LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR: **CAPE MAY COUNTY MUNICIPAL UTILITY AUTHORITY**

TRANSFER STATION
ADMINISTRATION BUILDING
650 SHUNPIKE ROAD
BURLEIGH, NJ 08210
ATTN: MR. JOSHUA PALOMBO
WASTEWATER ENGINEER

PREPARED BY: **CONCORD ENGINEERING GROUP**

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

CEG CONTACT: **PATRICK J. MULLEN, P.E.**
LEAD MECHANICAL ENGINEER
EMAIL: PMULLEN@CEG-INC.NET

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Table of Contents

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I. EXECUTIVE SUMMARY

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

Cape May County Municipal Utility Authority
- Transfer Station Administration Building
650 Shunpike Road
Burleigh, NJ 08210

Municipal Contact Person: Mr. Charles M. Norkis
Facility Contact Person: Mr. Joshua Palombo

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	$ 7,263
Fuel Oil - No. 2	$ 372
Total	$ 7,635

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's are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE level 2 audit. The cost and savings for each measure is ± 20%. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Table 1
Financial Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	Lighting Upgrade	$2,330	$492	4.7	216.7%
ECM #2	Lighting Controls	$1,240	$125	9.9	51.2%
ECM #3	Furnace Replacement - High Efficiency Upgrade	$6,000	$17	356.1	-95.8%
ECM #4	Condensing Unit Replacement	$4,753	$862	5.5	172.0%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	33.81 KW PV System	$304,290	$20,817	14.6	71.0%

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)	Oil (Gallons)
ECM #1	Lighting Upgrade	1.1	3195.0	0.0
ECM #2	Lighting Controls	0.0	813.0	0.0
ECM #3	Furnace Replacement - High Efficiency Upgrade	0.0	0.0	8.1
ECM #4	Condensing Unit Replacement	2.2	5600.0	0.0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	33.81 KW PV System	0.0	41304.0	0.0

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

- **ECM #1:** Lighting Upgrade
- **ECM #2:** Lighting Controls
- **ECM #4:** Condensing Unit Replacement

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.

Renewable Energy Measures (REMs) were also reviewed for implementation at the Transfer Station Administration Building. CEG utilized a roof mounted solar array to house a substantial PV system. The recommended 33.81 kW PV system will produce approximately 41,304 kWh of electricity annually and will reduce the schools electrical consumption from the grid by 23%. The system's calculated simple payback of 14.62 years is past the standard 10 year simple payback threshold; however, with alternative funding this payback could be lessened. CEG recommends the Owner review all funding options before deciding to not implement this renewable energy measure.

Overall, the Transfer Station Administration Building appears to be operating at a average efficiency level compared to other Transfer Station Administration Buildings in the region. With the implementation of the above recommended measures the CMC MUA will realize further energy savings at the Transfer Station Administration Building.

II. INTRODUCTION

The comprehensive energy audit covers the 2,456 square foot Transfer Station Administration Building, which includes the following spaces: office, scale room, break room, men's and women's restrooms, mechanical room and maintenance shop.

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

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

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

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

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

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

III. METHOD OF ANALYSIS

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

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

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

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

ECM Calculation Equations:

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

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

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

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

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

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

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

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

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

The oil usage profile shows the actual oil purchased for the facility. Oil is provided by PEDRONI to the facility. The oil provider measures consumption in gallons. One Gallon of No. 2 oil is equivalent to 140,000 BTUs of energy.

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

Description	Average
Electricity	15.4¢ / kWh
Fuel Oil	$2.07 / Gallon

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Atlantic City Electric
Rate: Monthly General
Meter No: 83222024
Customer ID No: 0278 9249 9990
Third Party Utility
TPS Meter / Acct No:

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Dec-08	3,480	28.0	$555
Jan-09	4,280	31.6	$681
Feb-09	5,520	27.6	$877
Mar-09	3,200	21.6	$511
Apr-09	3,280	30.4	$523
May-09	2,760	30.4	$442
Jun-09	3,920	26.8	$241
Jul-09	4,360	26.8	$859
Aug-09	4,640	23.2	$914
Sep-09	4,320	18.0	$851
Oct-09	4,160	24.8	$259
Nov-09	3,240	19.6	$551
Totals	**47,160**	**31.6 Max**	**$7,263**

