LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR: **TOWNSHIP OF MIDDLE**
33 MECHANIC STREET
CAPE MAY COURT HOUSE, NJ 08210
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REPORT ISSUANCE: **FINAL, APRIL 11, 2011**

PROJECT NO: **9C10106**

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I. EXECUTIVE SUMMARY

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

Middle Township
Town Hall Municipal Building
33 Mechanic Street
Cape May Court House, NJ 08210

Municipal and Facility Contact Person: Jill Zarharchuck, Director of Economic Development / Grants coordinator

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	$ 65,469
Natural Gas	$ 3,888
Total	$ 69,357

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	Premium Efficient Motor Upgrade	$3,913	$124	31.7	-68.4%
ECM #2	Split System Upgrade	$5,115	$129	39.6	-62.2%
ECM #3	PTAC Upgrade	$7,684	$546	14.1	6.5%
ECM #4	AHU Upgrade	$47,555	$763	62.3	-75.9%
ECM #5	RTU Upgrade	$19,453	$791	24.6	-39.0%
ECM #6	Demand Control Ventilation	$42,000	$1,569	26.8	-44.0%
ECM #7	Water Heater Upgrade	$6,850	$44	155.5	-92.3%
ECM #8	Window Upgrade	$61,528	$2,272	27.1	-7.7%
ECM #9	Lighting Upgrade-General	$21,878	$7,952	2.8	445.2%
ECM #10	Lighting Control Upgrade	$3,740	$2,833	1.3	1036.2%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	Solar PV 113.85 KWdc System	$1,024,650	$69,305	14.8	69.1%

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	Premium Efficient Motor Upgrade	0.3	823.8	0.0
ECM #2	Split System Upgrade	1.0	860.1	0.0
ECM #3	PTAC Upgrade	3.2	3,636.7	0.0
ECM #4	AHU Upgrade	0.6	5,089.8	0.0
ECM #5	RTU Upgrade	4.0	3,620.7	182.6
ECM #6	Demand Control Ventilation	0.0	3,811.8	732.9
ECM #7	Water Heater Upgrade	0.0	0.0	32.4
ECM #8	Window Upgrade	0.9	2,721.1	870.8
ECM #9	Lighting Upgrade-General	13.3	53,014.0	0.0
ECM #10	Lighting Control Upgrade	4.6	18,884.0	0.0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	Solar PV 113.85 KWdc System	92.2	137,782.0	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 #9:** Lighting Upgrade
- **ECM #10:** Lighting Controls

Although ECM #3 does not provide a payback less than 10 years, it is recommended to proceed with the installation of efficient PTAC units as suggested in ECM #3 (or equal) for the Police Station, since the existing PTAC units are past their expected lifespan.

Indicated in the next section is the "Combined Project Approach" detailing a recommended packaging of energy conservation measures that provides a suitable payback as compared to implementation cost and resulting energy cost savings.

Combined Project Approach:

Although individual projects with a simple payback of 10 years and less are considered financially self sustaining, it is important to consider how multiple projects can be combined together. When ECMs are aggregated into a single project, the lower cost ECMs provides valuable savings to offset the higher cost ECMs.

Table 3
Combined Project Summary

ENERGY SAVINGS IMPROVEMENT PROGRAM - POTENTIAL ENERGY EFFICIENCY PROJECT						
ECM #	**FACILITY ENERGY EFFICIENCY PROJECTS**	**ANNUAL ENERGY SAVINGS ($)**	**PROJECT COST ($)**	**REBATES, INCENTIVES***	**CUSTOMER COST ****	**SIMPLE PAYBACK**
ECM #1	Premium Efficient Motor Upgrade	$124	$4,066	$153	$3,913	31.7
ECM #2	Split System Upgrade	$129	$5,253	$138	$5,115	39.6
ECM #3	PTAC Upgrade	$546	$7,879	$195	$7,684	14.1
ECM #4	AHU Upgrade	$763	$47,670	$115	$47,555	62.3
ECM #5	RTU Upgrade	$791	$20,183	$730	$19,453	24.6
ECM #6	Demand Control Ventilation	$1,569	$42,000	$0	$42,000	26.8
ECM #7	Water Heater Upgrade	$44	$6,900	$50	$6,850	155.5
ECM #8	Window Upgrade	$1,592	$61,528	$0	$61,528	38.6
ECM #9	Lighting Upgrade-General	$7,952	$24,768	$2,890	$21,878	2.8
ECM #10	Lighting Control Upgrade	$2,833	$4,930	$1,190	$3,740	1.3
Total Entity Project		**$16,343**	**$225,176**	**$5,461**	**$219,715**	**13.4**

Total Middle Township Town Hall Energy Costs: **$69,357**
Est. Total Middle Township Town Hall Energy Savings: **$16,343**
Overall Middle Township Town Hall Percent Reduction: **23.6%**

* Rebates / Incentives represent an estimate for the potential incentives (not guarenteed for the ECM specified.)
** Customer cost is based on maximum incentive available (Smart Start)

A funding mechanism that is available for large scale, combined projects is the E.S.I.P, P.L. 2009, c.4. The Energy Savings Improvement Program (ESIP) allows for financing of any combination of energy efficiency projects into one large project. The term of the financing must be under 15 years and the savings provides the revenue for the financing cost. The combination of all projects into one large energy efficiency project provides Middle Township Town Hall Building with the opportunity to implement ECM #1 through #10 as identified within this report with an overall simple payback of 13.4 years. This option allows Middle Township Town Hall Building to implement much needed infrastructure improvements such as premium efficient pump motors, split system upgrade , PTAC unit upgrade, new air conditioning air handling unit, Packaged roof top unit, demand controlled ventilation, water heater upgrade, Window Upgrade, high efficiency lighting and lighting controls. The program financing allows for the implementation with no upfront cost for Middle Township Town Hall Building. Implementation of an ESIP provides significant benefits and should be strongly considered for Middle Township Town Hall Building. The total Entity Project Summary table below shows the savings, costs, incentive programs and paybacks for all ECMs at Middle Township Town Hall Building that can be combined and will have a payback in less than 15 years.

It is pertinent to note that if Middle Township has available capital funds, these projects would be highly recommended for implementation and would not require the use of the ESIP legislation.

Implementation of all ECMs identified within the Combined Project Summary table represents a total annual savings of approximately $16,343 for the Middle Township Town Hall Building which is a 23.6% reduction in overall annual utility costs. The description of each ECM is shown later in this report.

Capital Improvement Energy Conservation Measures:

The ECMs that have much longer paybacks are considered capital improvement ECMs. These ECMs typically have high installation costs that are more difficult to justify the savings based solely on the energy savings associated with the improvement. Despite the long paybacks, these ECMs in many cases provide valuable and much needed infrastructure improvements for the facility. These ECMs include HVAC equipment upgrades, electric motor upgrades and building envelope improvements. The savings identified for the following ECMs provides additional incentive for Middle Township Town Hall Building's capital improvement projects.

Although ECM #1 does not provide a payback less than 10 years, it is recommended to proceed with the installation of premium efficient pump motors as suggested in ECM #1 (or equal) for the heating hot water circulation pumps, since the existing pumps are past their expected lifespan.

Although ECM #2 does not provide a payback less than 10 years, it is recommended to proceed with the installation of efficient split system units as suggested in ECM #2 (or equal) for the Town Hall Building, since the existing split system is past its expected lifespan.

Although ECM #4 does not provide a payback less than 10 years, it is highly recommended to proceed with the installation of an efficient central station rooftop air handling unit as suggested in ECM #4 (or equal) for the Administration and Municipal areas of the Town Hall building. The existing air handling unit has a compromised enclosure and a less efficient fan motor as compared to today's efficiencies. The system's associated condensing unit was recently replaced and is in good condition. The condensing unit efficiency is where most of the system's savings would occur. The compromised air handling unit enclosure allows rain water infiltration and air infiltration which can significantly reduce the unit's efficiency. Although a makeshift roof has been placed on the unit to stop the water infiltration, it does not address the more costly efficiency loss. Upgrading the existing air handling unit, since it is past its expected lifespan, will eliminate the water and air infiltration and have a considerable energy reduction. This ECM should be implemented with ECM #6 to maximize energy savings.

Although ECM #5 does not provide a payback less than 10 years, it is recommended to proceed with the installation of an efficient rooftop unit as suggested in ECM #5 (or equal) for the Atrium, since the existing rooftop unit is past its expected lifespan and will have a considerable energy reduction.

Although ECM #6 does not provide a payback less than 10 years, it is recommended to proceed with the installation and implementation of demand controlled ventilation as suggested in ECM #6 (or equal) for the Carrier air handling unit serving the administration and municipal offices of the Town Hall. This control scheme will provide considerable energy reduction. This ECM can be implemented by itself or with ECM #4.

Although ECM #7 does not provide a payback less than 10 years, it is recommended to proceed with the installation of an efficient condensing water heater as suggested in ECM #7 (or equal) for the Administration and Municipal offices, since the existing water heater unit is past its expected lifespan and will have a notable energy reduction.

Although ECM #8 does not provide a payback less than 10 years, it is recommended to proceed with the installation of new windows as suggested in ECM #8 (or equal) for the Middle Township Town Hall building envelope since the upgrade would eliminate needed near term maintenance, reduce infiltration, improve occupant comfort, provide a notable energy reduction and provide a return on investment.

Other Considerations:

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

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

Renewable Energy Measures (REMs) were also reviewed for implementation at the Middle Township Town Hall Building. CEG utilized a parking lot mounted solar array to house a substantial PV system. The recommended 113.85 kW PV system will produce approximately 137,782 kWh of electricity annually and will reduce the Town Hall's electrical consumption from the grid by 31.6%. The system's calculated simple payback of 14.8 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 Assessment:

Overall, the Middle Township Town Hall Building appears to be operating at a lower efficiency level compared to other offices in the region. With the implementation of the above recommended measures Middle Township will realize further energy savings at the Town Hall Building.

II. INTRODUCTION

The comprehensive energy audit covers the 23,650 square foot Town Hall Municipal Building, houses the Municipal Administration and Police departments which includes the following spaces: administration offices, conference room, restrooms, storage, Court Room, file storage, police communications, holding cell, locker room, equipment storage, electrical room and mechanical rooms.

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:

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

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

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

$$Lifetime\ Maintenanc\ e\ Savings = (Yearly\ Maintenanc\ e\ Savings \times ECM\ Lifetime)$$

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

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

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

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

The electric usage profile represents the actual electrical usage for the facility. The facilities receive electric distribution service through Atlantic City Electric (ACE) under their Annual General Service rate structure. The Township has contracted Hess Corporation, a Third Party Supplier (TPS), to provide electric commodity supply (generation) service. This was in effect during the last three months analyzed. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

The gas usage profile shows the actual natural gas energy usage for the facility. South Jersey Gas provides natural gas to the facility under the General Service Gas (GSG) rate structure. A Third Party 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.

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

Description	Average
Electricity	15.0¢ / kWh
Natural Gas*	$1.36 / Therm

* - The gas meter history and five utility bills were provided. The bills were low usage months (January, February, May, July and August 2010 bills) and the average cost per therm was calculated from these bills.

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: Atlantic City Electric
Rate: Annual General Service
Meter No: 28262005
Account # 0036 2589 9996
Third Party Utility Provider: Amerada Hess (10/2010-12/2010)
TPS Meter / Acct No:

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-10	24,160	64.0	$3,610
Feb-10	27,920	60.0	$4,113
Mar-10	23,480	82.4	$3,666
Apr-10	28,480	91.2	$4,171
May-10	42,560	99.2	$6,393
Jun-10	45,360	114.4	$7,861
Jul-10	56,640	110.4	$9,436
Aug-10	49,760	99.2	$8,399
Sep-10	38,560	96.0	$4,853
Oct-10	32,480	91.5	$4,163
Nov-10	28,000	91.5	$3,732
Dec-10	38,640	91.5	$5,072
Totals	**436,040**	**114.4 Max**	**$65,469**

AVERAGE DEMAND **90.9 KW average**
AVERAGE RATE **$0.150** **$/kWh**

Figure 1
Electricity Usage Profile

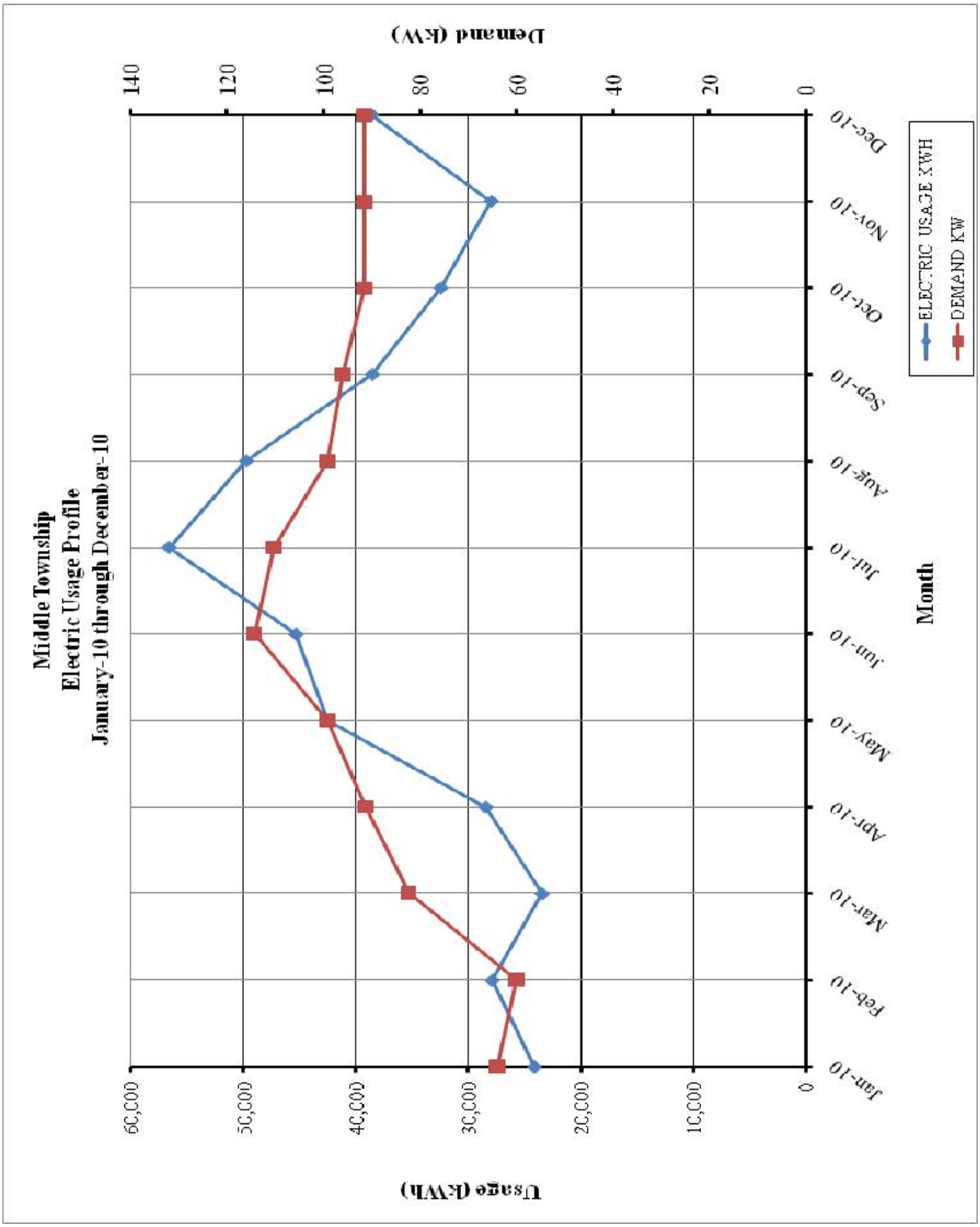
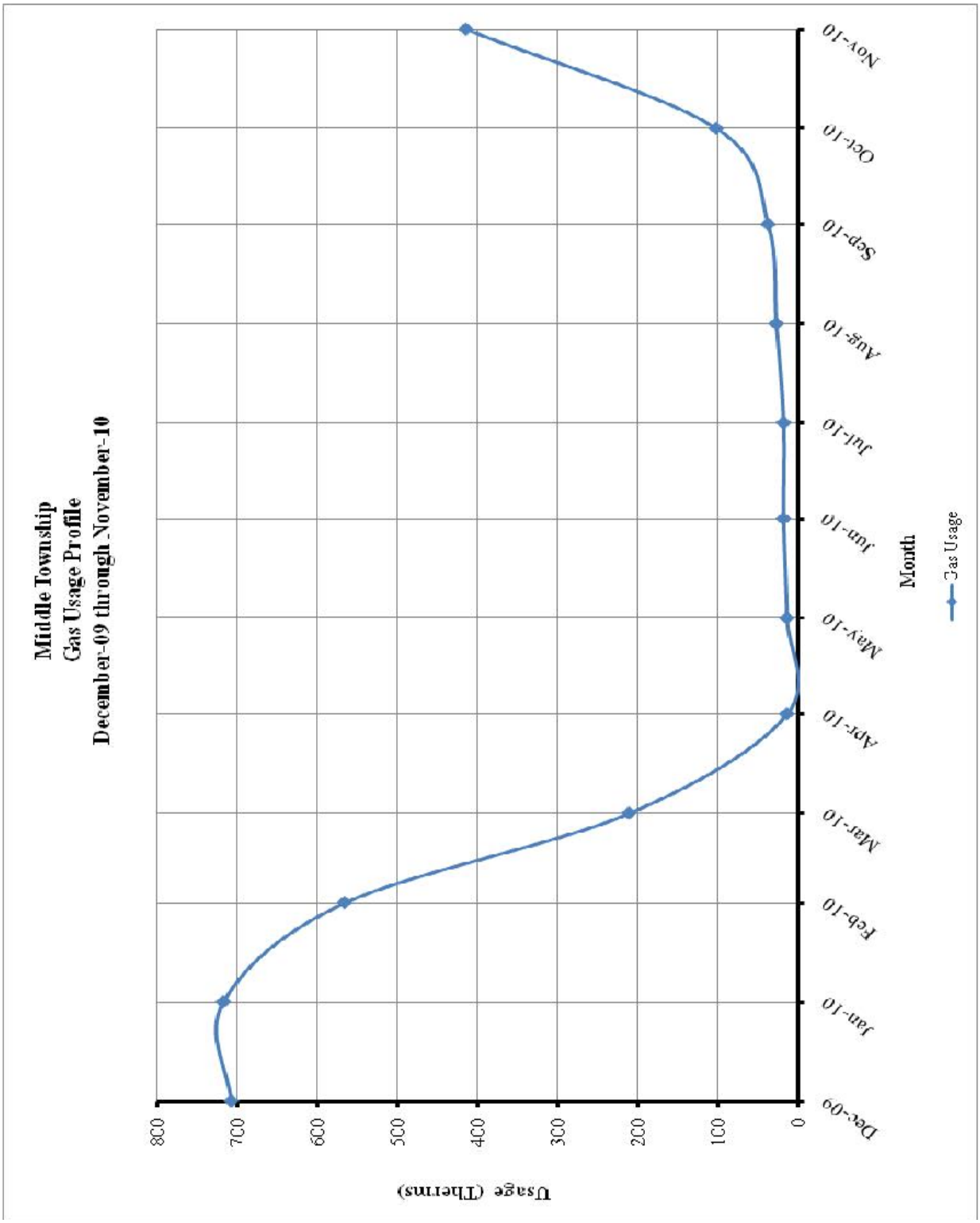


