ENERGY AUDIT – FINAL REPORT

EAST AMWELL TOWNSHIP
MUNICIPAL COMPLEX

1070 ROUTE 202 / 31
RINGOES, NJ 08551
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CEG PROJECT NO. 9C09056

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I. EXECUTIVE SUMMARY

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

East Amwell Township
Municipal Complex
1070 Route 202 / 31
Ringoes, NJ 08551

Municipal Contact Person: Timothy L. Matheny, Township Administrator

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	$ 17,640
Natural Gas	$ 6,049
Total	$ 23,689

The potential annual energy cost savings for each energy conservation measure (ECM) are shown below in Table 1. Be aware that the ECM'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 Cost Summary - Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST[A]	ANNUAL SAVINGS[B]	SIMPLE PAYBACK (YEARS)	SIMPLE LIFETIME ROI
1	Lighting Upgrade – Office / Courts	$9,169	$4,245	2.2	1057%
2	Lighting Upgrade - Garage	$4,005	$1,283	3.1	700%
3	Lighting Upgrade - Trailer	$950	$137	6.9	260%
4	Furnace Replacement - Garage	$4,800	$2,189	2.2	492%
5	Daylighting System – Garage	$20,300	$1,184	17.1	45%
6	DDC System – Office / Courts	$20,448	$811	25.2	(41%)

Notes: A. Cost takes into consideration applicable NJ Smart Start™ incentives.
B. Savings takes into consideration applicable maintenance savings.

The estimated demand and energy savings for each ECM is shown below in Table 2. The information in this table corresponds to the ECM's in Table 1.

Table 2
Estimated Energy Savings - Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELEC. DEMAND (KW)	ELEC. CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Lighting Upgrade – Office / Courts	6.3	20,974	0
2	Lighting Upgrade – Garage	2.9	6,809	0
3	Lighting Upgrade - Trailer	1.1	568	0
4	Furnace Replacement - Garage	0	979	1,315
5	Daylighting System – Garage	3.0	7,089	0
6	DDC System – Office / Courts	0	1,920	319

The potential annual energy cost savings for each renewable energy measure (REM) are shown below in Table 3.

Table 3
Financial Cost Summary – Renewable Energy Measures (REM's)

REM NO.	DESCRIPTION	COST	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE LIFETIME ROI[A]
1	Solar Photovoltaic System	$331,200	$9,590	11.2	124%

Notes: A. Estimated lifetime based on 25 years; includes SREC credit of $20,000 per year for lifetime.

The estimated demand and energy savings for each REM is shown below in Table 4. The information in this table corresponds to the REM's in Table 3.

Table 4
Estimated Energy Savings - Renewable Energy Measures (REM's)

REM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELEC. DEMAND (KW)	ELEC. CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Solar Photovoltaic System	0	20,974	0

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

- **ECM #1:** Lighting Upgrade – Offices / Courts
- **ECM #2:** Lighting Upgrade - Garage
- **ECM #3:** Lighting Upgrade – Trailer
- **ECM #4:** Furnace Replacement - Garage

The Township should also pay special attention to the renewable energy measures (REMs) calculated within the report. The photovoltaic array as outlined in Section VIII of this report proves to substantially reduce the electric consumption that the Township will require from the standard electric grid. This REM could prove to be beneficial to the Township over the continuing life of the Municipal Complex.

In addition to the ECMs and REMs, there are maintenance and operational measures that can provide significant energy savings and provide immediate benefit. The ECMs listed above represent investments that can be made to the facility which are justified by the savings seen

overtime. However, the maintenance items and small operational improvements below are typically achievable with on site staff or maintenance contractors and in turn have the potential to provide substantial operational savings compared to the costs associated. The following are recommendations which should be considered a priority in achieving an energy efficient building:

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

II. INTRODUCTION

The comprehensive energy audit covers the East Amwell Municipal Building and stand-alone Trailer. The Municipal Building and attached Garage encompass approximately 9,516 square feet and house the municipal court, administrative offices, file storage rooms, conference rooms and the DPW garage. The Trailer is approximately 552 square feet and is utilized as the office for the town's baseball league.

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 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:

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

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

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

Table 5 and Figure 1 represent the electrical usage for the Municipal Building and DPW Garage from January-08 to December-08. Table 6 and Figure 2 represent the electrical usage for the Municipal Trailer located on the same site from January-08 to December-08. Jersey Central Power and Light (JCP&L) provides electricity to the facility under the General Service Secondary (GSS) Rate Schedule. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. 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 most current rate structure available.

Table 7 and Figure 3 depict the natural gas energy usage for the Municipal Building and DPW Garage from June-08 to May-09. The East Amwell Municipal Building and DPW Garage receives natural gas from Elizabethtown Gas under the General Delivery Service (GDS) - "Multi-Family/ Use" rate structure. The Municipal Trailer does not have a natural gas service.

