



ENERGY AUDIT – FINAL REPORT

**BRICK TOWNSHIP M.U.A.
OPERATIONS AND WAREHOUSE
1551 HIGHWAY 88 WEST
BRICK, NJ 08724**

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CEG PROJECT No. 9C09064

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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	31
IX.	ENERGY PURCHASING AND PROCUREMENT STRATEGY	34
X.	INSTALLATION FUNDING OPTIONS.....	38
XI.	ADDITIONAL RECOMMENDATIONS	40
	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:

Brick Township M.U.A.
Operations and Warehouse
1551 Highway 88 West
Brick, NJ 08724-2399

Facility Contact Person: Jay Delaney, Project Manager

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 Campus	\$1,003,386 (Total)
Electricity (SF Est.)	\$186,371
Natural Gas	\$ 3,226
<hr/>	
Total	\$ 189,597

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 - Operations Building	\$7	\$227	0.0	50435.6%
ECM #2	Lighting Upgrade - Operations Warehouse	\$3,980	\$1,440	2.8	442.9%
ECM #3	Lighting Controls - Operation Building	\$1,960	\$146	13.4	12.0%
ECM #4	Lighting Controls - Operations Warehouse	\$1,120	\$263	4.3	252.6%
ECM #5	Domestic Water Heater Replacement	\$15,940	\$287	55.5	-78.4%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST	ANNUAL SAVINGS	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
REM #1	32.2 KW PV SOLAR SYSTEM	\$289,800	\$18,045	16.1	55.7%

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 - Operations Building	0.6	1,552.2	-
ECM #2	Lighting Upgrade - Operations Warehouse	3.2	8,221.2	-
ECM #3	Lighting Controls - Operation Building	0.0	1,030.6	-
ECM #4	Lighting Controls - Operations Warehouse	0.0	1,853.8	-
ECM #5	Domestic Water Heater Replacement	-	-	183.5
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	32.2 KW PV SOLAR SYSTEM	-	36,676.0	-

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 – Operations Building
- **ECM #2:** Lighting Upgrade – Operations Warehouse
- **ECM#4:** Lighting Controls – Operations Warehouse

Although ECM #5 does not provide a payback less than 10 years, it is recommended to proceed with the installation of an efficient water heater as suggested in ECM #5 (or equal) since the existing water heater is past its expected lifespan.

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.
5. Confirm that outside air economizers on the rooftop units are functioning properly to take advantage of free cooling and avoid excess outside air during occupied periods.

II. INTRODUCTION

The comprehensive energy audit covers the 3,635 square foot Operations Building and the 7,167 square foot Warehouse Building, which includes the following spaces: Offices, restrooms, locker room and showers.

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. Jersey Central Power and Light (JCP&L) provides electricity to the facility, through a campus service under their General Service Primary rate structure. ConEdison is a third party supplier. 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. New Jersey Natural Gas provides natural gas to the facility under the Basic General Supply Service (BGS) rate structure. 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.

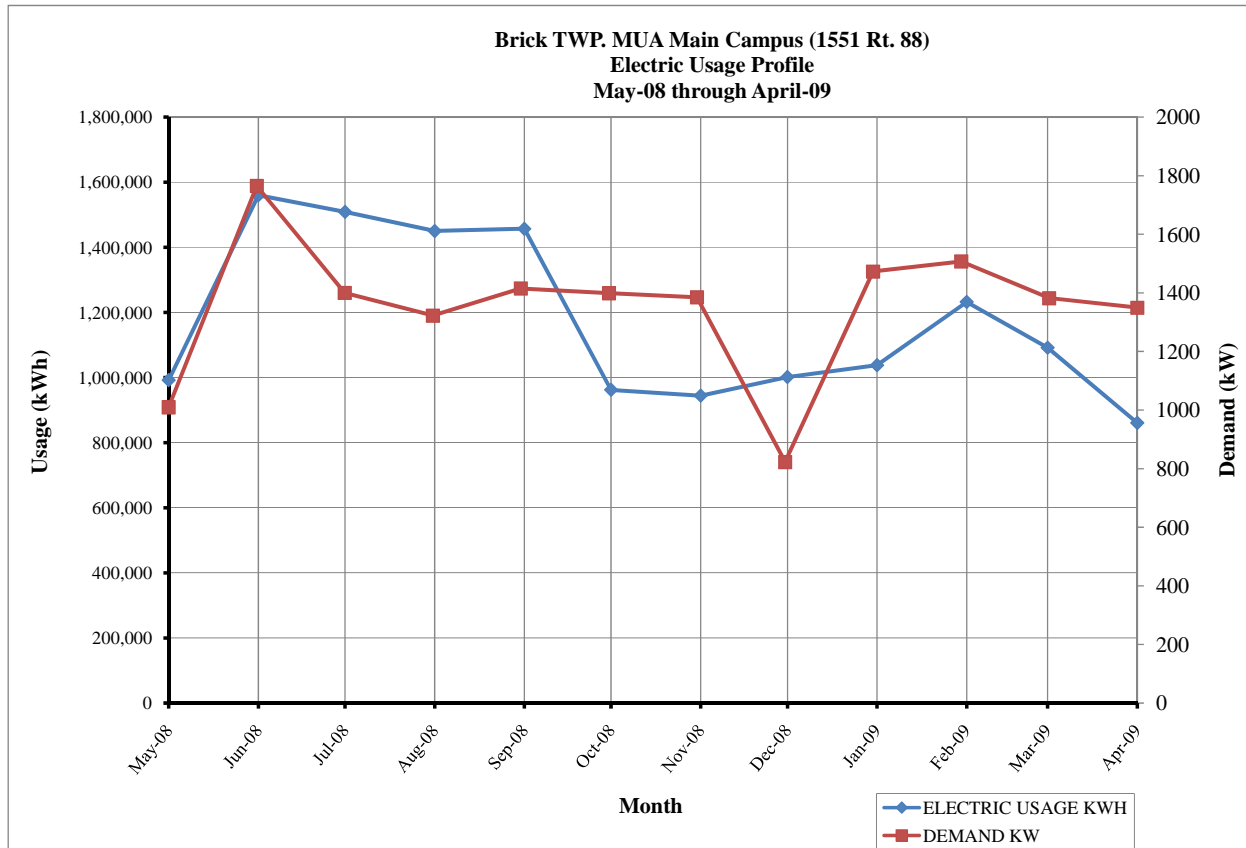
The overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history provided, the average cost for utilities at this facility is as follows:

<u>Description</u>	<u>Average</u>
Electricity	14.2¢ / kWh
Natural Gas	\$1.562 / Therm

**Table 3
Electricity Billing Data**

ELECTRIC USAGE SUMMARY			
Utility Provider: JCP&L Rate: JC_GP_01D Meter No: L97024331 / Customer ID No: 0801431959 Third Party Utility ConEdison TPS Meter / Acct No: 517809			
MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
May-08	496,245	1009.9	\$69,412
Jun-08	779,938	1765.4	\$111,093
Jul-08	754,427	1400.4	\$105,271
Aug-08	725,072	1322.6	\$101,046
Sep-08	728,453	1415.3	\$102,106
Oct-08	481,309	1399.2	\$70,051
Nov-08	472,382	1385.3	\$69,192
Dec-08	500,951	823.0	\$69,134
Jan-09	519,121	1473.1	\$75,703
Feb-09	616,249	1507.7	\$88,262
Mar-09	545,960	1382.4	\$78,496
Apr-09	430,501	1350.0	\$63,620
Totals	7,050,608	1765.4 Max	\$1,003,386
<p align="center">AVERAGE DEMAND 1352.9 KW average AVERAGE RATE \$0.142 \$/kWh</p>			

