LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR:

CITY OF NORTH WILDWOOD
901 ATLANTIC AVENUE
NORTH WILDWOOD, NJ 08260
ATTN: RAYMOND TOWNSEND
CITY ADMINISTRATOR

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:

KEVIN C. BLANKENBUEHLER
DIRECTOR OF ENERGY SERVICES
EMAIL: KBLANK@CEG-INC.NET

REPORT ISSUANCE: **FINAL, JANUARY 21, 2011**

PROJECT NO: **9C10097**

TABLE OF CONTENTS

REPORT DISCLAIMER

The information contained within this report, including any attachment(s), is intended solely for use by the named addressee(s). If you are not the intended recipient, or a person designated as responsible for delivering such messages to the intended recipient, you are not authorized to disclose, copy, distribute or retain this report, in whole or in part, without written authorization from Concord Engineering Group, Inc., 520 S. Burnt Mill Road, Voorhees, NJ 08043.

This report may contain proprietary, confidential or privileged information. If you have received this report in error, please notify the sender immediately. Thank you for your anticipated cooperation.

I. EXECUTIVE SUMMARY

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

North Wildwood
City Hall
901 Atlantic Avenue
North Wildwood, NJ 08260

Municipal Contact Person: Raymond Townsend
Facility Contact Person: Doug Ford

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	$ 21,624
Natural Gas	$ 3,436
Total	$ 25,060

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	$5,827	$331	17.6	-14.8%
ECM #2	Lighting Controls	$1,250	$117	10.7	40.4%
ECM #3	Occupancy Controlled Power Strips	$2,160	$311	6.9	44.2%
ECM #4	DHW Heater Upgrade	$2,625	$447	5.9	104.3%
ECM #5	Replace WSHP Units	$225,360	$1,576	143.0	-86.7%
ECM #6	Constant Volume Rooftop Units	$125,460	$5,004	25.1	-40.2%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	7 kW Roof PV System	$64,170	$4,205	15.3	63.8%

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	1.1	1912.0	0.0
ECM #2	Lighting Controls	0.4	676.1	0.0
ECM #3	Occupancy Controlled Power Strips	0.0	1800.0	0.0
ECM #4	DHW Heater Upgrade	4.5	3588.0	-125.0
ECM #5	Replace WSHP Units	12.0	7397.0	213.0
ECM #6	Constant Volume Rooftop Units	7.0	24208.0	587.0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	**DESCRIPTION**	**ANNUAL UTILITY REDUCTION**		
		ELECTRIC DEMAND (KW)	**ELECTRIC CONSUMPTION (KWH)**	**NATURAL GAS (THERMS)**
REM #1	7 kW Roof PV System	7.1	8040.0	0.0

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

- **ECM #3:** Power Strips
- **ECM #4:** DHW Heater Upgrade

Although ECM#2 Lighting Controls payback is beyond 10 years it is recommended the city look further into installing these controls in areas such as offices, restroom, and storage rooms where lights could be inadvertently left on while unoccupied.

Furthermore ECM #6 Constant Volume Rooftop units should be considered as the current Water Source Heat Pump system is nearing the end of its useful, and the cooling tower is in need of replacement. The installation of the rooftops will provide an energy reduction over the existing system, however not enough to meet the payback criteria. The system will provide additional benefits through improved occupant comfort, more controllability, and improved indoor air quality.

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. These recommendations are discussed in further detail in Section XI.

Renewable Energy Measures (REMs) were also reviewed for implementation at City Hall. CEG utilized a roof mounted solar array to house a PV system. The recommended 7.13 kW PV system will produce approximately 8,040 kWh of electricity annually and will reduce the facility's electrical consumption from the grid by 6%. The system's calculated simple payback of 15.6 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 North Wildwood City Hall appears to be operating as efficiently as possible with its current equipment. With the implementation of the above recommended measures the city could realize substantial energy savings and additional ancillary benefits that could improve the building.

II. INTRODUCTION

The comprehensive energy audit covers the 7,500 square foot City Hall Building, which includes the following space types of offices, Council Chambers, storage rooms, boiler room, vault, restrooms and lobby.

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 (ACE) provides electricity to the facility under their Annual General Service rate structure. A Third Part Supplier (TPS) was recently contracted through the county consortium which is with Hess Corporation; the billing data obtained reflects this change in the most recent month only. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

The gas usage profile shows the actual natural gas energy usage for the facility. South Jersey Gas Company (SJG) provides natural gas to the facility under the General Service Gas (GSG) rate structure. A Third Part Supplier (TPS) has not been contracted. 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.

Description	Average
Electricity	17.3¢ / kWh
Natural Gas	$1.39 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Atlantic City Electric
Rate: Annual General Service
Meter No: 81957061
Account # 0013 5279 9991
Third Party Utility Hess
TPS Meter / Acct No:

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Nov-09	7,120	22.0	$1,178
Dec-09	10,440	30.8	$1,614
Jan-10	10,600	36.0	$1,573
Feb-10	10,560	32.0	$1,618
Mar-10	9,040	29.2	$1,383
Apr-10	7,480	29.2	$1,203
May-10	7,480	26.4	$1,230
Jun-10	12,200	31.6	$2,161
Jul-10	13,160	31.6	$2,319
Aug-10	14,400	33.2	$2,541
Sep-10	12,120	30.8	$2,176
Oct-10	10,240	30.8	$2,628
Totals	**124,840**	**36.0 Max**	**$21,624**