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: South Jersey Gas		
Rate: General service		
Meter No: 0460262		
Acct No. 4 09 54 0112 0 7		
Third Party Utility Provider: N/A		
TPS Meter No: N/A		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Dec-09	707.60	$932.47
Jan-10	717.58	$948.52
Feb-10	566.35	$770.24
Mar-10	211.36	$287.44
Apr-10	14.38	$36.12
May-10	14.39	$34.25
Jun-10	18.56	$42.18
Jul-10	18.47	$43.91
Aug-10	27.65	$37.60
Sep-10	37.80	$51.41
Oct-10	102.50	$139.40
Nov-10	414.93	$564.31
TOTALS	**2,851.56**	**$3,887.85**
AVERAGE RATE:	**$1.36**	**$/THERM**
Cost/Therm estimated from Jan, Feb, May, Jul and Aug 2010 Bills average 1.36/Therm. Other Cost data unavailable.		

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:

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

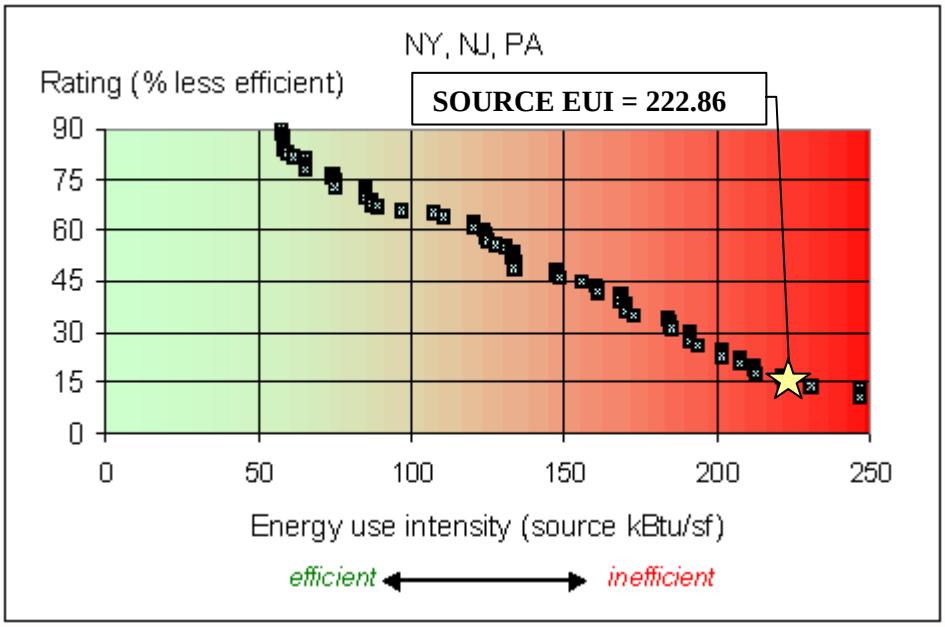
$$Building\ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ X\ SS\ Ratio + Gas\ Usage\ in\ kBtu\ X\ SS\ Ratio)}{Building\ Square\ Footage}$$

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	436,040.0			1,488,641	3.340	4,972,059
NATURAL GAS		2,851.6		285,156	1.047	298,559
TOTAL				1,773,797		5,270,618
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		23,650	SQUARE FEET			
BUILDING SITE EUI		*75.00*	kBtu/SF/YR			
BUILDING SOURCE EUI		*222.86*	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



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: middletwp
Password: lgeaceg2010

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

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**
Town Hall	34	50

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

V. FACILITY DESCRIPTION

The 23,650 square foot Town Hall Municipal Building is a multi level facility comprised of three sections. The original Administration office area is a one story building. The Police department has a basement level, a lower level and an upper level. A two story Municipal Building addition was built on the south side of the police station and the administration building. This facility is comprised of administration offices, conference room, restrooms, storage, Court Room, file storage, police communications, holding cell, locker room, equipment storage, electrical room and mechanical rooms. The typical hours of operation for the Administration and Municipal building addition are between 8:30 am and 4:30 pm. There are approximately 22 occupants during normal business hours. The conference room is used from 6:00 pm to 8:00 pm once week in the summer and twice a week in the winter. The court room has night meetings from 6:00 pm to 8:00 pm once week in the summer and twice a week in the winter. The court room holds approximately 100 occupants. The Police department is occupied 24/7 and will have between three and twenty occupants at various times during the day and night. The department will have eight occupants during business hours. 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 fair condition and appear to be in need of maintenance. There is approximately 820 square feet of windows. Typical windows throughout the facility are double pane, ¼" clear glass with vinyl clad wood 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 Administration portion of the roof is a roll roof. The Police department and Municipal building addition is a gable roof with shingles. The amount of insulation below the roofing is unknown. The building was built around 1960 with the Municipal Building addition in 1987.

HVAC Systems

The building heat is provided by three (3) Buderus Logamax condensing wall hung boilers located in the first floor mechanical room. Each boiler has a 214.3 kbtuh natural gas input capacity and they are 89% efficient. These units are three (3) years old and are in good condition. There are three zone pumps located in the second floor mechanical room. Pump 1 is a 2 hp Taco in-line pump serving the original Administration Building. Pump 2 is a 2 hp Taco in-line pump serving the 1st and 2nd floor Municipal Building addition. Pump 3 is a 1 hp Taco in-line pump serving the air handling unit that serves the Administration Building. These pumps are thirteen years old, are in fair to poor condition and are three (3) years past the ASHRAE expected useful service life.

The administration building and Municipal Building addition is conditioned by a central VAV rooftop air handling unit (AHU) made by Carrier and an air cooled condensing unit manufactured by International Comfort Products. The condensing unit has 20 Ton nominal cooling capacity and was recently replaced. The direct expansion (DX) cooling uses R-22 refrigerant. The outdoor air handling unit has the DX cooling coil and hot water heating coil. The air is ducted down into the building. Local thermostats control each VAV box's airflow to regulate space temperature. The VAV boxes are cooling only. There are perimeter hot water baseboard radiation and cabinet unit heaters located near exterior doors. The ceiling space is used as a return air plenum to transfer the return air back to the unit's return air intake and has an acoustical elbow. The AHU unit is twenty-

four years old, is in poor condition, is nine (9) years past its ASHRAE expected useful service life and should be replaced.

The Atrium is conditioned by a packaged single zone constant volume rooftop unit made by Carrier. The unit has a 10 Ton nominal cooling capacity and 220 kbtuh natural gas input heating capacity. It includes a gas heat exchanger to heat the supply air and DX cooling using R-22 refrigerant to cool the air. The unit is controlled by a single zone thermostat. The RTU unit is twenty-four years old, in poor condition, nine (9) years past its ASHRAE expected useful service life and should be replaced.

There are four (4) packaged terminal air conditioning units (PTAC) with electric heat located in the police station East offices. They each unit has a 1 Ton nominal cooling capacity and a 12,000 nominal BTUH heating capacity. The Amana model PTA123 was recently installed. The other PTAC units are in fair to poor condition and are past their ASHRAE expected useful service life and should be replaced.

There is a Trane indoor cabinet fan model T3 and an Indeeco 42 kW electric duct heater that serves the police basement and provides heat and ventilation. This fan is believed to have a fractional horse power fan motor but was unable to verify. These units are thirty-seven (37) years old, in fair condition and are twenty-two (22) years past there ASHRAE expected useful service life.

There is a Carrier model 38QR and a ceiling cassette air handling unit serving the police first floor Patrol Room 3. Personnel stated this is abandoned in place and does not work. There is a Sanyo ductless split system serving this area. The heat pump condensing unit is model CH1872 indoor air handling unit model KHS 1872. The system is rated at 20 SEER, 11.7 EER and 10.0 HSPF. The system is three years old and in good condition.

There is a Sanyo ductless split system serving the Police Station. The outdoor air conditioner condensing unit is model CL2472 with the indoor air handling unit model KS2472 and has low ambient controls. The system is rated at 17 SEER and 9.8 EER. The system is three years old and in good condition.

There is a Sanyo ductless split system serving the Police communications room. The heat pump condensing unit is model CH2442 and indoor ceiling cassette air handling unit model KH 2442. The system has a 2 Ton nominal cooling capacity and a 25 kbtuh heating capacity. The system is rated at 10.0 EER and 7.0 HSPF. The system is eight years old, in fair condition and has seven years of ASHRAE expected useful service life remaining.

A Nordyne model FT38B-036KA split system serves the 1st Floor records room. It has a 3 Ton nominal cooling capacity, is in fair condition and has nine years of ASHRAE expected useful service life remaining.

A Mammoth model GS3BM-090C split system serves the Chief's Office. It has a 7.5 Ton nominal cooling capacity, is in good condition and has twelve years of ASHRAE expected useful service life remaining.

There is an NCP model S240A-19K10-1 that serves the police station. The system has a 1.5 Ton nominal cooling capacity. This system is twenty-four (24) years old, in fair to poor condition and is nine (9) years past its ASHRAE expected useful service life.

A Nordyne model FT3BA-030KA split system serves the 2nd Floor Detective's room. It has a 2.5 Ton nominal cooling capacity, is in fair condition and has nine years of ASHRAE expected useful service life remaining.

A Zenith model ZW6500R window air conditioner serves the Department of construction. The unit has a ½ ton cooling capacity, is in fair condition and has five years of ASHRAE expected useful service life remaining.

Exhaust System

Air is exhausted from the toilet rooms through the roof exhausters. The toilet room exhaust fans are operated 24/7.

HVAC System Controls

The HVAC systems within the facility are controlled via local, individual unit and zone thermostats. The Honeywell pneumatic control system that is twenty-four years old. The air compressor serving the control system is a De VILBISS model HU DK-55025 with a ¾ hp motor. The system is in fair to poor condition and is nine (9) years past its ASHRAE expected useful service life.

Domestic Hot Water

Domestic hot water for the Administration and Municipal Building Addition restrooms is provided by a 30 gallon Mor-Flo Industries gas water heater with 40,000 BTUH natural gas input and has 80% combustion efficiency. The domestic hot water is circulated throughout the building by a hot water re-circ pump. The circulation pump is controlled by an aqua stat. The domestic hot water piping insulation appeared to be in fair condition. This water heater is approximately twenty-four years old, is in fair to poor condition and is past its expected service life. This water heater can be replaced with a high efficiency condensing water heater.

Domestic hot water for the Police Station restrooms and showers is provided by a 120 gallon A.O. Smith Permaglas II model PEN 120 780 located in the basement. It has a 6 kW electric heating input. The domestic hot water is circulated throughout the building by a hot water re-circ pump. The circulation pump is controlled by an aqua stat. The domestic hot water piping insulation appeared to be in fair condition. This water heater is approximately thirty-seven years old, is in fair condition and is past its expected service life. Due to this water heaters location, it is not a good candidate for replacement with a gas fired water heater. This water heater can be repaired or replaced in kind as needed.

Lighting

Typical lighting throughout building is fluorescent tube fixtures with T-12 lamps and magnetic ballasts. There are some fluorescent fixtures with older generation, 700 series 32W T8 lamps and electronic ballasts. There are some areas lit with incandescent lamps.

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: NEMA Premium Efficient Motor Upgrade

Description:

Replacing the old electric motors with new efficient motor is a simple change that can provide substantial savings. The zone pump motors are past their ASHRAE expected useful service life and should be replaced.

Existing electric motors equal to or greater than one horsepower ranged from 76.7 to 80.8% efficient. The improved efficiency of the NEMA premium efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95 % of its total lifetime operating cost. Because many motors operate 40-80 hours per week, even small increases in efficiency can yield substantial energy and dollar savings.

This energy conservation measure would replace all motors equal to or greater than 1 HP with NEMA Premium® Efficient Motors. NEMA Premium® is the most efficient motor designation in the marketplace today. Using MotorMaster+, Version 4, the energy & cost savings were calculated for the fan/pump motors in this facility that are greater than or equal to 1 HP.

Energy Savings Calculations:

Existing: A 2 HP system pump motor with the following characteristics:
Existing Motor Efficiency = 80.8%
1 HP = 0.746 Watt
Load Factor = 75%
Cost of electricity = $0.150 / kWh

Annual Hours of Operations = 3198 hrs

Existing 2HP Motor Operating Cost =
{0.746 Watt/HP x Motor HP x Load Factor x Hours of Operation x Cost of Electricity] ÷ Motor Efficiency
= [0.746 x 2 x 0.75 x 3198 x 0.150] ÷ 0.808 = $664.38 / Year

New NEMA Premium Motor Efficiency = 86.5%

New NEMA Premium Efficiency Motor Operating Cost =
{0.746 x 2 x 0.75 x 3198 x 0.150} ÷ 0.8656 = $620.56 / Year

Savings = $664.38 - $620.56 = $43.78/ Year

Installed Cost of a 2 HP NEMA Premium® Efficiency Motor = $1,408.
The Smart Start® Incentive for 2 hp ODP is $54 per motor and for 1 hp ODP is $45 per motor.

Simple Payback = ($1,408-$54) / $43.78 = 30.8 Years

kWh saved = $43.78 / $0.150/kWh = 291.9 kWh
kW saved = 291.9 kWh 3,198 hrs./yr. = 0.09 kW

NEMA Premium Efficient Motor Replacement							
Equipment Tag	**Motor HP**	**Hours / Year**	**Existing Efficiency**	**NEMA Premium Efficiency**	**kW Savings**	**kWh Savings**	**Cost Savings**
P-1	2	3198	80.8%	86.5%	0.09	292	$43.8
P-2	2	3198	80.8%	86.5%	0.09	292	$44
P-3	1	3198	76.7%	85.5%	0.08	240	$36
Total Savings					**0.3**	**824**	**$124**

The following table outlines the motor replacement plan for this facility:

MOTOR REPLACEMENT PLAN							
Motor HP	**QTY**	**ENCL. TYPE**	**No. of POLEs**	**INSTALLED Cost ****	**TOTAL COST**	**TOTAL SAVINGS**	**Simple Payback**
2	1	ODP	4-Pole	$1,354	$1,354	$43.78	30.9
2	1	ODP	4-Pole	$1,354	$1,354	$43.78	30.9
1	1	ODP	4-Pole	$1,204	$1,204	$36.02	33.4
				Totals:	*$3,913*	*$124*	*31.7*

**** Net Cost after the SmartStart Buildings® incentive is applied.**

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,066
NJ Smart Start Equipment Incentive ($):	$153
Net Installation Cost ($):	$3,913
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$124
Total Yearly Savings ($/Yr):	$124
Estimated ECM Lifetime (Yr):	10
Simple Payback	31.7
Simple Lifetime ROI	-68.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,236
Internal Rate of Return (IRR)	-17%
Net Present Value (NPV)	($2,858.52)

ECM #2: Replace 1.5-Ton Split AC Unit

Description:

The NCP model S240A-19K10-1 split air conditioning system is old and in poor condition. The system consists of a remote condensing unit and an indoor air handling unit. The unit is inefficient compared to today's high efficiency standards. The efficiency of the unit is estimated to be 10 SEER in cooling operation based on the age of the equipment. It is recommended to replace this system with a new 1.5-Ton split system air conditioning system unit.