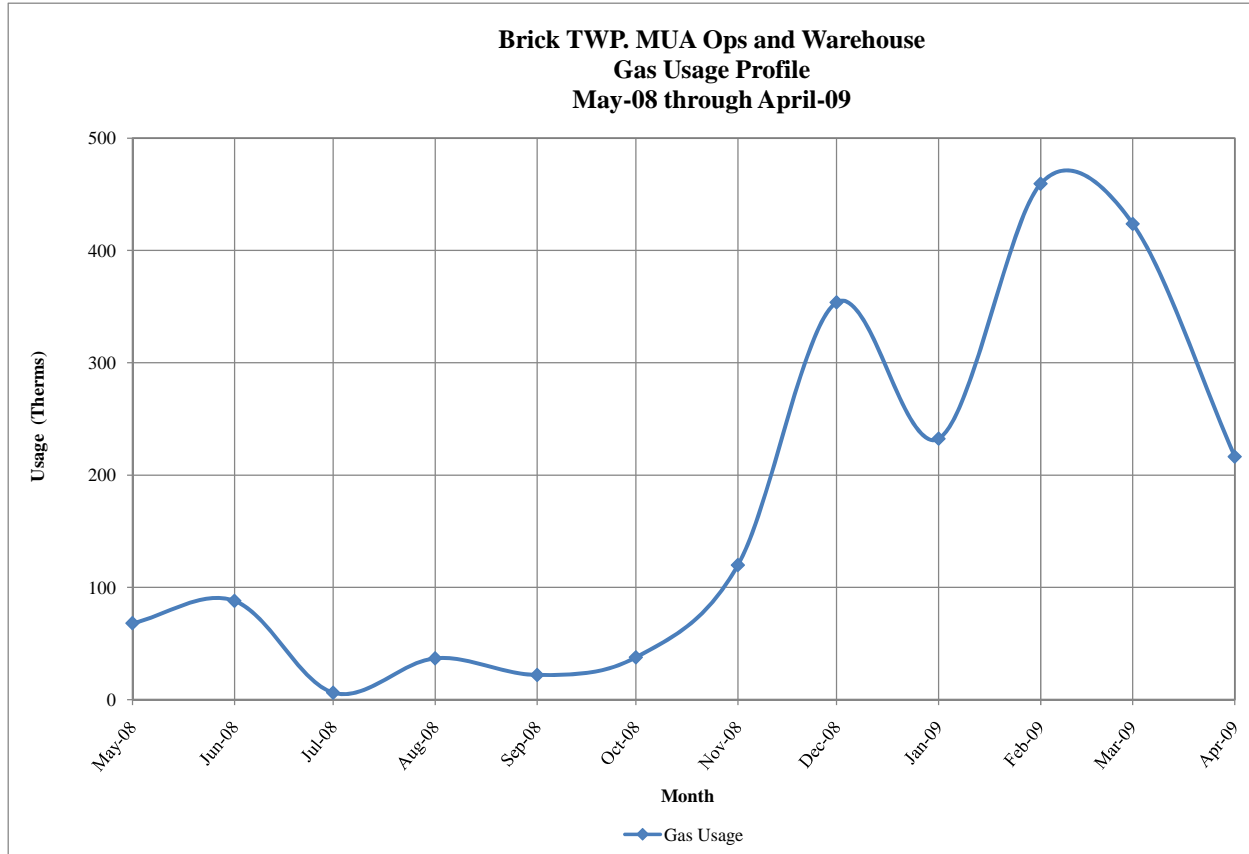
Figure 1
Electricity Usage Profile



**Table 4
Natural Gas Billing Data**

NATURAL GAS USAGE SUMMARY		
Utility Provider: New Jersey Natural Gas		
Rate: BGS		
Meter No: 589759		
Point of Delivery ID: 0		
Third Party Utility Provider:		
TPS Meter No:		
MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
May-08	68.22	\$110.40
Jun-08	88.14	\$145.16
Jul-08	6.32	\$24.20
Aug-08	36.93	\$68.33
Sep-08	22.10	\$46.95
Oct-08	37.85	\$74.06
Nov-08	119.96	\$213.43
Dec-08	353.92	\$586.82
Jan-09	232.51	\$367.61
Feb-09	459.58	\$656.32
Mar-09	423.83	\$594.14
Apr-09	216.49	\$338.43
TOTALS	2,065.85	\$3,225.85
AVERAGE RATE:	\$1.562	\$/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:

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

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

The site and source EUI cannot be accurately calculated for this building. There are nine (9) buildings on the campus electric meter and the individual buildings are not sub-metered. It would not be an accurate estimate to average the usage based on building square footage as this would improperly proportion the loading on the larger buildings like the Administration building where the pump stations would have the larger electrical loading. The proportioned square footages for the complex are as indicated in Table 5 below:

Table 5
Campus Building Areas

1551 Rt. 88 Campus		
BUILDING	AREA (SQFT)	% AREA
Administration Bldg.	16,128	0.277
Ops / Warehouse	10,802	0.186
Maintenance Garage	3,362	0.058
Generator Bldg	4,438	0.076
Base 1	1,850	0.032
Raw Water Pump Station	2,490	0.043
Pre-Treatment	4,080	0.070
Control	12,582	0.216
Finished Water Pump Station	2,424	0.042
Campus Total	58,156	1.000

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: bricktwpmua
 Password: lgeaceg2009
 Security Question: What city were you born in?
 Security Answer: Brick

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
Operations and Warehouse	N/A	50

A **Statement of Energy Performance** detailing energy summary cannot be provided for this campus facility. The electric service to this building is not separately metered and an accurate estimate cannot be made.

V. FACILITY DESCRIPTION

The Operations Warehouse was built in 1980. It is a steel framed building with metal panels and has a floor area of 7,167 square feet. There is a small enclosed office space (Coordinator's Office) within the Warehouse that contains double pane, aluminum framed windows. The roof of the Warehouse is pitched with batt insulation between the roof and steel. Based on information provided by the Owner, the Warehouse is occupied by one person for approximately 50 hours per week.

The Operations Building was built in 1995 as an addition to the Operations Warehouse. It is a one story structure directly adjacent to the Warehouse. The overall floor area of the building is 3,635 square feet. The walls are constructed with brick and block. The building has double pane thermal windows and a flat built up roof. Based on information provided by the owner, the building is occupied by two to five people for approximately 50 hours per week.

HVAC System

The Operation Warehouse is heated via one (1) gas-fired Reznor Infrared Heater located close to the main garage door entrance and three (3) Reznor Unit Heaters located throughout the Warehouse. The infrared heater has an input of 125 MBH. Each of the unit heaters have an input of 100 MBH and are approximately 80% efficient. Based on information gathered from the equipment nameplate, it appears all four (4) of the heaters were installed in 1999. The Coordinator's Office in the Warehouse is heated with a nine (9) foot long section of electric baseboard.

The main portion of the Operations Warehouse is not cooled. There is minimal ventilation provided by a wall mounted, propeller fan located in the mezzanine that is thermostatically controlled. The Coordinator's Office in the Warehouse is cooled with a General Electric through-the-wall air conditioning unit. The unit appears to be approximately 15-20 years old and has an estimated capacity of 12 MBH; nameplate data was unavailable.

The Operations Building is heated and cooled with four (4) Florida Heat Pump water source heat pump units; (3) units for conditioning (heating and cooling) and (1) unit for ventilation. There is a supplemental electric resistance heating coil in each heat pump that operates when loop temperatures are not within the specified parameters. The heat pump utilized for "ventilation" has been noted by the Owner to have issues with handling outside air temperatures below 30 degrees Fahrenheit. The heat pumps are approximately thirteen (13) years old and have an expected remaining life of seven (7) years based on 2007 ASHRAE Applications Handbook.

Domestic Hot Water System

The Operations Warehouse does not contain domestic hot water equipment.

The Operations Building receives domestic hot water via a natural gas-fired, Ruud Commercial hot water heater with a fractional horsepower bronze circulator pump by Bell and Gossett. The domestic hot water heater has a storage capacity of 91 gallons and an input of 300 MBH. The

hot water heater is approximately thirteen (13) years old and is nearing the end of its remaining useful life.

Controls

The unit heaters in the Operations Warehouse are manually switched on for 30 minute maximum intervals via timer-switches located outside the Coordinator's Office. The electric baseboard within the Coordinator's office is controlled by a standard, non-digital thermostat.

The Operations Building's HVAC systems are controlled via zone thermostats that are digital and programmable as manufactured by Honeywell. The thermostats are pre-programmed with occupied, unoccupied, continuous unoccupied and 3-hour occupied settings. There is only electronic control being utilized on the HVAC systems within the facility.

Lighting

The Operations Warehouse contains fixtures with four (4) foot and eight (8) foot T12 lamps. There are also two (2) 400 W high pressure sodium lamps in the Warehouse. The Coordinator's Office light fixtures contain four (4) foot T8 lamps. The building mounted, outdoor lighting fixtures are 100 W metal halide wall packs.

The Operations Building contains fixtures with four (4) foot and two (2) foot T8 lamps. The building mounted, outdoor lighting fixtures are 100 W metal halide wall packs.

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 – Operations Building

Description: General

The lighting in the Operations Building is primarily made up of fluorescent fixtures with T-8 lamps with electronic ballasts. The building mounted, outdoor lighting fixtures are 100 W metal halide wall packs. The Men's Room has an incandescent high hat fixture.

This ECM includes replacement of all incandescent lamps to compact fluorescent lamps. The energy usage of an incandescent compared to a compact fluorescent approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours.

Energy Savings Calculations:

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

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

From the Smart Start Incentive appendix, there is no incentive for replacing incandescent lamps with compact fluorescent lamps. The incentive is only available if the entire light fixture is replaced. In most cases, the existing fixtures can be re-lamped by the facility's staff to obtain the energy savings without the expense of a new fixture and the involvement of an electrician to install a new fixture.

Replacement and Maintenance Savings are calculated as follows:

$$\text{Savings} = (\text{reduction in lamps replaced per year}) \times (\text{replacment } \$ \text{ per lamp} + \text{Labor } \$ \text{ per lamp})$$

$$\text{Savings} = (1 \text{ lamp per year}) \times (\$2.00 + \$5.00) = \$7$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$7
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$7
Maintenance Savings (\$/Yr):	\$7
Energy Savings (\$/Yr):	\$220
Total Yearly Savings (\$/Yr):	\$227
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.0
Simple Lifetime ROI	50435.6%
Simple Lifetime Maintenance Savings	\$105
Simple Lifetime Savings	\$3,411
Internal Rate of Return (IRR)	3369%
Net Present Value (NPV)	\$2,708.06

* ECM#1 Calculations DO NOT include lighting control changes implemented in ECM#3. If ECM#1 and #3 are implemented together the savings will be relatively lower than shown above.

