
04/01/2009	04/30/2009	10,080.00
03/01/2009	03/31/2009	8,160.00
02/01/2009	02/28/2009	10,000.00
01/01/2009	01/31/2009	8,920.00
12/01/2008	12/31/2008	7,840.00
11/01/2008	11/30/2008	8,880.00
10/01/2008	10/31/2008	7,920.00
09/01/2008	09/30/2008	8,960.00
08/01/2008	08/31/2008	9,520.00
07/01/2008	07/31/2008	9,840.00
06/01/2008	06/30/2008	9,440.00
Electric Meter Consumption (kWh (thousand Watt-hours))		104,760.00
Electric Meter Consumption (kBtu (thousand Btu))		357,441.12
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		357,441.12
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		<input type="checkbox"/>
Fuel Type: Natural Gas		
Meter: Natural Gas Meter (therms)		
Space(s): Entire Facility		
Start Date	End Date	Energy Use (therms)
05/01/2009	05/31/2009	0.00
04/01/2009	04/30/2009	426.00
03/01/2009	03/31/2009	784.00
02/01/2009	02/28/2009	1,243.00
01/01/2009	01/31/2009	2,047.00
12/01/2008	12/31/2008	1,966.00
11/01/2008	11/30/2008	1,884.00
10/01/2008	10/31/2008	156.00
09/01/2008	09/30/2008	2.00
08/01/2008	08/31/2008	0.00

07/01/2008	07/31/2008	0.00
06/01/2008	06/30/2008	0.00
Natural Gas Meter Consumption (therms)		8,508.00
Natural Gas Meter Consumption (kBtu (thousand Btu))		850,800.00
Total Natural Gas Consumption (kBtu (thousand Btu))		850,800.00
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		<input type="checkbox"/>

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.	<input type="checkbox"/>

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.	<input type="checkbox"/>

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
Orange Street Warehouse
701 Orange St.
Millville, NJ 08332

Facility Owner
Millville Board of Education
110 N. Third Street
Millville, NJ 08332

Primary Contact for this Facility
Toni Basich
110 N. Third Street
Millville, NJ 08332

General Information

Orange Street Warehouse	
Gross Floor Area Excluding Parking: (ft ²)	18,000
Year Built	1960
For 12-month Evaluation Period Ending Date:	May 31, 2009

Facility Space Use Summary

Warehouse	
Space Type	Warehouse (Unrefrigerated)
Gross Floor Area(ft ²)	18,000
Workers on Main Shift	6
Weekly operating hours	40
Percent Cooled	20
Percent Heated	100
Number of walk-in refrigeration/freezer units	1
Distribution Center ^o	N

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 05/31/2009)	Baseline (Ending Date 05/31/2009)	Rating of 75	Target	National Average
Energy Performance Rating	29	29	75	N/A	50
Energy Intensity					
Site (kBtu/ft ²)	67	67	33	N/A	50
Source (kBtu/ft ²)	116	116	57	N/A	86
Energy Cost					
\$/year	N/A	N/A	N/A	N/A	N/A
\$/ft ² /year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
MtCO ₂ e/year	100	100	49	N/A	74
kgCO ₂ e/ft ² /year	6	6	3	N/A	4

More than 50% of your building is defined as Warehouse (Unrefrigerated). 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.

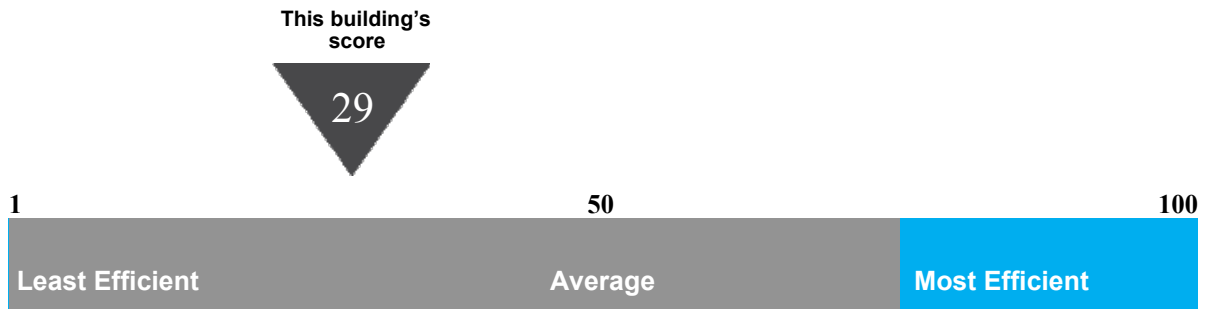
Statement of Energy Performance

2009

Orange Street Warehouse
701 Orange St.
Millville, NJ 08332

Portfolio Manager Building ID: 1874989

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 116 kBtu per square foot per year.*