The average costs of each respective utility for the facilities studied are as follows:

Description	Average
Electricity – Municipal Building and DPW Garage	16.7¢ / kWh
Electricity – Municipal Trailer	17.9¢ / kWh
Natural Gas – Municipal	$1.54 / Therm

Table 5
Electricity Billing Data - Municipal Building and DPW Garage

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
1/08	13,080	34	$1,998
2/08	9,040	38	$1,505
3/08	11,320	33	$1,665
4/08	7,520	34	$1,166
5/08	7,480	31	$1,144
6/08	11,040	40	$2,005
7/08	10,560	36	$1,948
8/08	10,880	35	$2,010
9/08	8,560	36	$1,583
10/08	5,920	36	$1,038
11/08	8,000	28	$1,279
12/08	10,540	32	$1,684
Totals	**113,940**	**40 Max**	**$19,025**

Figure 1
Electricity Usage Profile - Municipal Building and DPW Garage

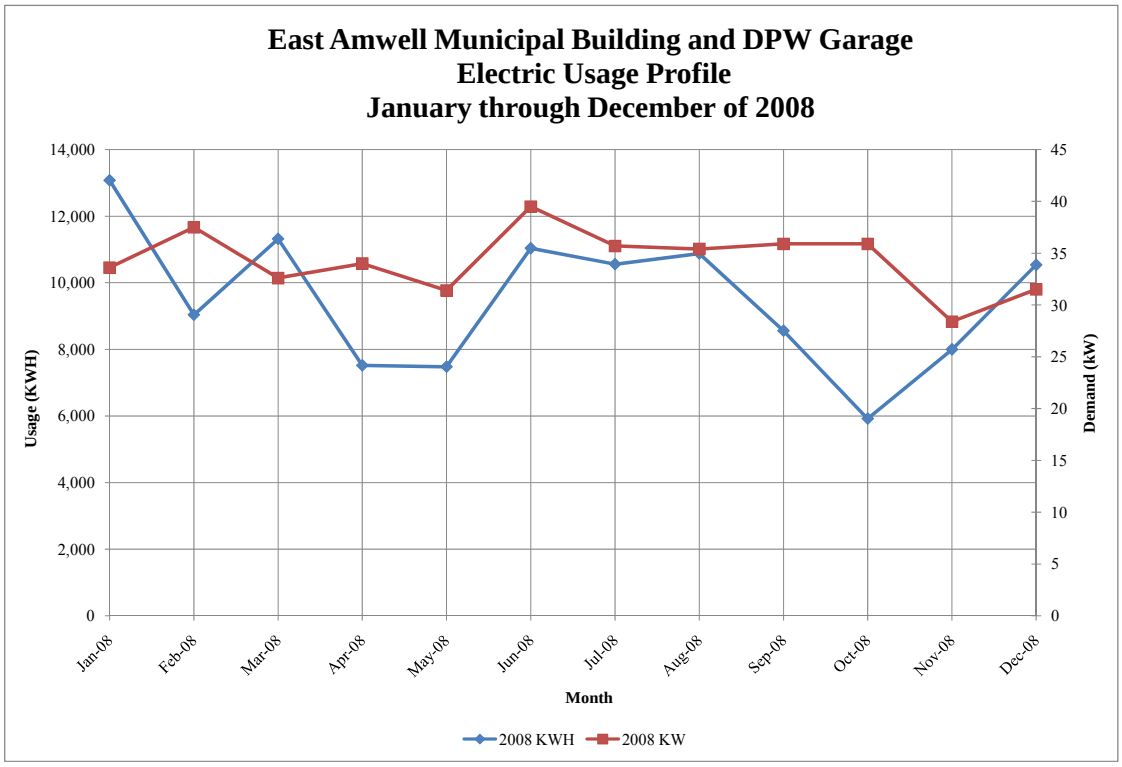


Table 6
Electricity Billing Data – Municipal Trailer

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
1/08	3,068	-	$467
2/08	1,422	-	$262
3/08	765	-	$141
4/08	1,100	-	$194
5/08	1,306	-	$220
6/08	2,366	-	$430
7/08	1,788	-	$347
8/08	1,195	-	$252
9/08	1,013	-	$218
10/08	1,107	-	$206
11/08	1,348	-	$222
12/08	1,424	-	$251
Totals	**17,902**	**- Max**	**$3,210**