ECM #2: Lighting Upgrade – Operations Warehouse

Description: General

The Operations Warehouse is primarily made up of fluorescent fixtures with T-12 lamps and magnetic ballasts, T-8 lamps with electronic ballasts. There are two (2) 400 W high pressure sodium lamps in the Warehouse and the building mounted, outdoor lighting fixtures are 100 W metal halide wall packs.

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.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix – ECM#2** 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.

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

$$\text{Smart Start}^{\circledR} \text{ Incentive} = (52 \times \$ 25) - (2 \times \$ 30) = \$ 1,360$$

Replacement and Maintenance Savings are calculated as follows:

$$\text{Savings} = (\text{reduction in lamps replaced per year}) \times (\text{repackment } \$ \text{ per lamp} + \text{Labor } \$ \text{ per lamp})$$

$$\text{Savings} = (39 \text{ lamps per year}) \times (\$ 2.00 + \$ 5.00) = \$ 273.$$

From the Smart Start Incentive appendix, there is no incentive for replacing incandescent lamps with compact fluorescent lamps. The incentive is only available if the entire light fixture is replaced. In most cases, the existing fixtures can be re-lamped by the facility's staff to obtain the energy savings without the expense of a new fixture and the involvement of an electrician to install a new fixture.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$5,340
NJ Smart Start Equipment Incentive (\$):	\$1,360
Net Installation Cost (\$):	\$3,980
Maintenance Savings (\$/Yr):	\$273
Energy Savings (\$/Yr):	\$1,167
Total Yearly Savings (\$/Yr):	\$1,440
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.8
Simple Lifetime ROI	442.9%
Simple Lifetime Maintenance Savings	\$4,095
Simple Lifetime Savings	\$21,606
Internal Rate of Return (IRR)	36%
Net Present Value (NPV)	\$13,215.52

* ECM#2 Calculations DO NOT include lighting control changes implemented in ECM#4. If ECM#2 and #4 are implemented together the savings will be relatively lower than shown above.

ECM #3: Install Lighting Controls – Operations Building

Description:

In some areas the lighting is left on unnecessarily. There has been a belief that it is better to keep the lights on rather than to continuously switch them on and off. This on/off dilemma was studied, and it was determined that the best option is to turn the lights off whenever possible. Although this practice reduces the lamp life, the energy savings far outweigh the lamp replacement costs.

Lighting controls are available in many forms. Lighting controls can be as simplistic as an additional switch. Timeclocks are often used which allow the user to set an on/off schedule. Timeclocks range from a dial clock with on/off indicators to a small box the size of a thermostat with user programs for on/off schedule in digital format. 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 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 private offices, conference rooms, restrooms, lunch rooms, storage rooms, lounges, file rooms, etc.

Energy Savings Calculations:

From **Investment Grade Lighting Audit Appendix – ECM#3** of this report, we calculated the existing lighting usage, costs and the proposed costs of controls. An example calculation for the Tech room is below. The building is occupied 50 hours a week. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

Example Calculation (Tech Rm):

$$10\% \times 3 \text{ fixtures} \times 82 \text{ Watts / fixture} \times (52 \times 50) \text{ hrs/yr.} \times 1 \text{ kW} / 1000 \text{ W} = 63.96 \text{ kWh}$$

$$\text{Savings} = 63.96 \text{ kWh} \times \$0.142 \text{ Wh} = \$9.08 / \text{yr}$$

$$\text{Yearly Simple Payback} = \$160 / \$9.08 = 17.62 \text{ years}$$

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is \$160/unit including material and labor. The SmartStart Buildings® incentive is \$20 per control which equates to an installed cost of \$140/unit. Total number of rooms to be retrofitted is 15. Total cost to install sensors is \$140/ceiling unit x 158 units = \$2,100.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$2,240
NJ Smart Start Equipment Incentive (\$):	\$280
Net Installation Cost (\$):	\$1,960
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$146
Total Yearly Savings (\$/Yr):	\$146
Estimated ECM Lifetime (Yr):	15
Simple Payback	13.4
Simple Lifetime ROI	12.0%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$2,195
Internal Rate of Return (IRR)	1%
Net Present Value (NPV)	(\$212.88)

ECM #4: Install Lighting Controls – Operations Warehouse

Description:

In some areas the lighting is left on unnecessarily. There has been a belief that it is better to keep the lights on rather than to continuously switch them on and off. This on/off dilemma was studied, and it was determined that the best option is to turn the lights off whenever possible. Although this practice reduces the lamp life, the energy savings far outweigh the lamp replacement costs.

Lighting controls are available in many forms. Lighting controls can be as simplistic as an additional switch. Timeclocks are often used which allow the user to set an on/off schedule. Timeclocks range from a dial clock with on/off indicators to a small box the size of a thermostat with user programs for on/off schedule in digital format. 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 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 private offices, conference rooms, restrooms, lunch rooms, storage rooms, lounges, file rooms, etc.

Energy Savings Calculations:

From **Investment Grade Lighting Audit Appendix – ECM#4** of this report, we calculated the existing lighting usage, costs and the proposed costs of controls. An example calculation for the Tech room is below. The building is occupied 50 hours a week. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

Example Calculation (Office):

$$10\% \times 2 \text{ fixtures} \times 109 \text{ Watts} / \text{fixture} \times (52 \times 50) \text{ hrs/yr.} \times 1\text{kW}/1000\text{W} = 56.68 \text{ kWh}$$

$$\text{Savings} = 56.68 \text{ kWh} \times \$0.142/\text{kWh} = \$8.05 / \text{yr}$$

$$\text{Yearly Simple Payback} = \$160 / \$8.05 = 19.9 \text{ years}$$

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is \$160/unit including material and labor. The SmartStart Buildings® incentive is \$20 per control which equates to an installed cost of \$140/unit. Total number of rooms to be retrofitted is 15. Total cost to install sensors is \$140/ceiling unit x 9 units = \$1,260.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$1,280
NJ Smart Start Equipment Incentive (\$):	\$160
Net Installation Cost (\$):	\$1,120
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$263
Total Yearly Savings (\$/Yr):	\$263
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.3
Simple Lifetime ROI	252.6%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$3,949
Internal Rate of Return (IRR)	22%
Net Present Value (NPV)	\$2,022.54

ECM #5: Domestic Water Heater Replacement

Description:

The domestic hot water for the building is provided by one (1) Rudd Commercial domestic water heater located in the storage room. The water heater has a natural gas input of 300 MBH, and a storage capacity of 91 gallons with recovery at 280 gallons per hour and has an 80% thermal efficiency.

This energy conservation measure will replace the existing water heater with a commercial grade 96% thermal efficient Bradford White model EF-100T-300E-3NA gas fired domestic hot water heater having 300 MBH input and 100-gallon storage capacity or equivalent.

Energy Savings Calculations:

Existing Natural Gas DW Heater

Rated Capacity = 300 MBH input; 91 gallons storage

Combustion Efficiency = 80%

Age & Radiation Losses = 5%

Thermal Efficiency = 75%

Proposed Natural Gas-Fired, High-Efficiency DW Heater

Rated Capacity = 300 MBH input; 100 gallons storage

Thermal Efficiency = 96%

Radiation Losses = 0.5%

Net Efficiency = 95.5%

NATURAL GAS EQUIPMENT LIST - Estimated Annual Usage Per Unit										
Concord Engineering Group										
"Operations Warehouse and Operations Office Building"										
EQUIPT TAG	LOCATION	AREA SERVED	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	HEATING DATA		% OF Connected load	Estimated Annual Therms	
						FUEL	INPUT (MBH)			
DWH	Office Building Storage Room	Office Building	Rudd Commercial	RFD91-300A	0396G01104	Nat. Gas	300	0.41	854.8	
Unit Heater	Warehouse Attic Mezzanine	Warehouse	Reznor	B100-3	A9C31K5H04173	Gas Htx	100	0.14	284.9	
Unit Heater	Warehouse; Below Attic Mezzanine	Warehouse	Reznor	B100-3	A9C31K5N04172	Gas Htx	100	0.14	284.9	
Unit Heater	Warehouse; Below Attic Mezzanine	Warehouse	Reznor	B100-3	A9C31K5N04174	Gas Htx	100	0.14	284.9	
Infrared Heater	Warehouse	Warehouse	Reznor	TR125	AYB66M4N37697X	Gas-Tube Htx	125	0.17	356.2	
							Total	725	1	-
							Facility Total	2065.85	-	2065.85

Operating Data for Domestic Water Heater

$$\text{Estimated Consumption} = \frac{300 \text{ MBH input}}{725 \text{ MBH bldginput}} \times 2,065.85 \text{ Therms/year} = 854.8 \text{ Therms/year}$$

Energy Savings = Old Water Heater Energy Input x ((New Water Heater Efficiency – Old Water Heater) / New Water Heater Efficiency)

$$\text{Energy Savings} = 854.8 \text{ Therms} \times \frac{(95.5\% - 75\%)}{(95.5\%)} = 183.5 \text{ Therms}$$

Average Cost of Natural Gas = \$1.562/Therm

Yearly Savings = 183.5 Therm x \$1.562/ Therm = \$287/year

Cost of one (1) Commercial Domestic ASME Water Heater and Installation = \$16,540

Simple Payback = \$16,540 / \$287 = 57.6 years

Smart Start Incentive = \$2.00/MBh /installed MBh x (300 MBh) = \$600.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$16,540
NJ Smart Start Equipment Incentive (\$):	\$600
Net Installation Cost (\$):	\$15,940
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$287
Total Yearly Savings (\$/Yr):	\$287
Estimated ECM Lifetime (Yr):	12
Simple Payback	55.5
Simple Lifetime ROI	-78.4%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$3,444
Internal Rate of Return (IRR)	-18%
Net Present Value (NPV)	(\$13,083.20)

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 2285 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 32.2 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 36,676 KWh annually, reducing the overall utility bill by approximately 0.5% 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	16.1 Years	6.2%	3.74%

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

The resultant Internal Rate of Return indicates that if the Owner was able to “direct purchase” the solar project, the project would be slightly more beneficial to the Owner.