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



MAJOR EQUIPMENT LIST

Concord Engineering Group

"Millville B.O.E. - Orange Street Warehouse"

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Equipment Tag	Model #	Serial #	Input (MBH)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Warehouse	Office	Bradford White	1	-	SE40D	MGI52642	4.5 kW	-	40	-	Electric	240	1	60	11	12	1

Air Handling Units

Location	Area Served	Manufacturer	Qty	Equipment Tag	Model #	Serial #	Cooling Coil	Cooling Capacity	Heating Type	Heating Type	Input (MBH)	Output (MBH)	Heating Eff. (%)	Fuel	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Warehouse	Office Right	Ducane	1	AHU-01	CMPA125C5	2493680041	DX R-22	5 Ton	Gas HX	Gas HX	125	117	94%	Nat. Gas	115	1	60			0
Warehouse	Office Left	Ducane	1	AHU-02	CMP125U5	2486900037	DX R-22	5 Ton	Gas HX	Gas HX	125	117	94%	Nat. Gas	115	1	60			0

AC Condensers

Location	Area Served	Manufacturer	Qty	Equipment Tag	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Roof	AHU-1	ICP Commercial	1	AC-01	N2A060AH2	XG7047806	5 Ton	10 SEER	R-22	208-230	3	60	2	20	18
Roof	AHU-2	Byram	1	AC-02	561C9060E	1899F2122	5 Ton	10 SEER	R-22	208-230	3	60	10	20	10
Roof	Computer Room	General Electric	1	AC-03	BTN736A100DA	218687102	3 Ton	8.4 SEER	R-22	230	1	60	23	20	-3

Unit Heaters and Cabinet Unit Heaters

Location	Area Served	Manufacturer	Qty	Equipment Tag	Model #	Serial #	Heating Type	Heating Input (MBH)	Heating Output (MBH)	Efficiency	CFM	RPM/HP	Approx. Age	ASHRAE Service Life	Remaining Life
Warehouse	Warehouse	Reznor	2	-	F300	-	Gas HX	300	240	80%	3800	850/1/4			0

INVESTMENT GRADE LIGHTING AUDIT

CEG Job #: 9C09072
 Project: Millville B.O.E.
 Address: 701 Orange Street
 Millville, NJ 08332
 Building SF: 18,000

"Millville - Orange Street Warehouse"