AVERAGE DEMAND **30.3 KW average**
AVERAGE RATE **$0.173** **$/kWh**

Figure 1
Electricity Usage Profile

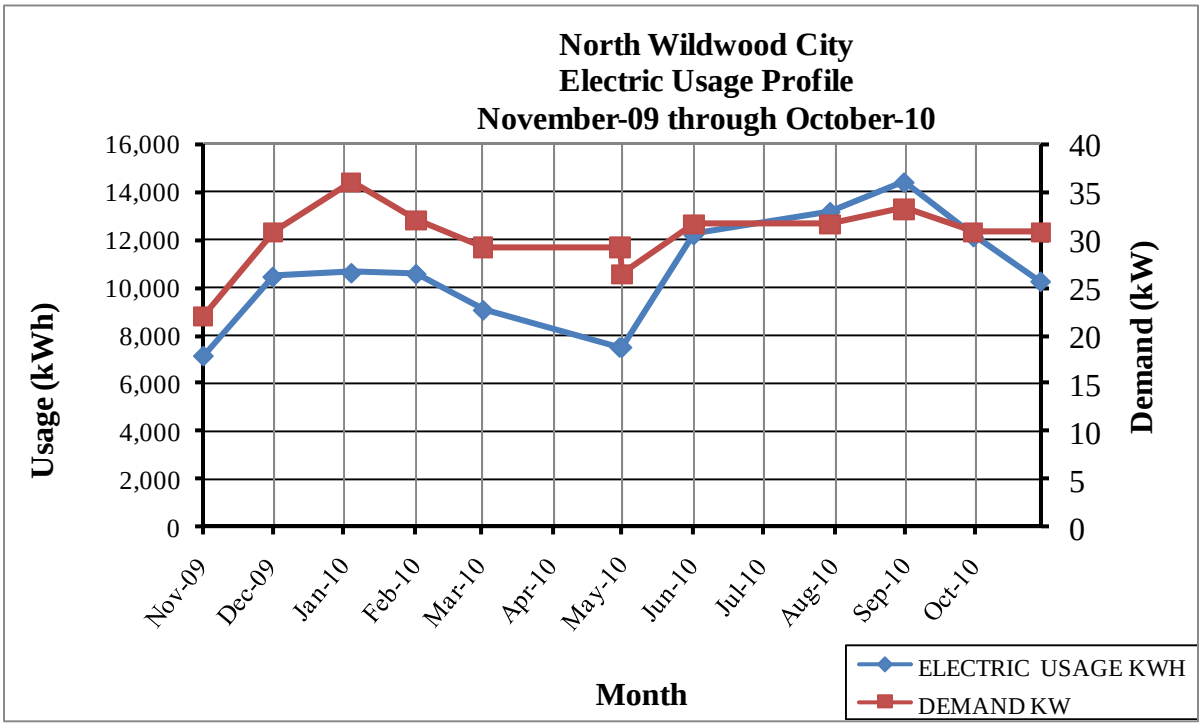


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY

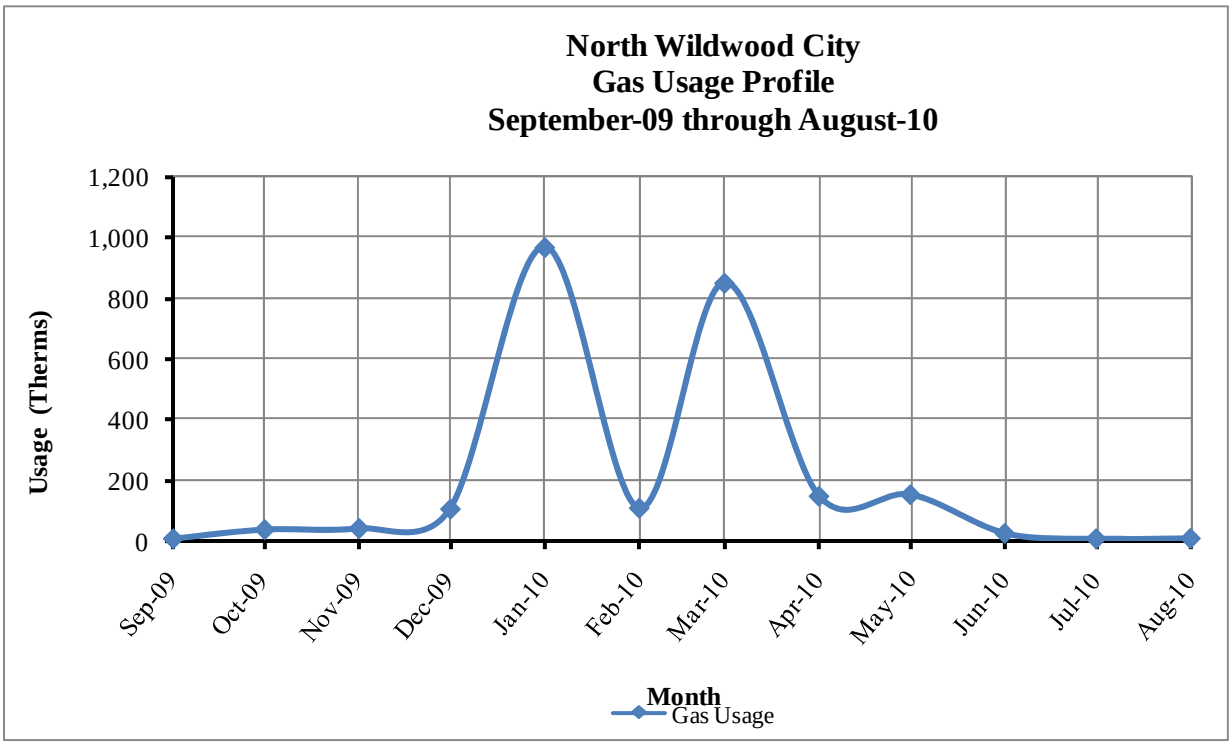
Utility Provider: South Jersey Gas
Rate: GSG
Meter No: 4389511
Point of Delivery ID: 4 12 51 2470 1 5
Third Party Utility Provider:
TPS Meter No:

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Sep-09	9.22	$33.04
Oct-09	39.12	$69.01
Nov-09	43.04	$75.92
Dec-09	106.81	$155.82
Jan-10	967.08	$1,271.58
Feb-10	109.78	$162.31
Mar-10	849.53	$1,119.60
Apr-10	148.92	$211.83
May-10	154.20	$218.04
Jun-10	26.81	$54.11
Jul-10	9.23	$30.70
Aug-10	10.24	$33.88
TOTALS	**2,473.98**	**$3,435.84**

AVERAGE RATE: **$1.39** **$/THERM**

* Note: For Billing Months Dec-09 and Feb-10 meter readings were estimated by the gas company, subsequently the months following were actual readings that are higher then typical usage due to the adjustment of the previous month's usage.

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

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

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

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

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

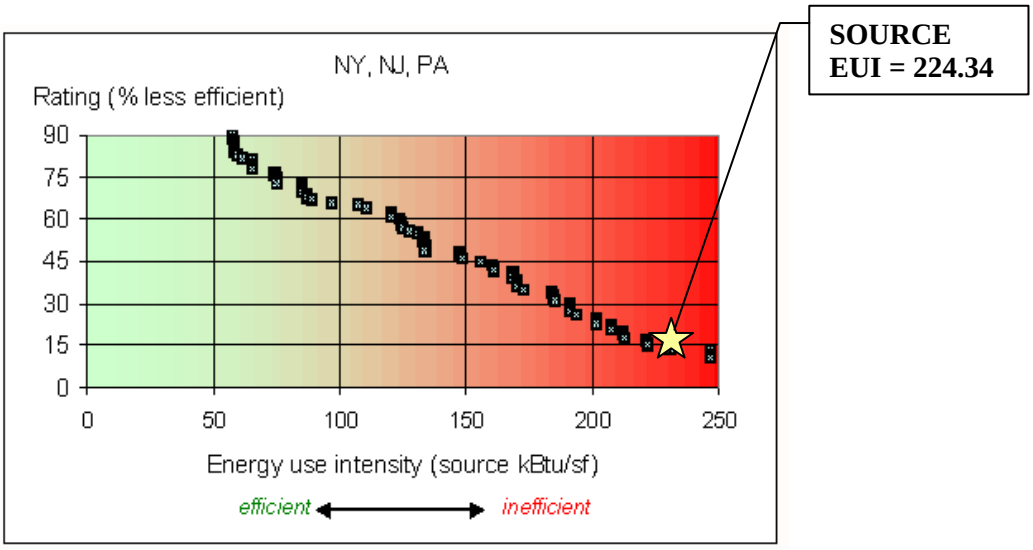
$$Building\ \ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ \ X\ \ SS\ \ Ratio + Gas\ Usage\ in\ kBtu\ \ X\ \ SS\ \ Ratio)}{Building\ \ Square\ \ Footage}$$

Table 5
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	124,840.0			426,204	3.340	1,423,521
NATURAL GAS		2,474.0		247,398	1.047	259,026
TOTAL				673,602		1,682,546
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		7,500	SQUARE FEET			
BUILDING SITE EUI		*89.81*	kBtu/SF/YR			
BUILDING SOURCE EUI		*224.34*	kBtu/SF/YR			

Figure 3 below depicts a national EUI grading for the source use of *Office Buildings*

Figure 3
Source Energy Use Intensity Distributions: Office Buildings



Based on the information compiled for the studied facility, as compared to the national average the energy usage is approximately 79% higher than the baseline data.

C. EPA Energy Benchmarking System

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

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

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

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

User Name: NWildwood
Password: lgeaceg2010

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

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**
City Hall	20	50

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

V. FACILITY DESCRIPTION

The 7,500 SF City Hall Building is a two story facility comprised of administrative offices, lobby/reception area, restrooms, and Council Chamber room. The typical hours of operation for this facility are between 9:00 am and 4:00 pm, and during these hours normally occupied by approximately thirty city employees. Exterior walls are brick construction with minimum insulation typical of the time period. 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 vinyl 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 built up. The amount of insulation below the roofing is not specifically known but is at most minimal. The building was built in 1976 with no major additions since the original construction.

HVAC Systems

The facility is conditioned via a Water Source Heat Pump loop that has console units located in each area. The typical console units are 1992 vintage and manufactured by American Air Filter (AAF) or Synder General/McQuay. Each unit is rated at 9,000 Btu/h of cooling and approximately 10,000 Btu/h of heating capacity. Each heat pump is controlled via unit mounted controls that only allow selection of cooling or heating mode, and a fan speed setting. There are approximately twenty-seven console units located throughout the building. Loop water is circulated via two B&G pumps rated at ¼ and ¾ horsepower each. In the summer only one pump is required to operate to satisfy the building load and both pumps operate in the winter. Facility staff stated the loop temperature was generally kept around 70 degree Fahrenheit during the cooling season and 80 degree Fahrenheit during heating season.