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:

This facility was built in 1980. The Operations Building was built in 1995 as an addition to the Operations Warehouse. Based on information provided by the owner, the building is occupied by two to five people for approximately 50 hours per week.

The Electric Usage Profile demonstrates a fairly typical load shape throughout the year. The profile is said to be typical in that the winter consumption consistently drops off. The winter (October – March) is flat and is elevated, still demonstrating a good consumption level. The summer (May – September) demonstrates a consistent hump, that is consistent with a cooling (air conditioner) load. The main portion of the Operations Warehouse is not cooled. The Operations Building is cooled by (4) four Florida Heat Pump water source heat pumps, (3) three units for conditioning (heating and cooling) and (1) one, unit for ventilation. This facility is supplied electricity by Jersey Central Power and Light (JCP&L). The Delivery service is provided by JCP&L on a GSS 3-phase tariff on all electric accounts. All electric accounts are served electric Commodity service by JCP&L, except the Water Treatment Plant which is served via Con – Ed Solutions a Third Party Supplier. A flatter load profile will allow for more competitive energy prices when shopping for alternative energy suppliers.

Natural Gas:

The Natural Gas Usage Profile demonstrates a fairly typical heating load profile. An increase in consumption is observed November through March during the standard heating season. Heating in the Operations Warehouse is supplied via one (1) gas-fired Reznor Infrared Heater and three (3) Reznor Unit Heaters located throughout the Warehouse. The Operations Warehouse does not have domestic hot water service. The Operations Building is supplied domestic hot water via a natural gas-fired Ruud Commercial hot water heater. This facility receives its natural gas Delivery and Commodity service from New Jersey Natural (NJN) on a GSS and BGS rate schedule.

Tariff:Electricity:

This facility receives electrical Delivery service through Jersey Central Power & Light (JCP&L) on a GSS (General Service Secondary – 3 Phase) rate. Service classification GS 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 a Third Party Supplier (TPS), Con-Ed Solutions and from the utility JCP&L. This facility uses the Delivery Service of the utility (JCP&L). The Delivery Service includes the following charges: Customer Charge, Supplemental Customer Charge, Distribution Charge (kW Demand), kWh Charge, Non-utility Generation Charge, TEFA, SBC, SCC, Standby Fee and RGGI.

Natural Gas:

This facility receives utility Delivery and Commodity service from New Jersey Natural Gas Company (NJN) on a GSS (General Service Small) utility rate classification. This service is available to any customer in the entire territory served by the Company who uses less than 5,000 therms annually and uses gas for all purposes other than residential service and interruptible service. Where the customer uses the Air Conditioning and Pool Heating serviced ("CAC"), the company will upon application by the customer, meter the space heating and CAC use separately. Street lighting service will also be applied under this rate schedule. The monthly fees associated with this rate schedule are as follows: Customer Charge, Delivery Charge, BGSS Charge and Balancing Charges.

This service is a "firm" character of service, where the customer may either purchase gas supply from the Company's Rider "A" for Basic Gas Supply Service ("BGSS") or from a Marketer or Broker. This facility purchases its natural gas Commodity service from NJN's Basic Gas Supply Service.

"Firm" delivery service defines the reliability of the transportation segment of the pricing. Much like the telecom industry, natural gas pipelines were un-bundled in the late 1990's and the space was divided up and marketed into reliability of service. Firm Service is said to be the most reliable and last in the pecking order for interruption. This service should not be interrupted. Commodity Charges: Customer may choose to receive gas supply from either: A TPS or from JCP&L through its Basic Gas Supply Service default service. JCP&L may also supply Emergency Sales Service in certain instances. This is at a much higher than normal rate. It should be perceived as a penalty.

Please see CEG recommendations below.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities. Potential savings can be seen equally in the electric costs and the natural gas costs. The average price per kWh (kilowatt hour) for The Brick MUA based on a historical 1-year weighted average fixed “price to-compare” from a weighted average of the Third Party Supplier (TPS) Con-Ed Solutions and the utility JCP&L (Jersey Central Power & Light), is .09952 / kWh. *Note: The prices are weighted in an effort to average the rates in order to obtain the most accurate supplied rate. The Third Party Supplier –Con Ed Solutions supplies the Water Treatment Plant but not the other accounts. The Water Treatment Plant is also on a General Service-Primary (GS-P) rate, while the others are on a General Service –Secondary (3-phase) rate classification. The GSP rate is historically a lower delivered rate in that it is delivered at higher voltages, like HTS – (High Tension Service). It is possible that there would be a greater improvement in prices if the GS-P account were identified by itself.*

The fixed weighted average ‘price-to-compare’ per decatherm for natural gas service provided by the utility (New Jersey Natural-NJN), is approximately \$10.78 / Dth (dekatherm is the common unit of measure).

The “price to compare” is the netted cost of the energy (including other costs), that the customer will use to compare to other market driven prices offered by Third Party Supply sources when shopping for alternative suppliers. For electricity this cost would not include the utility transmission and distribution charges. For natural gas the cost would not include the utility distribution charges and is said to be delivered to the utilities city-gate.

Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. The MUA could see improvement in its energy costs if it were to take advantage of these current market prices quickly, before energy prices increase. Based on electric supply from JCP&L and utilizing the historical consumption data provided (May 2008 through April 2009) and current electric rates, Brick could see an improvement in its electric costs of up to 20 % 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”. While CEG recommends an RFP process to vet out the best possible prices, CEG further recommends that Brick utilize an energy advisor when creating such a program. CEG would recommend splitting the pricing by utility tariff rates, as to see the best price for the GS-P rate class as compared to the other rate classifications.

CEG’s second recommendation coincides with the natural gas costs. Based on current supply rates, CEG feels that there could be an improvement of up to 26 % or up to \$13,000 annually in its natural gas costs. CEG recommends the school receive further advisement on these prices through an energy advisor. They should also consider procuring energy (natural gas) through an alternative supply source on a “managed approach”.

CEG also recommends scheduling 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 county 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 Brick MUA 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 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.
- iv. *Pay For Performance* – *The New Jersey Smart Start Pay for Performance program includes incentives based on savings resulted from implemented ECMs. The program is available for all buildings with average demand loads above 200 KW. The facility’s participation in the program is assisted by an approved program partner. An “Energy Reduction Plan” is created with the facility and approved partner to show at least 15% reduction in the building’s current energy use. Multiple energy conservation measures implemented together are applicable toward the total savings of at least 15%. No more than 50% of the total energy savings can result from lighting upgrades / changes.*

Total incentive is capped at 50% of the project cost. The program savings is broken down into three benchmarks; Energy Reduction Plan, Project

Implementation, and Measurement and Verification. Each step provides additional incentives as the energy reduction project continues. The benchmark incentives are as follows:

- 1. Energy Reduction Plan – Upon completion of an energy reduction plan by an approved program partner, the incentive will grant \$0.10 per square foot between \$5,000 and \$50,000, and not to exceed 50% of the facility’s annual energy expense. (Benchmark #1 is not provided in addition to the local government energy audit program incentive.)*
- 2. Project Implementation – Upon installation of the recommended measures along with the “Substantial Completion Construction Report,” the incentive will grant savings per KWH or Therm based on the program’s rates. Minimum saving must be 15%. (Example \$0.11 / kWh for 15% savings, \$0.12/ kWh for 17% savings, ... and \$1.10 / Therm for 15% savings, \$1.20 / Therm for 17% saving, ...) Increased incentives result from projected savings above 15%.*
- 3. Measurement and Verification – Upon verification 12 months after implementation of all recommended measures, that actual savings have been achieved, based on a completed verification report, the incentive will grant additional savings per kWh or Therm based on the program’s rates. Minimum savings must be 15%. (Example \$0.07 / kWh for 15% savings, \$0.08/ kWh for 17% savings, ... and \$0.70 / Therm for 15% savings, \$0.80 / Therm for 17% saving, ...) Increased incentives result from verified savings above 15%.*

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.
- E. Confirm that outside air economizers on the rooftop units are functioning properly to take advantage of free cooling and avoid excess outside air during occupied periods.