Figure 2
Electricity Usage Profile – Municipal Trailer

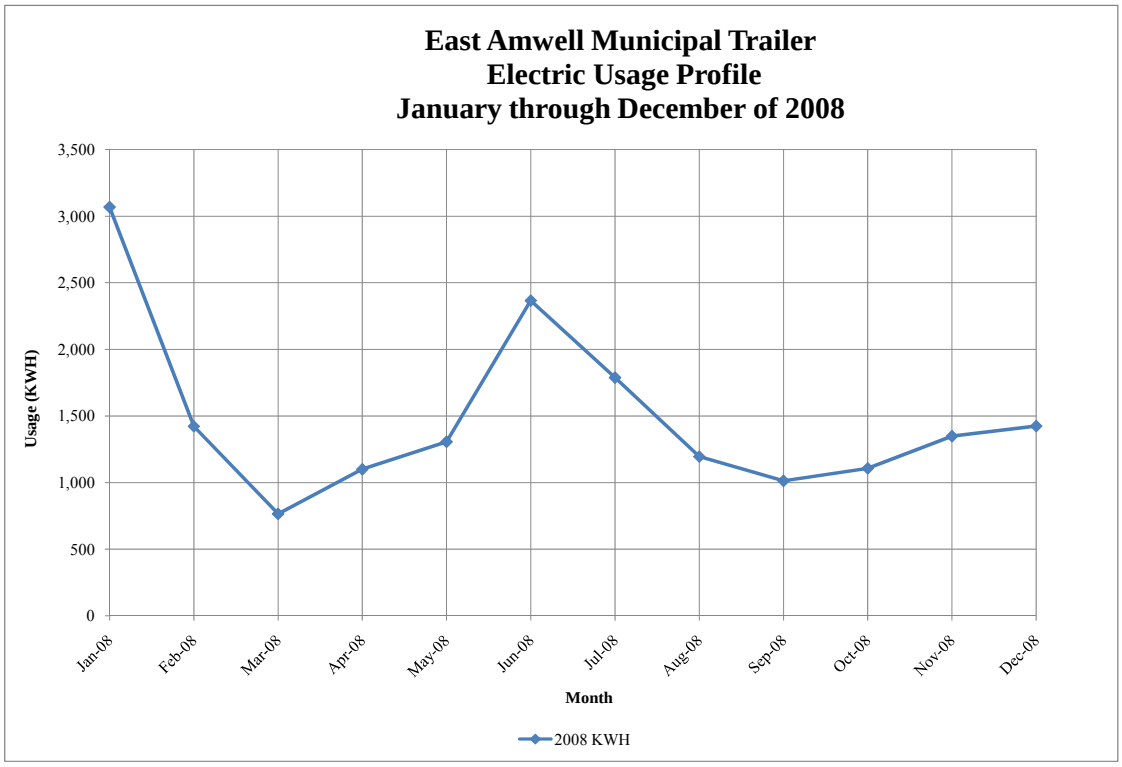
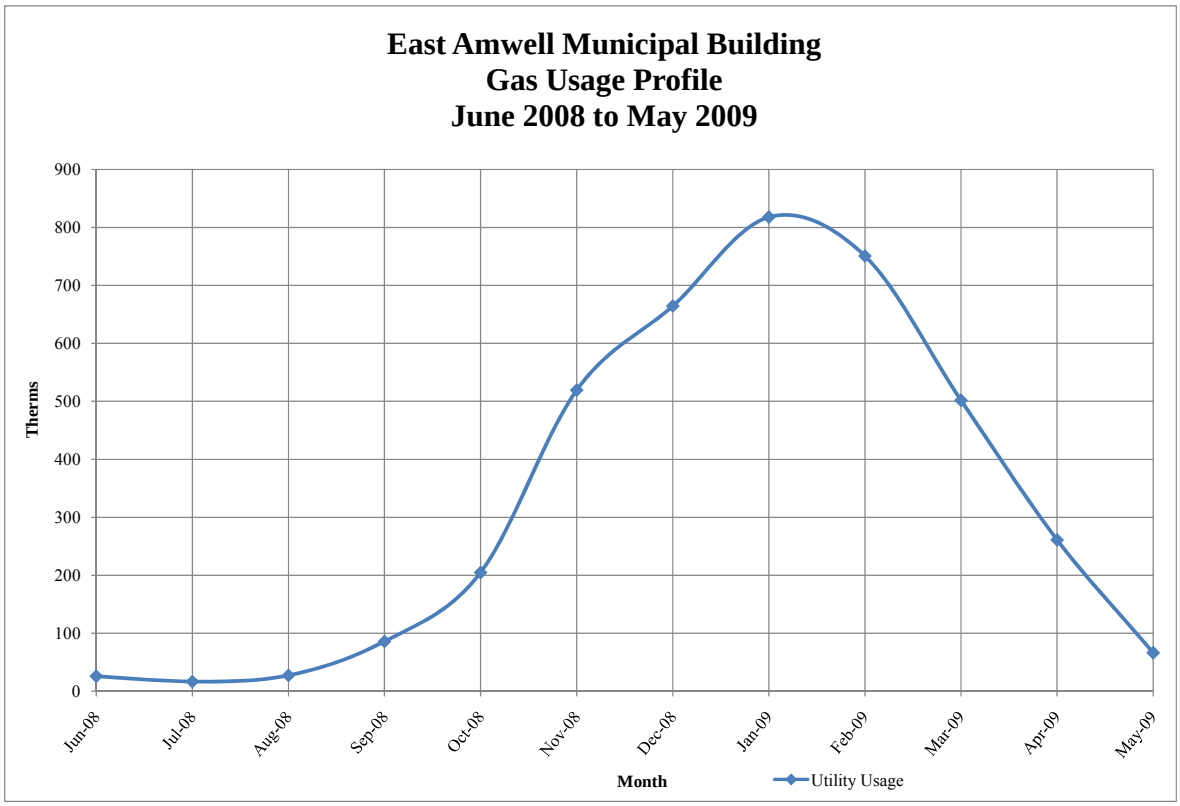