This ECM includes installation of a new split heat air conditioning system to replace the existing 1.5-Ton system. The basis for the new high efficiency condensing unit and the air handling unit is Sanyo 18KS72 / C1872 1.5-Ton split system with cooling efficiency of 20 SEER.

Energy Savings Calculations:

$$\text{EnergyUsage} = \frac{\text{Cooling(Tons)} \times 12{,}000\left(\frac{\text{Btu}}{\text{Ton hr}}\right) \times \text{Seasonal Cooling Hrs.}}{1000\left(\frac{\text{Wh}}{\text{kWh}}\right) \times \text{SEER}\left(\frac{\text{Btu}}{\text{Wh}}\right)}$$

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

$$\text{Cooling Cost} = \text{Energy Usage(kWh)} \times \text{Ave Electric Cost}\left(\frac{\$}{\text{kWh}}\right)$$

SPLIT A/C UNIT REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Unit	High Efficiency Air Conditioning Unit	
Cooling Capacity, Tons	1.5	1.5	
Efficiency (SEER)	9.7	20.0	
Seasonal Full Load Cooling Hours	900	900	
Elec Cost ($/kWh)	$0.150	$0.150	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Cooling Energy Cnsmption, kWh	1,670.1	810.0	860.1
Cooling Demand, kW	1.9	0.9	1.0
Electric Energy Cost ($)	$251	$122	$129
COMMENTS:	Cooling Full Load Hours based on ASHRAE 90.1-2007, Atlantic City		

Installed cost for the new split unit is estimated to be $8,120.

From the NJ Smart Start® Program appendix, the packaged unit's replacement falls under the category "Unitary HVAC and Split System" and warrants an incentive based on efficiency (SEER) at or above 14.0. The incentives are as follows:

$$\text{Smart Start}\,® \text{ Incentive} = (\text{AC Unit Tonnage} \times \$\,92/\text{Ton}) = (1.5 \times \$92) = \$138$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$5,253
NJ Smart Start Equipment Incentive ($):	$138
Net Installation Cost ($):	$5,115
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$129
Total Yearly Savings ($/Yr):	$129
Estimated ECM Lifetime (Yr):	15
Simple Payback	39.6
Simple Lifetime ROI	-62.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$1,935
Internal Rate of Return (IRR)	-10%
Net Present Value (NPV)	($3,574.62)

ECM #3: PTAC Units Upgrade

Description:

The police station has three packaged terminal heating and cooling units (PTACs) that are past their ASHRAE expected service life. The existing units are 1 ton nominal cooling with cooling efficiencies ranging from 8 to 10 EER. The Friedrich unit has electric heating and the two Carrier units are heat pumps. The heat pumps have a 2.2 and 2.5 coefficient of performance (COP). The efficiencies of the existing units are below today's standards for cooling efficiency. The proposed units are high efficiency heat pump PTAC units. The owner should have a professional engineer verify heating and cooling loads prior to moving forward with this ECM.

This ECM includes installation of three (3) high efficient heat pump PTACs. The ECM calculations are based on PTAC units made by GE model number AZ58H12D or equal.

Energy Savings Calculations:

$$EnergyUsage = \frac{Cooling(Tons) \times 12{,}000 \left(\frac{Btu}{Ton\ hr}\right) \times Full\ Load\ Hrs.}{1000 \left(\frac{Wh}{kWh}\right) \times EER\left(\frac{Btu}{Wh}\right)}$$

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

$$Cooling\ Cost = Energy\ Usage(kWh) \times Ave\ Electric\ Cost\left(\frac{\$}{kWh}\right)$$

$$Heating\ Energy\ Usage = \frac{HTG\ Full\ Load\ Hrs\ \times Htg\ BTU/Hr}{(COP\ \times\ 1000\ \text{watt/kW x 3.413 BTU/Watt})}$$

PTAC UNIT UPGRADE CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Freidrich Unit	High Efficiency Air Conditioning Unit	
Heating	Electric	Heat pump	
Heating Capacity, BTUH	9488	10700	
Cooling Capacity, Tons	1.0	1.0	
Efficiency (EER)	10.0	11.7	
Heating Efficiency COP	1.0	3.4	
Equivalent Full Load Cooling Hours	900	900	
Equivalent Full Load Heating Hours	810	810	
Elec Cost ($/kWh)	$0.150	$0.150	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Cooling Energy Consumption, kWh	1,080.0	892.3	187.7
Cooling Demand, kW	1.2	1.0	0.2
Heating Energy Consumption, kWh	2251.8	746.9	1,504.9
Heating Demand, kW	2.8	0.9	1.9
Electric Cooling Cost ($)	$162	$134	$28
Electric Heating Cost ($)	$338	$112	$226
Total Electric Energy Cost ($)	$500	$246	$254
COMMENTS:	EquivalentCooling Full Load Hours based on ASHRAE 90.1-2007, Atlantic City		

PTAC UNIT UPGRADE CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Carrier Unit	High Efficiency Air Conditioning Unit	
Heating	Heat pump	Heat pump	
Heating Capacity, BTUH	12600	10700	
Cooling Capacity, Tons	1.0	1.0	
Efficiency (EER)	8.0	11.7	
Heating Efficiency COP	2.2	3.4	
Equivalent Full Load Cooling Hours	900	900	
Equivalent Full Load Heating Hours	810	810	
Elec Cost ($/kWh)	$0.150	$0.150	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Cooling Energy Consumption, kWh	1,350.0	892.3	457.7
Cooling Demand, kW	1.5	1.0	0.5
Heating Energy Consumption, kWh	1359.2	746.9	612.4
Heating Demand, kW	1.7	0.9	0.8
Electric Cooling Cost ($)	$203	$134	$69
Electric Heating Cost ($)	$204	$112	$92
Total Electric Energy Cost ($)	$406	$246	$161
COMMENTS:	EquivalentCooling Full Load Hours based on ASHRAE 90.1-2007, Atlantic City		

PTAC UNIT UPGRADE CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Carrier Unit	High Efficiency Air Conditioning Unit	
Heating	Heat pump	Heat pump	
Heating Capacity, BTUH	12600	10700	
Cooling Capacity, Tons	1.0	1.0	
Efficiency (EER)	8.2	11.7	
Heating Efficiency COP	2.5	3.4	
Equivalent Full Load Cooling Hours	900	900	
Equivalent Full Load Heating Hours	810	810	
Elec Cost ($/kWh)	$0.150	$0.150	
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Cooling Energy Consumption, kWh	1,317.1	892.3	424.8
Cooling Demand, kW	1.5	1.0	0.5
Heating Energy Consumption, kWh	1196.1	746.9	449.2
Heating Demand, kW	1.5	0.9	0.6
Electric Cooling Cost ($)	$198	$134	$64
Electric Heating Cost ($)	$179	$112	$67
Total Electric Energy Cost ($)	$377	$246	$131
COMMENTS:	EquivalentCooling Full Load Hours based on ASHRAE 90.1-2007, Atlantic City		

ENERGY CALCULATIONS SUMMARY			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Cooling Energy Consumption, kWh	3,747.1	2,676.9	1,070.2
Cooling Demand, kW	4.2	3.0	1.2
Heating Energy Consumption, kWh	4,807.2	2,240.7	2,566.5
Heating Demand, kW	5.9	2.8	3.2
Electric Cooling Cost ($)	562.1	401.5	$161
Electric Heating Cost ($)	721.1	336.1	$385
Total Electric Energy Cost ($)	1,283.1	737.6	$546
COMMENTS:	EquivalentCooling Full Load Hours based on ASHRAE 90.1-2007, Atlantic City		

Installation cost for the 3 PTAC units is estimated at $7,880.

From the NJ Smart Start® Program appendix, the packaged unit's replacement falls under the category "Unitary AC" and warrants an incentive based on efficiency (EER) at or above 11.0. The program incentives are calculated as follows:

$$\text{Smart Start®}\ Incentive = (Cooling Tons \times \$/Ton\ Incentive)$$
$$= ((3x1) Tons \times \$65/Ton) = \$195$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,879
NJ Smart Start Equipment Incentive ($):	$195
Net Installation Cost ($):	$7,684
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$546
Total Yearly Savings ($/Yr):	$546
Estimated ECM Lifetime (Yr):	15
Simple Payback	14.1
Simple Lifetime ROI	6.5%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$8,183
Internal Rate of Return (IRR)	1%
Net Present Value (NPV)	($1,172.05)

ECM #4: Air handling Unit Upgrade

Description:

Carrier roof top air handling units with hot water heating coil and direct expansion (DX) refrigerant cooling coil has surpassed its expected service life of fifteen (15) years as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. This unit is a 1987 vintage, and is an excellent candidate for replacement due to escalating owning and maintenance costs. The unit contains a hot water heating section and a DX cooling section and savings can we yielded from year round operation. The unit has a 15 hp supply fan motor that provides a nominal 17,500 CFM (cubic feet per minute) capacity. The associated condensing unit was recently replaced.

This energy conservation measure would replace air handling units with fan motors equal to or greater than 1 HP with new air handling units having NEMA Premium® Efficient Motors. NEMA Premium® is the most efficient motor designation in the marketplace today. The Carrier series model 39MW36 or equivalent is utilized as a basis of design. Because the unit operates in excess of 80 hours per week, even small increases in efficiency can yield substantial energy and dollar savings.

Energy Savings Calculations:

Existing: Carrier AHU, has a fan motor with the following characteristics:
Existing motor HP = 15 HP
Annual Hours of Operations = 5169 heating season +3198 cooling season = 8367 hrs
1 HP = 0.746 Watt
Load Factor = 75%
Cost of electricity = $0.150 / kWh

AHU Motor Operating Cost =
{0.746 Watt/HP x Motor HP x Load Factor x Hours of Operation x Cost of Electricity] ÷ Motor Efficiency

kWh saved = $763.47 / $0.150/kWh = 5,089.8 kWh
kW saved = 5,089.8 kWh / 8,367 hrs./yr. =0.61 kW

AHU UPGRADE MOTOR CALCULATION							
Equipment Tag	**CFM**	**Motor HP**	**Existing Efficiency**	**NEMA Premium Efficiency**	**kW Savings**	**kWh Savings**	**Savings**
Carrier AHU, S/A	17,500	15	86.6%	92.4%	0.61	5,090	$763.5
Total Savings					**0.6**	**5,090**	**$763**

Installed Cost of a 17,500 CFM AHU with a 15 HP NEMA Premium® Efficiency Motor = $47,670.

NEMA PREMIUM EFFICIENT - INCENTIVE				
Equipment Tag	**Motor HP**	**NEMA Premium Efficiency**	**Type**	**Incentive**
Carrier AHU, S/A	15	92.4%	TEFC	115
Total Savings				**$115**

Net installed Cost = $47,670 - $115 = $47,555.

Simple Payback = $47,555 / $763.47 = 62 Years

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$47,670
NJ Smart Start Equipment Incentive ($):	$115
Net Installation Cost ($):	$47,555
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$763
Total Yearly Savings ($/Yr):	$763
Estimated ECM Lifetime (Yr):	15
Simple Payback	62.3
Simple Lifetime ROI	-75.9%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$11,452
Internal Rate of Return (IRR)	-14%
Net Present Value (NPV)	($38,440.78)

ECM #5: Packaged Cool/Heat Rooftop Unit Upgrade

Description:

The Middle Township Town Hall Building has one (1) packaged, direct expansion cooling-natural gas heat rooftop unit (RTU). The unit's cooling efficiencies are as shown below. The existing units had a combustion efficiency of 80% when new. Due to the age of these unit heaters in conjunction with radiation losses has brought the efficiency down to approximately 75%. The unit is past its ASHRAE expected useful service life. The unit is in poor condition and is in need of replacement. The efficiencies of the existing units are below today's standards for cooling efficiency. The proposed unit is a high efficiency one-for-one replacement of the existing unit. The owner should have a professional engineer verify heating and cooling loads prior to moving forward with this ECM.

This ECM includes installation of one (1) high efficient packaged rooftop unit. The ECM calculations are based on Carrier Packaged Rooftop Unit model series 48HC or equivalent. Means Costworks software is used to estimate demolition and labor costs for a generic rooftop AC unit replacement.

Calculation Constants	
Full Load Hours	900
Heating Degree Day	5,169
Outdoor Design Temp, F	8.00
Oversize Factor	80.00%
Degree Day Adjustment Factor, Office	0.52
Electric Cost, $/kWh	$0.150
NG Cost, $/therm	$1.36

Tag	Cooling Capacity (Tons)	Exist. Cooling EER	Proposed Cooling EER	Existing Heating Btu/h Input	Exist. Thermal Efficency	Proposed Heating Btu/h Input	Proposed Thermal Efficiency
Carrier RTU	10	8.3	11.50	220,000	75%	224,000	82%

Energy Savings Calculations:

Cooling Savings for 10 Ton Unit Upgrade:

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

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

$$Cooling\ Cost\ Savings = EnergySavings \times EnergyUnitCost\left(\frac{\$}{kWh}\right)$$

$$HeatingSavings = \frac{Capcity\left(\frac{Btu}{hr}\right) \times HeatDegDays \times AdjustmentFactor \times 24Hrs \times OversizeFactor}{DesignTempDifference(^{\circ}F) \times FuelHeatValue\left(\frac{Btu}{Therm}\right)}$$

$$x\left(\frac{1}{Eff_{OLD}} - \frac{1}{Eff_{NEW}}\right)$$

The calculations are carried out and the results are tabulated in the below table.

Tag	Cooling Capacity (Tons)	Energy Savings (kWh)	Demand Savings (kW)	Gas Savings, therms	Total Energy Cost Saved
Carrier RTU	10	3,621	4.02	182.55	$791.38
Total	10.0	3,621	4.02	182.55	$791.38

From the NJ Smart Start® Program appendix, the packaged unit replacement falls under the category "Electric Unitary HVAC" and warrants an incentive based on efficiency (EER) at or above 11.5. The program incentives are calculated as follows:

$$SmartStart® \ Incentive = (CoolingTons \times \ \$/Ton\ Incentive)$$

Central DX AC Systems

<5.4 tons, minimum 14.0 SEER,	$92/ton
>5.4 tons to 11.25 tons, minimum 11.5 EER,	$73/ton
>11.25 tons to 20 tons, minimum 11.5 EER,	$79/ton

Tag	Cooling Capacity (Tons)	Incentives
Carrier RTU	10	$730
Total		$730

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$20,183
NJ Smart Start Equipment Incentive ($):	$730
Net Installation Cost ($):	$19,453
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$791
Total Yearly Savings ($/Yr):	$791
Estimated ECM Lifetime (Yr):	15
Simple Payback	24.6
Simple Lifetime ROI	-39.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$11,871
Internal Rate of Return (IRR)	-6%
Net Present Value (NPV)	($10,005.06)

ECM #6: Demand Controlled Ventilation

Description:

Demand Controlled Ventilation (DCV) is a means to provide active, zone level control of ventilation for spaces within a facility. The basic premise behind DCV is monitoring indoor CO2 levels versus outdoor CO2 levels in order to provide proper ventilation to the spaces within the facility as well as saving costly dollars treating unconditioned ventilation air. Carbon dioxide ventilation control or demand controlled ventilation (DCV) allows for the measurement and control of outside air ventilation levels to a target cfm/person ventilation rate in the space (i.e., 15 cfm/person) based on the number of people in the space. It is a direct measure of ventilation effectiveness and is a method whereby buildings can regain active and automatic zone level ventilation control, without having to open windows. The fixed ventilation approach depends on a set-it-and-forget-it methodology that is completely unresponsive to changes in the way spaces are utilized/occupied or how equipment is maintained. A DCV system utilizes various control algorithms to maintain a base ventilation rate. The system monitors space CO2 levels and the algorithm automatically adjusts the outdoor and return air dampers to provide the quantity of outdoor air to maintain the required CO2 level in the space. System designs are normally designed for maximum occupancy and the ventilation rates are designed for this (maximum) occupancy. In areas where occupancy swings are prevalent there is ample opportunity to reduce outdoor air quantity to satisfy the needs of the actual number of occupants present. By installing the DCV controls, energy savings are realized by the reduced quantities of outdoor air that do not require heating and cooling energy from the water boilers and air cooled condensing unit.