The heat pump loop is connected to a closed circuit cooling tower and an additional loop storage tank. The tower is manufactured by BAC with no visible name plate information; the fan was driven by a single motor approximately 10 – 15 horsepower with no variable speed drive controls. The tower had an additional 5 horsepower condenser loop pump vertical mounted.

Hot Water for heating is injected into the water source heat pump loop via one natural gas Weil McLain cast iron boiler rated at 260 MBH output. There is an additional ¼ HP circulator pump attached to the boiler plant.

The facility additionally has hot water baseboard located in the restrooms on the first and second floors, and the first floor lobby had a 115 V electric radiant heater to provide additional heat by the entranceway.

Domestic Hot Water

Domestic hot water for the restrooms and office kitchenette is provided by a 30 gallon AO Smith electric hot water heater, capacity of 4500 Watts. The domestic hot water is circulated throughout the building by a hot water re-circ pump. The domestic hot water piping insulation appeared to be in good condition.

Lighting

Typical lighting throughout building is fluorescent tube lay-in fixtures with T-8 lamps and electronic ballasts. Storage rooms and closets lit with a mixture of incandescent lamps and compact fluorescent lamps. It was noted that many of the existing fixture lenses had become discolored from dirt and moisture over time, it is recommended that new lenses be installed to improve light quality in these spaces.

VI. MAJOR EQUIPMENT LIST

The equipment list contains major energy consuming equipment that through implementation of 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

Description:

Lighting throughout the facility consists mainly of 32 watt T8 lamps with electronic ballasts, some incandescent medium base lamps, compact fluorescent lamps, and some remaining T12 34 watt lamps with magnetic ballasts. It is recommended that all T12 lamps be upgraded to T8 technology, and that all T8 lamps in the facility be changed over to 28 watt Super Saver T8 lamps, additionally any incandescent lamps should be retrofitted to CFL. Further detail of the proposed retrofit is provided in the Lighting Audit Appendix.

Energy Savings Calculations:

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

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,857
NJ Smart Start Equipment Incentive ($):	$30
Net Installation Cost ($):	$5,827
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$331
Total Yearly Savings ($/Yr):	$331
Estimated ECM Lifetime (Yr):	15
Simple Payback	17.6
Simple Lifetime ROI	-14.8%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$4,964
Internal Rate of Return (IRR)	-2%
Net Present Value (NPV)	($1,876.50)

ECM #2: Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. In many cases the lights are left on because of the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. This is common in rooms that are occupied for only short periods and only a few times per day. In some instances lights are left on due to the misconception that it is better to keep the lights on rather than to continuously switch lights on and off. Although increased switching reduces lamp life, the energy savings outweigh the lamp replacement costs. The payback timeframe for when to turn the lights off is approximately two minutes. If the lights are expected to be off for at least a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed. Occupancy sensors detect motion and will switch the lights on when the room is occupied. Occupancy sensors can either be mounted in place of a current wall switch, or on the ceiling to cover large areas. Photocell control senses light levels and turn off or reduce lights when there is adequate daylight. Photocells are mostly used outside, but are becoming more popular in energy-efficient interior lighting designs as well.

The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Occupancy Sensors for Lighting Control - 20%-28%.

Energy savings achieved for "Occupancy Sensors for Lighting Control" average 20%-28%. Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the total light energy controlled by occupancy sensors. The estimated savings is below the average listed above due to the continuous occupancy nature of college educational facilities. The majority of the savings is expected to be after school hours when rooms are left with lights on.

The ECM includes replacement of standard wall switches with sensors wall switches for individual offices, classrooms, and study areas. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. See the "Investment Grade Lighting Audit" appendix for details.

The **Investment Grade Lighting Audit Appendix** of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by 10% for all areas that include occupancy sensors.

Energy Savings Calculations:

$$Energy\ \ Savings = \left(10\% \times Occuapancy\ \ Sensored\ \ Light\ \ Energy\ \left(kWh/Yr\right)\right)$$

$$Savings. = Energy\ \ Savings\ \left(kWh\right) \times Ave\ Elec\ Cost\left(\frac{\$}{kWh}\right)$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,650
NJ Smart Start Equipment Incentive ($):	$400
Net Installation Cost ($):	$1,250
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$117
Total Yearly Savings ($/Yr):	$117
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.7
Simple Lifetime ROI	40.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,755
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	$146.38

ECM #3: Occupancy Controlled Power Strips

Description:

Plug loads in buildings are increasingly becoming a majority share of electrical consumption annually, as HVAC and lighting technologies are becoming more efficient and more energy is being utilized other equipment. The City Hall has approximately twenty four computers used by staff during the survey it was noted that many of these computers were on and operating while no one was using the work station. To reduce idle power draw load from the computer and peripheral equipment while not in use, CEG recommends the installation of Watt Stopper IDP-3050 occupancy controlled power strip. The power strip has the same features of a typical strip except it is fitted with an infrared occupancy sensor. The sensor reads when an occupant is using their workstation and insures all equipment is fully powered, however when an occupant is not present the strip shuts power off to devices plugged into the control outlets of the strip. Installing these power strips could substantially reduce energy waste due to plugged in equipment. The intent of this ECM is to provide control of ancillary devices such as computer monitors, speakers, printers, phone charges, task lights, and etc. that can be shut off by the control outlets when the user is not present.

Energy Savings Calculations:

The manufacturer has estimated that typical savings for their power strip can save 75 kilowatt-hours per work station or more.

POWER STRIP SAVINGS CALCULATIONS	
ECM INPUTS	
Number of Computers	24
Power Strip Information	
Manufacturer	Watt Stopper
Model	IDP-3050
Savings per Workstation (kWh/yr)	75
Electric Cost ($/kWh)	$0.173
Total Electric Savings, kWh	1,800
Total Cost Savings	$311.40

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,160
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$2,160
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$311
Total Yearly Savings ($/Yr):	$311
Estimated ECM Lifetime (Yr):	10
Simple Payback	6.9
Simple Lifetime ROI	44.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,114
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	$496.31

ECM #4: DHW Heater Upgrade

Description:

The City Hall's existing electric hot water heater is a 30 gallon 4.5 kilowatt AO Smith boiler located in the basement mechanical room Electric water heating, although potentially 100% efficient (100% of Btu's from electricity transferred into heating the water), is generally more expensive due to the high cost of electricity. The heater appears to be past the its useful life and could be replace with a much more cost effective natural gas fired tank-less hot water heating system, given the low hot water demand requirements of the office environment.

It is recommended the existing hot water heater be replaced with a Rinnai Model RC98HPi natural gas fired tank-less hot water heater. The unit is rated at 199 MBH max output and 96% thermal efficiency.

Energy Savings Calculations:

Savings calculations are based on the Energy Information Administration Commercial Building Energy Consumption Survey 2003 data for office type water heating. The below table shows savings calculations based on existing and proposed conditions.

Incentive value is based on NJ SmartStart Program which provides $300 dollars per tank-less natural gas fired heater.

CONDENSING DOM. HOT WATER HEATER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Hot Water Heater	Rinnai Tank-less High Efficiency	
Building Type	Office		
Building Square-foot	7,500	7,500	
Domestic Water Heat Energy Usage , kBtu	12,000.00	12,000.00	
DHW Heating Fuel Type	Electric	Gas	
Fuel Heat Value Electricity(BTU/KWH)	*3,413*	*3,413*	
Fuel Heat Value Nat Gas (Btu/Therms)	*100,000*	*100,000*	
Heating Efficiency	98%	96%	
Total Usage (kBTU)	12,245	12,500	
Electric Cost ($/kWh)	$ 0.173	$ 0.173	
Nat Gas Cost ($/Therm)	$ 1.390	$ 1.390	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Electric Consumption (kWh)	3,588	0	3,588
Nat Gas Consumption (Therms)	0	125	-125
Energy Cost ($)	$621	$174	$447
COMMENTS:	Savings are based on Energy Information Administration Commercial Building Energy Consumption Survey 2003 Information		

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,925
NJ Smart Start Equipment Incentive ($):	$300
Net Installation Cost ($):	$2,625
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$447
Total Yearly Savings ($/Yr):	$447
Estimated ECM Lifetime (Yr):	12
Simple Payback	5.9
Simple Lifetime ROI	104.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$5,364
Internal Rate of Return (IRR)	13%
Net Present Value (NPV)	$1,824.44

ECM #5: Replace WSHP Units

Description:

The existing water source heat pumps through the building are antiquated and past their useful equipment lives. New more efficient water source console units could be installed that would provide better control capabilities to each user. The cooling tower is also well past its useful life and is in need of replacement, as the cooling tower further ages the efficiency of the tower will diminish. The installation of a new tower with variable speed drive controls can significantly reduce the required fan power at part load scenarios.