AVERAGE DEMAND 25.7 KW average

AVERAGE RATE $0.154 $/kWh

Figure 1
Electricity Usage Profile

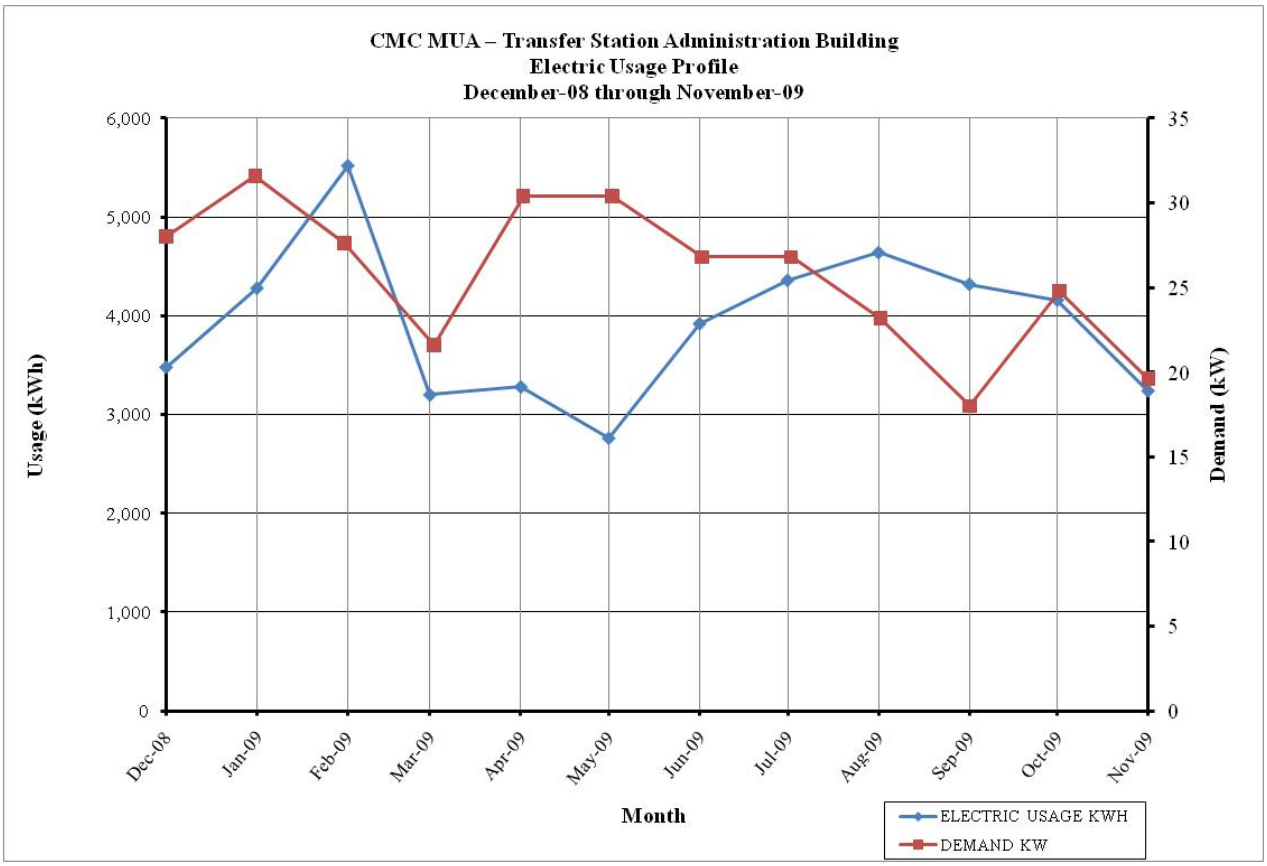
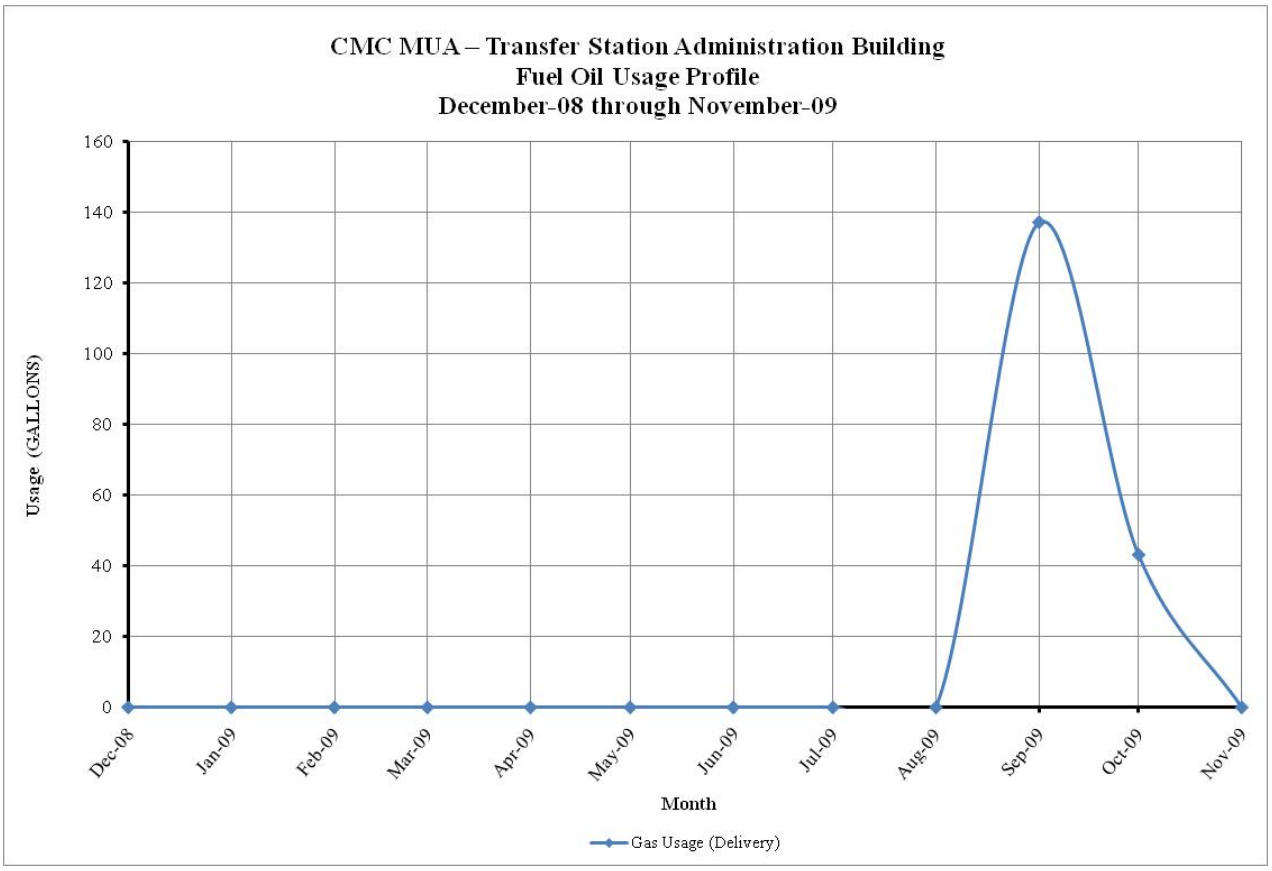


Table 4
Fuel Oil Billing Data

FUEL OIL USAGE SUMMARY		
Utility Provider:	Pedroni Fuel Co.	
Rate:	Varies	
Meter No:	-	
Point of Delivery ID:	-	
MONTH OF USE	**Delivery (Gallons)**	**TOTAL BILL**
Dec-08	0.00	$0.00
Jan-09	0.00	$0.00
Feb-09	0.00	$0.00
Mar-09	0.00	$0.00
Apr-09	0.00	$0.00
May-09	0.00	$0.00
Jun-09	0.00	$0.00
Jul-09	0.00	$0.00
Aug-09	0.00	$0.00
Sep-09	137.00	$274.27
Oct-09	43.10	$97.71
Nov-09	0.00	$0.00
TOTALS	**180.10**	**$371.98**
AVERAGE RATE:	**$2.07**	**$/GALLON**

Based on fuel bills provided. Usage is not metered.

Figure 2
Fuel Oil Usage Profile



B. Energy Use Index (EUI)

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

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

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

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

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

Table 5
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	**BUILDING USE**			**SITE ENERGY**	**SITE-SOURCE RATIO**	**SOURCE ENERGY**
	kWh	**Therms**	**Gallons**	**kBtu**		**kBtu**
ELECTRIC	47160.0			161,004	3.340	537,754
FUEL OIL			180.1	25,034	1.010	25,284
TOTAL				186,038		563,038
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA	2,456	SQUARE FEET				
BUILDING SITE EUI	*75.75*	kBtu/SF/YR				
BUILDING SOURCE EUI	*229.25*	kBtu/SF/YR				

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

- Other (Administration and Sludge Processing):
  104 kBtu/SF Site Energy, 213 kBtu/SF Source Energy, 56% electric usage

Based on the information compiled for the studied facility, as compared to the national average the energy usage is approximately 72.8% of the baseline building site data. Normalizing the building site data for 86.5% electric, site energy is 120.2 kBtu/SF and as compared to the national average the energy usage is approximately 63% of the baseline building site data.

C. EPA Energy Benchmarking System

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

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

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

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

User Name: capemaymua
Password: lgeaceg2009

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

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**
Transfer Station Administration	N/A	N/A

The current Energy Star Performance Rating for the Transfer Station Administration Building is unable to be calculated because the gross floor area must be greater than or equal to 5,000 square

feet and the Administration Building does not satisfy these conditions. See the **Statement of Energy Performance Appendix** for the detailed energy summary.