The Carrier Air handling unit provides heating and air conditioning to the Administration and Municipal Building addition which includes the conference room and court room. When operating, these units provide minimum amount of outside air to the space. The outside air volume is typically based on the maximum occupancy of the space conditioned. When a given space is not fully occupied the outside air quantity delivered to the space is greater than the amount needed for adequate ventilation.

This ECM includes the installation of CO_2 sensors integrated into a demand control ventilation system, for the unit mentioned above. This system allows the air handling unit to respond to changes in occupancy and therefore reduce the amount of outside air that has to be conditioned. Outside air accounts for a large portion of the energy consumption in the HVAC system, especially in high occupancy spaces. 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:

- Demand Control Ventilation - 10% - 15%.

Energy savings achieved through "Demand Control Ventilation" average 10%-15%. Savings resulting from the implementation of this ECM for energy management controls are estimated to be 15% of the total HVAC energy cost for this system.

The components required for the demand control ventilation system installation include damper actuators, Variable Frequency Drives, CO2 sensors, wiring, Energy Management System equipment expansion and programming. Each occupied zone would require minimum one CO_2 sensor installed to monitor occupancy levels.

IMPLEMENTATION SUMMARY					
INPUTS	**Service**	**Min # of CO2 SENSORS**	**HVAC Unit**	**Cooling Capaity, Tons**	**Heating Capacity, MBH**
DCV-1	Court Room, Admin Bldg Municipal Addition	6	Carrier AHU	20	380
Total				**20**	**380**

** Heating capacity of the ceiling hung AHU's estimated*

Energy Savings Calculations:

$$\text{Cooling EnergyUsage} = \frac{\text{Cooling(Tons)} \times 12{,}000 \left(\frac{\text{Btu}}{\text{Ton hr}}\right) \times \text{Annual Full Load Cooling Hrs.}}{1000 \left(\frac{\text{Wh}}{\text{kWh}}\right) \times \text{EER}\left(\frac{\text{Btu}}{\text{Wh}}\right)}$$

$$\text{EnergySavings} = \text{CoolingEnergy(kwh)} \times 15\%$$

$$\text{Cooling Cost} = \text{Energy Usage(kWh)} \times \text{Ave Electric Cost} \left(\frac{\$}{\text{kWh}}\right)$$

$$\text{Heating Energy (Therms)} = \frac{\text{Heating Capacity}\left(\frac{\text{Btu}}{\text{Hr.}}\right) \times \text{HDD(Day °F)} \times 24\left(\frac{\text{Hr.}}{\text{Day}}\right) \times (0.60)}{65(°\text{F}) \times \text{Fuel Heat Value}\left(\frac{\text{Btu}}{\text{Therms}}\right) \times \text{Heating Efficiency (\%)}}$$

$$\text{Heating Cost} = \text{Heating Energy(Therms)} \times \text{Ave Fuel Cost} \left(\frac{\$}{\text{Therms}}\right)$$

$$\text{EnergySavings} = \text{HeatingEnergy(Therms)} \times 15\%$$

DEMAND CONTROLLED VENTILATION	
ECM INPUTS	**DCV**
Equipment	Carrier AHU
Total Cooling Capacity, Tons	20
Efficiency (EER)	9
Annual Full Load Cooling Hours	900
Total Heating Capacity, MBh	380
Heating Efficiency (Gas)	89%
Heating Degree Days (65°F)	5169
Energy Savings	15.0%
Elec Cost ($/kWh)	$0.150
Natural Gas Cost ($/Therm)	$1.36
ENERGY SAVINGS	
ECM RESULTS	**DCV**
Cooling Energy Consumption, kWh	25,412
Heating Energy (Therms)	4,886
Cooling Energy Savings kWh	3,812
Heating Energy Savings (Therms)	733
Electric Energy Cost Savings ($)	$572
Total Gas Cost Savings ($)	$997
Total Cost Savings ($)	$1,569
COMMENTS:	HDD estimated based on Atlantic City, NJ

Cost and Incentives:

Estimated installed cost for demand controlled ventilation for the Cafeteria Areas is $42,000. Estimated cost includes CO2 sensors, control wiring, electrical wiring, control system equipment expansion and programming.
There are currently no Smart Start ® incentives available for a Demand Control Ventilation System.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$42,000
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$42,000
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,569
Total Yearly Savings ($/Yr):	$1,569
Estimated ECM Lifetime (Yr):	15
Simple Payback	26.8
Simple Lifetime ROI	-44.0%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$23,528
Internal Rate of Return (IRR)	-7%
Net Present Value (NPV)	($23,274.97)

ECM #7: Condensing Domestic Water Heater

Description:

The primary source for domestic hot water for the Administration and Municipal addition building is provided by one 40 gallon Mor-Flo Industries model GV303T natural gas water heater with a total 40 MBH natural gas input. The heater provides hot water for the restrooms. This water heater is past its useful service life and is less efficient than other available water heaters. Condensing water heaters provide substantially improved operating costs over standard efficiency water heaters. The thermal efficiency of condensing hot water heaters is approximately 90%.

This ECM includes installation of one condensing water heater to replace the existing water heater.

The basis for this ECM is the AO Smith condensing hot water heater model number BTX 80 to replace the existing tank style water heater or equal.

Energy Savings Calculations:

The annual gas usage is based on average monthly usage. The gas utility usage from April through August is averaged.

Annual Domestc water gas usage = ((Apr+May+Jun+Jul+Aug)/5) x 12 months

GAS USAGE FOR DOMESTIC HOT WATER HEATING			
MONTH	TOTAL GAS USAGE,	DOMESTIC HW USAGE,	DOMESTIC HW COST
Dec-09	707.6	18.7	$25.48
Jan-10	717.6	18.7	$25.48
Feb-10	566.4	18.7	$25.48
Mar-10	211.4	18.7	$25.48
Apr-10	**14.4**	18.7	$25.48
May-10	**14.4**	18.7	$25.48
Jun-10	**18.6**	18.7	$25.48
Jul-10	**18.5**	18.7	$25.48
Aug-10	**27.6**	18.7	$25.48
Sep-10	37.8	18.7	$25.48
Oct-10	102.5	18.7	$25.48
Nov-10	414.9	18.7	$25.48
TOTAL	**2851.6**	**224**	**$306**

$$\text{Dom. HW Gas Usage} = \frac{\text{Dom HW Heat Cons.}(\text{Btu})}{\text{Heating Eff.}(\%) \times \text{Fuel Heat Value}\left(\frac{\text{BTU}}{\text{Therm}}\right)}$$

$$\text{Gas Energy Cost} = \text{Heating Gas Usage}(\text{Therms}) \times \text{Ave Fuel Cost}\left(\frac{\$}{\text{Therm}}\right)$$

HIGH EFFICIENCY WATER HEATER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Gas Fired Hot Water Heater	High Efficiency Condensing HW	-
Water Heater Efficiency (%)	77%	90%	13%
Water Heater Input, BTU/Hr.	40,000	76,000	
Nat Gas Heat Value (BTU/Therm)	100,000	100,000	-
Annual Gas usage for DHW, Therms	224	-	
Gas Cost ($/Therm)	$1.36	$1.36	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Natural Gas Usage (Therms)	224	191.9	32
Energy Cost ($)	$305	$261	$44
COMMENTS: 1. Existing efficiency = 80%-3%Age & Radiation Losses 2. Annual gas usage based on average monthly usage (Jan+ Feb+May+Jul+Aug)/5			

Cost, Rebates and Incentives

Typical installed cost for a condensing hot water heater is estimated to be $6,850.

From the NJ Smart Start® Program appendix, the hot water heater installation falls under the category “Gas Water Heating” and warrants an incentive as follows:

Smart Start® Incentive: $50 per water heater ≤ 50 gallons, 0.67 energy factor or better
1 x $50 = $50

COST & SAVINGS SUMMARY					
ECM INPUT	INSTALLED COST	SMART START REBATES Per UNIT	TOTAL COST PER UNIT	# OF UNITS	TOTAL NET COST
AO SMITH BTX 80	$6,900	$50	$6,850	1	$6,850
TOTAL			**$6,850**	**1**	**$6,850**

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,900
NJ Smart Start Equipment Incentive ($):	$50
Net Installation Cost ($):	$6,850
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$44
Total Yearly Savings ($/Yr):	$44
Estimated ECM Lifetime (Yr):	12
Simple Payback	155.5
Simple Lifetime ROI	-92.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$529
Internal Rate of Return (IRR)	-27%
Net Present Value (NPV)	($6,411.47)

ECM #8: Window Replacement

Description:

The envelope of the Middle Township Town Hall building consists of double pane double hung windows with vinyl clad wood frames. The windows were installed in 1987. These windows and frames are in fair to poor condition with some maintenance required. The windows account for energy use through infiltration leakage loss and conductive loss. This style of window construction allows higher infiltration energy loss where a different style of window can reduce this energy loss. These factors lead to increased energy use in the heating and cooling seasons. The energy loss due to double pane clear glass is combined with energy loss due to poor seals at each operable window can be reduced with technology that is available today.

New double pane casement windows with argon filled low E glazing offer a substantial improvement in thermal performance in both the summer and winter months. The Town Hall is open year round and can benefit from year round savings and occupant comfort.

This ECM includes the replacement of all existing windows in the Town Hall building with double pane, argon filled low emissivity glass. The proposed windows include reduced outside air leakage. In addition the double pane structure will significantly increase the insulation value compared to the existing double pane, air filled clear window structure. The basis for this ECM is Anderson Windows at $75 per SF of window installed.

Energy Savings Calculations:

$$\text{Infiltration}\left(\frac{\text{Ft}^3}{\text{Min.}}\right)=\frac{\text{Area}\left(\text{Ft}^2\right)\times\text{Ave Height}\left(\text{Ft}\right)\times\text{AirChanges Per Hour}\left(\frac{1}{\text{Hr.}}\right)}{60\left(\frac{\text{Min}}{\text{Hr.}}\right)}$$

$$\text{Heat Load}\left(\frac{\text{Btu}}{\text{Hr.}}\right)=1.1\times\text{Infiltration}\left(\frac{\text{Ft}^3}{\text{Min}}\right)\times\text{Design Temperature Difference}\left(^{\circ}\text{F}\right)$$

$$\text{Cooling Load}\left(\text{Ton}\right)=\text{Infiltration}\left(\frac{\text{Ft}^3}{\text{Min}}\right)\times\frac{1\,\text{Ton Cooling}}{400\left(\frac{\text{Ft}^3}{\text{Min}}\right)}$$

$$\text{Heating Leakage Energy}\left(\text{Therms}\right)=\frac{\text{Heat Load}\left(\frac{\text{Btu}}{\text{Hr.}}\right)\times\text{HDD}\left(\text{Day }^{\circ}\text{F}\right)\times 24\left(\frac{\text{Hr.}}{\text{Day}}\right)\times\left(0.60\right)}{65\left(^{\circ}\text{F}\right)\times\text{Fuel Heat Value}\left(\frac{\text{Btu}}{\text{Therms}}\right)\times\text{Heating Efficiency}\left(\%\right)}$$

$$\text{Cooling Leakage Energy}\left(\text{kWh}\right)=\frac{\text{Cooling Load}\left(\text{Ton}\right)\times\left(\frac{12{,}000\text{ Btu}}{\text{Ton Hr.}}\right)\times\text{Full Load Cooling Hours}}{\frac{1000\text{ W.h}}{\text{kWh}}\times\text{Cooling Efficiency}\left(\text{EER}\right)}$$

$$\text{Conductive Energy}\left(\text{Therms}\right)=\frac{\text{U}-\text{Value}\times\text{Area}\left(\text{Ft}^2\right)\times\text{HDD}\left(\text{Day }^{\circ}\text{F}\right)\times 24\left(\frac{\text{Hr.}}{\text{Day}}\right)\times\left(0.60\right)}{65\left(^{\circ}\text{F}\right)\times\text{Fuel Heat Value}\left(\frac{\text{Btu}}{\text{Therms}}\right)\times\text{Heating Efficiency}\left(\%\right)}$$

$$\text{Heating Energy Cost} = \text{Total Heating Energy}\left(\text{Therms}\right)\times\text{Ave Fuel Cost}\left(\frac{\$}{\text{Therms}}\right)$$

$$\text{Cooling Energy Cost} = \text{Total Cooling Energy}\left(\text{kWh}\right)\times\text{Ave Fuel Cost}\left(\frac{\$}{\text{kWh}}\right)$$

Energy calculations are summarized in the table below.

WINDOW REPLACEMENT CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Description:	Existing Windows (double pane)	Double Pane Low-E Windows	-
Affected Bldg Area (SF)	23,650	23,650	-
Average Ceiling Height (Ft)	9	9	-
Window (SF)	820	820	-
U-Value (BTU/HR/SF*°F)	0.53	0.45	0.08
Average Leakage Rate (Air Changes per Hr)	0.75	0.5	0.3
Infiltration, CFM	2661	1774	-
Heating System Efficiency (%)	89%	89%	-
Heating Degree Days (HDD)	5,169	5,169	-
Design Day Temp Diff (°F)	65	65	-
Heating Hrs Per Day (Hrs)	24	24	-
Full Load Cooling Hours	900	900	-
Average Cooling Efficiency, EER	8.8	8.8	-
Gas Cost ($/Therm)	1.36	1.36	-
Electric Cost ($/kWh)	0.150	0.150	-
Gas Heat Value (BTU/Therm)	100,000	100,000	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Heat Load (BTU/Hr)	190,235	126,823	63,412
Leakage Energy (Therms)	2,448	1,632	816
Conductive Energy (Therms)	364	309	55
Total Heating Energy (Therms)	2,811	1,941	871
Cooling Load (Ton)	7	4	2
Cooling Demand (kW)	2.6	1.7	0.9
Total Cooling Energy (kWh)	8,163	5,442	2,721
Gas Energy Cost ($)	$3,823	$2,639	$1,184
Electric Energy Cost ($)	$1,224	$816	$408
Comments:	1. Proposed window U-value Based on ASHRAE 90.1 - 2007		

Estimated cost for replacing all the windows at the Town Hall building is $61,528. There are NJ Smart Start® incentives available for window replacement.

Simple Payback = Cost/Savings = $61,528 / $1592 = 27.1

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$61,528
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$61,528
Maintenance Savings ($/Yr):	$680
Energy Savings ($/Yr):	$1,592
Total Yearly Savings ($/Yr):	$2,272
Estimated ECM Lifetime (Yr):	25
Simple Payback	27.1
Simple Lifetime ROI	-7.7%
Simple Lifetime Maintenance Savings	$17,000
Simple Lifetime Savings	$56,811
Internal Rate of Return (IRR)	-1%
Net Present Value (NPV)	($21,958.09)

Note: This ECM demonstrates a general order of magnitude estimate of energy savings and construction costs. It is used to illustrate the potential for energy savings. Before proceeding with this ECM, the owner should have an engineering study performed that should include a detailed survey, analysis and a construction cost estimate. The analysis would confirm actual current materials and conditions, make a design selection for new windows materials and perform load calculation to assure the projected savings.

ECM #9: Lighting Upgrade – General

Description:

There are still a large amount of T-12 fixtures throughout the Town Hall Building. Improved fluorescent lamps and ballasts are available as direct replacements for the existing lamps and ballasts. A simple retrofit of the existing fixture can provide substantial savings. For example, a conventional drop-ceiling lay in fixture with four, 4-foot lamps (34 Watt lamps with magnetic ballast) has a total wattage of 144 Watts per fixture. By using T-8 lamps and electronic ballasts, the total wattage would be reduced to 86 Watts. The light levels would increase by about 15% and the light quality would increase by 35%.

Some of the remaining interior lighting at the Middle Township Town Hall building is provided with fluorescent fixtures with older generation, 700 series 32W T8 lamps and electronic ballasts. Although 700 series T8 lamps are considered fairly efficient, further energy savings can be achieved by replacing the existing T8 lamps with new generation, 800 series 28W T8 lamps without compromising light output. CEG recommends, re-lamping all of the fixtures with 28W T8 lamps.

This ECM includes retrofitting each of the existing T-12 fluorescent lamp and magnetic ballast fixtures with T-8 lamps and high-power electronic ballasts. High efficiency electronic ballasts reduce overall wattage while maintaining the existing lumen levels of the various rooms. This ECM also includes re-lamping of the existing fluorescent fixtures with 800 series, 28W T8 lamps. Additionally, the retrofit of all older fluorescent fixtures with T8 or T5 fluorescent fixtures with electronic ballasts in the building would prove to be more energy efficient. The new, energy efficient T8 fixtures will provide adequate lighting and will save on electrical costs due to better performance of the lamp and ballasts. This ECM also includes maintenance savings through the reduced number of lamps replaced per year. The expected lamp life of a T8 lamp is approximately 30,000 burn-hours, in comparison to the existing T12 lamps which is approximately 20,000 burn-hours. The facility will need approximately 33% less lamps replaced per year for each one for one fixture replaced.