The ECM would require the removal of approximately 27 console units in the facility and the installation of new McQuay water source heat pump high efficiency console units rated at 9,000 Btu/h of cooling at 14.1 EER and 11,000 Btu/h of heating at 4.7 COP. The existing BAC cooling tower will also need to removed and replaced with a new tower fitted with variable speed drive controls.

Energy Savings Calculations:

Savings Calculations were calculated with energy modeling software, Trane Trace 700 version 6.2.6.5, to compare the existing conditions to the alternative energy conservation measure. The model was built using existing information collected and provided by the city regarding lighting power density, occupancy profiles, HVAC information, and available floor plans.

Incentives were calculated based on WSHP incentive values:

27 units x 0.75 tons per unit x $81 per ton = $1,640

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$227,000
NJ Smart Start Equipment Incentive ($):	$1,640
Net Installation Cost ($):	$225,360
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,576
Total Yearly Savings ($/Yr):	$1,576
Estimated ECM Lifetime (Yr):	19
Simple Payback	143.0
Simple Lifetime ROI	-86.7%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$29,944
Internal Rate of Return (IRR)	-15%
Net Present Value (NPV)	($202,785.69)

ECM #6: Constant Volume Rooftop Units

Description:

The existing water source system console units and cooling tower are currently at the end of their useful lives and are in need of replacement. It was noted by facility staff that much of the piping loop piping is damaged and in need of repair. The current state of the water source system is making it an inefficient and maintenance intensive system that should be replaced with something more efficient. Given the expense of replacing the water source and the relatively small size of the building it was discussed with the facility staff in regard to feasibility of installing high efficiency rooftop units with direct expansion cooling and natural gas fired heating to condition City Hall.

This ECM would require the removal of all existing console heat pump units and cooling tower. This includes installation of two rooftop units that will be high efficiency ASHRAE 90.1-2007 compliant or better with direct expansion cooling and natural gas fired heat exchangers, and be outfitted with economizer controls and programmable thermostats with occupied/unoccupied capability. The units will be rated at approximately 10 tons of cooling for the first floor and 15 tons of cooling for the second floor. Additionally all required new ductwork in the ceiling space, diffusers, electrical wiring, thermostat controls, and gas piping shall be provided for the units.

Energy Savings Calculations:

Savings Calculations were calculated with energy modeling software, Trane Trace 700 version 6.2.6.5, to compare the existing conditions to the alternative energy conservation measure. The model was built using existing information collected and provided by the city regarding lighting power density, occupancy profiles, HVAC information, and available floor plans.

Incentives were calculated based on:

Unitary HVAC Equipment:

10 ton x $73 per ton = $730
15 ton x $79 per ton = $1,185

Economizer Controls:

2 x $250 per control = $500

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$127,875
NJ Smart Start Equipment Incentive ($):	$2,415
Net Installation Cost ($):	$125,460
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$5,004
Total Yearly Savings ($/Yr):	$5,004
Estimated ECM Lifetime (Yr):	15
Simple Payback	25.1
Simple Lifetime ROI	-40.2%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$75,060
Internal Rate of Return (IRR)	-6%
Net Present Value (NPV)	($65,722.57)

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy 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 Generation

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which are 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 500 S.F. can be utilized for a PV system, after review of roof obstruction and shading concerns. 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 7.13 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 8,040 KWh annually, reducing the overall utility bill by approximately 6.5% 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.

Direct purchase involves the City 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**	**INTERNAL RATE OF RETURN**
Direct Purchase	15.6 Years	4.9%

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

Wind Generation

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, while there is adequate wind speeds in the area to provide substantial electric product the site is not conducive for installation of a turbine. The limited site space and resultant proximity the turbine would have to be from the building and adjacent buildings would cause wind shear that would further reduce production of the turbine. While smaller architectural or vertical turbines could be considered as a roof mounted alternative, the age of the building and structural loading capability of the roof does not lend it self for this type of installation. Therefore, wind energy is not a viable option to implement.

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

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

Electricity:

The Electric Usage Profile demonstrates a fairly typical cooling load profile. The summer (May-August) demonstrates increased consumption typical to air conditioning load. There is a fairly steady yearlong electric load most likely attributable to the internal loads, lighting, electric heaters, and the domestic hot water heater which is also electric. The major contributor to increased heating season electric load is due to the water source heat pump system compressor operation in heating mode and the additional pumping energy used from operating both loop pumps. A flat load profile will allow for more competitive energy prices when shopping for alternative suppliers.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical natural gas (heat load) profile. The summer months demonstrate very low consumption (complimenting the cooling electric load), May through September. There is an increase in consumption January through March, and again October through December. A gas heating hot water boilers is responsible for the natural gas load. A base-load shaping (flat) will secure more competitive energy prices when procuring through an alternative energy source.

Tariff Analysis:

Electricity:

This facility receives electrical service through Atlantic City Electric (ACE) on a AGS (annual General Service) rate. This facility's rate is a single or three phase service at secondary voltages. For electric supply (generation), the customer will use the utilities Basic Generation Service (BGS) or a Third Party Supplier (TPS). This facility uses a third part supplier, Hess Incorporated, to purchase its electric supply through a combined consortium offer through the county at a rate of approximately $0.0914 per kilowatt-hour. The utility Delivery Service includes the following charges: Customer Charge, Distribution Charge (kW Demand), kWh Charge, Market Transition Charge, Transition Bond Charge, Non-utility Generation Charge, SBC, Infrastructure Investment Surcharge, SCC, and Regulatory Assets Recovery Charge. .

Natural Gas:

This facility receives natural gas service through South Jersey Gas (SJG) on a GSG (General Service Gas) rate for commercial and industrial customers who do not qualify for any other rate structure. Customers under this rate can either elect for Firm Sales Service or Firm Transportation Service, but must have a third party market supplier. If customers elect to use Firm Sales Service they purchase gas supply through SJG's Basic Gas Supply Service tariff.

The service described above has a much higher priority of delivery, based on the pipeline capacity. When the pipelines capacity was unbundled (much like the telecom service), it was divided into various levels of service. The "firm" service is the highest priority, and does not get interrupted.

This rate schedule has a Delivery Charge Mechanism which includes: Capital Investment Recovery Tracker, Transportation Initiation Charge, Societal Benefits Charge, Temperature Adjustment Charge, Balancing Service Charge, CIP Charge, and Energy Efficiency Tracker Charge. The customer can elect to have the Supply Charge (Commodity Charge) serviced through the utility or by a Third Party Supplier (TPS). Note: Should the TPS not deliver, the customer may receive service from SJG under BGSS. 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:

At this time the City has already signed on for a third party supplier for its electric commodity through a consortium. This provides them with the lowest possible price; compared if they were to go out on their own and solicit pricing their low usage would hinder highly competitive pricing. While this approach can provide significant savings to the city, CEG recommends taking the most proactive approach possible and being fully educated on the contract language and terms when it comes time extend or renegotiate their third party supplier. It is also suggested that when renegotiating their contract the City review market outlooks for energy to decide on a long or short term contract. Given these recommendation the City will be more likely to see further savings on utility costs.

CEG's secondary recommendation coincides with the natural gas costs. Based on the current market, North Wildwood could improve its natural gas costs. CEG recommends that the city receive further advisement on these prices through discussion with South Jersey Gas. These discussions would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), the city can learn more about the competitive supply process, and acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu.

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. *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 60% 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. *Energy Efficiency and Conservation Block Grants* – The EECGB rebate provides supplemental funding up to $20,000 for counties and local government entities to implement energy conservation measures. The EECGB funding is provided through the American Recovery and Reinvestment Act (ARRA). The local government must be among the eligible local government entities listed on the NJ Clean Energy website as follows - http://njcleanenergy.com/commercial-industrial/programs/eecbg-eligible-entities. This program is limited to municipalities and counties that have not already received grants directly through the US department of Energy.