V. FACILITY DESCRIPTION

The 2,456 SF Transfer Station Administration Building is a one story facility comprised of a office, scale room, break room, men's and women's restrooms, mechanical room and maintenance shop. The facility operates 55 hours per week primarily between 7:00 am and 5:00 pm. It is a metal building with metal exterior walls and roof with minimum insulation typical of the time period. The office, restrooms, scale room and break room have an interior stud and drywall. The amount of insulation within the wall is unknown. The windows throughout the facility are in good condition and appear to be maintained. Typical windows throughout the facility are double pane, ¼" clear glass with aluminum frames. Blinds are utilized through the facility per occupant comfort. The blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat in the summer. The majority of the roof is a metal roof system. The amount of insulation below the roofing is unknown. The building was built in 1984 with no additions since the original construction.

HVAC Systems

The administration areas are conditioned by a split system consisting of a condensing unit and an up flow furnace. The condensing unit is York International model H1RA042S06D with cooling coil model G2FD048H21A. The system is 10 years old, is in fair condition and has five (5) years of ASHRAE expected useful service life remaining.

The administration areas are heated by a Trane up flow furnace model TCU085B936B with a Becket oil burner model AFGDU201. The furnace is rated 82.3% efficient with 85 MBH output. The furnace is twenty six (26) years old, is in fair condition and is eight (8) years past its ASHRAE expected useful service life. The burner is twenty six (26) years old, is in fair condition and is five (5) years past its ASHRAE expected useful service life. Conditioned air is distributed to the space through ductwork and ceiling diffusers. A single thermostat controls the unit operation located in the office area.

The Maintenance shop is heated by a Modine model PBH 100A unit heater. The unit heater is oil fired by a Beckett 100 MBH input and 84.6% efficient burner. The unit heater is twenty six (26) years old, is in fair condition and is eight (8) years past its ASHRAE expected useful service life. The burner is twenty six (26) years old, is in fair condition and is five (5) years past its ASHRAE expected useful service life.

Exhaust System

Air is exhausted from the toilet rooms through the fractional horsepower roof exhausters. The toilet room exhaust fan is operated based on the facility occupancy schedule.

HVAC System Controls

The HVAC systems within the facility are controlled via local thermostat.

Domestic Hot Water

Domestic hot water for the restrooms is provided by a 50 gallon Bradford White model MII50-9-3SF-008 electric water heater, capacity of 9KW. The domestic hot water piping insulation appeared to be in fair condition.

Lighting

The lighting in the Transfer Station Administration Building is primarily made up of fluorescent fixtures with T-12 lamps and magnetic ballasts and T-8 lamps with electronic ballasts. There are a few storage rooms, original boiler room and closets with incandescent lighting and compact fluorescent fixtures. The work shop areas have metal halide and exterior areas have high pressure sodium lamps.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrade - General

Description: General

The lighting in the Transfer Station Administration Building is primarily made up of fluorescent fixtures with T-12 lamps and magnetic ballasts and T-8 lamps with electronic ballasts. There are a few storage rooms, original boiler room and closets with incandescent lighting and compact fluorescent fixtures. The work shop areas have metal halide and exterior areas have high pressure sodium lamps.

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

In addition, the maintenance shop at the Transfer Station Administration Building utilizes low bay metal halide fixtures for its lighting. Metal halide bulbs provide a reasonably efficient option for bay lighting however a few draw-backs that are common. Metal halide fixtures often have poor overall efficacy which limits the amount of light actually leaving the fixture. Also metal halide bulbs require a significant warm-up period and even longer cool down period eliminating the potential for occupancy sensors frequent switching. This symptom encourages the maintenance shop lighting to be left on continuously during the day. Another drawback is the reduced lumen output (Lumen Maintenance) of the metal halide bulb over its life time. Average bulb output or “mean lumens,” is approximately 25% less than the bulb’s initial lumens for typical metal halide lamps. In addition the most rapid rate of light output decline is during the beginning of its life, approximately 15-20% light loss within the first 20% of its rated life. It is important to note that the light loss has no savings in energy used; therefore the overall light efficiency is continuously decreasing with age. The final drawback is the light quality or Color Rendering Index (CRI). Typical values for metal halide bulbs is 65, which is a measure of how close the light is to true “full spectrum” light produced by sunlight or incandescent lighting. Metal halide bulbs also show noticeable color shifting when the bulb is reaching the end of its life.

Utilizing fluorescent fixtures in low and high bay spaces is a superior option over metal halide fixtures in all areas described above. Although metal halide fixtures provide light very efficiently at the start of the bulb life, the average efficiency over the life is below that of fluorescent fixtures.

This ECM also includes replacement of each of the existing maintenance shop low bay metal halide light fixtures with pendant mounted fluorescent fixtures with T-5 HO bulbs. The retrofit for the metal halide fixtures includes a one for one pendant style fixture replacement. The

fluorescent fixtures selected will provide equivalent light compared to the average light output of the existing metal halide fixtures. Note light output of the T-5 fixtures is reduced compared to the initial lumen output of the metal halide fixture. The bulb replacement cost for T-5 HO lamps compared to the existing pulse start metal halide lamps were found to be approximately equal and therefore not included in the savings calculations.

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**, the following incentives are warranted:

Retrofit fluorescent T12 lamps and magnetic ballast with T-5 or T-8 lamps w/electronic ballast (1-4 lamp retrofitted) = $15 per fixture.

$$\text{Smart Start®}\ \textit{Incentive} = (\#\ \textit{of}\ 1-4\ \textit{lamp fixtures retrofitted} \times\ \$15)$$
$$\text{Smart Start®}\ \textit{Incentive} = (16 \times\ \$15) = \underline{\$240}$$

Replace HID metal halide 100w-174w fixture with new T-5 or T-8 lamps fixture w/electronic ballast = $30 per fixture.

$$\text{Smart Start®}\ \textit{Incentive} = (T5 \textit{or} T8\ \textit{lamp fixtures} \times\ \$30)$$
$$\text{Smart Start®}\ \textit{Incentive} = (5 \times\ \$30) = \underline{\$150}$$

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 #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,720
NJ Smart Start Equipment Incentive ($):	$390
Net Installation Cost ($):	$2,330
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$492
Total Yearly Savings ($/Yr):	$492
Estimated ECM Lifetime (Yr):	15
Simple Payback	4.7
Simple Lifetime ROI	216.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$7,380
Internal Rate of Return (IRR)	20%
Net Present Value (NPV)	$3,543.46

ECM #2: Lighting Occupancy Sensors

Description:

A common occurrence in many facilities is lighting fixtures being 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. The 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. To better control lighting according to occupancy and reduce lighting energy consumption, CEG recommends installing occupancy sensors. Private offices, file rooms, lounges, kitchens, conference rooms, etc. are good candidates for wall-mounted or ceiling mounted occupancy sensors. Dual technology sensors (ultrasonic and infrared) detect human motion and presence to ensure proper activation of lights. The basis of calculation is the SensorSwitch Model WSD wall switch and Model CM ceiling mount controls or equivalent.

Energy Savings Calculations:

To determine an estimated savings for lighting controls, CEG 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, the kitchen/lounge, small-sized mechanical rooms, storage rooms, data rooms, file rooms, etc. This energy conservation measure can be applied to five (5) areas throughout the facility which amounts to approximately 1,100 square feet of space.