ECM COST & SAVINGS BREAKDOWN
CONCORD ENGINEERING GROUP

Brick Township Operations warehouse/ Building

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. / SREC (\$/Yr)							
ECM #1	Lighting Upgrade - Operations Building	\$7	\$0	\$0	\$7	\$220	\$7	\$227	\$5,411	\$105	50435.6%	0.0	3.66904%	\$2,708.06
ECM #2	Lighting Upgrade - Operations Warehouse	\$5,340	\$0	\$1,360	\$3,980	\$1,167	\$273	\$1,440	\$21,606	\$4,095	442.9%	2.8	35.82%	\$13,215.52
ECM #3	Lighting Controls - Operations Building	\$2,240	\$0	\$280	\$1,960	\$146	\$0	\$146	\$2,195	\$0	12.0%	13.4	1.45%	(\$212.88)
ECM #4	Lighting Controls - Operations Warehouse	\$1,280	\$0	\$160	\$1,120	\$263	\$0	\$263	\$3,949	\$0	252.6%	4.3	22.37%	\$2,022.54
ECM #5	Domestic Water Heater Replacement	\$16,540	\$0	\$600	\$15,940	\$387	\$0	\$387	\$5,444	\$0	-78.4%	55.5	-18.17%	(\$13,083.20)
RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY														
REM #1	32.2 KW PV SOLAR SYSTEM	\$289,800	\$0	\$0	\$289,800	\$5,208	\$12,837	\$18,045	\$451,125	\$320,925	55.7%	16.1	3.74%	\$24,470.25

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	
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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

Operations / Warehouse

Building ID: 1949751
For 12-month Period Ending: April 30, 2009¹
Date SEP becomes ineligible: N/A

Date SEP Generated: December 08, 2009

Facility
Operations / Warehouse
1551 Highway 88 West
Brick Township, NJ 08724

Facility Owner
Brick Utilities
1551 Highway 88 West
Brick Township, NJ 08724

Primary Contact for this Facility
Jay Delaney
1551 Highway 88 West
Brick Township, NJ 08724

Year Built: 1980
Gross Floor Area (ft²): 10,802

Energy Performance Rating² (1-100) N/A

Site Energy Use Summary³

Natural Gas (kBtu) ⁴	206,585
Electricity - (kBtu)	0
Total Energy (kBtu)	206,585

Energy Intensity⁵

Site (kBtu/ft ² /yr)	19
Source (kBtu/ft ² /yr)	20

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	11
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Electric Distribution Utility

FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	-91%
Building Type	Other

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 Road
Voorhees, NJ 08043

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	Operations / Warehouse	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		<input type="checkbox"/>
Type	Other	Is this an accurate description of the space in question?		<input type="checkbox"/>
Location	1551 Highway 88 West, Brick Township, NJ 08724	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"/>
Operations/Warehouse Natural Gas (Other)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	<input checked="" type="checkbox"/>
Gross Floor Area	10,802 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.		<input type="checkbox"/>
Number of PCs	8 (Optional)	Is this the number of personal computers in the space?		<input type="checkbox"/>
Weekly operating hours	50 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		<input type="checkbox"/>
Workers on Main Shift	2 (Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		<input type="checkbox"/>

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Natural Gas		
Meter: Operations/Warehouse Natural Gas (therms) Space(s): Operations/Warehouse Natural Gas		
Start Date	End Date	Energy Use (therms)
04/01/2009	04/30/2009	216.49
03/01/2009	03/31/2009	423.83
02/01/2009	02/28/2009	459.58
01/01/2009	01/31/2009	232.51
12/01/2008	12/31/2008	353.92
11/01/2008	11/30/2008	119.96
10/01/2008	10/31/2008	37.85
09/01/2008	09/30/2008	22.10
08/01/2008	08/31/2008	36.93
07/01/2008	07/31/2008	6.32
06/01/2008	06/30/2008	88.14
05/01/2008	05/31/2008	68.22
Operations/Warehouse Natural Gas Consumption (therms)		2,065.85
Operations/Warehouse Natural Gas Consumption (kBtu (thousand Btu))		206,585.00
Total Natural Gas Consumption (kBtu (thousand Btu))		206,585.00
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

Operations / Warehouse
1551 Highway 88 West
Brick Township, NJ 08724

Facility Owner

Brick Utilities
1551 Highway 88 West
Brick Township, NJ 08724

Primary Contact for this Facility

Jay Delaney
1551 Highway 88 West
Brick Township, NJ 08724

General Information

Operations / Warehouse	
Gross Floor Area Excluding Parking: (ft ²)	10,802
Year Built	1980
For 12-month Evaluation Period Ending Date:	April 30, 2009

Facility Space Use Summary

Operations/Warehouse Natural Gas	
Space Type	Other - Other
Gross Floor Area(ft ²)	10,802
Number of PCs ^o	8
Weekly operating hours ^o	50
Workers on Main Shift ^o	2

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 04/30/2009)	Baseline (Ending Date 04/30/2009)	Rating of 75	Target	National Average
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft ²)	19	19	0	N/A	104
Source (kBtu/ft ²)	20	20	0	N/A	213
Energy Cost					
\$/year	\$ 3,225.85	\$ 3,225.85	N/A	N/A	\$ 17,546.46
\$/ft ² /year	\$ 0.30	\$ 0.30	N/A	N/A	\$ 1.63
Greenhouse Gas Emissions					
MtCO ₂ e/year	11	11	0	N/A	60
kgCO ₂ e/ft ² /year	1	1	0	N/A	5

More than 50% of your building is defined as Other. This building is currently ineligible for a rating. Please note the National Average column represents the CBECS national average data for Other. This building uses X% less energy per square foot than the CBECS national average for Other.

Notes:

o - This attribute is optional.

d - A default value has been supplied by Portfolio Manager.

MAJOR EQUIPMENT LIST
Concord Engineering Group
"Operations Warehouse and Operations Office Building"

EQUIP TAG	LOCATION	AREA SERVED	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	ELECTRICAL DATA			HEATING DATA			SERVICE LIFE			REMARKS			
						VPH/Hz	FLA	MCA	MOP	FUEL	INPT (MBH)	REMARKER (GALL)	CAPACITY (GALL)	EFF. (%)		APPROX AGE	ASRAE SERVICE LIFE	REMAINING LIFE
-	Office Building Storage Room	Office Building	Road Commercial	BDP91-30A	05WGD104	115/160	0.3	-	15	Nat Gas	300	-	91	-	13	12	(1)	

Unit Heaters and Infrared Heaters (Gas-Fired)

EQUIP TAG	LOCATION	AREA SERVED	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	ELECTRICAL DATA			HEATING DATA			SERVICE LIFE			REMARKS			
						VPH/Hz	FLA	MCA	MOP	TYPE	INPT (MBH)	OUTPUT (MBH)	EFF. (%)	FUEL		APPROX AGE	ASRAE SERVICE LIFE	REMAINING LIFE
Unit Heater	Warehouse - A1c	Warehouse	Reznor	B100-3	ASC3JKSN04173	115/160	-	7	15	Gas/Hrs	100	80	80%	Natural Gas	10	13	3	
Unit Heater	Warehouse - A1c	Warehouse	Reznor	B100-3	ASC3JKSN04172	115/160	-	7	15	Gas/Hrs	100	80	80%	Natural Gas	10	13	3	
Unit Heater	Warehouse - A1c	Warehouse	Reznor	B100-3	ASC3JKSN04174	115/160	-	7	15	Gas/Hrs	100	80	80%	Natural Gas	10	13	3	
Infrared Heater	Warehouse	Warehouse	Reznor	TR125	ATB0604N37977X	115/160	-	1	15	Gas-Tube/Hrs	125	-	-	Natural Gas	10	13	3	

Heat Pumps

EQUIP TAG	LOCATION	AREA SERVED	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	ELECTRICAL DATA			COOLING DATA			HEATING DATA			SERVICE LIFE		REMARKS		
						VPH/Hz	FLA	MCA	MOP	REFRIGERANT	CAPACITY (TONS)	EFF.(EER)	OUTPUT (MBH)	INPT (MBH)	EFF.(COP)	APPROX AGE		ASRAE SERVICE LIFE	REMAINING LIFE
HP-1	Office Building - Above Ceiling	Meeting Room	Frieda Heat Pump	SL106-4HZC	CH08266	400/500	-	9.1	15	R-22	3.3	12.9	Heat Pump	-	29	3.0	19	6	*Performance Information Estimated; Etc. A/c Coil
HP-2	Office Building - Above Ceiling	Reg. Sec. Office	Frieda Heat Pump	SL106-4HZC	CH08267	400/500	-	10.7	15	R-22	3.9	12.2	Heat Pump	-	36	3.0	19	6	*Performance Information Estimated; Etc. A/c Coil
HP-3	Office Building - Above Ceiling	Lockers	Frieda Heat Pump	SL106-4HZC	CH08268	400/500	-	5.9	15	R-22	2.6	12.1	Heat Pump	-	22	3.0	19	6	*Performance Information Estimated; Etc. A/c Coil
HP-4 (AMU-1)	Office Building - Above Ceiling	Ventilation	Frieda Heat Pump	SL106-4HZC	CH08269	400/500	-	5.9	15	R-22	2.6	12.1	Heat Pump	-	22	3.0	19	6	*Performance Information Estimated; Etc. A/c Coil