Table 7
Natural Gas Billing Data - Municipal Building and DPW Garage

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
6/08	25.9	$49
7/08	16.6	$37
8/08	27.2	$50
9/08	85.8	$123
10/08	204.7	$312
11/08	519.3	$794
12/08	664.3	$1,012
1/09	817.7	$1,242
2/09	750.5	$1,141
3/09	501.6	$768
4/09	260.9	$407
5/09	66.3	$116
Totals	**3,940.8**	**$6,051**

Figure 3
Natural Gas Usage Profile - Municipal Building and DPW Garage



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. (See Table 8 for details):

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

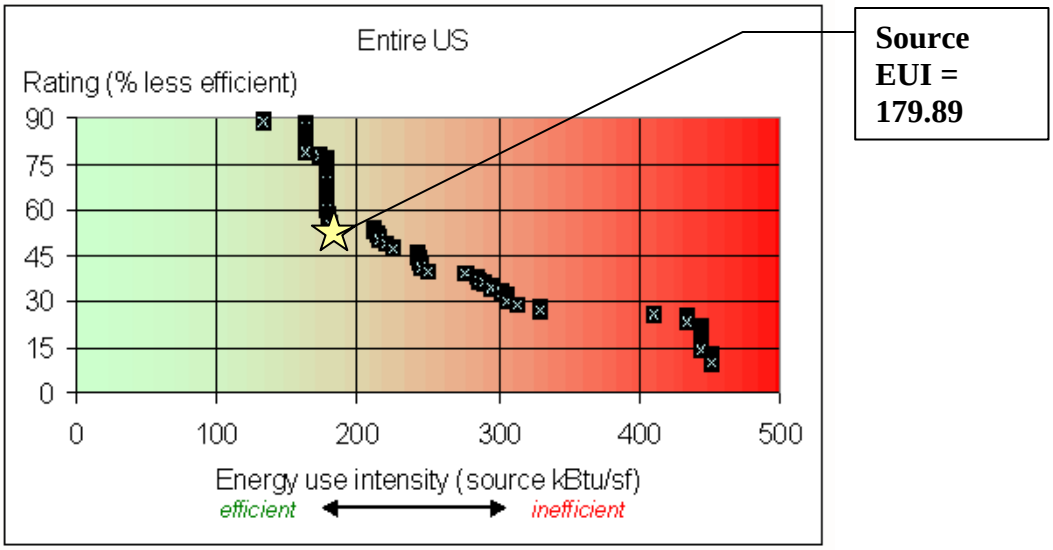
$$Building\ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ X\ SS\ Ratio + Gas\ Usage\ in\ kBtu\ X\ SS\ Ratio)}{Building\ Square\ Footage}$$

Table 8
East Amwell Municipal Building and DPW Garage EUI Calculations

ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu	RATIO	kBtu
ELECTRIC	113,940			388,991	3.340	1,299,230
NATURAL GAS		3,940.80		394,080	1.047	412,602
FUEL OIL			0.00	0	1.010	0
PROPANE			0.00	0	1.010	0
TOTAL				783,071		1,711,832
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA	9,516		SQUARE FEET			
BUILDING SITE EUI	*82.29*		kBtu/SF/YR			
BUILDING SOURCE EUI	*179.89*		kBtu/SF/YR			

Figure 4 below depicts a national EUI grading for the source use of public order and safety buildings.

Figure 4
Source Energy Use Intensity Distributions: Public Order 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:	eastamwelltwp
Password:	lgeaceg2009
Security Question:	What city were you born in?
Security Answer:	eastamwell

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 9
ENERGY STAR Performance Rating

FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Municipal Bldg Complex	N/A	50

See the "Statement of Energy Performance" Appendix for the detailed energy summary report.
As noted above, the East Amwell Municipal Building Complex was given an energy performance rating of "N/A" due to the fact that the building serves as a multi-use facility and cannot be given a specific building type. Specific building types are detailed on the ENERGY STAR website. Non-typical buildings are covered by an "Other" category. The East Amwell Municipal Building falls under this "Other" category. The "Other" category is used if your building type or a section of the building is not represented by one of the specific categories. An Energy Performance Rating cannot be calculated if more than 10% of a building is classified as "Other." The majority of the Public Works Garage would be classified as "Other" and therefore cannot be given an Energy Performance Rating. Despite this, the Portfolio Manager calculates the building EUI. The EUI is an important tool that can be used to track the energy efficiency if the building. Baselines for improvement can be set that the municipality can strive to meet. CEG strongly urges East Amwell Township to keep their Portfolio Manager account up to date to monitor the performance of the building.

V. FACILITY DESCRIPTION

The East Amwell Municipal Complex consists of the Municipal Building with attached Department of Public Works (DPW) Garage and a stand-alone Trailer located on the same site. The Municipal Building with attached DPW Garage consists of the judicial court, offices, courtroom, police areas and garage portions; totaling approximately 9,516 SF. The Municipal Building is a single-story structure with a basement. The building is constructed of standard concrete block with exterior stucco. The windows appear to be double-pane replacement windows and the roof is a flat rubber roof coated with a grey paint. The DPW Garage portion of the Municipal Building is standard block construction minus the finish coating. The DPW Garage roof is a flat, rubber roof that is dark-colored and has been recently replaced. The original facility was constructed in the 1940-50's and had interior renovations completed in 2008. The Municipal Building is typically occupied from 8 AM until 5 PM, Monday through Friday with meetings typically occurring for 3 to 4 hours per night, two days per week. On weekends, the Municipal Building is utilized for community activities and for religious events. This equates to an estimated usage of approximately 3,432 hours per year. The DPW Garage is normally occupied Monday through Friday, 7 AM until 3:30 PM from September through March and 6 AM until 2:30 PM from April through August; approximately 2,340 hours per year.