The **Investment Grade Lighting Audit Appendix – ECM#2** outlines the proposed controls, costs, savings, and payback periods.

The various types of sensors and quantities are as follows:

Wall Switches	3 Units
Ceiling Mounted Sensors	4 Units

The installed cost of each type of occupancy sensor including dimming ballast, rewiring, relays, J-Boxes, sensors, power packs, on/off photocells, inhibit photocells, etc. is as follows:

Wall Switches	$160/Unit x 3 Units = $480
Ceiling Mounted Sensors	$240/Unit x 4 Units = $960
	TOTAL COST = $1,440

From the **NJ Smart Start Appendix**, the installation of Occupancy Sensor Remote Mounted (OSR) lighting controls warrants a $35 incentive per control. In addition the installation of Occupancy Sensor Wall Mounted (OSW) lighting controls warrants a $20 incentive per control.

Therefore, with three (3) wall switches and four (4) ceiling mounted sensors, the following incentives take place:

Three (3) wall mount x $20/sensor = $60
Four (4) ceiling sensors x $35/sensor = $140.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,440
NJ Smart Start Equipment Incentive ($):	$200
Net Installation Cost ($):	$1,240
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$125
Total Yearly Savings ($/Yr):	$125
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.9
Simple Lifetime ROI	51.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,875
Internal Rate of Return (IRR)	6%
Net Present Value (NPV)	$252.24

ECM #3: Furnace Replacement – High Efficiency Upgrade

Description:

In the Transfer Station Administration Building, there is one (1) Trane oil fired furnace model TCU0858936B, 106 MBH input, which has a combustion efficiency of 82% when new. This furnace is 11 years past its ASHRAE useful service life.

This energy conservation measure will replace the oil fired furnace serving the facility. Calculation is based on the following equipment: Thermo Pride, OL5-85 Oil Fired Furnace or equivalent. The existing unit will be replaced with a higher energy efficient unit with capacities typical of the existing unit.

Energy Savings Calculations:

Existing 106 MBh Oil Fired Furnace:
Rated Capacity = 106 MBh Input, 85 MBh Output (Oil)

Combustion Efficiency = 82%
Age & Radiation Losses = 5%
Thermal Efficiency = 78%

Replacement Oil Fired Furnace:
High-Efficiency Oil Fired Furnace

Rated Capacity = 100 MBh Input, 85 MBh Output (oil)

Combustion Efficiency = 86%
Radiation Losses = 0.5%
Thermal Efficiency = 85.5%

Oil Fired Equipment List - Estimated Annual Usage per unit

Concord Engineering Group

Transfer Station Administration Building

Manufacturer	Qty.	Model #	Serial #	Input (MBh)	% of Total Input	Estimated Annual Gallons
TRANE	1	TCU0858936B	M3814610X	106.4	51.55%	92.84
Modine	1	PBH 100	1501111283	100	48.45%	87.26
			Total Input MBH	206	1.00	180.10
		Total Gas Consumption Gallons / yr.		180.1		

Operating Data:

Heating Season Fuel Consumption = 92.79 Gallons/yr

$$Heating\ Energy\ Savings = Fuel\ Consumption \times (New\ Boiler\ Efficiency - Old\ Boiler\ Efficiency)$$

Heating Energy Savings = 92.79 Gallons x ((85.5% - 78%) / (85.5%)) = 8.14 Gallons

Total Heating Cost savings

Heating Energy Cost Savings = Annual Energy Savings x $/Gallon

Heating Energy Cost Savings = (8.14 Gallons) x $2.07/Gallon = $16.85/ yr.

Installed cost of (1) one new OL5-85 Oil Fired Furnace, 106 MBH input with one (1) BMS II sequencing panel, sensor kit and installation is $6,000.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$6,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$17
Total Yearly Savings ($/Yr):	$17
Estimated ECM Lifetime (Yr):	15
Simple Payback	356.1
Simple Lifetime ROI	-95.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$253
Internal Rate of Return (IRR)	-26%
Net Present Value (NPV)	($5,798.85)

ECM #4: High Efficiency Condenser Unit Replacement

Description:

The office area in the Transfer Station Administration Building is served by a York International split system that has a cooling capacity of 42,000 BTUH with the compressor/condenser on grade and the evaporator/fan in the ceiling above the office space. The compressor/condenser unit on grade is approximately 26 years old, in poor condition and very inefficient (EER=7.8).

This ECM would replace the existing rooftop condenser with a high-efficiency Trane Model XL15i or equal with an efficiency of EER=13.

Energy Savings Calculations:

Cooling Assumptions:

Total Cooling Capacity	= 3.5 Tons
Average Unit Efficiency	= 7.8 SEER
New Unit Efficiency	= 13 EER
Average Cost of Electricity	= $0.154/kWh
Average Annual Hours @ Full Load	= 2,600 Hours

Cooling Savings Calculation:

$$EnergySavings = \frac{Cooling(Tons)\times 12{,}000\left(\frac{Btu}{Ton\ hr}\right)}{1000\left(\frac{Wh}{kWh}\right)}\times\left(\frac{1}{EER_{OLD}}-\frac{1}{EER_{NEW}}\right)\times Cooling\ \ Hrs.$$

$$EnergySavings = \frac{3.5\,(Tons)\times 12{,}000\left(\frac{Btu}{Ton\ hr}\right)}{1000\left(\frac{Wh}{kWh}\right)}\times\left(\frac{1}{7.8\left(\frac{Btu}{W}\right)}-\frac{1}{13\left(\frac{Btu}{W}\right)}\right)\times 2{,}600\ hours$$

$$= \underline{5{,}600\ kWh}$$

$$Demand\ \ Savings = \frac{Energy\ Savings\,(kWh)}{Hrs\ of\ \ Cooling}$$

$$Demand\ Savings = \frac{5{,}600\ (kWh)}{2{,}600\ Hrs.} = \underline{2.15\ kW}$$

Total Annual Energy Cost Savings = 5,600 kWh x $0.154/kWh = $862 per year

$$\text{Smart Start®}\ Incentive = (Number\ of\ Tons \times\ \$\,92/Ton) = (3.5 \times \$\,92) = \$322$$

The total installed cost of a 3.5-Ton condenser unit with an ambient kit is $5,075.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,075
NJ Smart Start Equipment Incentive ($):	$322
Net Installation Cost ($):	$4,753
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$862
Total Yearly Savings ($/Yr):	$862
Estimated ECM Lifetime (Yr):	15
Simple Payback	5.5
Simple Lifetime ROI	172.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$12,930
Internal Rate of Return (IRR)	16%
Net Present Value (NPV)	$5,537.50

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 2400 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 33.81 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 41,304 KWh annually, reducing the overall utility bill by approximately 87.58% 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.