This incentive is provided in addition to the other NJ Clean Energy program funding. This program's incentive is considered the entity's capital and therefore can be applied to the LGEA program's requirements to implement the recommended energy conservation measures totaling at least 25% of the energy audit cost. Additional requirements of this program are as follows:

1. The entity must utilize additional funding through one or more of the NJ Clean Energy programs such as Smart Start, Direct Install, and Pay for Performance.

2. The EECBG funding in combination with other NJ Clean Energy programs may not exceed the total cost of the energy conservation measures being implemented.

3. Envelope measures are applicable only if recommended by the LGEA energy audit and if the energy audit was completed within the past 12 months.

4. New construction and previously installed measures are not eligible for the EECBG rebate.

5. Energy conservation measures eligible for the EECBG must fall within the list of approved energy conservation measures. The complete list of eligible measures and other program requirements are included in the "EECBG Complete Application Package." The application package is available on the NJ Clean Energy website - http://njcleanenergy.com/commercial-industrial/programs/energy-efficiency-and-conservation-block-grants.

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. Verify occupants are turning heat pump units down to low heating or cooling mode during unoccupied hours to reduce runtime.

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. Ensure timers or photocell sensors are being utilized efficiently on outdoor lighting fixtures.

F. Maintain all pipe insulation on all hot water and cooling loop pipe to reduce system losses.

G. Perform regular maintenance and chemical treatment on cooling tower to ensure optimal efficiency and help prolong life expectancy.

XII. ENERGY AUDIT ASSUMPTIONS

The assumptions utilized in this energy audit include but are not limited to following:

A. Cost Estimates noted within this report are based on industry accepted costing data such as RS Means™ Cost Data, contractor pricing and engineering estimates. All cost estimates for this level of auditing are +/- 20%. Prevailing wage rates for the specified region has been utilized to calculate installation costs. The cost estimates indicated within this audit should be utilized by the owner for prioritizing further project development post the energy audit. Project development would include investment grade auditing and detailed engineering.
B. Energy savings noted within this audit are calculated utilizing industry standard procedures and accepted engineering assumptions. For this level of auditing, energy savings are not guaranteed.
C. Information gathering for each facility is strongly based on interviews with operations personnel. Information dependent on verbal feedback is used for calculation assumptions including but not limited to the following:
    a. operating hours
    b. equipment type
    c. control strategies
    d. scheduling
D. Information contained within the major equipment list is based on the existing owner documentation where available (drawings, O&M manuals, etc.). If existing owner documentation is not available, catalog information is utilized to populate the required information.
E. Equipment incentives and energy credits are based on current pricing and status of rebate programs. Rebate availability is dependent on the individual program funding and applicability.
F. Equipment (HVAC, Plumbing, Electrical, & Lighting) noted within an ECM recommendation is strictly noted as a **basis for calculation** of energy savings. The owner should use this equipment information as a benchmark when pursuing further investment grade project development and detailed engineering for specific energy conservation measures.
G. Utility bill annual averages are utilized for calculation of all energy costs unless otherwise noted. Accuracy of the utility energy usage and costs are based on the information provided. Utility information including usage and costs is estimated where incomplete data is provided.

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

CITY HALL

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	$5,857	$0	$30	$5,827	$331	$0	$331	15	$4,964	$0	-14.8%	17.6	-1.94%	($1,876.50)
ECM #2	Lighting Controls	$1,650	$0	$400	$1,250	$117	$0	$117	15	$1,755	$0	40.4%	10.7	4.57%	$146.38
ECM #3	Occupancy Controlled Power Strips	$2,160	$0	$0	$2,160	$311	$0	$311	10	$3,114	$0	44.2%	6.9	7.27%	$496.31
ECM #4	DHW Heater Upgrade	$1,800	$1,125	$300	$2,625	$447	$0	$447	12	$5,364	$0	104.3%	5.9	13.17%	$1,824.44
ECM #5	Replace WSHP Units	$161,500	$65,500	$1,640	$225,360	$1,576	$0	$1,576	19	$29,944	$0	-86.7%	143.0	-15.15%	($202,785.69)
ECM #6	Constant Volume Rooftop Units	$74,250	$53,625	$2,415	$125,460	$5,004	$0	$5,004	15	$75,060	$0	-40.2%	25.1	-5.83%	($65,722.57)
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	7 kW Roof PV System	$64,170	$0	$0	$64,170	$1,391	$2,814	$4,205	25	$105,125	$70,350	63.8%	15.3	4.22%	$9,052.29

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* .

APPENDIX B

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	$10 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)
Replacement of incandescent with screw-in PAR 38 or PAR 30 (CFL) bulb	$7 per bulb
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%

APPENDIX C

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
City Hall

Building ID: 2530243
For 12-month Period Ending: September 30, 2010[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: December 17, 2010

Facility
City Hall
901 Atlantic Avenue
North Wildwood, NJ 08260

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1976
Gross Floor Area (ft²): 7,500

Energy Performance Rating[2] (1-100) 20

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	426,029
Natural Gas (kBtu)[4]	249,542
Total Energy (kBtu)	675,571

Energy Intensity[5]

Site (kBtu/ft²/yr)	90
Source (kBtu/ft²/yr)	225

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	78

Electric Distribution Utility
Pepco - Atlantic City Electric Co

National Average Comparison

National Average Site EUI	64
National Average Source EUI	159
% Difference from National Average Source EUI	41%
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.

Certifying Professional
N/A

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**

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.

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering Group

North Wildwood - City Hall

Rooftop / AC Units

Tag	HP-1 (Typ)		
Unit Type	Console		
Qty	27		
Location	In Offices		
Area Served			
Manufacturer	Snyder General		
Model #	WMH009AMGR		
Serial #	7 XJ02556 00		
Cooling Type	Water Source Heat Pump		
Cooling Capacity (Tons)	0.75		
Cooling Efficiency (SEER/EER)	8 EER		
Heating Type	Water Source HP		
Heating Input (MBH)	10.9		
Efficiency	3.0 COP		
Fuel	Electric		
Approx Age	18		
ASHRAE Service Life	19		
Remaining Life	1		
Comments	208V/1P/60H		

MAJOR EQUIPMENT LIST

Concord Engineering Group

North Wildwood - City Hall

Boilers

Tag	Boiler-1		
Unit Type	Cast Iron		
Qty	1		
Location	Basement Boiler Room		
Area Served	Entire Building		
Manufacturer	Weil McLain		
Model #	PFG-6		
Serial #	07981		
Input Capacity (MBH)	325		
Rated Output Capacity (MBH)	260		
Approx. Efficiency %	70%		
Fuel	Natural Gas		
Approx Age	31		
ASHRAE Service Life	30		
Remaining Life	(1)		
Comments	Boiler is in Good Condition		

MAJOR EQUIPMENT LIST

Concord Engineering Group

North Wildwood - City Hall

Domestic Water Heaters

Tag	HWH-1		
Unit Type	Domestic Boiler w/ Storage		
Qty	1		
Location	Basement Boiler Room		
Area Served	Entire Building		
Manufacturer	AO Smith		
Model #	KEN-30-780		
Serial #	780T-L-75-09402		
Size (Gallons)	30		
Input Capacity (MBH/KW)	4.5 KW		
Recovery (Gal/Hr)	N/A		
Efficiency %	98%		
Fuel	Electric		
Approx Age	32		
ASHRAE Service Life	12		
Remaining Life	(20)		
Comments			

MAJOR EQUIPMENT LIST

Concord Engineering Group

North Wildwood - City Hall

Cooling Tower

Tag	CT-1		
Unit Type	Closed Circuit Cooler		
Qty	1		
Location	Outdoors Ground Level		
Area Served	Entire Building		
Manufacturer	BAC		
Model #	N/A		
Serial #	N/A		
Rated Flow GPM	N/A		
EWT / LWT	N/A		
Motor HP	Unknown		
Electrical	N/A		
Chilled Water GPM / ΔT	N/A		
Condenser Water GPM / ΔT	N/A		
Approx Age	15		
ASHRAE Service Life	15		
Remaining Life	0		
Comments			