The Municipal Trailer is approximately 552 square feet and contains office space and storage area. The Municipal Trailer was originally utilized as a Library but is currently occupied by the Amwell Valley Little League. The Municipal Trailer contains wood-frame construction with a shingled, pitched roof. The existing windows appear to be in decent condition. The Municipal Trailer is typically unoccupied during the daytime, Monday through Friday, but is utilized some evening for meetings and on weekends to have meetings and store equipment for the fields. Estimated usage for this facility is approximately ten hours per week; totaling approximately 520 hours per year.

HVAC Systems

The Municipal Building is split into three (3) thermal zones. The zones are as follows:

- The Main Office area is heated and cooled via a Lennox packaged rooftop unit that contains natural gas heating and DX cooling. The rooftop unit has been recently replaced and has a remaining useful life of approximately fourteen (14) years per 2007 ASHRAE Applications Handbook. The unit is controlled by a programmable, digital thermostat.

- The Courtroom is heated and cooled by a Carrier gas-fired furnace located in Municipal Building basement mechanical room with a Lennox remote, air-cooled condensing unit located at grade. The furnace is in decent condition and appears to be maintained. The condensing unit has been recently replaced in 2006. The unit is controlled by a programmable, digital thermostat.

- The Basement of the Municipal Building is heated and cooled by a Lennox air handling unit with 2.5 tons of cooling capacity that is located in the open basement area. The unit is controlled by a non-programmable, digital thermostat.

The DPW Garage is heated by two ceiling mounted, gas-fired unit heaters. The first is a gas-fired Reznor unit heater rated at approximately 120,000 BTUH input with an estimated remaining service life of five (5) years. The second is a gas-fired Lennox unit heater rated at approximately 100,000 BTUH input that appears to be original to the construction of the garage. The unit has surpassed its estimated service life however; there was no complaint of the unit having operational issues by the Owner.

The Municipal Trailer is heated by approximately 22 feet of electric baseboard controlled by a Chromalox thermostat. Cooling in the trailer is provided by two (2) Westinghouse window mounted air conditioning units. The air-conditioning units were missing nameplates but appear to have a cooling capacity of approximately 12,000 Btu/h. These units are approximately five (5) years past their useful service life but appear to be meeting the requirements for cooling of the Municipal Trailer.

Domestic Hot Water

Domestic hot water is provided throughout the Municipal Building via a 40 gallon, 38,000 BTUH input, A.O. Smith domestic hot water heater. The hot water heater is approximately six (6) years old and has an estimated six (6) years remaining useful life.

Lighting

The Municipal Building lighting varies from space to space. The following is a brief summary of the lighting type per area:

- The Offices and Courtroom are lit via 4-foot recessed fixtures with prismatic lenses containing T12 fluorescent lamps and magnetic ballasts. Some storage closets are lit by standard incandescent lamps. Standard switching is utilized in the Office and Courtroom areas.

- The Basement is lit by 4-foot recessed fixtures with prismatic lenses containing T8 fluorescent lamps and electronic ballasts. A wall-mounted, occupancy sensor is used in the main (open) basement area to control the lighting. Standard switching is utilizing is the enclosed rooms.

The Garage lighting is supplied by six (6) high pressure sodium light fixtures along with several 8-foot industrial T12 fixtures.

The Municipal Trailer is lit by 8-foot, industrial fixtures with wrap around lenses containing T12 fluorescent lamps and magnetic ballasts.

The Municipal Complex exterior lighting consists of HID fixtures that are both building mounted and pole-mounted. The building-mounted fixtures located on the Municipal Building consist of multiple 175 Watt Metal Halide lights. The building mounted fixtures located on the Municipal Garage are high-pressure sodium (HPS) HID fixtures. The parking lot pole mounted fixtures appear to be metal halide HID fixtures. Exterior lighting at the facility is controlled via photo-cell and/or time clock.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrade – Office / Courts

Description:

The Municipal Building lighting varies from space to space. The following lighting fixtures are typical to the respective spaces:

- The Offices and Courtroom are lit via 4-foot recessed fixtures with prismatic lenses containing T12 fluorescent lamps and magnetic ballasts. Some storage closets are lit by standard incandescent lamps. Standard switching is utilized in the Office and Courtroom areas.

- The Basement is lit by 4-foot recessed fixtures with prismatic lenses containing T8 fluorescent lamps and electronic ballasts. A wall-mounted, occupancy sensor is used in the main (open) basement area to control the lighting. Standard switching is utilizing is the enclosed rooms.