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

Table 7
Financial Summary – Photovoltaic System

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM			
PAYMENT TYPE	**SIMPLE PAYBACK**	**SIMPLE ROI**	**INTERNAL RATE OF RETURN**
Direct Purchase	14.62 Years	6.8%	5.2%

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

Given the large amount of capital required by the CMC MUA – Transfer Station Administration Building to invest in a solar system through a Direct Purchase CEG does not recommend the CMC MUA – Transfer Station Administration Building pursue this route. It would be more advantageous for the CMC MUA – Transfer Station Administration Building to solicit Power

Purchase Agreement (PPA) Providers who will own, operate, and maintain the system for a period of 15 years. During this time the PPA Provider would sell all of the electric generated by Solar Arrays to the CMC MUA – Transfer Station Administration Building at a reduced rate compared to their existing electric rate.

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

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

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

Electricity:

The Electric Usage Profile shows increased usage in the heating season as well as the cooling season. This is not typical for an administration building with fossil fuel heat, however the office administration area is only part of the load feed from the electric service. The load profile is dependent on other buildings with electrical heat and / or process loads provided by this shared service. The cooling season represents a typical load profile with increase usage from the building air conditioning systems. The electric demand is at its peak in the month of January (likely due to the other facilities / loads on this service). The hours of operation of the administration building are typical for an office building. Due to other loads which operate at relatively short periods of time the load factor rating for this service is approximately 17%. Load factor is the total usage divided by the demand times the total hours (KWH/KW*8760). This means that the full load electric draw for the facility is only used for 17% of the time. A higher load factor (rating of 50% or higher) along with a flat load profile will allow for more competitive energy prices when shopping for alternative suppliers.

#2 Heating Oil:

The primary use of the heating oil is the oil fired furnace and unit heaters. Heating oil is purchased based on market driven pricing and delivered on an as needed bases. This utility is unlike natural gas and electric utilities where time of use and load profiling has a more significant role. It was noted that the tank size for this facility was much larger than typical tanks for the amount used throughout the year. The utility profile for the year represents considerable storage capacity that was used from the previous year, therefore the overall usage and profile does not reflect the actual monthly utility profile for the building.

Tariff Analysis:

Electricity:

This facility receives electrical service through Atlantic City Electric on their Monthly General Service (MGS-Secondary) rate. This service classification is available for general service purposes on secondary voltages. This facility's rate is a three phase service at secondary voltages. For electric supply (generation), the customer has the option to purchase energy

through the utility's Generation Charge or a Third Party Supplier (TPS). This facility utilizes the generation service provide through Atlantic City Electric (BGS), Therefore, they will pay according to the default service. The Delivery Service includes the following charges: Customer Charge, Distribution Charge (kW Demand), Reactive Demand Charge (kvar Demand, over 1/3 kW), Distribution Charge (kWh usage), Non-utility Generation Charge, Societal benefits Charge kWh, Regulatory Assets Recovery Charge kWh, Transition Bond Charge kWh, Market Transition Charge Tax kWh, System Control Charge kWh, CIEP Standby Fee kWh, Transmission Demand Charge kW, Reliability Must Run Transmission Surcharge kWh, Transmission Enhancement Charge kWh, Basic Generation Service Charge kWh, Regional Greenhouse Gas Initiative Recovery Charge kWh, Infrastructure Investment Surcharge.

The Demand charges are based on measurement of the highest demand set in any given month. The usage charges are based on a stepped rate structure. The demand charges for this rate structure are typically less than the usage charges on a typical basis making this rate structure less dependent on demand versus usage. However because of the extremely low load factor and high demand relative to the overall usage, the demand charges play a more significant role in the overall electric costs. The resulting cost for electricity is increased due to high fluctuations in electric draw (high demand).

#2 Heating Oil:

This facility receives deliveries for #2 heating oil on an as needed basis. The cost per gallon is determined based on the market driven costs. These utilities do not include tariffs and rate structures.

Natural gas is a utility similar to electric which includes delivery and supply charges based on a rate structure and utility tariff. If the county were to consider the addition of natural gas to this facility, the County should review the following: Customers of natural gas service may either purchase gas supply from a Third Party (TPS) or from Public Services Basic Gas Supply Service default service as detailed in the utility rate schedule. Different service rates are available and should be considered for the facility prior to beginning a contract.

When considering a third party supplier for natural gas it is important to understand the costs associated with imbalances. Most natural gas rate schedules have a balancing charge included in their rate structure. Should the TPS not deliver, the customer may receive service from the default delivery utility under their Emergency Sales Service. Emergency Sales Service carries an extremely high penalty cost of service. Should the TPS un-deliver to the utility on behalf of the client, the utility will automatically supply this default service to the client. Imbalances occur when Third Party Suppliers are used to supply natural gas, full-delivery is not made, and when a new supplier is contracted or the customer returns to the utility. It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used. Otherwise, imbalances can occur, jeopardizing economics and scheduling.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within the County. Based on the latest electric utility bill, the average price per kWh (kilowatt hour) for the building based on 1-year historical average price is $0.1276/kWh based on the utility information provided (this is the average "price to compare" if the client intends to shop for energy). The average price per gallon of #2 oil is $ 2.07 / gallon. Energy commodities are among the most volatile of all commodities, however at this point and time, energy is relatively competitive. The County should consider procuring energy through alternative supply sources to shop for the most competitive prices.

CEG also recommends that the County schedule a meeting with the current utility providers to review their utility charges and current tariff structures for electricity. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), the County can learn more about the competitive supply process. Cape May County can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu. The County should 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. The County should ask the utility representative about alternative billing options, such as consolidated billing when utilizing the service of a Third Party Supplier. This could be performed with the aid of an "energy advisor".

X. INSTALLATION FUNDING OPTIONS

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

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

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

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

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 shown 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%.Direct Install Program* – The New Jersey Clean Energy's Direct Install Program is a state funded program that targets small commercial and industrial facilities with peak demand of less than 200 kW. This turnkey program is aimed at providing owners a seamless, comprehensive process for analysis, equipment replacement and financial incentives to reduce consumption, lower utility costs and improve profitability. The program covers up to 80% of the cost for eligible upgrades including lighting, lighting controls, refrigeration, HVAC, motors, variable speed drives, natural gas and food service. Participating contractors (refer to www.njcleanenergy.com) conduct energy assessments in addition to your standard local government energy audit and install the cost-effective measures.

v. Direct Install Program – The New Jersey Clean Energy's Direct Install Program is a state funded program that targets small commercial and industrial facilities with peak demand of less than 200 kW. This turnkey program is aimed at providing owners a seamless, comprehensive process for analysis, equipment replacement and financial incentives to reduce

consumption, lower utility costs and improve profitability. The program covers up to 80% of the cost for eligible upgrades including lighting, lighting controls, refrigeration, HVAC, motors, variable speed drives, natural gas and food service. Participating contractors (refer to www.njcleanenergy.com) conduct energy assessments in addition to your standard local government energy audit and install the cost-effective measures.