MAJOR EQUIPMENT LIST

Concord Engineering Group

North Wildwood - City Hall

Pumps

Tag	CWP-1	CWP-2	HWP-1
Unit Type			
Qty	1	1	1
Location	Basement Boiler Room	Basement Boiler Room	Basement Boiler Room
Area Served	Loop Pump	Loop Pump	Circulator
Manufacturer	Bell & Gosset	Bell & Gosset	Bell & Gosset
Model #	N/A	N/A	N/A
Serial #	N/A	N/A	N/A
Horse Power	0.75	0.25	0.25
Flow	N/A	N/A	N/A
Motor Info	B&G	B&G	B&G
Electrical Power	115V/1P/60H	115V/1P/60H	115V/1P/60H
RPM	1725	1725	1725
Motor Efficiency %	N/A	N/A	N/A
Approx Age	N/A	N/A	N/A
ASHRAE Service Life	20	20	20
Remaining Life	-	-	-
Comments	In Good Condition	In Good Condition	In Good Condition

Pumps

Tag	CTP-1		
Unit Type	Cooling Tower Circ Pump		
Qty	1		
Location	Outdoors		
Area Served	Cooling Tower		
Manufacturer	Paco		
Model #	N/A		
Serial #	N/A		
Horse Power	5		
Flow	N/A		
Motor Info	Baldor		
Electrical Power	200V		
RPM	2850		
Motor Efficiency %	N/A		
Approx Age	N/A		
ASHRAE Service Life	20		
Remaining Life	-		
Comments			

APPENDIX E

Investment Grade Lighting Audit

CEG Job #: 9C100097
Project: North Wildwood LGEA
Address: 901 Atlantic Ave.
North Wildwood, NJ
Building SF: 7,500

City Hall

KWH COST: $0.173

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
	1ST FLOOR																					
1	Lobby	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.12	211.1	$36.52	2	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$56.50	$113.00	0.01	21.84	$3.78	29.91
2	Clerk Reception	1820	3	2	2-L 17W T8 2x2 Recessed Prismatic Lens	28	0.08	152.9	$26.45	3	2	Existing to Remain	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1	Tax Assessor Office	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.17	316.7	$54.79	3	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.16	283.92	$49.12	$56.50	$169.50	0.02	32.76	$5.67	29.91
1	Tax A. Back Office	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.12	211.1	$36.52	2	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$56.50	$113.00	0.01	21.84	$3.78	29.91
1	Clerk Office	1820	6	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.35	633.4	$109.57	6	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.31	567.84	$98.24	$56.50	$339.00	0.04	65.52	$11.33	29.91
2	Clerk Office	1820	3	2	2-L 17W T8 2x2 Recessed Prismatic Lens	28	0.08	152.9	$26.45	3	2	Existing to Remain	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
3	Clerk Hallway	1820	2	2	2-L 34W U T8 2x2 Recessed Prismatic Lens	73	0.15	265.7	$45.97	2	2	Replace Fixture w/ Lamar LS-2-17-22-E8-U-PA	28	0.06	101.92	$17.63	$290.00	$580.00	0.09	163.8	$28.34	20.47
4	Clerk Storage	1820	2	4	4-L 32W T8 2x4 Recessed Prismatic Lens	114	0.23	415.0	$71.79	2	2	De-Lamp/Re-Lamp Install New Reflector w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$81.50	$163.00	0.12	225.68	$39.04	4.17
1	Clerk Back Office	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.12	211.1	$36.52	2	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$56.50	$113.00	0.01	21.84	$3.78	29.91
5	Men's Restroom	1820	1	2	2-L 32W T8 2x4 Surface Wrap Prismatic Lens	58	0.06	105.6	$18.26	1	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.05	94.64	$16.37	$56.50	$56.50	0.01	10.92	$1.89	29.91
5	Women's Restroom	1820	1	2	2-L 32W T8 2x4 Surface Wrap Prismatic Lens	58	0.06	105.6	$18.26	1	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.05	94.64	$16.37	$56.50	$56.50	0.01	10.92	$1.89	29.91
6	Elevator Hall	1820	2	1	23 Watt CFL Medium Base	23	0.05	83.7	$14.48	2	1	Existing to Remain	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
3	Elevator Hall	1820	1	2	2-L 34W U T8 2x2 Recessed Prismatic Lens	73	0.07	132.9	$22.98	1	2	Replace Fixture w/ Lamar LS-2-17-22-E8-U-PA	28	0.03	50.96	$8.82	$290.00	$290.00	0.05	81.9	$14.17	20.47
1	Elevator	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.12	211.1	$36.52	2	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$56.50	$113.00	0.01	21.84	$3.78	29.91
1	Planning & Zonning Office	1820	4	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.23	422.2	$73.05	4	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.21	378.56	$65.49	$56.50	$226.00	0.02	43.68	$7.56	29.91
2	Tax Collector Lobby	1820	4	2	2-L 17W T8 2x2 Recessed Prismatic Lens	28	0.11	203.8	$35.26	4	2	Existing to Remain	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1	Tax Collector Office	1820	4	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.23	422.2	$73.05	4	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.21	378.56	$65.49	$56.50	$226.00	0.02	43.68	$7.56	29.91

Investment Grade Lighting Audit

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
2	Tax Collector Office	1820	3	2	2-L 17W T8 2x2 Recessed Prismatic Lens	28	0.08	152.9	$26.45	3	2	Existing to Remain	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1	Tax Storage	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.12	211.1	$36.52	2	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$56.50	$113.00	0.01	21.84	$3.78	29.91
8	Tax Vault	1820	1	2	2-L 32W T8 Utility Strip	58	0.06	105.6	$18.26	1	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.05	94.64	$16.37	$56.50	$56.50	0.01	10.92	$1.89	29.91
1	Tax Rear Office	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.12	211.1	$36.52	2	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$56.50	$113.00	0.01	21.84	$3.78	29.91
8	Boiler Room	1820	2	2	2-L 32W T8 Utility Strip	58	0.12	211.1	$36.52	2	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$56.50	$113.00	0.01	21.84	$3.78	29.91
6	Boiler Room Stair	1820	1	1	23 Watt CFL Medium Base	23	0.02	41.9	$7.24	1	1	Existing to Remain	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
9	Entrance Vestibule	1820	1	2	2-L 34 W T12 U Recessed Opaque Lens	82	0.08	149.2	$25.82	1	2	Re-Ballast & Re-Lamp w/ T8 Ballast and Sylvania FO28/841/XP/SS/ECO	52	0.05	94.64	$16.37	$124.00	$124.00	0.03	54.6	$9.45	13.13
10	Lobby Entrance	1820	3	1	60 W Incandescent Medium Base	60	0.18	327.6	$56.67	3	1	Re-Lamp 23 W CFL Medium Base Lamp	23	0.07	125.58	$21.73	$35.75	$107.25	0.11	202.02	$34.95	3.07
	2ND FLOOR																					
1	Main Stair	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.17	316.7	$54.79	3	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.16	283.92	$49.12	$56.50	$169.50	0.02	32.76	$5.67	29.91
1	Mayor Reception Front	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.12	211.1	$36.52	2	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$56.50	$113.00	0.01	21.84	$3.78	29.91
1	Treasurer Admin	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.17	316.7	$54.79	3	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.16	283.92	$49.12	$56.50	$169.50	0.02	32.76	$5.67	29.91
1	Treasurer Office	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.17	316.7	$54.79	3	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.16	283.92	$49.12	$56.50	$169.50	0.02	32.76	$5.67	29.91
1	Rear Reception	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.17	316.7	$54.79	3	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.16	283.92	$49.12	$56.50	$169.50	0.02	32.76	$5.67	29.91
1	Administrators Office	1820	4	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.23	422.2	$73.05	4	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.21	378.56	$65.49	$56.50	$226.00	0.02	43.68	$7.56	29.91
10	Elevator Hallway	1820	2	1	60 W Incandescent Medium Base	60	0.12	218.4	$37.78	2	1	Re-Lamp 23 W CFL Medium Base Lamp	23	0.05	83.72	$14.48	$35.75	$71.50	0.07	134.68	$23.30	3.07
3	Elevator Hallway	1820	1	2	2-L 34W U T8 2x2 Recessed Prismatic Lens	73	0.07	132.9	$22.98	1	2	Replace Fixture w/ Lamar LS-2-17-22-E8-U-PA	28	0.03	50.96	$8.82	$290.00	$290.00	0.05	81.9	$14.17	20.47
11	IT Closet	1820	2	2	2-L 34W T12 2x4 Recessed Prismatic Lens	82	0.16	298.5	$51.64	2	2	Re-Ballast & Re-Lamp w/ T8 Ballast and Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$124.00	$248.00	0.06	109.2	$18.89	13.13
5	Men's Restroom	1820	2	2	2-L 32W T8 2x4 Surface Wrap Prismatic Lens	58	0.12	211.1	$36.52	2	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$56.50	$113.00	0.01	21.84	$3.78	29.91
5	Women's Restroom	1820	2	2	2-L 32W T8 2x4 Surface Wrap Prismatic Lens	58	0.12	211.1	$36.52	2	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.10	189.28	$32.75	$56.50	$113.00	0.01	21.84	$3.78	29.91
1	Construction Office	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.17	316.7	$54.79	3	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.16	283.92	$49.12	$56.50	$169.50	0.02	32.76	$5.67	29.91
4	Construction Office	1820	1	4	4-L 32W T8 2x4 Recessed Prismatic Lens	114	0.11	207.5	$35.89	1	2	De-Lamp/Re-Lamp Install New Reflector w/ Sylvania FO28/841/XP/SS/ECO	52	0.05	94.64	$16.37	$81.50	$81.50	0.06	112.84	$19.52	4.17