The ECM also includes replacement of any incandescent lamps with compact fluorescent lamps. Compact fluorescent lamps (CFL's) were designed to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: a 13-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 26-Watt CFL for a 100-Watt incandescent lamp. The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures. Where the existing fixture is controlled by a dimmer switch, the CFL bulb must be compatible with a dimmer switch. In some locations the bulb replacement will need to be tested to make sure the larger base of the CFL will fit into the existing fixture. The energy usage

of an incandescent compared to a compact fluorescent approximately 3 to 4 times greater. In addition to the energy savings, compact fluorescent fixtures burn-hours are 8 to 15 times longer than incandescent fixtures ranging from 6,000 to 15,000 burn-hours compared to incandescent fixtures ranging from 750 to 1000 burn-hours. However, the maintenance savings due to reduced lamp replacement is offset by the higher cost of the CFL's compared to the incandescent lamps.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the hours of operation, proposed retrofits, costs, savings, and payback periods for each set of fixtures in the each building.

Rebates and Incentives:

There are incentives available from NJ Smart Start® Program for a portion of the retrofits in this ECM. Incentives are calculated as follows:

From the Smart Start Incentive appendix, the retrofit of a T-12 fixture to a T-5 or T-8 fixture or the retrofit of existing 32 watt T-8 system to reduced wattage (28w/25w 4') warrants the following incentive: $10 per fixture.

$$\text{SmartStart® Incentive} = (\#\text{ of } 1-4 \text{ lamp fixtures} \times \$10) = 289 \times \$10 = \$2{,}890$$

Energy Savings Summary:

ECM #9 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$24,768
NJ Smart Start Equipment Incentive ($):	$2,890
Net Installation Cost ($):	$21,878
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$7,952
Total Yearly Savings ($/Yr):	$7,952
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.8
Simple Lifetime ROI	445.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$119,280
Internal Rate of Return (IRR)	36%
Net Present Value (NPV)	$73,052.46

ECM #10: Lighting Controls Upgrade – Occupancy Sensors

Description:

Some of the lights in the Middle Township Town Hall building are 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.

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.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 20% of the total light energy controlled by occupancy sensors and daylight sensors (The majority of the savings is expected to be after school hours when rooms are left with lights on)

This ECM includes installation of ceiling or switch mount sensors for individual offices, classrooms, large bathrooms, and libraries. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. 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 the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

$$\text{Energy Savings} = \left(\%\ \text{Savings} \times \text{Controlled Light Energy}\ \left(\text{kWh/Yr}\right)\right)$$

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

Cost and Incentives:

Installation cost per dual-technology sensors (Basis: Sensor switch or equivalent) are as follows:

Dual Technology Occupancy Sensor - Remote Mount	$160 per installation
Dual Technology Occupancy Sensor - Switch Mount	$75 per installation

Cost includes material and labor.

From the **NJ Smart Start® Program Incentives Appendix**, the installation of a lighting control device warrants the following incentive:

Occupancy Sensor Fixture Mounted (existing facility only) = $20 per sensor
Occupancy Sensor Remote Mounted (existing facility only) = $35 per sensor

$$\text{Smart Start® Incentive} = (\#\text{ of wall mount} \times \$\,20) + (\#\text{ of ceiling mount} \times \$35)$$
$$\text{Smart Start® Incentive} = (7\text{ wall mount} \times \$\,20) + (30\text{ ceiling mount} \times \$35) = \$1{,}190$$

Energy Savings Summary:

ECM #10 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,930
NJ Smart Start Equipment Incentive ($):	$1,190
Net Installation Cost ($):	$3,740
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,833
Total Yearly Savings ($/Yr):	$2,833
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.3
Simple Lifetime ROI	1036.2%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$42,495
Internal Rate of Return (IRR)	76%
Net Present Value (NPV)	$30,080.17

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 Middle Township Town Hall 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 typically 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). Township staff suggested a potential for physical changes of the roof as well as existing roof pitch conditions that are deterrents from a roof mounted PV system. Parking lots can also be utilized for the installation of a solar array. A truss system can be installed that is high enough to park vehicles under the array and no parking lot area is lost.

The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $350, this value was used in our financial calculations. This equates to $0.35 per kWh generated.

CEG has reviewed the existing roof area and site of Middle Township Town Hall for the purposes of determining a potential for a photovoltaic system. CEG believes a ground mounted parking lot canopy system is best suited for this site. An area of 8,075 S.F. can be utilized for a PV system as depicted in the **Renewable / Distributed Energy Measures Calculation Appendix**. Using this square footage it was determined that a system size of 113.85 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 137,782 KWh annually, reducing the overall utility bill by approximately 31.6% 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 parking lot space at the existing facility and limited by the peak demand. 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 township paying for 100% of the total project cost upfront via one of the methods noted in the Installation Funding Options section below. Calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following is the payback period:

Table 7
Financial Summary – Photovoltaic System

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM			
PAYMENT TYPE	**SIMPLE PAYBACK**	**SIMPLE ROI**	**INTERNAL RATE OF RETURN**
Direct Purchase	14.78 Years	6.8%	5.1%

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

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

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, it was determined that the low average wind speed, proximity to residential neighborhoods, and limited site space make the Town Hall a poor candidate for wind energy production. 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 of air conditioning loads. There is a fairly steady yearlong electric load most likely attributable to the various split systems utilized throughout the facility for zone cooling. 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 exhibit very low consumption (complimenting the cooling electric load), May through August. There is an increase in consumption January through March, and again October through December. Multiple gas-fired boilers, gas-fired packaged rooftop units and one of the domestic hot water systems are responsible for the natural gas load. Similar to the electric profile, creating 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 an 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 Corporation, 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.

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 Township has already signed on for a third party supplier for its electric commodity through a consortium; South Jersey Power Cooperative. 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. It is pertinent to note, the term contract for electric supply ceases September 9, 2011. While this approach can provide significant savings to the Township, 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 Township review market outlooks for energy to decide on a long or short term contract. Given these recommendations the Township 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, Middle Township 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.

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X. INSTALLATION FUNDING OPTIONS

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

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

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

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

iv. *Pay For Performance* – The New Jersey Smart Start Pay for Performance program includes incentives based on savings resulted from implemented ECMs. The program is available for all buildings that were audited as part of the NJ Clean Energy's Local Government Energy Audit Program. The facility's participation in the program is assisted by an approved program partner. An "Energy Reduction Plan" is created with the facility and approved partner to shown at least 15% reduction in the building's current energy use. Multiple energy conservation measures implemented together are applicable toward the total savings of at least 15%. No more than 50% of the total energy savings can result from lighting upgrades / changes.

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

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

1. Energy Reduction Plan – Upon completion of an energy reduction plan by an approved program partner, the incentive will grant $0.10 per square foot between $5,000 and $50,000, and not to exceed 50% of the facility's annual energy expense. (Benchmark #1 is not provided in addition to the local government energy audit program incentive.)

2. Project Implementation – Upon installation of the recommended measures along with the "Substantial Completion Construction Report," the incentive will grant savings per KWH or Therm based on the program's rates. Minimum saving must be 15%. (Example $0.11 / kWh for 15% savings, $0.12/ kWh for 17% savings, … and $1.10 / Therm for 15% savings, $1.20 / Therm for 17% saving, …) Increased incentives result from projected savings above 15%.

3. Measurement and Verification – Upon verification 12 months after implementation of all recommended measures, that actual savings have been achieved, based on a completed verification report, the incentive will grant additional savings per kWh or Therm based on the program's rates. Minimum savings must be 15%. (Example $0.07 / kWh for 15% savings, $0.08/ kWh for 17% savings, … and $0.70 / Therm for 15% savings, $0.80 / Therm for 17% saving, …) Increased incentives result from verified savings above 15%.

v. *Direct Install Program* – The New Jersey Clean Energy's Direct Install Program is a state funded program that targets small commercial and industrial facilities with peak demand of less than 100 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.

vi. *Energy Efficiency and Conservation Block Grants* – The EECGB rebate provides supplemental funding up to $50,000 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. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

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

E. Replace computer CRT monitors with energy saving LCD monitors.

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. Solar PV system REM assumes panel locations are acceptable. Before proceeding with the panel locations, a structural engineer must be consulted to determine the adequacy of the structures and whether or not structural modifications would be required.

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.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Middle Township - Town Hall

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM #1	Premium Efficient Motor Upgrade	$3,058	$1,008	$153	$3,913	$124	$0	$124	10	$1,236	$0	-68.4%	31.7	-16.86%	($2,858.52)
ECM #2	Split System Upgrade	$2,626	$2,626	$138	$5,115	$129	$0	$129	15	$1,935	$0	-62.2%	39.6	-10.25%	($3,574.62)
ECM #3	PTAC Upgrade	$4,830	$3,049	$195	$7,684	$546	$0	$546	15	$8,183	$0	6.5%	14.1	0.80%	($1,172.05)
ECM #4	AHU Upgrade	$44,450	$3,220	$115	$47,555	$763	$0	$763	15	$11,452	$0	-75.9%	62.3	-14.11%	($38,440.78)
ECM #5	RTU Upgrade	$16,705	$3,478	$730	$19,453	$791	$0	$791	15	$11,871	$0	-39.0%	24.6	-5.62%	($10,005.06)
ECM #6	Demand Control Ventilation	$27,100	$14,900	$0	$42,000	$1,569	$0	$1,569	15	$23,528	$0	-44.0%	26.8	-6.50%	($23,274.97)
ECM #7	Water Heater Upgrade	$3,200	$3,700	$50	$6,850	$44	$0	$44	12	$529	$0	-92.3%	155.5	-26.88%	($6,411.47)
ECM #8	Window Upgrade	$61,528	$0	$0	$61,528	$1,592	$680	$2,272	25	$56,811	$17,000	-7.7%	27.1	-0.60%	($21,958.09)
ECM #9	Lighting Upgrade-General	$19,814	$4,954	$2,890	$21,878	$7,952	$0	$7,952	15	$119,280	$0	445.2%	2.8	35.99%	$73,052.46
ECM #10	Lighting Control Upgrade	$3,944	$986	$1,190	$3,740	$2,833	$0	$2,833	15	$42,495	$0	1036.2%	1.3	75.73%	$30,080.17
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Solar PV 113.85 KWdc System	$1,024,650	$0	$0	$1,024,650	$21,081	$48,224	$69,305	25	$1,732,625	$1,205,600	69.1%	14.8	4.53%	$182,168.20

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

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February 15, 2011:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2007

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 - $92 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 90.1-2007

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%

Ground Source Heat Pumps

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

Energy Efficiency must comply with ASHRAE 90.1-2007

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per VFD rated hp
Compressors	$5,250 to $12,500 per drive
Cooling Towers ≥ 10 hp	$60 per VFD rated hp

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons, 0.67 energy factor or better	$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 (1-4 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 Including Parking Lot	$25 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $200 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

Prescriptive Lighting - LED

LED New Exit Sign Fixture Existing Facility < 75 kw Existing Facility > 75 kw	 $20 per fixture $10 per fixture
LED Display Case Lighting	$30 per display case
LED Shelf-Mtd. Display & Task Lights	$15 per linear foot
LED Portable Desk Lamp	$20 per fixture
LED Wall-wash Lights	$30 per fixture
LED Recessed Down Lights	$35 per fixture
LED Outdoor Pole/Arm-Mounted Area and Roadway Luminaries	$175 per fixture
LED Outdoor Pole/Arm-Mounted Decorative Luminaries	$175 per fixture
LED Outdoor Wall-Mounted Area Luminaries	$100 per fixture
LED Parking Garage Luminaries	$100 per fixture
LED Track or Mono-Point Directional Lighting Fixtures	$50 per fixture
LED High-Bay and Low-Bay Fixtures for Commercial & Industrial Bldgs.	$150 per fixture
LED High-Bay-Aisle Lighting	$150 per fixture
LED Bollard Fixtures	$50 per fixture
LED Linear Panels (2x2 Troffers only)	$100 per fixture
LED Fuel Pump Canopy	$100 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 90.1-2007 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%

STATEMENT OF ENERGY PERFORMANCE
Town Hall

Building ID: 2650615
For 12-month Period Ending: December 31, 2010[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: March 16, 2011

Facility
Town Hall
33 Mechanic Street
Cape May Court House, NJ 08210

Facility Owner
Middle Township
33 Mechanic Street
Cape May Court House, NJ 08210

Primary Contact for this Facility
Jill Zarharchuck
33 Mechanic Street
Cape May Court House, NJ 08210

Year Built: 1960
Gross Floor Area (ft²): 23,650

Energy Performance Rating[2] (1-100) 34

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,484,567
Natural Gas (kBtu)[4]	270,414
Total Energy (kBtu)	1,754,981

Energy Intensity[5]

Site (kBtu/ft²/yr)	74
Source (kBtu/ft²/yr)	222

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	N/A

Electric Distribution Utility
N/A

National Average Comparison

National Average Site EUI	62
National Average Source EUI	187
% Difference from National Average Source EUI	19%
Building Type	Office

Stamp of Certifying Professional

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

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

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

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

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Town Hall	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Office	Is this an accurate description of the space in question?		☐
Location	33 Mechanic Street, Cape May Court House, NJ 08210	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Town Hall (Office)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	23,650 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Weekly operating hours	46 Hours	Is this the total number of hours per week that the Office space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	30	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100. The normal worker density ranges between 0.3 and 5.3 workers per 1000 square feet (92.8 square meters)		☐
Number of PCs	52 (Default)	Is this the number of personal computers in the Office?		☐
Percent Cooled	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility:

Fuel Type: Electricity		
Meter: Electric (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
11/10/2010	12/10/2010	28,000.00
10/13/2010	11/09/2010	32,480.00
09/11/2010	10/12/2010	38,560.00
08/11/2010	09/10/2010	49,760.00
07/13/2010	08/10/2010	56,640.00
06/11/2010	07/12/2010	45,360.00
05/12/2010	06/10/2010	42,560.00
04/13/2010	05/11/2010	28,480.00
03/12/2010	04/12/2010	23,480.00
02/10/2010	03/11/2010	27,920.00
01/12/2010	02/09/2010	24,160.00
Electric Consumption (kWh (thousand Watt-hours))		**397,400.00**
Electric Consumption (kBtu (thousand Btu))		**1,355,928.80**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**1,355,928.80**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: GAS (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
11/09/2010	12/08/2010	414.93
10/09/2010	11/08/2010	102.50
09/10/2010	10/08/2010	37.80
08/10/2010	09/09/2010	27.65
07/09/2010	08/09/2010	18.47
06/10/2010	07/08/2010	18.56
05/08/2010	06/09/2010	14.39
04/10/2010	05/07/2010	14.38
03/11/2010	04/09/2010	211.36
02/10/2010	03/10/2010	566.35
01/12/2010	02/09/2010	717.58

GAS Consumption (therms)	**2,143.97**
GAS Consumption (kBtu (thousand Btu))	**214,397.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**214,397.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	☐

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

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

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Town Hall
33 Mechanic Street
Cape May Court House, NJ 08210

Facility Owner
Middle Township
33 Mechanic Street
Cape May Court House, NJ 08210

Primary Contact for this Facility
Jill Zarharchuck
33 Mechanic Street
Cape May Court House, NJ 08210

General Information

Town Hall	
Gross Floor Area Excluding Parking: (ft^2)	23,650
Year Built	1960
For 12-month Evaluation Period Ending Date:	December 31, 2010

Facility Space Use Summary

Town Hall	
Space Type	Office
Gross Floor Area(ft^2)	23,650
Weekly operating hours	46
Workers on Main Shift	30
Number of PCs[d]	52
Percent Cooled	50% or more
Percent Heated	50% or more

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2010)	**Baseline** (Ending Date 12/31/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	34	34	75	N/A	50
Energy Intensity					
Site (kBtu/ft^2)	74	74	46	N/A	62
Source (kBtu/ft^2)	222	222	138	N/A	187
Energy Cost					
$/year	$ 63,556.07	$ 63,556.07	$ 39,575.88	N/A	$ 53,501.52
$/$ft^2$/year	$ 2.69	$ 2.69	$ 1.68	N/A	$ 2.26
Greenhouse Gas Emissions					
$MtCO_2e$/year	N/A	N/A	N/A	N/A	N/A
$kgCO_2e/ft^2$/year	N/A	N/A	N/A	N/A	N/A

More than 50% of your building is defined as Office. Please note that your rating accounts for all of the spaces listed. The National Average column presents energy performance data your building would have if your building had an average rating of 50.