CEG Job #: 9C09064
 Project: Brick Township M.U.A.
 Address: 1551 Highway 88 West
 Brick NJ 08724
 Building SF: 3,635

"Operations Building"

KWH COST: \$0.142

ECM #1: Lighting Upgrade - Operations Building

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	Wats Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback		
	Receptionist	2600	6	4	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	109	0.65	1,700.4	\$241.46	6	4	No Change Required (N.C.R.)	109	0.65	1700.4	\$241.46	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
	Vest	2600	1	4	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	109	0.11	283.4	\$40.24	1	4	N.C.R.	109	0.11	283.4	\$40.24	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
	Closet Server	2600	1	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.08	213.2	\$30.27	1	3	N.C.R.	82	0.08	213.2	\$30.27	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
	Tech Rm	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	N.C.R.	82	0.25	639.6	\$90.82	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
	Metering Super	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	N.C.R.	82	0.25	639.6	\$90.82	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
	Mens Toilet	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	N.C.R.	82	0.25	639.6	\$90.82	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
		2600	1	1	Inc 60W High Hat	60	0.06	156.0	\$22.15	1	1	13W CFL Lamp Replacement	13	0.01	33.8	\$4.80	\$6.75	\$6.75	0.05	122.2	\$17.35	0.39		
	Locker	2600	4	3	2x2 T8 17W, Electronic Ballast, Recessed Mounting, Prismatic Lens	47	0.19	488.8	\$69.41	4	3	N.C.R.	47	0.19	488.8	\$69.41	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
	Dist Super	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	N.C.R.	82	0.25	639.6	\$90.82	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
	Foreman	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	N.C.R.	82	0.25	639.6	\$90.82	\$0.00	\$0.00	0.00	0	\$0.00	0.00		

Meeting Rm	2600	7	3	2x2 T8 17W, Electronic Ballast, Recessed Mounting, Prismatic Lens	47	0.33	855.4	\$121.47	7	3	N.C.R.	47	0.33	855.4	\$121.47	\$0.00	0.00	0	\$0.00	0.00
Launch Rm	2600	6	3	2x2 T8 17W, Electronic Ballast, Recessed Mounting, Prismatic Lens	47	0.28	733.2	\$104.11	6	3	N.C.R.	47	0.28	733.2	\$104.11	\$0.00	0.00	0	\$0.00	0.00
Corridor	2600	9	3	2x2 T8 17W, Electronic Ballast, Recessed Mounting, Prismatic Lens	47	0.42	1,099.8	\$156.17	9	3	N.C.R.	47	0.42	1,099.8	\$156.17	\$0.00	0.00	0	\$0.00	0.00
Washdown Rm	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	N.C.R.	82	0.25	639.6	\$90.82	\$0.00	0.00	0	\$0.00	0.00
Ice Rm	2600	1	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.08	213.2	\$30.27	1	3	N.C.R.	82	0.08	213.2	\$30.27	\$0.00	0.00	0	\$0.00	0.00
Jan Closet	2600	1	2	1x4 T8 32W, Electronic Ballast, Surface Mounting, No Lens	58	0.06	150.8	\$21.41	1	2	N.C.R.	58	0.06	150.8	\$21.41	\$0.00	0.00	0	\$0.00	0.00
Electric Rm	2600	1	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.08	213.2	\$30.27	1	3	N.C.R.	82	0.08	213.2	\$30.27	\$0.00	0.00	0	\$0.00	0.00
Rear Vest	2600	1	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.08	213.2	\$30.27	1	3	N.C.R.	82	0.08	213.2	\$30.27	\$0.00	0.00	0	\$0.00	0.00
W Rm	2600	2	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.16	426.4	\$60.55	2	3	N.C.R.	82	0.16	426.4	\$60.55	\$0.00	0.00	0	\$0.00	0.00
	2600	1	3	2x2 T8 14W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.08	213.2	\$30.27	1	3	N.C.R.	82	0.08	213.2	\$30.27	\$0.00	0.00	0	\$0.00	0.00
Outside Lights	2600	5	1	100W Metal Halide	110	0.55	1,430.0	\$203.06	5	1	N.C.R.	0	0.00	0	\$0.00	\$0.00	0.55	1430	\$203.06	0.00
Totals		68	63			4.95	12,867.4	\$1,827.17	68	63			4.352	113,152	\$1,606.76	\$6.75	0.60	1552.2	\$220.41	0.03

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

CEG Job #: 9C09064
 Project: Brick Township M.U.A.
 Address: 1551 Highway 88 West
 Brick NJ 08724
 Building SF: 7,167

"Operations Warehouse"

KWH COST: \$0.142

ECM #2: Lighting Upgrade - Operations Warehouse

EXISTING LIGHTING										PROPOSED LIGHTING										SAVINGS				
CEG Type	Fixture Location	Yearly Usage	No. Fixtures	No. Lamps	Fixture Type	Fixt Wats	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixtures	No. Lamps	Retro-Unit Description	Wats Used	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback		
	Office	2600	2	4	1x4 T8 32W, Electronic Ballast, Surface Mounting, Prismatic Lens	109	0.22	566.8	\$80.49	2	4	No Change Required (N.C.R.)	109	0.22	566.8	\$80.49	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
	Warehouse	2600	2	1	High Pressure Sodium, 400W	464	0.93	2,412.8	\$342.62	2	6	2'X4' 32W T-8 High Bay Fixture Reflector/Elect Ballast; Metalux 2HB Series or equal	169	0.34	878.8	\$124.79	\$550.00	\$1,100.00	0.59	1534	\$217.83	5.05		
		2600	3	2	8' T12 96W, Magnetic Ballast, Pendant Mounting, No Lens	222	0.67	1,731.6	\$245.89	6	2	4' 32W T-8 Electronic Ballast; Metalux or equal	55	0.33	858	\$121.84	\$100.00	\$600.00	0.34	873.6	\$124.05	4.84		
		2600	8	2	8' T12 96W, Magnetic Ballast, Surface Mounting, No Lens	222	1.78	4,617.6	\$655.70	16	2	4' 32W T-8 Electronic Ballast; Metalux or equal	55	0.88	2288	\$324.90	\$100.00	\$1,600.00	0.90	2329.6	\$330.80	4.84		
	Storage Rooms	2600	1	4	1x4 T12 34W, Magnetic Ballast, Surface Mounting, Prismatic Lens	160	0.16	416.0	\$59.07	1	3	4' 32W T-8 Electronic Ballast; Metalux or equal	81	0.08	210.6	\$29.91	\$120.00	\$120.00	0.08	205.4	\$29.17	4.11		
		2600	8	2	1x4 T12 34W, Magnetic Ballast, Surface Mounting, No Lens	80	0.64	1,664.0	\$236.29	8	2	4' 32W T-8 Electronic Ballast; Metalux or equal	55	0.44	1144	\$162.45	\$0.00	\$0.00	0.20	520	\$73.84	0.00		
	Inventory	2600	2	2	1x4 T12 34W, Magnetic Ballast, Surface Mounting, Prismatic Lens	80	0.16	416.0	\$59.07	2	2	4' 32W T-8 Electronic Ballast; Metalux or equal	55	0.11	286	\$40.61	\$0.00	\$0.00	0.05	130	\$18.46	0.00		
		2600	7	2	8' T12 96W, Magnetic Ballast, Surface Mounting, Prismatic Lens	222	1.55	4,040.4	\$573.74	14	2	4' 32W T-8 Electronic Ballast; Metalux or equal	55	0.77	2002	\$284.28	\$100.00	\$1,400.00	0.78	2038.4	\$289.45	4.84		
	Storage	2600	2	2	1x4 T12 34W, Magnetic Ballast, Pendant Mounting, No Lens	80	0.16	416.0	\$59.07	2	2	4' 32W T-8 Electronic Ballast; Metalux or equal	55	0.11	286	\$40.61	\$100.00	\$200.00	0.05	130	\$18.46	10.83		
		2600	1	2	8' T12 96W, Magnetic Ballast, Surface Mounting, No Lens	222	0.22	577.2	\$81.96	2	2	4' 32W T-8 Electronic Ballast; Metalux or equal	55	0.11	286	\$40.61	\$100.00	\$200.00	0.11	291.2	\$41.35	4.84		
	Storage Closet	2600	1	4	1x4 T12 34W, Magnetic Ballast, No Lens	146	0.15	379.6	\$53.90	1	3	4' 32W T-8 Electronic Ballast; Metalux or equal	81	0.08	210.6	\$29.91	\$120.00	\$120.00	0.07	169	\$24.00	5.00		
		2600	4	1	Metal Halide 100W, Well Pack	125	0.50	1,300.0	\$184.60	4	1	N.C.R.	125	0.50	1300	\$184.60	\$0.00	\$0.00	0.00	0	\$0.00	0.00		
	Totals		41	28			7.13	18,538.0	\$2,632.40	60	31			3.988	10316.8	\$1,464.99		\$5,340.00	3.16	8221.2	\$1,167.41	4.57		