KWH COST: \$0.156

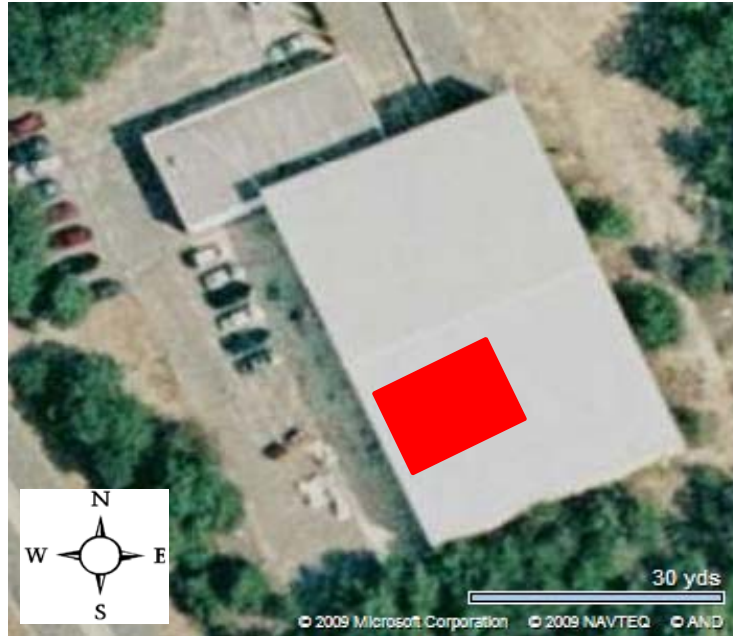
EXISTING LIGHTING		PROPOSED LIGHTING										SAVINGS										
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Wats	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback
1	Warehouse	2750	33	1	1-Lamp, HPS 250W	300	9.90	27,225.0	\$4,247.10	33	1	3-Lamp T-5 HO Cooper F-Bay	182	6.01	16516.5	\$2,576.57	\$300.00	\$9,900.00	3.89	10708.5	\$1,670.53	5.93
2		2750	3	1	1-Lamp, MH 400W	455	1.37	3,753.8	\$585.59	3	1	4-Lamp T-5 HO Cooper F-Bay	229	0.69	1889.25	\$294.72	\$400.00	\$1,200.00	0.68	1864.5	\$290.86	4.13
3	Conference Room	2750	15	4	2' x 4', 4-Lamp, T12 34W, Magnetic Ballast, Recessed Mount, Prismatic Lens	160	2.40	6,600.0	\$1,029.60	15	3	2'x4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	82	1.23	3382.5	\$527.67	\$140.00	\$2,100.00	1.17	3217.5	\$501.93	4.18
4	Office	2750	9	4	2' x 4', 4-Lamp, T12 34W, Magnetic Ballast, Recessed Mount, Prismatic Lens	160	1.44	3,960.0	\$617.76	9	3	2'x4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	82	0.74	2029.5	\$316.60	\$140.00	\$1,260.00	0.70	1930.5	\$301.16	4.18
5	File Storage	2750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	599.5	\$93.52	0	0	No Change Required (NCR)	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
6	Copy Room	2750	4	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.44	1,199.0	\$187.04	0	0	NCR	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
7	Office	2750	4	8	4' x 4', 8-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	218	0.87	2,398.0	\$374.09	0	0	NCR	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
8	Office Bathroom	2750	1	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	299.8	\$46.76	0	0	NCR	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
9	Office Shower	2750	1	4	2' x 4', 4-Lamp, T12 34W, Electronic Ballast, Recessed Mount, Prismatic Lens	160	0.16	440.0	\$68.64	1	3	2'x4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	82	0.08	225.5	\$35.18	\$140.00	\$140.00	0.08	214.5	\$33.46	4.18
10	Office/Receptionist	2750	27	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	2.94	8,093.3	\$1,262.55	0	0	NCR	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
11	Kitchen	2750	3	8	4' x 4', 8-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	218	0.65	1,798.5	\$280.57	0	0	NCR	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
12	Kitchen	2750	2	4	2' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	599.5	\$93.52	0	0	NCR	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
13	Empty Office	2750	2	4	4' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.22	599.5	\$93.52	0	0	NCR	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00
14	Vestibule	2750	1	4	4' x 4', 4-Lamp, T8 32W, Electronic Ballast, Recessed Mount, Prismatic Lens	109	0.11	299.8	\$46.76	0	0	NCR	0	0.00	0	\$0.00	\$0.00	\$0.00	0.00	0	\$0.00	0.00

INVESTMENT GRADE LIGHTING AUDIT

15	Women's Bathroom	2750	2	4	2' x 4' - 4-Lamp, T12 34W, Electronic Ballast, Recessed Mount, Prismatic Lens	160	0.32	880.0	\$137.28	2	3	2'x4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GCC8	82	0.16	451	\$70.36	\$140.00	\$280.00	0.16	429	\$66.92	4.18
16	Men's Bathroom	2750	2	4	2' x 4' - 4-Lamp, T12 34W, Electronic Ballast, Recessed Mount, Prismatic Lens	160	0.32	880.0	\$137.28	2	3	2'x4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GCC8	82	0.16	451	\$70.36	\$140.00	\$280.00	0.16	429	\$66.92	4.18
17	Storage	2750	2	4	2' x 4' - 4-Lamp, T12 34W, Electronic Ballast, Recessed Mount, Prismatic Lens	160	0.32	880.0	\$137.28	2	3	2'x4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GCC8	82	0.16	451	\$70.36	\$140.00	\$280.00	0.16	429	\$66.92	4.18
Totals			113	70			22.00	60,505.5	\$9,438.86	67	20		9,235	25,396.25	\$3,961.82		\$15,440.00	6.99	19,222.5	\$2,998.71	5.15	