Investment Grade Lighting Audit

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
1	Mayor's Office	1820	4	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.23	422.2	$73.05	4	2	Relamp w/ Sylvania FO28/841/XP/SS/ECO	52	0.21	378.56	$65.49	$56.50	$226.00	0.02	43.68	$7.56	29.91
12	Mayor's Restroom	1820	1	2	2-L 3' T12 Sidewall Prismatic Lens	60	0.06	109.2	$18.89	1	2	Replace Fixture w/ Progress Lighting # P7094 17 W	28	0.03	50.96	$8.82	$342.50	$342.50	0.03	58.24	$10.08	33.99
	Totals		95	80			5.33	9,695.1	$1,677.26	95	76			3.84	6994.26	$1,210.01		$5,857.25	1.05	1912.8	$330.92	17.70

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 #: 9C100097
Project: North Wildwood LGEA
Address: 901 Atlantic Ave.
North Wildwood, NJ
Building SF: 7500

City Hall

KWH COST: $0.173

ECM #2: Lighting Controls

EXISTING LIGHTING										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. Lamps	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
0	1ST FLOOR	0	0	0	0	0	0	0	0	0	0		0	0.00	0%	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
1	Lobby	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.116	211.12	36.52376	2	2	None	58	0.12	0%	211.12	$36.52	$0.00	$0.00	0.00	0	$0.00	0.00
2	Clerk Reception	1820	3	2	2-L 17W T8 2x2 Recessed Prismatic Lens	28	0.084	152.88	26.44824	3	2	None	28	0.08	0%	152.88	$26.45	$0.00	$0.00	0.00	0	$0.00	0.00
1	Tax Assessor Office	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.174	316.68	54.78564	3	2	Dual Technology Occupancy Sensor	58	0.16	10%	285.012	$49.31	$75.00	$75.00	0.02	31.668	$5.48	13.69
1	Tax A. Back Office	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.116	211.12	36.52376	2	2	Dual Technology Occupancy Sensor	58	0.10	10%	190.008	$32.87	$75.00	$75.00	0.01	21.112	$3.65	20.53
1	Clerk Office	1820	6	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.348	633.36	109.57128	6	2	Dual Technology Occupancy Sensor	58	0.31	10%	570.024	$98.61	$75.00	$75.00	0.03	63.336	$10.96	6.84
2	Clerk Office	1820	3	2	2-L 17W T8 2x2 Recessed Prismatic Lens	28	0.084	152.88	26.44824	3	2		28	0.08	10%	137.592	$23.80	$0.00	$0.00	0.01	15.288	$2.64	0.00
3	Clerk Hallway	1820	2	2	2-L 34W U T8 2x2 Recessed Prismatic Lens	73	0.146	265.72	45.96956	2	2	None	73	0.15	0%	265.72	$45.97	$0.00	$0.00	0.00	0	$0.00	0.00
4	Clerk Storage	1820	2	4	4-L 32W T8 2x4 Recessed Prismatic Lens	114	0.228	414.96	71.78808	2	4	Dual Technology Occupancy Sensor	114	0.21	10%	373.464	$64.61	$75.00	$75.00	0.02	41.496	$7.18	10.45
1	Clerk Back Office	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.116	211.12	36.52376	2	2	Dual Technology Occupancy Sensor	58	0.10	10%	190.008	$32.87	$75.00	$75.00	0.01	21.112	$3.65	20.53
5	Men's Restroom	1820	1	2	2-L 32W T8 2x4 Surface Wrap Prismatic Lens	58	0.058	105.56	18.26188	1	2	Dual Technology Occupancy Sensor	58	0.05	10%	95.004	$16.44	$75.00	$150.00	0.01	10.556	$1.83	82.14
5	Women's Restroom	1820	1	2	2-L 32W T8 2x4 Surface Wrap Prismatic Lens	58	0.058	105.56	18.26188	1	2	Dual Technology Occupancy Sensor	58	0.05	10%	95.004	$16.44	$75.00	$75.00	0.01	10.556	$1.83	41.07
6	Elevator Hall	1820	2	1	23 Watt CFL Medium Base	23	0.046	83.72	14.48356	2	1	None	23	0.05	0%	83.72	$14.48	$0.00	$0.00	0.00	0	$0.00	0.00
3	Elevator Hall	1820	1	2	2-L 34W U T8 2x2 Recessed Prismatic Lens	73	0.073	132.86	22.98478	1	2	None	73	0.07	0%	132.86	$22.98	$0.00	$0.00	0.00	0	$0.00	0.00
1	Elevator	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.116	211.12	36.52376	2	2	None	58	0.12	0%	211.12	$36.52	$0.00	$0.00	0.00	0	$0.00	0.00
1	Planning & Zonning Office	1820	4	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.232	422.24	73.04752	4	2	Dual Technology Occupancy Sensor	58	0.21	10%	380.016	$65.74	$75.00	$75.00	0.02	42.224	$7.30	10.27