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

CEG Job #: 9C09064
 Project: Brick Township M.U.A.
 Address: 1551 Highway 88 West
 Brick NJ 08724
 Building SF: 3,635

"Operations Building"

KWH COST \$0.142

ECM #3: Lighting Controls - Operations Building

CEG Type	EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS										SAVINGS				
	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly \$ Cost	No. Fixts	No. Lamps	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (UNSTALLED)	Total Cost	kWh Yr Savings	kW Savings	Yearly \$ Savings	Yearly Simple Payback		
	Receptionist	2600	6	4	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	109	0.65	1,700.4	\$241.46	6	4	None	109	0.65	0%	1700.4	\$241.46	\$0.00	\$0.00	0	0.00	\$0.00	0.00		
	Vest	2600	1	4	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	109	0.11	283.4	\$40.24	1	4	None	109	0.11	0%	283.4	\$40.24	\$0.00	\$0.00	0	0.00	\$0.00	0.00		
	Closet Server	2600	1	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.08	213.2	\$30.27	1	3	None	82	0.08	0%	213.2	\$30.27	\$0.00	\$0.00	0	0.00	\$0.00	0.00		
	Tech Rm	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	Dual Technology Occupancy Sensor	82	0.25	10%	575.64	\$81.74	\$160.00	\$160.00	63.96	0.00	\$9.08	17.62		
	Metering Super	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	Dual Technology Occupancy Sensor	82	0.25	10%	575.64	\$81.74	\$160.00	\$160.00	63.96	0.00	\$9.08	17.62		
	Mens Toilet	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	Dual Technology Occupancy Sensor	82	0.25	10%	575.64	\$81.74	\$160.00	\$160.00	63.96	0.00	\$9.08	7.85		
	Locker	2600	4	3	2x2 T8 17W, Electronic Ballast, Recessed Mounting, Prismatic Lens	47	0.19	488.8	\$69.41	4	3	Dual Technology Occupancy Sensor	47	0.19	10%	439.92	\$62.47	\$160.00	\$160.00	48.88	0.00	\$6.94	23.05		
	Dist Super	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	Dual Technology Occupancy Sensor	82	0.25	10%	575.64	\$81.74	\$160.00	\$160.00	63.96	0.00	\$9.08	17.62		
	Foreman	2600	3	3	2x4 T8 32W, Electronic Ballast, Recessed Mounting, Prismatic Lens	82	0.25	639.6	\$90.82	3	3	Dual Technology Occupancy Sensor	82	0.25	10%	575.64	\$81.74	\$160.00	\$160.00	63.96	0.00	\$9.08	17.62		
	Meeting Rm	2600	7	3	2x2 T8 17W, Electronic Ballast, Recessed Mounting, Prismatic Lens	47	0.33	855.4	\$121.47	7	3	Dual Technology Occupancy Sensor	47	0.33	10%	769.86	\$109.32	\$160.00	\$160.00	85.54	0.00	\$12.15	13.17		
	Lunch Rm	2600	6	3	2x2 T8 17W, Electronic Ballast, Recessed Mounting, Prismatic Lens	47	0.28	733.2	\$104.11	6	3	Dual Technology Occupancy Sensor	47	0.28	10%	659.88	\$93.70	\$160.00	\$160.00	73.32	0.00	\$10.41	15.37		

Corridor	2600	9	3	2x2 T8 17W, Electronic Ballast, Recessed Mounting, Prismatic Lens	47	0.42	1,099.8	\$156.17	9	3	Dual Technology Occupancy Sensor	47	0.42	10%	989.82	\$140.55	\$160.00	\$160.00	0.00	109.98	\$15.62	10.25
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Washdown Rm	2600	3	3	2600	3	3	82	0.25	639.6	\$90.82	3	3	Dual Technology Occupancy Sensor	82	0.25	10%	575.64	\$81.74	\$160.00	0.00	63.96	\$9.08	17.62
Ice Rm	2600	1	3	2600	1	3	82	0.08	213.2	\$30.27	1	3	Dual Technology Occupancy Sensor	82	0.08	10%	191.88	\$27.25	\$160.00	0.00	21.32	\$3.03	52.85
Jan Closet	2600	1	2	2600	1	2	58	0.06	150.8	\$21.41	1	2	None	58	0.06	0%	150.8	\$21.41	\$0.00	0.00	0	\$0.00	0.00
Electric Rm	2600	1	3	2600	1	3	82	0.08	213.2	\$30.27	1	3	Dual Technology Occupancy Sensor	82	0.08	10%	191.88	\$27.25	\$160.00	0.00	21.32	\$3.03	52.85
Rear Vest	2600	1	3	2600	1	3	82	0.08	213.2	\$30.27	1	3	None	82	0.08	0%	213.2	\$30.27	\$0.00	0.00	0	\$0.00	0.00
W Rm	2600	2	3	2600	2	3	82	0.16	426.4	\$60.55	2	3	Dual Technology Occupancy Sensor	82	0.16	10%	383.76	\$54.49	\$160.00	0.00	42.64	\$6.05	17.62
Outside Lights	2600	5	1	2600	5	1	110	0.55	1,430.0	\$203.06	5	1	Dual Technology Occupancy Sensor	110	0.55	10%	1,287	\$182.75	\$160.00	0.00	143	\$20.31	7.88
Totals		68	63		68	63	4.95	12,867.4	\$1,827.17	68	63	4.949	1,183.676	\$1,680.82	\$2,240.00	0.00	1030.6	\$146.35	15.31				

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

CEG Job #: 9C09064
 Project: Brick Township M.U.A.
 Address: 1551 Highway 88 West
 Brick NJ 08724
 Building SF: 7,167

"Operations Warehouse"

KWH COST \$0.142

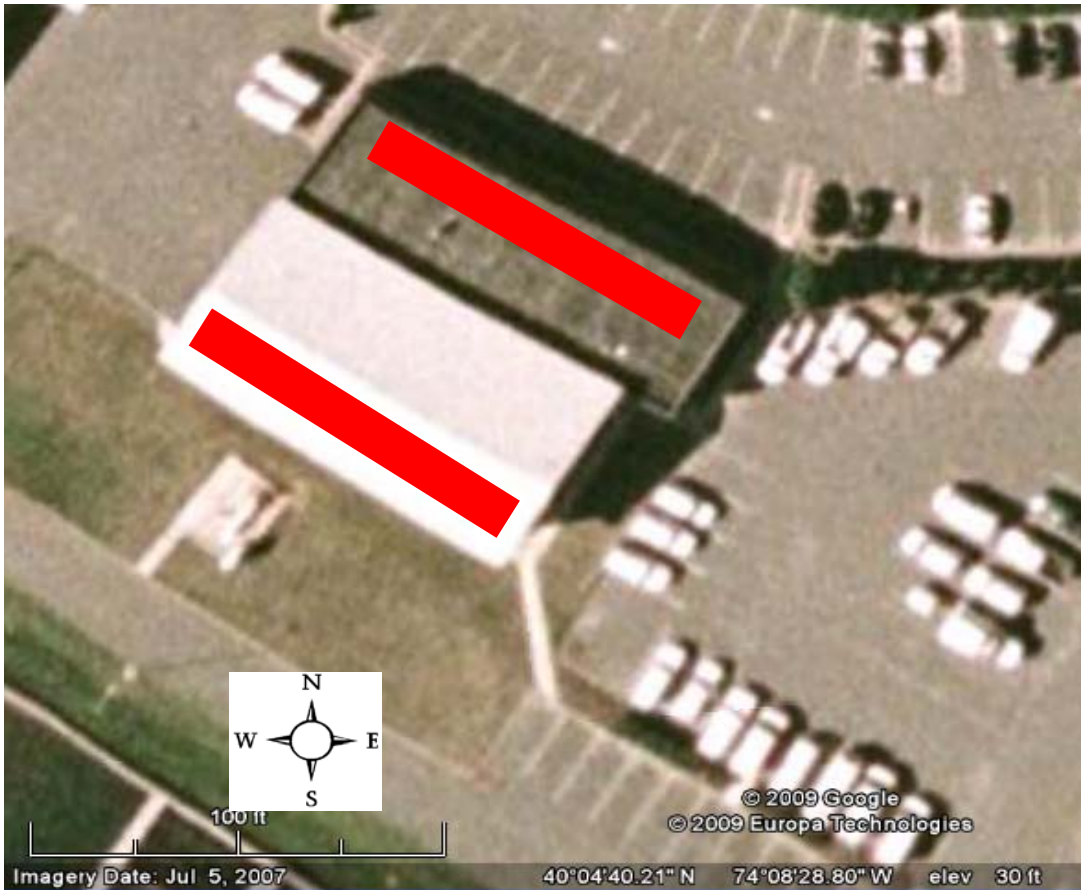
ECM #4: Lighting Controls - Operations Warehouse