Project Name: Millville BOE - Orange St. Warehouse							
Location: Millville, NJ 08332							
Description: Photovoltaic System - Direct Purchase							
Simple Payback Analysis							
	Photovoltaic System - Direct Purchase						
Total Construction Cost	\$190,440						
Annual kWh Production	27,878						
Annual Energy Cost Reduction	\$4,349						
Annual SREC Revenue	\$9,757						
First Cost Premium	\$190,440						
Simple Payback:	13.50						Years
Life Cycle Cost Analysis							
Analysis Period (years):	25			Financing %:	0%		
Financing Term (mths):	0			Maintenance Escalation Rate:	3.0%		
Average Energy Cost (\$/kWh)	\$0.156			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	\$190,440	0	0	0	\$0	(190,440)	0
1	\$0	27,878	\$4,349	\$0	\$9,757	\$14,106	(\$176,334)
2	\$0	27,739	\$4,479	\$0	\$9,709	\$14,188	(\$162,146)
3	\$0	27,600	\$4,614	\$0	\$9,660	\$14,274	(\$147,872)
4	\$0	27,462	\$4,752	\$0	\$9,612	\$14,364	(\$133,508)
5	\$0	27,325	\$4,895	\$281	\$9,564	\$14,177	(\$119,331)
6	\$0	27,188	\$5,042	\$280	\$9,516	\$14,277	(\$105,054)
7	\$0	27,052	\$5,193	\$279	\$9,468	\$14,382	(\$90,671)
8	\$0	26,917	\$5,349	\$277	\$9,421	\$14,492	(\$76,179)
9	\$0	26,782	\$5,509	\$276	\$9,374	\$14,607	(\$61,572)
10	\$0	26,648	\$5,674	\$274	\$9,327	\$14,727	(\$46,845)
11	\$0	26,515	\$5,845	\$273	\$9,280	\$14,852	(\$31,993)
12	\$0	26,382	\$6,020	\$272	\$9,234	\$14,982	(\$17,011)
13	\$0	26,251	\$6,201	\$270	\$9,188	\$15,118	(\$1,893)
14	\$0	26,119	\$6,387	\$269	\$9,142	\$15,259	\$13,366
15	\$0	25,989	\$6,578	\$268	\$9,096	\$15,407	\$28,773
16	\$0	25,859	\$6,776	\$266	\$9,051	\$15,560	\$44,332
17	\$0	25,729	\$6,979	\$265	\$9,005	\$15,719	\$60,052
18	\$0	25,601	\$7,188	\$264	\$8,960	\$15,885	\$75,936
19	\$0	25,473	\$7,404	\$262	\$8,915	\$16,057	\$91,993
20	\$0	25,345	\$7,626	\$261	\$8,871	\$16,236	\$108,229
21	\$1	25,219	\$7,855	\$260	\$8,827	\$16,422	\$124,651
22	\$2	25,093	\$8,090	\$258	\$8,782	\$16,614	\$141,265
23	\$3	24,967	\$8,333	\$257	\$8,739	\$16,814	\$158,079
24	\$4	24,842	\$8,583	\$256	\$8,695	\$17,022	\$175,101
25	\$5	24,718	\$8,841	\$255	\$8,651	\$17,237	\$192,339
Totals:		531,854	\$116,858	\$4,338	\$186,149	\$382,779	\$298,669
Net Present Value (NPV)						\$192,364	
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
Orange St. Warehouse	1500	Sunpower SPR230	92	14.7	1,353	21.16	27,878	3,036	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:	21.2 kW
DC to AC Derate Factor:	0.810
AC Rating:	17.1 kW
Array Type:	Fixed Tilt
Array Tilt:	39.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	15.6 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	3.61	1994	311.06
2	4.20	2076	323.86
3	4.78	2505	390.78
4	5.23	2573	401.39
5	5.44	2701	421.36
6	5.48	2528	394.37
7	5.55	2614	407.78
8	5.41	2575	401.70
9	5.23	2465	384.54
10	4.60	2305	359.58
11	3.59	1831	285.64
12	3.17	1710	266.76
Year	4.69	27878	4348.97

[Red Square] := Proposed PV Layout

Notes:

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