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

XI. ADDITIONAL RECOMMENDATIONS

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

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

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

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

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Transfer Station Admin

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM #1	Lighting Upgrade	$2,720	$0	$390	$2,330	$492	$0	$492	15	$7,380	$0	216.7%	4.7	19.69%	$3,543.46
ECM #2	Lighting Controls	$1,440	$0	$200	$1,240	$125	$0	$125	15	$1,875	$0	51.2%	9.9	5.68%	$252.24
ECM #3	Furnace Replacement - High Efficiency Upgrade	$6,000	$0	$0	$6,000	$17	$0	$17	15	$253	$0	-95.8%	356.1	-26.13%	($5,798.85)
ECM #4	Condensing Unit Replacement	$5,075	$0	$322	$4,753	$862	$0	$862	15	$12,930	$0	172.0%	5.5	16.24%	$5,537.50
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	33.81 KW PV System	$304,290	$0	$0	$304,290	$6,361	$14,456	$20,817	25	$520,425	$361,400	71.0%	14.6	4.64%	$58,199.50

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 February, 2010:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2004

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $93 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat

Energy Efficiency must comply with ASHRAE 90.1-2004

Ground Source Heat Pumps

Closed Loop & Open Loop	$450 per ton, EER ≥ 16 $600 per ton, EER ≥ 18 $750 per ton, EER ≥ 20

Energy Efficiency must comply with ASHRAE 90.1-2004

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, AFUE ≥ 92%

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
Gas Fired Tankless Water Heaters	$300 per unit

Prescriptive Lighting

Retro fit of T12 to T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$15 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$25 per fixture (1-2 lamps) $30 per fixture (3-4 lamps)
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
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
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 100w	$70 per fixture
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$42 per 5 foot $65 per 6 foot

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
Daylight Dimming - office	$50 per fixture controlled

Premium Motors

Three-Phase Motors	$45 - $700 per motor
Fractional HP Motors Electronic Communicated Motors (replacing shaded pole motors in refrigerator/freezer cases)	$40 per electronic communicated motor

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
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%

STATEMENT OF ENERGY PERFORMANCE
TRANSFER STATION ADMIN

Building ID: 2261620
For 12-month Period Ending: November 30, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: March 31, 2010

Facility
TRANSFER STATION ADMIN
650 Shunpike Road
Burleigh, NJ 08210

Facility Owner
Cape May MUA
1523 Route 9 North
Swainton, NJ 08210

Primary Contact for this Facility
Josh Palombo
1523 Route 9 North
Swainton, NJ 08210

Year Built: 1984
Gross Floor Area (ft²): 2,456

Energy Performance Rating[2] (1-100) N/A

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	160,910
Fuel Oil (No. 2) (kBtu)	24,978
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	185,888

Energy Intensity[5]	
Site (kBtu/ft²/yr)	76
Source (kBtu/ft²/yr)	229

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	26

Electric Distribution Utility
Pepco - Atlantic City Electric Co

National Average Comparison	
National Average Site EUI	77
National Average Source EUI	182
% Difference from National Average Source EUI	26%
Building Type	Office

Stamp of Certifying Professional

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

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

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

Certifying Professional
Michael Fischette
520 South Burnt Mill Road
Voorhees, NJ 08043

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	TRANSFER STATION ADMIN	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Office	Is this an accurate description of the space in question?		☐
Location	650 Shunpike Road, Burleigh, NJ 08210	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
TRANSFER STATION ADMIN (Office)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	2,456 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.		☐
Weekly operating hours	55 Hours	Is this the total number of hours per week that the Office 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.		☐
Workers on Main Shift	15	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. The normal worker density ranges between 0.3 and 10 workers per 1000 square feet (92.8 square meters)		☐
Number of PCs	5 (Default)	Is this the number of personal computers in the Office?		☐
Percent Cooled	Less than 50%	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

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

Fuel Type: Electricity

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

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
11/01/2009	11/30/2009	3,240.00
10/01/2009	10/31/2009	4,160.00
09/01/2009	09/30/2009	4,320.00
08/01/2009	08/31/2009	4,640.00
07/01/2009	07/31/2009	4,360.00
06/01/2009	06/30/2009	3,920.00
05/01/2009	05/31/2009	2,760.00
04/01/2009	04/30/2009	3,280.00
03/01/2009	03/31/2009	3,200.00
02/01/2009	02/28/2009	5,520.00
01/01/2009	01/31/2009	4,280.00
12/01/2008	12/31/2008	3,480.00
Electric Consumption (kWh (thousand Watt-hours))		**47,160.00**
Electric Consumption (kBtu (thousand Btu))		**160,909.92**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**160,909.92**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Fuel Oil (No. 2)

Meter: Gas (Gallons)
Space(s): Entire Facility

Start Date	End Date	Energy Use (Gallons)
11/01/2009	11/30/2009	0.00
10/01/2009	10/31/2009	43.10
09/01/2009	09/30/2009	137.00
08/01/2009	08/31/2009	0.00
07/01/2009	07/31/2009	0.00
06/01/2009	06/30/2009	0.00
05/01/2009	05/31/2009	0.00
04/01/2009	04/30/2009	0.00
03/01/2009	03/31/2009	0.00
02/01/2009	02/28/2009	0.00

01/01/2009	01/31/2009	0.00
12/01/2008	12/31/2008	0.00
Gas Consumption (Gallons)		**180.10**
Gas Consumption (kBtu (thousand Btu))		**24,978.16**
Total Fuel Oil (No. 2) Consumption (kBtu (thousand Btu))		**24,978.16**
Is this the total Fuel Oil (No. 2) consumption at this building including all Fuel Oil (No. 2) meters?		☐

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

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

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
TRANSFER STATION ADMIN
650 Shunpike Road
Burleigh, NJ 08210

Facility Owner
Cape May MUA
1523 Route 9 North
Swainton, NJ 08210

Primary Contact for this Facility
Josh Palombo
1523 Route 9 North
Swainton, NJ 08210

General Information

TRANSFER STATION ADMIN	
Gross Floor Area Excluding Parking: (ft^2)	2,456
Year Built	1984
For 12-month Evaluation Period Ending Date:	November 30, 2009

Facility Space Use Summary

TRANSFER STATION ADMIN	
Space Type	Office
Gross Floor Area(ft^2)	2,456
Weekly operating hours	55
Workers on Main Shift	15
Number of PCs[d]	5
Percent Cooled	Less than 50%
Percent Heated	50% or more

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 11/30/2009)	**Baseline** (Ending Date 11/30/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft^2)	76	76	30	N/A	77
Source (kBtu/ft^2)	229	229	90	N/A	182
Energy Cost					
$/year	$ 7,635.98	$ 7,635.98	$ 2,996.28	N/A	$ 7,768.14
$/$ft^2$/year	$ 3.11	$ 3.11	$ 1.22	N/A	$ 3.16
Greenhouse Gas Emissions					
$MtCO_2e$/year	26	26	10	N/A	26
$kgCO_2e/ft^2$/year	11	11	4	N/A	11

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

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

CMC MUA - TRANSFER STATION ADMINISTRATION BUILDING

Burner

Tag	Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
-	MECHANICAL ROOM	Furnace	Beckett	1	AFG DU201	970210-84057	.76 GPH	80.7	#2 OIL	1984	18	(-8)	