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

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

Energy Savings Calculations:

The Investment Grade Lighting Audit appendix outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

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

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

$$\text{Smart Start®}\ Incentive = (11 \times \$\ 25) + (75 \times \$\ 30) = \underline{\$2{,}525}$$

Replacement and Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ \ lamps \times \%\ reduction \times \$\ \ per\ lamp) + Installation\ Labor$$
$$Maintenance\ Savings = (\ 322 \times 33\%\ reduction \times \$\ 2.00) + (\$5\ labor \times 106) = \underline{\$742}$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$11,694
NJ Smart Start Equipment Incentive ($):	($2,525)
Net Installation Cost ($):	$9,169
Annual Energy Savings ($ / yr):	$3,503
Annual Maintenance Savings ($ / yr):	$742
Annual Cost Savings ($ / yr):	$4,245
Simple Payback (yrs):	*2.2*
Simple Return On Investment (%):	*1057%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Energy Savings ($):	*$87,575*
Simple Lifetime Maintenance Savings ($):	*$18,550*

ECM #2: Lighting Upgrade – Garage

Description:

The Garage Bay Area is currently lit via six (6) HID, 350 W High Pressure Sodium fixtures that are mounted approximately 20'-0" above the finished floor. The lighting system is antiquated and the space would be better served with a more efficient, fluorescent lighting system. Studies have shown that high pressure sodium lighting systems have a steep lumen depreciation rate (rate at which light is produced from fixture) which equates to approximately a 26% to 35% reduction in lighting output at 40% of the rated lamp life. In addition, the new fluorescent system will provide a better quality of light and save the Owner many dollars on replacement of the highly expensive high pressure sodium lamps.

CEG recommends upgrading the lighting within the Garage Bay Area to an energy-efficient T-5 lighting system that includes new lighting fixtures with high efficiency, electronic ballasts and T-5 high output (HO) lamps. The T-5 HO lamps are rated for 20,000 hours versus the 10,000 hours for the 400W Metal Halide lamps so there would be a savings in replacement cost and labor. In addition to the standard lighting features of the T-5 fixtures; an occupancy sensor option should be selected for the lights in order to take advantage of reduced light levels when the Garage Bay is not occupied during the day.

In addition to the above HID lighting, there are also multiple 4'-0" and 8'-0" long T12 fluorescent fixtures utilized for general lighting that should be replaced with more energy efficient T8 fixtures.

This measure will consist of the following:

- Replacement of all the HID, 350 W High Pressure Sodium fixtures in the Garage Bay Area with approximately six (6), 4-lamp T5HO high bay fixtures with reflectors and high-efficiency, electronic ballasts.
- Replacement of the 4'-0" and 8'-0" long T12 fixtures with more energy efficient T8 fixtures.

Energy Savings Calculations:

The Investment Grade Lighting Audit appendix outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

HID Replacement: Replacement of a 250 W to 399 W HID fixtures to a T-5 or T-8 fixture warrants the following incentive: $50 per fixture.

$$\text{Smart Start®}\ \textit{Incentive} = (\#\ \textit{of}\ \ \textit{fixtures} \times\ \$50) = (6 \times \$50) = \underline{\$300}$$

T12 Replacement: Replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-2 lamp) = $25 per fixture, T-5 or T-8 (3-4 lamp) = $30 per fixture.

$$\text{Smart Start® } \textit{Incentive} = (\#\ of\ 1-2\ lamp\ \ fixtures\ \times\ \$\,25) + (\#\ of\ 3-4\ lamp\ \ fixtures\ \times\ \$\,30)$$
$$\text{Smart Start® } \textit{Incentive} = (9\times\ \$\,25) + (3\times\ \$\,30) = \underline{\$315}$$

Total Smart Start Incentive = $750 + $125 = $615

Maintenance savings are calculated based on the facility operational hours as indicated by the Owner. For the Garage Bay the estimated operational hours are 2,340 hours per year. Based on the lamp life comparison, there will be two (2) complete lamp replacements required for the high pressure sodium system at the time when one (1) complete lamp replacement would be required for the fluorescent lighting system. Based on industry pricing, the lamp cost for a 350W high pressure sodium lamp is approximately ±$35 per lamp and a T-5 54HO fluorescent lamp is approximately ±$5 per lamp. Maintenance savings can also be realized with the replacement of a T12 fixture with a comparable T8 fixture. Therefore, the maintenance savings for this ECM are calculated as follows:

HID Replacement Maintenance Savings:

$$\textit{Maintenance Savings} = (\#\ of\ \ HPS\ lamps\times\ \$35\ \ per\ lamp) - (\#\ of\ \ T5HO\ lamps\times\$5\ \ per\ lamp)$$
$$\textit{Maintenance Savings} = (6\ lamps\times\ \$35\ \ per\ lamp) - (24\ lamps\times\$5\ \ per\ lamp) = \underline{\$90}$$

It is pertinent to note, that installation labor was not included in the maintenance savings.