EXISTING LIGHTING										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. Lamps	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
2	Tax Collector Lobby	1820	4	2	2-L 17W T8 2x2 Recessed Prismatic Lens	28	0.112	203.84	35.26432	4	2	None	28	0.11	0%	203.84	$35.26	$0.00	$0.00	0.00	0	$0.00	0.00
1	Tax Collector Office	1820	4	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.232	422.24	73.04752	4	2	Dual Technology Occupancy Sensor	58	0.21	10%	380.016	$65.74	$75.00	$75.00	0.02	42.224	$7.30	10.27
2	Tax Collector Office	1820	3	2	2-L 17W T8 2x2 Recessed Prismatic Lens	28	0.084	152.88	26.44824	3	2	Dual Technology Occupancy Sensor	28	0.08	10%	137.592	$23.80	$0.00	$0.00	0.01	15.288	$2.64	0.00
1	Tax Storage	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.116	211.12	36.52376	2	2		58	0.10	10%	190.008	$32.87	$75.00	$75.00	0.01	21.112	$3.65	20.53
8	Tax Vault	1820	1	2	2-L 32W T8 Utility Strip	58	0.058	105.56	18.26188	1	2	Dual Technology Occupancy Sensor	58	0.05	10%	95.004	$16.44	$75.00	$75.00	0.01	10.556	$1.83	41.07
1	Tax Rear Office	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.116	211.12	36.52376	2	2	Dual Technology Occupancy Sensor	58	0.10	10%	190.008	$32.87	$75.00	$75.00	0.01	21.112	$3.65	20.53
8	Boiler Room	1820	2	2	2-L 32W T8 Utility Strip	58	0.116	211.12	36.52376	2	2		58	0.10	10%	190.008	$32.87	$0.00	$0.00	0.01	21.112	$3.65	0.00
6	Boiler Room Stair	1820	1	1	23 Watt CFL Medium Base	23	0.023	41.86	7.24178	1	1		23	0.02	10%	37.674	$6.52	$0.00	$0.00	0.00	4.186	$0.72	0.00
9	Entrance Vestibule	1820	1	2	2-L 34 W T12 U Recessed Opaque Lens	82	0.082	149.24	25.81852	1	2	None	82	0.08	0%	149.24	$25.82	$0.00	$0.00	0.00	0	$0.00	0.00
10	Lobby Entrance	1820	3	1	60 W Incandescent Medium Base	60	0.18	327.6	56.6748	3	1	None	60	0.18	0%	327.6	$56.67	$0.00	$0.00	0.00	0	$0.00	0.00
	2ND FLOOR																						
1	Main Stair	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.174	316.68	54.78564	3	2	None	58	0.17	0%	316.68	$54.79	$0.00	$0.00	0.00	0	$0.00	0.00
1	Mayor Reception Front	1820	2	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.116	211.12	36.52376	2	2	None	58	0.12	0%	211.12	$36.52	$0.00	$0.00	0.00	0	$0.00	0.00
1	Treasurer Admin	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.174	316.68	54.78564	3	2	Dual Technology Occupancy Sensor	58	0.16	10%	285.012	$49.31	$75.00	$75.00	0.02	31.668	$5.48	13.69
1	Treasurer Office	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.174	316.68	54.78564	3	2	Dual Technology Occupancy Sensor	58	0.16	10%	285.012	$49.31	$75.00	$75.00	0.02	31.668	$5.48	13.69
1	Rear Reception	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.174	316.68	54.78564	3	2	None	58	0.17	0%	316.68	$54.79	$0.00	$0.00	0.00	0	$0.00	0.00
1	Administrators Office	1820	4	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.232	422.24	73.04752	4	2	Dual Technology Occupancy Sensor	58	0.21	10%	380.016	$65.74	$75.00	$75.00	0.02	42.224	$7.30	10.27

EXISTING LIGHTING										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. Lamps	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
10	Elevator Hallway	1820	2	1	60 W Incandescent Medium Base	60	0.12	218.4	37.7832	2	1	None	60	0.12	0%	218.4	$37.78	$0.00	$0.00	0.00	0	$0.00	0.00
3	Elevator Hallway	1820	1	2	2-L 34W U T8 2x2 Recessed Prismatic Lens	73	0.073	132.86	22.98478	1	2	None	73	0.07	0%	132.86	$22.98	$0.00	$0.00	0.00	0	$0.00	0.00
11	IT Closet	1820	2	2	2-L 34W T12 2x4 Recessed Prismatic Lens	82	0.164	298.48	51.63704	2	2	Dual Technology Occupancy Sensor	82	0.15	10%	268.632	$46.47	$75.00	$75.00	0.02	29.848	$5.16	14.52
5	Men's Restroom	1820	2	2	2-L 32W T8 2x4 Surface Wrap Prismatic Lens	58	0.116	211.12	36.52376	2	2	Dual Technology Occupancy Sensor	58	0.10	10%	190.008	$32.87	$75.00	$75.00	0.01	21.112	$3.65	20.53
5	Women's Restroom	1820	2	2	2-L 32W T8 2x4 Surface Wrap Prismatic Lens	58	0.116	211.12	36.52376	2	2	Dual Technology Occupancy Sensor	58	0.10	10%	190.008	$32.87	$75.00	$75.00	0.01	21.112	$3.65	20.53
1	Construction Office	1820	3	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.174	316.68	54.78564	3	2	Dual Technology Occupancy Sensor	58	0.16	10%	285.012	$49.31	$75.00	$75.00	0.02	31.668	$5.48	13.69
4	Construction Office	1820	1	4	4-L 32W T8 2x4 Recessed Prismatic Lens	114	0.114	207.48	35.89404	1	4		114	0.10	10%	186.732	$32.30	$0.00	$0.00	0.01	20.748	$3.59	0.00
1	Mayor's Office	1820	4	2	2-L 32W T8 2x4 Recessed Prismatic Lens	58	0.232	422.24	73.04752	4	2	Dual Technology Occupancy Sensor	58	0.21	10%	380.016	$65.74	$75.00	$75.00	0.02	42.224	$7.30	10.27
12	Mayor's Restroom	1820	1	2	2-L 3' T12 Sidewall Prismatic Lens	60	0.06	109.2	18.8916	1	2	Dual Technology Occupancy Sensor	60	0.05	10%	98.28	$17.00	$75.00	$75.00	0.01	10.92	$1.89	39.70
	Totals		95	80			5.33	9,695.1	$1,677.26	95	80			4.9555		9019.01	$1,560.29		$1,650.00	0.37	676.1	$116.97	14.11

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

APPENDIX F

Project Name: **LGEA Solar PV Project - City Hall**
Location: **North Wildwood, NJ**
Description: **Photovoltaic System - Direct Purchase**

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$64,170
Annual kWh Production	8,040
Annual Energy Cost Reduction	$1,391
Annual SREC Revenue	$2,814
First Cost Premium	**$64,170**
Simple Payback:	**15.26** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.173**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$64,170	0	0	0	$0	(64,170)	0
1	$0	8,040	$1,391	$0	$2,814	$4,205	($59,965)
2	$0	8,000	$1,433	$0	$2,800	$4,233	($55,733)
3	$0	7,960	$1,476	$0	$2,786	$4,262	($51,471)
4	$0	7,920	$1,520	$0	$2,772	$4,292	($47,179)
5	$0	7,880	$1,565	$81	$2,758	$4,242	($42,937)
6	$0	7,841	$1,612	$81	$2,744	$4,276	($38,661)
7	$0	7,802	$1,661	$80	$2,731	$4,311	($34,349)
8	$0	7,763	$1,711	$80	$2,717	$4,348	($30,002)
9	$0	7,724	$1,762	$80	$2,703	$4,386	($25,616)
10	$0	7,685	$1,815	$79	$2,690	$4,426	($21,190)
11	$0	7,647	$1,869	$79	$2,676	$4,467	($16,723)
12	$0	7,609	$1,925	$78	$2,663	$4,510	($12,213)
13	$0	7,571	$1,983	$78	$2,650	$4,555	($7,659)
14	$0	7,533	$2,043	$78	$2,636	$4,602	($3,057)
15	$0	7,495	$2,104	$77	$2,623	$4,650	$1,593
16	$0	7,458	$2,167	$77	$2,610	$4,700	$6,293
17	$0	7,420	$2,232	$76	$2,597	$4,753	$11,046
18	$0	7,383	$2,299	$76	$2,584	$4,807	$15,853
19	$0	7,346	$2,368	$76	$2,571	$4,864	$20,717
20	$0	7,310	$2,439	$75	$2,558	$4,922	$25,639
21	$1	7,273	$2,512	$75	$2,546	$4,983	$30,621
22	$2	7,237	$2,588	$75	$2,533	$5,046	$35,667
23	$3	7,201	$2,665	$74	$2,520	$5,111	$40,778
24	$4	7,165	$2,745	$74	$2,508	$5,179	$45,957
25	$5	7,129	$2,827	$73	$2,495	$5,249	$51,206
	Totals:	189,390	$50,712	$1,622	$66,286	$115,376	($161,383)
				Net Present Value (NPV)			**$51,231**
				Internal Rate of Return (IRR)			**4.9%**

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
City Hall	450	Sunpower SPR230	31	14.7	456	7.13	8,040	1,023	15.64

.= Proposed PV Layout

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

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	7.1 kW
DC to AC Derate Factor:	0.77
AC Rating:	5.5 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	225.0°
Energy Specifications	
Cost of Electricity:	17.0 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	2.42	404	$68.68
2	3.19	496	$84.32
3	4.19	704	$119.68
4	5.13	816	$138.72
5	5.83	938	$159.46
6	6.11	914	$155.38
7	6.04	920	$156.40
8	5.46	839	$142.63
9	4.73	716	$121.72
10	3.59	567	$96.39
11	2.5	389	$66.13
12	2.09	337	$57.29
Year	4.28	8040	$1,366.80