Domestic Hot Water Heater

Tag	Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	Service Life	Remaining Life	Notes
-	MECHANICAL ROOM	RESTROOMS/BREAK RM.	Bradford White	1	MI150-9-3SF-008	Aj-01-2019	9 kW	-	50	-	Electric 208/1/60	6	12	6	

Air Handling Units

Tag	Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity MBH	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts / Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
-	MECHANICAL ROOM	OFFICE AREA	TRANE	1	TCU0858936B	M3814610X	Trane G2FD048H21A	8.2	42	Oil HX	106.4	85	82%	#2 oil	-	-	1984	15	(-11)	

AC Condensers

Tag	Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity MBH	Eff.	Refrigerant	Volts / Phase	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
-	South Side on Grade	Office Area	York International	1	H1RA042S06D	WELM031977	42	7.8	R-22	208/1	1984	15	(-11)	

Unit Heaters and Cabinet Unit Heaters

Tag	Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Heating Type	Input GPH	Heating Output Capacity (MBH)	CFM	RPM / HP	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
-	Maintenance Area	Maintenance Area	Modine	1	PBH 100	1501111283	Oil HX	0.85	100	1890	1100 / 1/5	1984	18	(-8)	84.6 % Eff.

Air Compressor

Tag	Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	Pressure	Capacity	Volts / Phase	FLA	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
-	Maintenance Area	Maintenance Area	Wesward	1	5Z399C	L 2/14/03-0004	5	175	17.1 SCFM, 80 GALLON	460/3	-	2003	20	13	Emerson Motor H19307, 1755 RMP, 184T, 85.5 % NEMA Eff.

NOTE: IF AN ITEM IS LEFT BLANK, THE INFORMATION IS EITHER NOT AVAILABLE OR NOT APPLICABLE FOR THIS PIECE OF EQUIPMENT.

Investment Grade Lighting Audit

CEG Job #: 9C09168
Project: CMC MUA - Transfer Station Admin.
Address: 650 Shunpike Road
Burleigh, NJ 08210
Building SF: 2,456

"Transfer Station Admin"

KWH COST: $0.154

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING										SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
142.21	Office	3200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	921.6	$141.93	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector ; retrofit	86	0.17	550.4	$84.76	$100.00	$200.00	0.12	371.2	$57.16	3.50
142.21	Scale Office	3200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	921.6	$141.93	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector ; retrofit	86	0.17	550.4	$84.76	$100.00	$200.00	0.12	371.2	$57.16	3.50
611	Restroom	650	1	1	Pendant Mnt., 100w A19 Lamp	100	0.10	65.0	$10.01	1	1	(1) 26w CFL Lamp	26	0.03	16.9	$2.60	$20.00	$20.00	0.07	48.1	$7.41	2.70
122.21	Corridor	3600	3	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	75	0.23	810.0	$124.74	3	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.17	626.4	$96.47	$100.00	$300.00	0.05	183.6	$28.27	10.61
600		8760	1	1	LED Exit Sign	5	0.01	43.8	$6.75	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
132.21	Lunch Room	3200	2	3	2x4, 3-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	104	0.21	665.6	$102.50	2	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.12	371.2	$57.16	$100.00	$200.00	0.09	294.4	$45.34	4.41
142.21	Men's Restroom/ Locker Room	3200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	921.6	$141.93	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector ; retrofit	86	0.17	550.4	$84.76	$100.00	$200.00	0.12	371.2	$57.16	3.50
126		3200	1	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.04	134.4	$20.70	1	2	2 Lamp, 17w T8, Elect. Ballast; retorfit	32	0.03	102.4	$15.77	$100.00	$100.00	0.01	32	$4.93	20.29
142.21	Women's Restroom/ Locker Room	3200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	921.6	$141.93	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector ; retrofit	86	0.17	550.4	$84.76	$100.00	$200.00	0.12	371.2	$57.16	3.50
126		3200	1	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.04	134.4	$20.70	1	2	2 Lamp, 17w T8, Elect. Ballast; retorfit	32	0.03	102.4	$15.77	$100.00	$100.00	0.01	32	$4.93	20.29
732	Maintenance Shop	3200	5	1	150w HPS Lo Bay - No Lens	188	0.94	3,008.0	$463.23	5	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, w/Wire Guard - Lo Bay	120	0.60	1920	$295.68	$220.00	$1,100.00	0.34	1088	$167.55	6.57
121.16		3200	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	68	0.07	217.6	$33.51	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	185.6	$28.58	$100.00	$100.00	0.01	32	$4.93	20.29
221.36	Heater Room	3200	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Clear Acrylic Lens	58	0.06	185.6	$28.58	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
727	Entrance (Front)	3600	1	1	70w HPS, 1x1 Surface Mnt., Prismatic Lens	92	0.09	331.2	$51.00	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
727	Entrance (Side)	8760	1	1	70w HPS, 1x1 Surface Mnt., Prismatic Lens	92	0.09	805.9	$124.11	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
600	Various	8760	2	1	LED Exit Sign	5	0.01	87.6	$13.49	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		28	35			3.03	10,175.5	$1,567.03	28	27			1.726	5526.5	$851.08		$2,720.00	1.05	3194.9	$492.01	5.53

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 replacment calculations

CEG Job #: 9C09168
Project: CMC MUA - Transfer Station Admin.
Address: 650 Shunpike Road
Burleigh, NJ 08210
Building SF: 2456

"Transfer Station Admin"

KWH COST: **$0.154**

ECM #2: Lighting Controls

EXISTING LIGHTINC										PROPOSED LIGHTING CONTROLS										SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
142.2	Office	3200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	921.6	$141.93	2	1	Dual Technology Occupancy Sensor	144	0.29	10%	829.44	$127.73	$160.00	$160.00	0.00	92.16	$14.19	11.27
142.2	Scale Office	3200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	921.6	$141.93	2	0	No Change	144	0.29	0%	921.6	$141.93	$160.00	$0.00	0.00	0	$0.00	0.00
611	Restroom	650	1	1	Pendant Mnt., 100w A19 Lamp	100	0.10	65.0	$10.01	1	0	No Change	100	0.10	0%	65	$10.01	$160.00	$0.00	0.00	0	$0.00	0.00
122.2	Corridor	3600	3	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	75	0.23	810.0	$124.74	3	0	No Change	75	0.23	0%	810	$124.74	$160.00	$0.00	0.00	0	$0.00	0.00
600		8760	1	1	LED Exit Sign	5	0.01	43.8	$6.75	1	0	No Change	5	0.01	0%	43.8	$6.75	$160.00	$0.00	0.00	0	$0.00	0.00
132.2	Lunch Room	3200	2	3	2x4, 3-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	104	0.21	665.6	$102.50	2	1	Dual Technology Occupancy Sensor	104	0.21	10%	599.04	$92.25	$160.00	$160.00	0.00	66.56	$10.25	15.61
142.2	Men's Restroom/ Locker Room	3200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	921.6	$141.93	2	1	Dual Technology Occupancy Sensor	144	0.29	10%	829.44	$127.73	$160.00	$160.00	0.00	92.16	$14.19	9.84
126		3200	1	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.04	134.4	$20.70	1	0		42	0.04	10%	120.96	$18.63	$160.00	$0.00	0.00	13.44	$2.07	0.00
142.2	Women's Restroom/ Locker Room	3200	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	144	0.29	921.6	$141.93	2	1	Dual Technology Occupancy Sensor	144	0.29	10%	829.44	$127.73	$160.00	$160.00	0.00	92.16	$14.19	9.84
126		3200	1	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.04	134.4	$20.70	1	0		42	0.04	10%	120.96	$18.63	$160.00	$0.00	0.00	13.44	$2.07	0.00
732	Maintenance Shop	3200	5	1	150w HPS Lo Bay - No Lens	188	0.94	3,008.0	$463.23	5	0	No Change	188	0.94	0%	3008	$463.23	$160.00	$0.00	0.00	0	$0.00	0.00