T12 Replacement Maintenance Savings:

$$\textit{Maintenance Savings} = (\#\ of\ \ lamps\times\%\ reduction\times\$\ \ per\ lamp) + \textit{Installation Labor}$$
$$\textit{Maintenance Savings} = (\ 24\times 33\%\ reduction\times\$\,2.00) + (\$5\ labor\times 8) = \underline{\$56}$$

Total Maintenance Savings = $90 + $56 = $146

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,620
NJ Smart Start Equipment Incentive ($):	($615)
Net Installation Cost ($):	$4,005
Annual Energy Savings ($ / yr):	$1,137
Annual Maintenance Savings ($ / yr):	$146
Annual Cost Savings ($ / yr):	$1,283
Simple Payback (yrs):	*3.1*
Simple Return On Investment (%):	*700%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Energy Savings ($):	*$28,425*
Simple Lifetime Maintenance Savings ($):	*$3,650*

ECM #3: Lighting Upgrade – Trailer

Description:

The Municipal Trailer is lit by 8-foot, industrial fixtures with wrap around lenses containing T12 fluorescent lamps and magnetic ballasts.

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

Energy Savings Calculations:

The Investment Grade Lighting Audit appendix outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

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

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

$$\text{Smart Start®}\ Incentive = (0 \times\ \$\ 25) + (9 \times\ \$\ 30) = \underline{\$270}$$

Replacement and Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ \ lamps \times \%\ reduction \times \$\ \ per\ lamp) + Installation\ Labor$$
$$Maintenance\ Savings = (\ 16 \times 33\%\ reduction \times \$\ 2.00) + (\$5\ labor \times 5) = \underline{\$35}$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,220
NJ Smart Start Equipment Incentive ($):	($270)
Net Installation Cost ($):	$950
Annual Energy Savings ($ / yr):	$102
Annual Maintenance Savings ($ / yr):	$35
Annual Cost Savings ($ / yr):	$137
Simple Payback (yrs):	*6.9*
Simple Return On Investment (%):	*260%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Energy Savings ($):	*$2,550*
Simple Lifetime Maintenance Savings ($):	*$875*

ECM #4: Furnace Replacement - Garage

Description:

The DPW Garage is heated by two ceiling mounted, gas-fired unit heaters. The first is a gas-fired Reznor unit heater rated at approximately 120,000 BTUH input with an estimated remaining service life of five (5) years. The second is a gas-fired Lennox unit heater rated at approximately 100,000 BTUH input that appears to be original to the construction of the garage. The unit has surpassed its estimated service life however; there was no complaint of the unit having operational issues by the Owner. These units utilize forced hot air to heat their repective zones within the open Garage. Heating a large space like the Garage with a forced hot air system is not the most efficient means of heating a space of this type. The workers did not complain of inadequate working conditions during the winter time, however, CEG believes there could be efficiency and cost savings in utilizing a low intensity infrared (IR) tube heating system in-lieu of the gas-fired unit heater system.

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

This ECM recommends the installation of IR heaters by Sterling Model SLR or equivalent in place of the air handling unit currently utilized. The Owner can choose to abandon the existing unit heaters in place or remove them.

Energy Savings Calculations:

Garage Heat Loss Calculations:

Based on the size of the existing gas-fired unit heaters and the use of engineering calculations, the heat loss for the Garage has been calculated to be approximately 175,000 Btu/h (65 Btu/h per SF, 2700 SF). The Base Building Heat Loss calculation is based on maintaining a 60 º F delta in temperature between indoor and outdoor ambient, respectively.

The heat loss that the warm-air system needs to overcome is actually greater than the base heat loss because infrared systems provides a higher mean radiant temperature (MRT) through warm floors, equipment, etc., and because stratification is lower than forced-air systems. Traditionally, warm air systems in industrial and commercial applications will require approximately 10 º F higher average air temperatures to provide equivalent comfort as provided by an infrared system. Due to this fact, the following is the calculation of the heat loss the warm air system will be required to meet:

$$\text{Heat Loss}_{WA} = \text{(Base Building Heat Loss x Revised } \Delta T \text{ (70 º F)) / Standard } \Delta T \text{ (60 º F)}$$
$$= \text{(175,000 Btu/h x 70 º F) / (60 º F)}$$
$$= \text{204,167 Btu/h}$$

Estimated Fan Energy Savings:

The two (2) gas-fired unit heaters each have a fractional horsepower supply fan (approx. 1/4 HP) that runs each time the unit calls for heating. Assuming that this motor is 80% efficient and the total run hours is 2,800 hours per year, this equates to an electrical savings of:

Fan Energy Savings = [0.746 Watt/HP x Motor HP x Load Factor (0.75) x Hours of Operation x Cost of Electricity ($0.167)] ÷ Motor Efficiency

Total Fan energy Savings = $81.75 per motor x 2 motors = $163.50 per year

Natural Gas Energy Savings:

To estimate the amount of energy consumed by the existing unit heaters or the infra-red heaters throughout the heating season, the Degree Day method of energy estimating is being utilized. The equation is as follows:

$$EnergyUsed = \frac{H_L \times DD \times Hrs}{\Delta t \times Eff \times V}$$

Where:

H_L = Building Heat Loss, BTU/Hr. (Warm Air = 204,167 Btu/h, Infrared = 175,000 Btu/h)

DD = number of Heating Degree Days as Specified Base Temperature
(Warm Air $DD_{70^\circ F}$ = 6,280; Infrared $DD_{60^\circ F}$ = 3,878 for Newark, NJ)

Hrs = Hours per Day

Δt = Design temperature difference, ° F (Warm Air = 70 ° F, Infrared = 60 ° F)