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

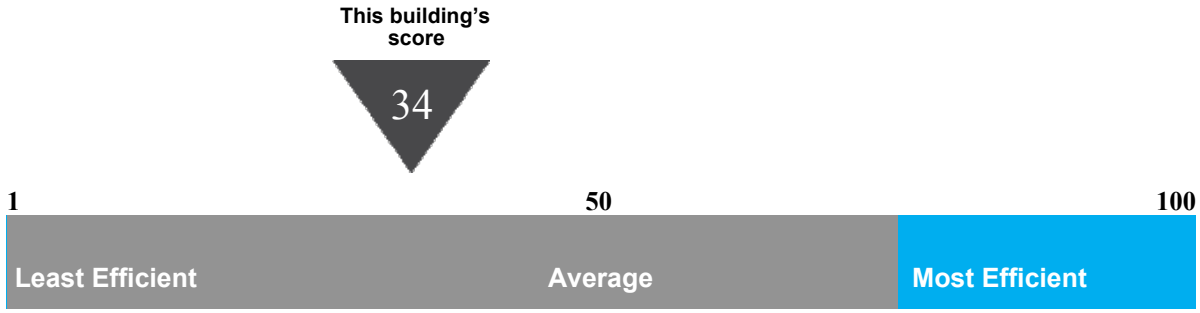
Statement of Energy Performance

2010

Town Hall
33 Mechanic Street
Cape May Court House, NJ 08210

Portfolio Manager Building ID: 2650615

The energy use of this building has been measured and compared to other similar buildings using the Environmental Protection Agency's (EPA's) Energy Performance Scale of 1–100, with 1 being the least energy efficient and 100 the most energy efficient. For more information, visit energystar.gov/benchmark.



This building uses 222 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending December 2010

Buildings with a score of 75 or higher may qualify for EPA's ENERGY STAR.

I certify that the information contained within this statement is accurate and in accordance with U.S. Environmental Protection Agency's measurement standards, found at energystar.gov

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 03/16/2011

MAJOR EQUIPMENT LIST

Concord Engineering Group

Middletown Township - Town Hall

Rooftop / AC Units

Tag	CU	AHU	CU
Unit Type	Split System Condensing Unit	Split System Air Handling Unit	Split System Condensing Unit
Qty	1	1	1
Location	Exterior Wall Mtd.	Electric Room	Exterior Wall Mtd.
Area Served	Police Station	Police Station	Patrol Rm 3
Manufacturer	Sanyo	Sanyo	Sanyo
Model #	CL2472	KS2472	CH1872
Serial #	0025581	0081581	0000381
Cooling Type	DX, R-410A	DX, R-410A	DX, R-410A
Cooling Capacity (Tons)	2.0	2.0	1.5
Cooling Efficiency (SEER/EER)	17 SEER / 9.8 EER	17 SEER / 9.8 EER	20 SEER / 11.7 EER
Heating Type	-	-	Heat Pump
Heating Input (MBH)	-	-	20.4
Efficiency	-	-	10.0 HSPF
Fuel	208/1	-	-
Approx Age	2008	2008	2008
ASHRAE Service Life	15	15	15
Remaining Life	12	12	12
Comments	Low ambiant	-	-

Rooftop / AC Units

Tag	AHU	HP	AHU
Unit Type	Split System Air Handling Unit	Split System Condensing Unit	Split System Air Handling Unit
Qty	1	1	1
Location	Ceiling Cassett	Roof	Ceiling Cassett
Area Served	Patrol Rm 3	Communications	Communications
Manufacturer	Sanyo	Sanyo	Sanyo
Model #	KHS 1872	CH2442	KH2442
Serial #	0049482	0017633	-
Cooling Type	DX, R-410A	DX, R-22	DX, R-22
Cooling Capacity (Tons)	1.5	2	2
Cooling Efficiency (SEER/EER)	20 SEER / 11.7 EER	10 EER	10 EER
Heating Type	-	Heat Pump	-
Heating Input (MBH)	-	25	-
Efficiency	-	7.0 HSPF	-
Fuel	-	-	-
Approx Age	2008	2003	2003
ASHRAE Service Life	15	15	15
Remaining Life	12	7	7
Comments	Wall mtd remote control thermostat	-	-

Rooftop / AC Units

Tag	PTAC	PTAC	PTAC
Unit Type	Packaged Terminal Air Conditioner	Packaged Terminal Air Conditioner	Packaged Terminal Air Conditioner
Qty	1	1	1
Location	Police	Police	Personnel
Area Served	-	Lt J. Edwards	Personnel
Manufacturer	Freidrich	Amana	Carrier
Model #	TEC12K34STC	PTA123B35AMBP	52BQA514301AA
Serial #	LKHP00243	0605040429	2487A08383
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	1	1	1
Cooling Efficiency (SEER/EER)	10.0	10.8	7.0
Heating Type	Forced Air	Forced Air	Forced Air
Heating Input (MBH)	3400 w / 2780 w	12	12.6
Efficiency	-	-	2.2 COP
Fuel	Electric	Electric	Electric
Approx Age	1995	2006	1987
ASHRAE Service Life	15	15	15
Remaining Life	(1)	10	(9)
Comments	-	-	-

Rooftop / AC Units

Tag	PTAC	AHU	DH
Unit Type	Packaged Terminal Air Conditioner	Indoor Cabinet Fan	Duct Heater
Qty	1	1	1
Location	Police East Office	Basement Water heater room	Basement Water Heater Rm
Area Served	-	Basement	Trane AHU T-3
Manufacturer	Carrier	Trane	Indeeco
Model #	52BCA312301AA	T-3	831N-02173
Serial #	1687A08832	K4K276632	K74
Cooling Type	DX, R-22	-	-
Cooling Capacity (Tons)	1	-	-
Cooling Efficiency (SEER/EER)	8.2	-	-
Heating Type	Forced Air	See Indeeco duct heater	208/3
Heating Input (MBH)	12.6	-	42.0 kW
Efficiency	2.5 COP	-	-
Fuel	Electric	-	Electric
Approx Age	1987	1974	1974
ASHRAE Service Life	15	15	15
Remaining Life	(9)	(22)	(22)
Comments	-	-	-

Rooftop / AC Units

Tag	RTU	AHU-1	CU
Unit Type	Packaged Roof Top Unit	Outdoor Air Handling Unit	Split System Condensing Unit
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	Atrium	Admin.	Carrier 39ER36
Manufacturer	Carrier	Carrier	Internatonal Comfort Product
Model #	48DP012	39ER36	CAE240HAA
Serial #	-	4287 T 03911	2208G4D076
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	10	-	20
Cooling Efficiency (SEER/EER)	8.0		8.5 EER
Heating Type	Gas Furnace	Hot Water	-
Heating Input (MBH)	220	-	-
Efficiency	80%	-	-
Fuel	Natural Gas	-	-
Approx Age	1987	1987	2008
ASHRAE Service Life	15	15	15
Remaining Life	(9)	(9)	12
Comments	-	Build: MXB4 ANG1 LCS11 FCS2; Century Motor, Part 6-357963-01, Frame S254T, 15 hp, 1750 rpm, 200-208v/3ph, 85.6% eff	-

Rooftop / AC Units

Tag	CU	CU	CU
Unit Type	Split System Condensing Unit	Split System Condensing Unit	Split System Condensing Unit
Qty	1	1	1
Location	Roof	Roof	Roof
Area Served	Police 1st Fl Ceiling Cassett	1st Fl Record Rm	Chief's Office
Manufacturer	Carrier	Nordyne	Mammoth
Model #	38QR036C500	FT38B-036KA	GS3BM-090C
Serial #	3792X30296	FTA050603299	GSF070470097
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	3.0	3.0	7.5
Cooling Efficiency (SEER/EER)	8.8 EER	10.9 EER	7.3 EER
Heating Type	-	-	-
Heating Input (MBH)	-	-	-
Efficiency	-	-	-
Fuel	-	-	-
Approx Age	1992	2005	2008
ASHRAE Service Life	15	15	15
Remaining Life	(4)	9	12
Comments	Not Used	-	-

Rooftop / AC Units

Tag	CU	CU	AC
Unit Type	Split System Condensing Unit	Split System Condensing Unit	Window
Qty	1	1	1
Location	Roof	Roof	SW 2nd fl
Area Served	Indoor unit S240A-19K10-1	2nd Fl Detective	Dept. of Construction
Manufacturer	NCP	Nordyne	Zenith
Model #	S240A-19K10-0	FT3BA-030KA	ZW6500R
Serial #	-	FTA030600343	901HATH19593
Cooling Type	DX, R-22	DX, R-22	DX, R-22
Cooling Capacity (Tons)	1.5	2.5	0.5
Cooling Efficiency (SEER/EER)	9.7 EER	9.7 EER	9.7 EER
Heating Type	-	-	-
Heating Input (MBH)	-	-	-
Efficiency	-	-	-
Fuel	-	-	-
Approx Age	1987	2005	2001
ASHRAE Service Life	15	15	15
Remaining Life	(9)	9	5
Comments	-	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Middletown Township - Town Hall

Boilers

Tag	Boiler	Boiler	Boiler
Unit Type	Wall hung Condensing	Wall hung Condensing	Wall hung Condensing
Qty	1	1	1
Location	Boiler Room	Boiler Room	Boiler Room
Area Served	Bldg. heat	Bldg. heat	Bldg. heat
Manufacturer	Buderus	Buderus	Buderus
Model #	Logamax plus GB-142-60	Logamax plus GB-142-60	Logamax plus GB-142-60
Serial #	87470212-03-7187-2219	87470212-01-6075-0416	87470212-01-6005-0222
Input Capacity (MBH)	214.3	214.3	214.3
Rated Output Capacity (MBH)	190.1	190.1	190.1
Approx. Efficiency %	89%	89%	89%
Fuel	Natural Gas	Natural Gas	Natural Gas
Approx Age	3	3	3
ASHRAE Service Life	30	30	30
Remaining Life	27	27	27
Comments	Cat. IV appliance, NJ 118013-09H	Cat. IV appliance, NJ 118012-09H	Cat. IV appliance, NJ 118014-09H

MAJOR EQUIPMENT LIST

Concord Engineering Group

Middletown Township - Town Hall

Domestic Water Heaters

Tag	WH	WH	-
Unit Type	Tank	Tank	-
Qty	1	1	-
Location	2nd Floor Mech. Room	Basement	-
Area Served	Administration	Police Station	-
Manufacturer	Mor-Flo Industries	AO Smith	-
Model #	GV 303T	Permaglas II, PEN 120 780	-
Serial #	L872100648	780-R74-07301	-
Size (Gallons)	30	120	-
Input Capacity (MBH/KW)	40	6 kW	-
Recovery (Gal/Hr)	60	90 gal @ 100°F	-
Efficiency %	80%	0.9 EF	-
Fuel	Natural Gas	208v	-
Approx Age	1987	1974	-
ASHRAE Service Life	12	12	-
Remaining Life	(12)	(25)	-
Comments	-	-	-

MAJOR EQUIPMENT LIST

Concord Engineering Group

Middletown Township - Town Hall

Pumps

Tag	P-1	P-2	P-3
Unit Type	in-line pump	in-line pump	in-line pump
Qty	1	1	1
Location	2nd fl mech rm	2nd fl mech rm	2nd fl mech rm
Area Served	Admin. 1st Fl. Perimeter heat	Municipal Bldg Addition 1st & 2nd Fl Perimeter heat	AHU-1 Carrier unit
Manufacturer	Taco	Taco	Taco
Model #	-	-	-
Serial #	-	-	-
Horse Power	2	2	1
Flow	-	-	-
Motor Info	General Electric m/n:5K49UG1342K	General Electric m/n:5K49UG1342K	Emerson m/n:P63CZ0-3021, CAT 138-148
Electrical Power	200/3/60	200/3/60	200/3/60
RPM	1725	1725	1725
Motor Efficiency %	80.8%	80.8%	76.7%
Approx Age	1998	1998	1998
ASHRAE Service Life	10	10	10
Remaining Life	(3)	(3)	(3)
Comments	Frame: 56Y	Frame: 56Y	-

Misc. Equipment

Tag	-	-	-
Unit Type	Air Compressor	-	-
Qty	1	-	-
Location	Mechanical Room	-	-
Area Served	HVAC Pneumatic Controls	-	-
Manufacturer	De VILBISS	-	-
Model #	HU DK-55025	-	-
Serial #	11654 AD	-	-
Horse Power	3/4	-	-
Flow	-	-	-
Motor Info	Marathon Electric m/n 7PC56B17D2010E P, CAT G919	-	-
Electrical Power	115/208-230	-	-
RPM	1500	-	-
Motor Efficiency %	-	-	-
Approx Age	1987	-	-
ASHRAE Service Life	15	-	-
Remaining Life	(9)	-	-
Comments	Honeywell Control System	-	-

Investment Grade Lighting Audit

CEG Job #: 9C10106

Project: Middle Township LGEA — **Administration / Police Building** — **KWH COST:** $0.150

33 Mechanic Street

Cape May Courthouse, 08210

Bldg. Sq. Ft. 23,650

ECM #9: 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
611	Dispatch	8760	6	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.24	2,102.4	$315.36	6	1	(1) 26w CFL Lamp	13	0.08	683.28	$102.49	$20.00	$120.00	0.16	1419.12	$212.87	0.56
232.22	Records	8760	7	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.60	5,273.5	$791.03	7	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.50	4415.04	$662.26	$21.00	$147.00	0.10	858.48	$128.77	1.14
242.22	Patrol Room #3	8760	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.83	7,288.3	$1,093.25	8	0	Relamp - Sylvania Lamp FO28/841/SS/ECO	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Lobby	8760	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.09	753.4	$113.00	1	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.07	630.72	$94.61	$21.00	$21.00	0.01	122.64	$18.40	1.14
232.21	Hallway	8760	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.17	1,506.7	$226.01	2	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.14	1261.44	$189.22	$21.00	$42.00	0.03	245.28	$36.79	1.14
127.21		8760	5	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.39	3,416.4	$512.46	5	3	3 Lamp, 17w T8, Elect. Ballast; retrofit	47	0.24	2058.6	$308.79	$100.00	$500.00	0.16	1357.8	$203.67	2.45
126	Patrol Room #2	8760	2	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.08	735.8	$110.38	2	2	2 Lamp, 17w T8, Elect. Ballast; retrofit	32	0.06	560.64	$84.10	$80.00	$160.00	0.02	175.2	$26.28	6.09
126	Locker Area	8760	2	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.08	735.8	$110.38	2	2	2 Lamp, 17w T8, Elect. Ballast; retrofit	32	0.06	560.64	$84.10	$80.00	$160.00	0.02	175.2	$26.28	6.09
126	Patrol Room #1	8760	4	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.17	1,471.7	$220.75	4	2	2 Lamp, 17w T8, Elect. Ballast; retrofit	32	0.13	1121.28	$168.19	$80.00	$320.00	0.04	350.4	$52.56	6.09
142.11	ID Room	8760	1	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.16	1,366.6	$204.98	1	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.09	753.36	$113.00	$100.00	$100.00	0.07	613.2	$91.98	1.09
142.11		8760	1	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.16	1,366.6	$204.98	1	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.09	753.36	$113.00	$100.00	$100.00	0.07	613.2	$91.98	1.09
126	Kitchen	1200	1	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.04	50.4	$7.56	1	2	2 Lamp, 17w T8, Elect. Ballast; retrofit	32	0.03	38.4	$5.76	$80.00	$80.00	0.01	12	$1.80	44.44
142.11	Office	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.31	811.2	$121.68	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.17	447.2	$67.08	$100.00	$200.00	0.14	364	$54.60	3.66
142.11	Sargeant Office	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.31	811.2	$121.68	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.17	447.2	$67.08	$100.00	$200.00	0.14	364	$54.60	3.66
126		2600	1	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.04	109.2	$16.38	1	2	2 Lamp, 17w T8, Elect. Ballast; retrofit	32	0.03	83.2	$12.48	$80.00	$80.00	0.01	26	$3.90	20.51
142.11	Luitenant Office	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.31	811.2	$121.68	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.17	447.2	$67.08	$100.00	$200.00	0.14	364	$54.60	3.66
126		2600	1	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.04	109.2	$16.38	1	2	2 Lamp, 17w T8, Elect. Ballast; retrofit	32	0.03	83.2	$12.48	$80.00	$80.00	0.01	26	$3.90	20.51