121.2	Maintenance Shop	3200	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	68	0.07	217.6	$33.51	1	0	No Change	68	0.07	0%	217.6	$33.51	$160.00	$0.00	0.00	0	$0.00	0.00
221.4	Heater Room	3200	1	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Clear Acrylic Lens	58	0.06	185.6	$28.58	1	0	No Change	58	0.06	0%	185.6	$28.58	$160.00	$0.00	0.00	0	$0.00	0.00
727	Entrance (Front)	3600	1	1	70w HPS, 1x1 Surface Mnt., Prismatic Lens	92	0.09	331.2	$51.00	1	0	No Change	92	0.09	0%	331.2	$51.00	$160.00	$0.00	0.00	0	$0.00	0.00
727	Entrance (Side)	8760	1	1	70w HPS, 1x1 Surface Mnt., Prismatic Lens	92	0.09	805.9	$124.11	1	1	"Fish Eye" Photo Cell	92	0.09	55%	362.664	$55.85	$160.00	$160.00	0.00	443.256	$68.26	2.34
600	Various	8760	2	1	LED Exit Sign	5	0.01	87.6	$13.49	2	0	No Change	5	0.01	0%	87.6	$13.49	$160.00	$0.00	0.00	0	$0.00	0.00
	Totals		28	35			3.03	10,175.5	$1,567.03	28	5			3.034	1.15	$9,362.34			800.00	0.0	813	125.23	6.39

Project Name: LGEA Solar PV Project - Cape May Transfer Station
Location: Cape May, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

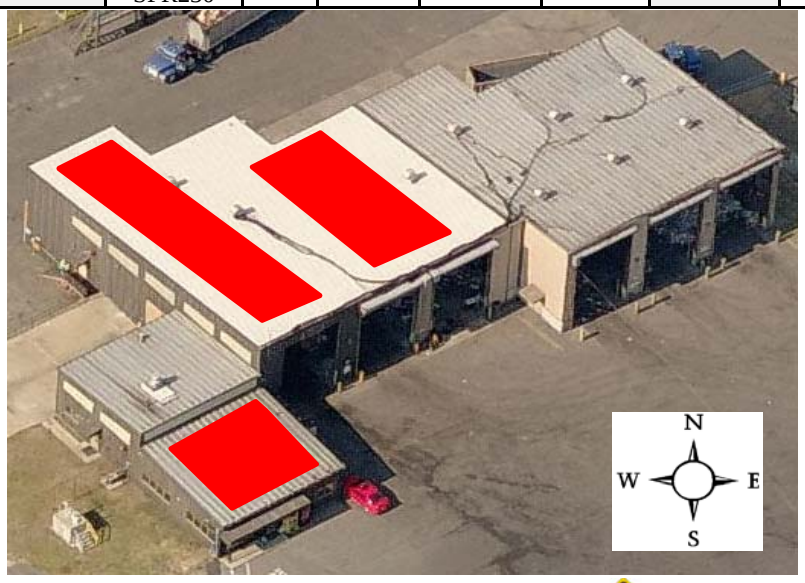
	Photovoltaic System - Direct Purchase
Total Construction Cost	$304,290
Annual kWh Production	41,304
Annual Energy Cost Reduction	$6,361
Annual SREC Revenue	$14,456
First Cost Premium	**$304,290**
Simple Payback:	**14.62** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.154**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$304,290	0	0	0	$0	(304,290)	0
1	$0	41,304	$6,361	$0	$14,456	$20,817	($283,473)
2	$0	41,097	$6,552	$0	$14,384	$20,936	($262,537)
3	$0	40,892	$6,748	$0	$14,312	$21,060	($241,477)
4	$0	40,688	$6,951	$0	$14,241	$21,191	($220,285)
5	$0	40,484	$7,159	$417	$14,169	$20,912	($199,374)
6	$0	40,282	$7,374	$415	$14,099	$21,058	($178,316)
7	$0	40,080	$7,595	$413	$14,028	$21,210	($157,106)
8	$0	39,880	$7,823	$411	$13,958	$21,370	($135,736)
9	$0	39,680	$8,058	$409	$13,888	$21,537	($114,198)
10	$0	39,482	$8,299	$407	$13,819	$21,711	($92,487)
11	$0	39,285	$8,548	$405	$13,750	$21,893	($70,594)
12	$0	39,088	$8,805	$403	$13,681	$22,083	($48,510)
13	$0	38,893	$9,069	$401	$13,612	$22,281	($26,230)
14	$0	38,698	$9,341	$399	$13,544	$22,487	($3,743)
15	$0	38,505	$9,621	$397	$13,477	$22,701	$18,959
16	$0	38,312	$9,910	$395	$13,409	$22,925	$41,883
17	$0	38,121	$10,207	$393	$13,342	$23,157	$65,040
18	$0	37,930	$10,513	$391	$13,276	$23,398	$88,439
19	$0	37,740	$10,829	$389	$13,209	$23,649	$112,088
20	$0	37,552	$11,154	$387	$13,143	$23,910	$135,998
21	$1	37,364	$11,488	$385	$13,077	$24,181	$160,179
22	$2	37,177	$11,833	$383	$13,012	$24,462	$184,641
23	$3	36,991	$12,188	$381	$12,947	$24,754	$209,395
24	$4	36,806	$12,554	$379	$12,882	$25,057	$234,452
25	$5	36,622	$12,930	$377	$12,818	$25,371	$259,822
	Totals:	972,955	$231,911	$8,332	$340,534	$564,112	($523,168)
				Net Present Value (NPV)		**$259,847**	
				Internal Rate of Return (IRR)		**5.2%**	

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
Transfer Station Admin building	2400	Sunpower SPR230	147	14.7	2,162	33.81	41,304	4,851	15.64



PVWatts

AC Energy & Cost Savings

Cautions for Interpreting the Results

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	33.8 kW
DC to AC Derate Factor:	0.810
AC Rating:	27.4 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	11.2 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	2.58	2196	245.95
2	3.33	2593	290.42
3	4.31	3622	405.66
4	5.20	4126	462.11
5	5.85	4712	527.74
6	6.14	4586	513.63
7	6.06	4633	518.90
8	5.54	4258	476.90
9	4.85	3661	410.03
10	3.76	2989	334.77
11	2.65	2094	234.53
12	2.23	1834	205.41
Year	4.38	41304	4626.05

.= Proposed PV Layout

Notes:

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