EXISTING LIGHTING										PROPOSED LIGHTING CONTROLS										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	Controls Description	Wats Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly \$ Cost	Unit Cost (UNSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly \$ Savings	Yearly Simple Payback	
	Office	2,600	2	4	1x4 T8 32W, Electronic Ballast, Surface Mounting, Prismatic Lens	109	0.22	566.8	\$80.49	2	4	Dual Technology Occupancy Sensor	109	0.22	10%	510.12	\$72.44	\$160.00	\$160.00	0.00	56.68	\$8.05	19.88	
	Warehouse	2,600	2	1	High Pressure Sodium, 400W	464	0.93	2,412.8	\$342.62	2	1	Dual Technology Occupancy Sensor	464	0.93	10%	2171.52	\$308.36	\$160.00	\$160.00	0.00	241.28	\$34.26	2.72	
		2,600	3	2	8" T12 96W, Magnetic Ballast, Pendant Mounting, No Lens	222	0.67	1,731.6	\$245.89	3	2		222	0.67	10%	1558.44	\$221.30	\$0.00	\$0.00	0.00	173.16	\$24.59		
		2,600	8	2	8" T12 96W, Magnetic Ballast, Surface Mounting, No Lens	222	1.78	4,617.6	\$655.70	8	2		222	1.78	10%	4155.84	\$590.13	\$160.00	\$160.00	0.00	461.76	\$65.57		
	Storage Rooms	2,600	1	4	1x4 T12 34W, Magnetic Ballast, Surface Mounting, Prismatic Lens	160	0.16	416.0	\$59.07	1	4	Dual Technology Occupancy Sensor	160	0.16	10%	374.4	\$53.16	\$0.00	\$0.00	0.00	41.6	\$5.91	1.68	
		2,600	8	2	1x4 T12 34W, Magnetic Ballast, Surface Mounting, No Lens	80	0.64	1,664.0	\$236.29	8	2		80	0.64	10%	1497.6	\$212.66	\$0.00	\$0.00	0.00	166.4	\$23.63		
	Inventory	2,600	2	2	1x4 T12 34W, Magnetic Ballast, Surface Mounting, Prismatic Lens	80	0.16	416.0	\$59.07	2	2	Dual Technology Occupancy Sensor	80	0.16	10%	374.4	\$53.16	\$160.00	\$160.00	0.00	41.6	\$5.91	27.09	
		2,600	7	2	8" T12 96W, Magnetic Ballast, Surface Mounting, Prismatic Lens	222	1.55	4,040.4	\$573.74	7	2		222	1.55	10%	3636.36	\$516.36	\$160.00	\$160.00	0.00	404.04	\$57.37	2.53	
	Storage	2,600	2	2	1x4 T12 34W, Magnetic Ballast, Pendant Mounting, No Lens	80	0.16	416.0	\$59.07	2	2	Dual Technology Occupancy Sensor	80	0.16	10%	374.4	\$53.16	\$0.00	\$0.00	0.00	41.6	\$5.91		
	Storage Closet	2,600	1	2	8" T12 96W, Magnetic Ballast, Surface Mounting, No Lens	222	0.22	577.2	\$81.96	1	2	Dual Technology Occupancy Sensor	222	0.22	10%	519.48	\$73.77	\$160.00	\$160.00	0.00	57.72	\$8.20	19.52	
	Storage Closet	2,600	1	4	1x4 T12 34W, Magnetic Ballast, No Lens	146	0.15	379.6	\$53.90	1	4	Dual Technology Occupancy Sensor	146	0.15	10%	341.64	\$48.51	\$160.00	\$160.00	0.00	37.96	\$5.39	29.68	
	Outside Lighting	2,600	4	1	Metal Halide 100W, Well Pack	125	0.50	1,300.0	\$184.60	4	1	Dual Technology Occupancy Sensor	125	0.50	10%	1170	\$166.14	\$160.00	\$160.00	0.00	130	\$18.46	8.67	
Totals			41	28		7.13	18,538.0	\$2,632.40	41	28		7.13	7.13			16684.2	\$2,369.16		\$1,280.00	0.00	1853.8	\$263.24	4.86	

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

Project Name: LGEA Solar PV Project - Brick Twp. MUA Operations/Warehouse							
Location: Brick Township, NJ							
Description: Photovoltaic System - Direct Purchase							
Simple Payback Analysis							
	Photovoltaic System - Direct Purchase						
Total Construction Cost	\$289,800						
Annual kWh Production	36,676						
Annual Energy Cost Reduction	\$5,208						
Annual SREC Revenue	\$12,837						
First Cost Premium	\$289,800						
Simple Payback:	16.06						Years
Life Cycle Cost Analysis							
Analysis Period (years):	25			Financing %:	0%		
Financing Term (mths):	0			Maintenance Escalation Rate:	3.0%		
Average Energy Cost (\$/kWh)	\$0.142			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	\$289,800	0	0	0	\$0	(289,800)	0
1	\$0	36,676	\$5,208	\$0	\$12,837	\$18,045	(\$271,755)
2	\$0	36,493	\$5,364	\$0	\$12,772	\$18,137	(\$253,619)
3	\$0	36,310	\$5,525	\$0	\$12,709	\$18,234	(\$235,385)
4	\$0	36,129	\$5,691	\$0	\$12,645	\$18,336	(\$217,049)
5	\$0	35,948	\$5,862	\$370	\$12,582	\$18,073	(\$198,976)
6	\$0	35,768	\$6,037	\$368	\$12,519	\$18,188	(\$180,788)
7	\$0	35,589	\$6,219	\$367	\$12,456	\$18,308	(\$162,480)
8	\$0	35,411	\$6,405	\$365	\$12,394	\$18,434	(\$144,045)
9	\$0	35,234	\$6,597	\$363	\$12,332	\$18,566	(\$125,479)
10	\$0	35,058	\$6,795	\$361	\$12,270	\$18,705	(\$106,774)
11	\$0	34,883	\$6,999	\$359	\$12,209	\$18,849	(\$87,925)
12	\$0	34,709	\$7,209	\$357	\$12,148	\$19,000	(\$68,926)
13	\$0	34,535	\$7,425	\$356	\$12,087	\$19,157	(\$49,769)
14	\$0	34,362	\$7,648	\$354	\$12,027	\$19,321	(\$30,448)
15	\$0	34,190	\$7,878	\$352	\$11,967	\$19,492	(\$10,956)
16	\$0	34,020	\$8,114	\$350	\$11,907	\$19,670	\$8,714
17	\$0	33,849	\$8,357	\$349	\$11,847	\$19,856	\$28,570
18	\$0	33,680	\$8,608	\$347	\$11,788	\$20,049	\$48,619
19	\$0	33,512	\$8,866	\$345	\$11,729	\$20,250	\$68,870
20	\$0	33,344	\$9,132	\$343	\$11,670	\$20,459	\$89,329
21	\$1	33,177	\$9,406	\$342	\$11,612	\$20,677	\$110,006
22	\$2	33,012	\$9,688	\$340	\$11,554	\$20,902	\$130,908
23	\$3	32,847	\$9,979	\$338	\$11,496	\$21,137	\$152,045
24	\$4	32,682	\$10,278	\$337	\$11,439	\$21,381	\$173,426
25	\$5	32,519	\$10,587	\$335	\$11,382	\$21,633	\$195,059
Totals:		863,938	\$189,880	\$7,399	\$302,378	\$484,859	\$484,859
Net Present Value (NPV)						\$195,084	
Internal Rate of Return (IRR)						4.3%	

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
Operations / Warehouse	2285	Sunpower SPR230	140	14.7	2,059	32.20	36,676	4,620	15.64



 .= Proposed PV Layout

Notes:

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



AC Energy
&
Cost Savings



Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	20.0 kW
DC to AC Derate Factor:	0.810
AC Rating:	16.2 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	212.0°
Energy Specifications	
Cost of Electricity:	0.1 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	2.34	1163	1.65
2	3.10	1421	2.02
3	4.01	1999	2.84
4	4.79	2239	3.18
5	5.67	2671	3.79
6	5.91	2609	3.70
7	5.76	2596	3.69
8	5.34	2388	3.39
9	4.59	2047	2.91
10	3.54	1662	2.36
11	2.27	1046	1.49
12	1.95	940	1.33
Year	4.11	22780	32.35

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AC Energy
&
Cost Savings



Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	12.2 kW
DC to AC Derate Factor:	0.810
AC Rating:	9.9 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	212.0°
Energy Specifications	
Cost of Electricity:	0.1 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	2.34	709	1.01
2	3.10	867	1.23
3	4.01	1219	1.73
4	4.79	1365	1.94
5	5.67	1629	2.31
6	5.91	1592	2.26
7	5.76	1584	2.25
8	5.34	1457	2.07
9	4.59	1249	1.77
10	3.54	1014	1.44
11	2.27	638	0.91
12	1.95	573	0.81
Year	4.11	13896	19.73

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