Investment Grade Lighting Audit

ECM #9: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
CEG Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
142.11	Special Services Office	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.31	811.2	$121.68	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.17	447.2	$67.08	$100.00	$200.00	0.14	364	$54.60	3.66
127.21	Stairwell	8760	6	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.47	4,099.7	$614.95	6	3	3 Lamp, 17w T8, Elect. Ballast; retrofit	47	0.28	2470.32	$370.55	$100.00	$600.00	0.19	1629.36	$244.40	2.45
127.21	Upstairs Hall Police/ Admin	8760	8	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.62	5,466.2	$819.94	8	3	3 Lamp, 17w T8, Elect. Ballast; retrofit	47	0.38	3293.76	$494.06	$100.00	$800.00	0.25	2172.48	$325.87	2.45
142.11	200 Conf Room	2600	6	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.94	2,433.6	$365.04	6	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.52	1341.6	$201.24	$100.00	$600.00	0.42	1092	$163.80	3.66
142.11	202 Twp Committee	2600	10	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	1.56	4,056.0	$608.40	10	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.86	2236	$335.40	$100.00	$1,000.00	0.70	1820	$273.00	3.66
560	Closet	1200	1	1	Recessed Down Light, 26w Quad PL Lamp	26	0.03	31.2	$4.68	1	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
611		1200	1	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.04	48.0	$7.20	1	1	(1) 26w CFL Lamp	13	0.01	15.6	$2.34	$20.00	$20.00	0.03	32.4	$4.86	4.12
142.11	Mens	2600	1	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.16	405.6	$60.84	1	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.09	223.6	$33.54	$100.00	$100.00	0.07	182	$27.30	3.66
121.16		2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	78	0.08	202.8	$30.42	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$22.62	$80.00	$80.00	0.02	52	$7.80	10.26
142.11	Womens	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.31	811.2	$121.68	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.17	447.2	$67.08	$100.00	$200.00	0.14	364	$54.60	3.66
121.16		2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	78	0.08	202.8	$30.42	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$22.62	$80.00	$80.00	0.02	52	$7.80	10.26
142.11	201 Mayor	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.31	811.2	$121.68	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.17	447.2	$67.08	$100.00	$200.00	0.14	364	$54.60	3.66
142.11	206	2600	5	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.78	2,028.0	$304.20	5	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.43	1118	$167.70	$100.00	$500.00	0.35	910	$136.50	3.66
142.11	203	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.31	811.2	$121.68	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.17	447.2	$67.08	$100.00	$200.00	0.14	364	$54.60	3.66
142.11	204 Treasurer	2600	17	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	2.65	6,895.2	$1,034.28	17	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.46	3801.2	$570.18	$100.00	$1,700.00	1.19	3094	$464.10	3.66
121.16	Bathroom	2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	78	0.16	405.6	$60.84	2	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.12	301.6	$45.24	$80.00	$160.00	0.04	104	$15.60	10.26
127.21		2600	1	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.08	202.8	$30.42	1	3	3 Lamp, 17w T8, Elect. Ballast; retrofit	47	0.05	122.2	$18.33	$100.00	$100.00	0.03	80.6	$12.09	8.27
127.21	Hall	4800	4	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.31	1,497.6	$224.64	4	3	3 Lamp, 17w T8, Elect. Ballast; retrofit	47	0.19	902.4	$135.36	$100.00	$400.00	0.12	595.2	$89.28	4.48
222.22		4800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.12	556.8	$83.52	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	480	$72.00	$14.00	$28.00	0.02	76.8	$11.52	2.43
142.11		2600	12	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	1.87	4,867.2	$730.08	12	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.03	2683.2	$402.48	$100.00	$1,200.00	0.84	2184	$327.60	3.66

Investment Grade Lighting Audit

ECM #9: 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
232.22	Offices	2600	18	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.55	4,024.8	$603.72	18	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	1.30	3369.6	$505.44	$21.00	$378.00	0.25	655.2	$98.28	3.85
242.22		2600	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.10	270.4	$40.56	1	0	Relamp - Sylvania Lamp FO28/841/SS/ECO	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
232.21	Stairwell	8760	3	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.26	2,260.1	$339.01	3	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.22	1892.16	$283.82	$21.00	$63.00	0.04	367.92	$55.19	1.14
611		8760	1	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.04	350.4	$52.56	1	1	(1) 26w CFL Lamp	13	0.01	113.88	$17.08	$20.00	$20.00	0.03	236.52	$35.48	0.56
232.22	Conference Room	2600	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.52	1,341.6	$201.24	6	3	Relamp - Sylvania Lamp FO28/841/SS/ECO	72	0.43	1123.2	$168.48	$21.00	$126.00	0.08	218.4	$32.76	3.85
611	Atrium	8760	10	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.40	3,504.0	$525.60	10	1	(1) 26w CFL Lamp	13	0.13	1138.8	$170.82	$20.00	$200.00	0.27	2365.2	$354.78	0.56
623	Classroom	8760	21	1	Track Head, 65w BR30	65	1.37	11,957.4	$1,793.61	21	1	Energy Star Rated, 26w CFL Flood Lamp	26	0.55	4782.96	$717.44	$20.00	$420.00	0.82	7174.44	$1,076.17	0.39
121.35		8760	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Pendant Mnt., White Diffuser	78	0.16	1,366.6	$204.98	2	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.12	1016.16	$152.42	$80.00	$160.00	0.04	350.4	$52.56	3.04
121.11	Locker	8760	14	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.09	9,565.9	$1,434.89	14	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.81	7113.12	$1,066.97	$100.00	$1,400.00	0.28	2452.8	$367.92	3.81
610		8760	1	1	Wall Mnt. "Vanity" Light, 60w A19 Lamps	60	0.06	525.6	$78.84	1	1	13w CFL Lamps	26	0.03	227.76	$34.16	$36.00	$36.00	0.03	297.84	$44.68	0.81
128.11	Radio Room	8760	3	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Surface Mnt., No Lens	209	0.63	5,492.5	$823.88	3	0	0	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
611	Dive Room	1200	2	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.08	96.0	$14.40	2	1	(1) 26w CFL Lamp	13	0.03	31.2	$4.68	$20.00	$40.00	0.05	64.8	$9.72	4.12
121.11	Patrolman Meeting Room	8760	6	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.47	4,099.7	$614.95	6	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.35	3048.48	$457.27	$100.00	$600.00	0.12	1051.2	$157.68	3.81
122.21	Court Clerk	2600	17	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	1.33	3,447.6	$517.14	17	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.85	2210	$331.50	$80.00	$1,360.00	0.48	1237.6	$185.64	7.33
611		2600	1	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.04	104.0	$15.60	1	1	(1) 26w CFL Lamp	13	0.01	33.8	$5.07	$20.00	$20.00	0.03	70.2	$10.53	1.90
121.11	Bathroom	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.08	202.8	$30.42	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$22.62	$100.00	$100.00	0.02	52	$7.80	12.82
122.21	102	2600	16	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	1.25	3,244.8	$486.72	16	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.80	2080	$312.00	$80.00	$1,280.00	0.45	1164.8	$174.72	7.33
122.21	100	2600	10	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.78	2,028.0	$304.20	10	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.50	1300	$195.00	$80.00	$800.00	0.28	728	$109.20	7.33
122.21	105 & 107	2600	5	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.39	1,014.0	$152.10	5	2	Reballast & Relamp; Sylvania Lamp FO28/841/SS/ECO	50	0.25	650	$97.50	$80.00	$400.00	0.14	364	$54.60	7.33
121.11	Womens	2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.16	405.6	$60.84	2	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.12	301.6	$45.24	$100.00	$200.00	0.04	104	$15.60	12.82
128.11	Boiler Room	2600	1	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Surface Mnt., No Lens	209	0.21	543.4	$81.51	1	0	0	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00

Investment Grade Lighting Audit

ECM #9: 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
121.11	104	2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.16	405.6	$60.84	2	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.12	301.6	$45.24	$100.00	$200.00	0.04	104	$15.60	12.82
121.11		2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.16	405.6	$60.84	2	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.12	301.6	$45.24	$100.00	$200.00	0.04	104	$15.60	12.82
121.11	Mens	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.08	202.8	$30.42	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$22.62	$100.00	$100.00	0.02	52	$7.80	12.82
121.11	101	2600	7	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.55	1,419.6	$212.94	7	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.41	1055.6	$158.34	$100.00	$700.00	0.14	364	$54.60	12.82
121.11	Vault	2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.16	405.6	$60.84	2	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.12	301.6	$45.24	$100.00	$200.00	0.04	104	$15.60	12.82
121.11	Hallway	4800	8	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.62	2,995.2	$449.28	8	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.46	2227.2	$334.08	$100.00	$800.00	0.16	768	$115.20	6.94
127.21		4800	14	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	1.09	5,241.6	$786.24	14	3	3 Lamp, 17w T8, Elect. Ballast; retrofit	47	0.66	3158.4	$473.76	$100.00	$1,400.00	0.43	2083.2	$312.48	4.48
111	Maintenance	1200	2	1	4' Channel, 1-Lamp, 34w T12, Mag. Ballast, Surface Mnt., No Lens	48	0.10	115.2	$17.28	2	1	1 Lamp, 32w T8, Elect. Ballast; retrofit	30	0.06	72	$10.80	$80.00	$160.00	0.04	43.2	$6.48	24.69
121.11	Mens	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.08	202.8	$30.42	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$22.62	$100.00	$100.00	0.02	52	$7.80	12.82
211.44		2600	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Wall MNt., No Lens	32	0.03	83.2	$12.48	1	1	Relamp - Sylvania Lamp FO28/841/SS/ECO	25	0.03	65	$9.75	$7.00	$7.00	0.01	18.2	$2.73	2.56
121.11	Womens	2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.16	405.6	$60.84	2	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.12	301.6	$45.24	$100.00	$200.00	0.04	104	$15.60	12.82
121.16		2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	78	0.08	202.8	$30.42	1	2	2 Lamp, 32w T8, Elect. Ballast; retrofit	58	0.06	150.8	$22.62	$80.00	$80.00	0.02	52	$7.80	10.26
142.11	Lawyer Room	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.31	811.2	$121.68	2	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	0.17	447.2	$67.08	$100.00	$200.00	0.14	364	$54.60	3.66
558	Courtroom	2600	22	1	Recessed Down Light, 65w R30 Lamp	100	2.20	5,720.0	$858.00	22	1	Energy Star Rated, Dimmable 26w CFL Lamp	26	0.57	1487.2	$223.08	$20.00	$440.00	1.63	4232.8	$634.92	0.69
142.11		2600	14	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	2.18	5,678.4	$851.76	14	3	3 Lamp , 32w T8, Elect. Ballast, Specular Reflector; retrofit	86	1.20	3130.4	$469.56	$100.00	$1,400.00	0.98	2548	$382.20	3.66
127.21	Hallway	4800	3	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.23	1,123.2	$168.48	3	3	3 Lamp, 17w T8, Elect. Ballast; retrofit	47	0.14	676.8	$101.52	$100.00	$300.00	0.09	446.4	$66.96	4.48
	Totals		359	180				146,627	$21,994	359	157			19.3	79,987	$11,998		$24,768	13.3	53,014	$7,952	3.11

CEG Job #: 9C10106
Project: Middle Township LGEA
Address: 33 Mechanic Street
Cape May Courthouse, 08210
Building SF: 23,650

Administration / Police Building

KWH COST: $0.150

ECM #10: 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. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
611	Dispatch	8760	6	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.24	2102.4	$315.36	6	0	No Change	40	0.24	0%	2102.4	$315.36	$150.00	$0.00	0.00	0	$0.00	0.00
232.22	Records	8760	7	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.602	5273.52	$791.03	7	1	Dual Technology Occupancy Sensor - Remote Mnt.	86	0.48	20%	4218.816	$632.82	$160.00	$160.00	0.12	1054.704	$158.21	1.01
242.22	Patrol Room #3	8760	8	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.832	7288.32	$1,093.25	8	1	Dual Technology Occupancy Sensor - Switch Mnt.	104	0.67	20%	5830.656	$874.60	$75.00	$75.00	0.17	1457.664	$218.65	0.34
232.21	Lobby	8760	1	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.086	753.36	$113.00	1	0	No Change	86	0.09	0%	753.36	$113.00	$300.00	$0.00	0.00	0	$0.00	0.00
232.21	Hallway	8760	2	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.172	1506.72	$226.01	2	0	No Change	86	0.17	0%	1506.72	$226.01	$300.00	$0.00	0.00	0	$0.00	0.00
127.21		8760	5	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.39	3416.4	$512.46	5	0	No Change	78	0.39	0%	3416.4	$512.46	$0.00	$0.00	0.00	0	$0.00	0.00
126	Patrol Room #2	8760	2	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.084	735.84	$110.38	2	1	Dual Technology Occupancy Sensor - Switch Mnt.	42	0.07	20%	588.672	$88.30	$75.00	$75.00	0.02	147.168	$22.08	3.40
126	Locker Area	8760	2	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.084	735.84	$110.38	2	0	No Change	42	0.08	0%	735.84	$110.38	$0.00	$0.00	0.00	0	$0.00	0.00
126	Patrol Room #1	8760	4	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.168	1471.68	$220.75	4	1	Dual Technology Occupancy Sensor - Switch Mnt.	42	0.13	20%	1177.344	$176.60	$75.00	$75.00	0.03	294.336	$44.15	1.70
142.11	ID Room	8760	1	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.156	1366.56	$204.98	1	1	Dual Technology Occupancy Sensor - Switch Mnt.	156	0.12	20%	1093.248	$163.99	$75.00	$75.00	0.03	273.312	$41.00	1.83
142.11		8760	1	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.156	1366.56	$204.98	1	1	Dual Technology Occupancy Sensor - Switch Mnt.	156	0.12	20%	1093.248	$163.99	$75.00	$75.00	0.03	273.312	$41.00	1.83
126	Kitchen	1200	1	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.042	50.4	$7.56	1	0	No Change	42	0.04	0%	50.4	$7.56	$0.00	$0.00	0.00	0	$0.00	0.00
142.11	Office	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.312	811.2	$121.68	2	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	0.25	20%	648.96	$97.34	$160.00	$160.00	0.06	162.24	$24.34	6.57
142.11	Sargeant Office	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.312	811.2	$121.68	2	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	0.25	20%	648.96	$97.34	$160.00	$160.00	0.06	162.24	$24.34	6.57
126		2600	1	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.042	109.2	$16.38	1	1	Dual Technology Occupancy Sensor - Remote Mnt.	42	0.03	20%	87.36	$13.10	$0.00	$0.00	0.01	21.84	$3.28	0.00
142.11	Luitenant Office	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.312	811.2	$121.68	2	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	0.25	20%	648.96	$97.34	$160.00	$160.00	0.06	162.24	$24.34	6.57
126		2600	1	2	6"x2, 2 Lamp, 20w T12, Mag. Ballast, Wall Mnt., Prismatic Lens	42	0.042	109.2	$16.38	1	1	Dual Technology Occupancy Sensor - Remote Mnt.	42	0.03	20%	87.36	$13.10	$0.00	$0.00	0.01	21.84	$3.28	0.00
142.11	Special Services Office	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.312	811.2	$121.68	2	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	0.25	20%	648.96	$97.34	$160.00	$160.00	0.06	162.24	$24.34	6.57
127.21	Stairwell	8760	6	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.468	4099.68	$614.95	6	0	No Change	78	0.47	0%	4099.68	$614.95	$150.00	$0.00	0.00	0	$0.00	0.00
127.21	Upstairs Hall Police/ Admin	8760	8	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.624	5466.24	$819.94	8	0	No Change	78	0.62	0%	5466.24	$819.94	$0.00	$0.00	0.00	0	$0.00	0.00
142.11	200 Conf Room	2600	6	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.936	2433.6	$365.04	6	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	0.75	20%	1946.88	$292.03	$160.00	$160.00	0.19	486.72	$73.01	2.19

ECM #10: 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. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
142.11	202 Twp Committee	2600	10	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	1.56	4056	$608.40	10	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	1.25	20%	3244.8	$486.72	$160.00	$160.00	0.31	811.2	$121.68	1.31
560	Closet	1200	1	1	Recessed Down Light, 26w Quad PL Lamp	26	0.026	31.2	$4.68	1	0	No Change	26	0.03	0%	31.2	$4.68	$0.00	$0.00	0.00	0	$0.00	0.00
611		1200	1	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.04	48	$7.20	1	0	No Change	40	0.04	0%	48	$7.20	$300.00	$0.00	0.00	0	$0.00	0.00
142.11	Mens	2600	1	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.156	405.6	$60.84	1	0	No Change	156	0.16	0%	405.6	$60.84	$300.00	$0.00	0.00	0	$0.00	0.00
121.16		2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	78	0.078	202.8	$30.42	1	0	No Change	78	0.08	0%	202.8	$30.42	$300.00	$0.00	0.00	0	$0.00	0.00
142.11	Womens	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.312	811.2	$121.68	2	0	No Change	156	0.31	0%	811.2	$121.68	$300.00	$0.00	0.00	0	$0.00	0.00
121.16		2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	78	0.078	202.8	$30.42	1	0	No Change	78	0.08	0%	202.8	$30.42	$300.00	$0.00	0.00	0	$0.00	0.00
142.11	201 Mayor	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.312	811.2	$121.68	2	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	0.25	20%	648.96	$97.34	$160.00	$160.00	0.06	162.24	$24.34	6.57
142.11	206	2600	5	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.78	2028	$304.20	5	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	0.62	20%	1622.4	$243.36	$160.00	$160.00	0.16	405.6	$60.84	2.63
142.11	203	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.312	811.2	$121.68	2	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	0.25	20%	648.96	$97.34	$160.00	$160.00	0.06	162.24	$24.34	6.57
142.11	204 Treasurer	2600	17	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	2.652	6895.2	$1,034.28	17	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	2.12	20%	5516.16	$827.42	$160.00	$160.00	0.53	1379.04	$206.86	0.77
121.16	Bathroom	2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	78	0.156	405.6	$60.84	2	0	No Change	78	0.16	0%	405.6	$60.84	$0.00	$0.00	0.00	0	$0.00	0.00
127.21		2600	1	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.078	202.8	$30.42	1	0	No Change	78	0.08	0%	202.8	$30.42	$300.00	$0.00	0.00	0	$0.00	0.00
127.21	Hall	4800	4	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.312	1497.6	$224.64	4	0	No Change	78	0.31	0%	1497.6	$224.64	$0.00	$0.00	0.00	0	$0.00	0.00
222.22		4800	2	2	2x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	58	0.116	556.8	$83.52	2	0	No Change	58	0.12	0%	556.8	$83.52	$300.00	$0.00	0.00	0	$0.00	0.00
142.11	Offices	2600	12	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	1.872	4867.2	$730.08	12	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	1.50	20%	3893.76	$584.06	$160.00	$160.00	0.37	973.44	$146.02	1.10
232.22		2600	18	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	1.548	4024.8	$603.72	18	1	Dual Technology Occupancy Sensor - Remote Mnt.	86	1.24	20%	3219.84	$482.98	$160.00	$160.00	0.31	804.96	$120.74	1.33
242.22		2600	1	4	2x4, 4 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	104	0.104	270.4	$40.56	1	1	Dual Technology Occupancy Sensor - Remote Mnt.	104	0.08	20%	216.32	$32.45	$160.00	$160.00	0.02	54.08	$8.11	19.72
232.21	Stairwell	8760	3	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	86	0.258	2260.08	$339.01	3	0	No Change	86	0.26	0%	2260.08	$339.01	$300.00	$0.00	0.00	0	$0.00	0.00
611		8760	1	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.04	350.4	$52.56	1	0	No Change	40	0.04	0%	350.4	$52.56	$0.00	$0.00	0.00	0	$0.00	0.00
232.22	Conference Room	2600	6	3	2x4, 3 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Parabolic Lens	86	0.516	1341.6	$201.24	6	1	Dual Technology Occupancy Sensor - Remote Mnt.	86	0.41	20%	1073.28	$160.99	$160.00	$160.00	0.10	268.32	$40.25	3.98
611	Atrium	8760	10	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.4	3504	$525.60	10	0	No Change	40	0.40	0%	3504	$525.60	$0.00	$0.00	0.00	0	$0.00	0.00
623	Classroom	8760	21	1	Track Head, 65w BR30	65	1.365	11957.4	$1,793.61	21	1	Dual Technology Occupancy Sensor - Remote Mnt.	65	1.09	20%	9565.92	$1,434.89	$160.00	$160.00	0.27	2391.48	$358.72	0.45

ECM #10: 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. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
121.35		8760	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Pendant Mnt., White Diffuser	78	0.156	1366.56	$204.98	2	1	Dual Technology Occupancy Sensor - Remote Mnt.	78	0.12	20%	1093.248	$163.99	$160.00	$160.00	0.03	273.312	$41.00	3.90
121.11	Locker	8760	14	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	1.092	9565.92	$1,434.89	14	1	Dual Technology Occupancy Sensor - Remote Mnt.	78	0.87	20%	7652.736	$1,147.91	$160.00	$160.00	0.22	1913.184	$286.98	0.56
610		8760	1	1	Wall Mnt. "Vanity" Light, 60w A19 Lamps	60	0.06	525.6	$78.84	1	0	No Change	60	0.06	0%	525.6	$78.84	$0.00	$0.00	0.00	0	$0.00	0.00
128.11	Radio Room	8760	3	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Surface Mnt., No Lens	209	0.627	5492.52	$823.88	3	1	Dual Technology Occupancy Sensor - Remote Mnt.	209	0.50	20%	4394.016	$659.10	$160.00	$160.00	0.13	1098.504	$164.78	0.97
611	Dive Room	1200	2	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.08	96	$14.40	2	0	No Change	40	0.08	0%	96	$14.40	$0.00	$0.00	0.00	0	$0.00	0.00
121.11	Patrolman Meeting Room	8760	6	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.468	4099.68	$614.95	6	1	Dual Technology Occupancy Sensor - Remote Mnt.	78	0.37	20%	3279.744	$491.96	$160.00	$160.00	0.09	819.936	$122.99	1.30
122.21	Court Clerk	2600	17	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	1.326	3447.6	$517.14	17	1	Dual Technology Occupancy Sensor - Remote Mnt.	78	1.06	20%	2758.08	$413.71	$160.00	$160.00	0.27	689.52	$103.43	1.55
611		2600	1	1	Wall Mnt. Globe, (1) 40w A19 Lamps	40	0.04	104	$15.60	1	0	No Change	40	0.04	0%	104	$15.60	$300.00	$0.00	0.00	0	$0.00	0.00
121.11	Bathroom	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.078	202.8	$30.42	1	0	No Change	78	0.08	0%	202.8	$30.42	$0.00	$0.00	0.00	0	$0.00	0.00
122.21	102	2600	16	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	1.248	3244.8	$486.72	16	1	Dual Technology Occupancy Sensor - Remote Mnt.	78	1.00	20%	2595.84	$389.38	$160.00	$160.00	0.25	648.96	$97.34	1.64
122.21	100	2600	10	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.78	2028	$304.20	10	1	Dual Technology Occupancy Sensor - Remote Mnt.	78	0.62	20%	1622.4	$243.36	$160.00	$160.00	0.16	405.6	$60.84	2.63
122.21	105 & 107	2600	5	2	2x4, 2-Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.39	1014	$152.10	5	1	Dual Technology Occupancy Sensor - Remote Mnt.	78	0.31	20%	811.2	$121.68	$160.00	$160.00	0.08	202.8	$30.42	5.26
121.11	Womens	2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.156	405.6	$60.84	2	0	No Change	78	0.16	0%	405.6	$60.84	$0.00	$0.00	0.00	0	$0.00	0.00
128.11	Boiler Room	2600	1	2	8' Channel, 2 Lamp, 96w T12, Mag. Ballast, Surface Mnt., No Lens	209	0.209	543.4	$81.51	1	0	Dual Technology Occupancy Sensor - Switch Mnt.	209	0.17	20%	434.72	$65.21	$75.00	$0.00	0.04	108.68	$16.30	0.00
121.11	104	2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.156	405.6	$60.84	2	1	Dual Technology Occupancy Sensor - Remote Mnt.	78	0.12	20%	324.48	$48.67	$160.00	$160.00	0.03	81.12	$12.17	13.15
121.11		2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.156	405.6	$60.84	2	1	Dual Technology Occupancy Sensor - Remote Mnt.	78	0.12	20%	324.48	$48.67	$160.00	$160.00	0.03	81.12	$12.17	13.15
121.11	Mens	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.078	202.8	$30.42	1	0	No Change	78	0.08	0%	202.8	$30.42	$300.00	$0.00	0.00	0	$0.00	0.00
121.11	101	2600	7	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.546	1419.6	$212.94	7	1	Dual Technology Occupancy Sensor - Remote Mnt.	78	0.44	20%	1135.68	$170.35	$160.00	$160.00	0.11	283.92	$42.59	3.76
121.11	Vault	2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.156	405.6	$60.84	2	0	No Change	78	0.16	0%	405.6	$60.84	$300.00	$0.00	0.00	0	$0.00	0.00
121.11	Hallway	4800	8	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.624	2995.2	$449.28	8	0	No Change	78	0.62	0%	2995.2	$449.28	$150.00	$0.00	0.00	0	$0.00	0.00
127.21		4800	14	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	1.092	5241.6	$786.24	14	0	No Change	78	1.09	0%	5241.6	$786.24	$300.00	$0.00	0.00	0	$0.00	0.00
111	Maintenance	1200	2	1	4' Channel, 1-Lamp, 34w T12, Mag. Ballast, Surface Mnt., No Lens	48	0.096	115.2	$17.28	2	1	Dual Technology Occupancy Sensor - Switch Mnt.	48	0.08	20%	92.16	$13.82	$75.00	$75.00	0.02	23.04	$3.46	21.70
121.11	Mens	2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.078	202.8	$30.42	1	0	No Change	78	0.08	0%	202.8	$30.42	$300.00	$0.00	0.00	0	$0.00	0.00
211.44		2600	1	1	1x4, 1 Lamp, 32w T8, Elect. Ballast, Wall MNt., No Lens	32	0.032	83.2	$12.48	1	0	No Change	32	0.03	0%	83.2	$12.48	$300.00	$0.00	0.00	0	$0.00	0.00

ECM #10: 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. Cont.	Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
121.11	Womens	2600	2	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	78	0.156	405.6	$60.84	2	0	No Change	78	0.16	0%	405.6	$60.84	$300.00	$0.00	0.00	0	$0.00	0.00
121.16		2600	1	2	1x4, 2-Lamp, 34w T12, Mag. Ballast, Surface Mnt., Clear Acrylic Lens	78	0.078	202.8	$30.42	1	0	No Change	78	0.08	0%	202.8	$30.42	$0.00	$0.00	0.00	0	$0.00	0.00
142.11	Lawyer Room	2600	2	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	0.312	811.2	$121.68	2	1	Dual Technology Occupancy Sensor - Remote Mnt.	156	0.25	20%	648.96	$97.34	$160.00	$160.00	0.06	162.24	$24.34	6.57
558	Courtroom	2600	22	1	Recessed Down Light, 65w R30 Lamp	100	2.2	5720	$858.00	22	0	No Change	100	2.20	0%	5720	$858.00	$0.00	$0.00	0.00	0	$0.00	0.00
142.11		2600	14	4	2x4, 4 Lamp, 34w T12, Mag. Ballast, Surface Mnt., Prismatic Lens	156	2.184	5678.4	$851.76	14	0	No Change	156	2.18	0%	5678.4	$851.76	$0.00	$0.00	0.00	0	$0.00	0.00
127.21	Hallway	4800	3	2	2x2, 2 Lamp, 34w T12, Mag. Ballast, Recessed Mnt., Prismatic Lens	78	0.234	1123.2	$168.48	3	0	No Change	78	0.23	0%	1123.2	$168.48	$0.00	$0.00	0.00	0	$0.00	0.00
	Totals		359	180			34.3	146,627.1	$21,994	359	36			29.8		127,742.7	$19,161.40		$4,930	4.57	18,884	$2,833	1.74

Project Name: LGEA Solar PV Project - Middle Township Town Hall

Location: Cape May Court House, NJ

Description: Photovoltaic System 95% Financing - 25 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 25 year
Total Construction Cost	$1,024,650
Annual kWh Production	137,782
Annual Energy Cost Reduction	$20,667
Annual SREC Revenue	$48,224
First Cost Premium	**$1,024,650**
Simple Payback:	**14.87** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	300	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.150**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$51,233	0	0	0	$0	0	0	(51,233)	0
1	$0	137,782	$20,667	$0	$48,224	$67,667	$14,891	($13,668)	($64,900)
2	$0	137,093	$21,287	$0	$47,983	$66,591	$15,968	($13,289)	($78,189)
3	$0	136,408	$21,926	$0	$47,743	$65,437	$17,122	($12,890)	($91,080)
4	$0	135,726	$22,584	$0	$47,504	$64,199	$18,360	($12,471)	($103,551)
5	$0	135,047	$23,261	$1,391	$47,266	$62,872	$19,687	($13,422)	($116,973)
6	$0	134,372	$23,959	$1,384	$47,030	$61,448	$21,111	($12,954)	($129,927)
7	$0	133,700	$24,678	$1,377	$46,795	$59,922	$22,637	($12,463)	($142,390)
8	$0	133,031	$25,418	$1,370	$46,561	$58,286	$24,273	($11,950)	($154,340)
9	$0	132,366	$26,181	$1,363	$46,328	$56,531	$26,028	($11,413)	($165,754)
10	$0	131,704	$26,966	$1,357	$46,097	$54,650	$27,909	($10,853)	($176,607)
11	$0	131,046	$27,775	$1,350	$45,866	$52,632	$29,927	($10,268)	($186,874)
12	$0	130,391	$28,608	$1,343	$45,637	$50,469	$32,090	($9,657)	($196,531)
13	$0	129,739	$29,467	$1,336	$45,409	$48,149	$34,410	($9,020)	($205,551)
14	$0	129,090	$30,351	$1,330	$45,181	$45,661	$36,898	($8,356)	($213,908)
15	$0	128,445	$31,261	$1,323	$44,956	$42,994	$39,565	($7,665)	($221,573)
16	$0	127,802	$32,199	$1,316	$44,731	$40,134	$42,425	($6,946)	($228,518)
17	$0	127,163	$33,165	$1,310	$44,507	$37,067	$45,492	($6,197)	($234,715)
18	$0	126,527	$34,160	$1,303	$44,285	$33,778	$48,781	($5,418)	($240,133)
19	$0	125,895	$35,185	$1,297	$44,063	$30,252	$52,307	($4,608)	($244,741)
20	$0	125,265	$36,240	$1,290	$43,843	$26,471	$56,088	($3,766)	($248,507)
21	$0	124,639	$37,327	$1,284	$43,624	$24,117	$51,562	$3,988	($244,518)
22	$0	124,016	$38,447	$1,277	$43,406	$19,488	$42,431	$18,656	($225,862)
23	$0	123,396	$39,601	$1,271	$43,189	$0	$0	$81,518	($144,344)
24	$0	122,779	$40,789	$1,265	$42,973	$0	$0	$82,497	($61,847)
25	$0	122,165	$42,012	$1,258	$42,758	$0	$0	$83,512	$21,665
	Totals:	3,245,586	$753,515	$27,795	$1,135,955	$1,068,816	$719,961	$72,897	($4,099,670)
				Net Present Value (NPV)			**($98,994)**		
				Internal Rate of Return (IRR)			**0.5%**		

Project Name: LGEA Solar PV Project - Middle Township Town Hall

Location: Cape May Court House, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$1,024,650
Annual kWh Production	137,782
Annual Energy Cost Reduction	$20,667
Annual SREC Revenue	$48,224
First Cost Premium	**$1,024,650**
Simple Payback:	**14.87** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.150**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$1,024,650	0	0	0	$0	(1,024,650)	0
1	$0	137,782	$20,667	$0	$48,224	$68,891	($955,759)
2	$0	137,093	$21,287	$0	$47,983	$69,270	($886,489)
3	$0	136,408	$21,926	$0	$47,743	$69,669	($816,820)
4	$0	135,726	$22,584	$0	$47,504	$70,088	($746,733)
5	$0	135,047	$23,261	$1,391	$47,266	$69,137	($677,596)
6	$0	134,372	$23,959	$1,384	$47,030	$69,605	($607,991)
7	$0	133,700	$24,678	$1,377	$46,795	$70,096	($537,895)
8	$0	133,031	$25,418	$1,370	$46,561	$70,609	($467,286)
9	$0	132,366	$26,181	$1,363	$46,328	$71,146	($396,141)
10	$0	131,704	$26,966	$1,357	$46,097	$71,706	($324,435)
11	$0	131,046	$27,775	$1,350	$45,866	$72,291	($252,143)
12	$0	130,391	$28,608	$1,343	$45,637	$72,902	($179,241)
13	$0	129,739	$29,467	$1,336	$45,409	$73,539	($105,702)
14	$0	129,090	$30,351	$1,330	$45,181	$74,202	($31,500)
15	$0	128,445	$31,261	$1,323	$44,956	$74,894	$43,394
16	$0	127,802	$32,199	$1,316	$44,731	$75,613	$119,007
17	$0	127,163	$33,165	$1,310	$44,507	$76,362	$195,370
18	$0	126,527	$34,160	$1,303	$44,285	$77,141	$272,511
19	$0	125,895	$35,185	$1,297	$44,063	$77,951	$350,462
20	$0	125,265	$36,240	$1,290	$43,843	$78,793	$429,255
21	$1	124,639	$37,327	$1,284	$43,624	$79,667	$508,922
22	$2	124,016	$38,447	$1,277	$43,406	$80,575	$589,498
23	$3	123,396	$39,601	$1,271	$43,189	$81,518	$671,016
24	$4	122,779	$40,789	$1,265	$42,973	$82,497	$753,513
25	$5	122,165	$42,012	$1,258	$42,758	$83,512	$837,024
	Totals:	3,245,586	$753,515	$27,795	$1,135,955	$1,861,674	($2,215,762)
				Net Present Value (NPV)		**$837,049**	
				Internal Rate of Return (IRR)		**5.0%**	

Building	Parking Lot Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Town Hall Parking Lot	8,075	Sunpower SPR230	495	14.7	7,279	113.85	137,782	16,335	15.64

.= Proposed PV Layout

PVWatts AC Energy & Cost Savings — Cautions for Interpreting the Results

Middle Township Parking Lot

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	113.8 kW
DC to AC Derate Factor:	0.810
AC Rating:	92.2 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	206.0°
Energy Specifications	
Cost of Electricity:	0.2 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	2.52	7202	11.02
2	3.28	8608	13.17
3	4.27	12067	18.46
4	5.18	13854	21.20
5	5.85	15860	24.27
6	6.13	15414	23.58
7	6.06	15563	23.81
8	5.51	14247	21.80
9	4.80	12224	18.70
10	3.69	9880	15.12
11	2.59	6855	10.49
12	2.18	6009	9.19
Year	4.34	137782	210.81

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