Eff = Efficiency of Energy Utilization (NG Unit Heater = 0.75, Vented Infrared Heater = 0.84)

V = Heating value of fuel, BTU/Therm (Natural Gas = 100,000 Btu = 1 Therm)

Estimated Energy Consumption – Gas Fired Unit Heaters:

$$EnergyUsed = \frac{(204{,}167) \times (6{,}280) \times 12}{70 \times .75 \times 100{,}000}$$

Energy Used = 2,930 Therms/Year

Energy consumption using infra-red heaters is calculated as follows:

$$EnergyUsed = \frac{(175{,}000)\times(3{,}878)\times 12}{60\times .84\times 100{,}000}$$

Energy Used = 1,615 Therms/Year

Energy Savings = 2,930 – 1,615 = 1,315 Therms per year

Cost Savings = 1,315 Therms/yr x $1.54/Therm = $2,025 per year

Total Energy Savings = Fan Energy Savings + Natural Gas Savings
= $163.50 + $2,025 = $2,189 per year

The total implementation cost including material and labor is estimated at approximately $8000. It is pertinent to note, the labor cost includes installation of the infra-red heaters and required modifications of the existing natural gas piping.

Total Energy Savings = Fan Energy Savings + Natural Gas Savings
= $163.50 + $2,025 = $2,189 per year

The total implementation cost including material and labor is estimated at approximately $4,800. It is pertinent to note, the labor cost includes installation of the infra-red heaters and required modifications of the existing natural gas piping.

Also, incentives for the installation of the infrared heating system are not currently available and maintenance savings could not be adequately calculated because information was not available to baseline the savings.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,800
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$4,800
Annual Energy Savings ($ / yr):	$2,189
Annual Maintenance Savings ($ / yr):	$0
Annual Cost Savings ($ / yr):	$2,189
Simple Payback (yrs):	*2.2*
Simple Return On Investment (%):	*492%*
Estimated ECM Lifetime (yr):	*13*
Simple Lifetime Energy Savings ($):	*$28,457*
Simple Lifetime Maintenance Savings ($):	*$0*

ECM #5: Daylighting System - Garage

Description:

Daylighting systems have become more and more common as a means to provide lighting in building such as Maintenance Garages. Through the use of day-lighting a space can be provided lighting via an innovative and environmentally friendly lighting system. This ECM can work in conjunction with ECM#2 or by itself as an upgrade to the lighting within the DPW Garage. As noted in the ECM#2 description, the DPW Garage has main lighting provided by HID, 350 W high pressure sodium fixtures and miscellaneous T12 lighting throughout other areas within the space. The DPW Garage receives minimal daylight from the garage doors when they are open. Providing daylight in lieu of utilizing the HID and fluorescent fixtures for general illumination will provide the Owner with an energy efficient option to lighting the work areas within the DPW Garage during normal working hours.

CEG proposes that a day-lighting system be installed that includes highly reflective light tubes mounted in the roof and thru the rafters to provide natural light to the spaces below. This measure consists of installing three (3) daylight sensors, and eighteen (18) 21-inch Sola-tubes within the medium-bay areas. The basis of design for this measure is SOLATUBE or equivalent.

Energy Savings Calculations:

Existing DPW Garage lighting consists of six (6) 350W HPS fixtures and various T-12 lighting fixtures that consume approximately 11,822 kWh per year based on the operating hours of 2,340 hours per year. The approximated annual energy cost for the light fixtures in the DPW Garage alone is estimated as follows:

Annual Energy Cost = 11,822 kWh x $0.167 per kWh = $1,974 / Year

Based on the manufacturer's documentation and the assumption that day-lighting is available for 60% of the year to adequately light the space, then the energy cost savings utilizing day-lighting would be estimated as:

Energy Cost Savings = 60% x $1,974 = $1,184 per year

The resultant energy consumption and demand reduction is approximately 60% of the existing and is noted as follows:

Energy Consumption Savings = $1,184 / $0.167 per kWh = 7,089 kWh per year

Energy Demand Savings = Existing Demand (5 kW) x 60% Reduction = 3 kW per year

It is pertinent to note that incentives for the installation of the system are not currently available and maintenance savings could not be adequately calculated because information from the product manufacturer was not available to baseline the savings.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$20,300
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$20,300
Annual Energy Savings ($ / yr):	$1,184
Annual Maintenance Savings ($ / yr):	$0
Annual Cost Savings ($ / yr):	$1,184
Simple Payback (yrs):	*17.1*
Simple Return On Investment (%):	*45%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Energy Savings ($):	*$29,600*
Simple Lifetime Maintenance Savings ($):	*$0*

ECM #6: DDC System – Office / Courts

Description:

The current HVAC systems within the Municipal Building are controlled via digital thermostats with either programmable or non-programmable setpoint/scheduling functions. Programmable digital thermostats control both the packaged rooftop unit that serves the Main Office and the air-handling unit that serves the Courtroom. A non-programmable thermostat controls the air-handling unit that served the Basement. During initial discussions with the Owner it was noted that the hours of operation of the facility fluctuate based on after-hours usage during weeknights and weekends and thermostat adjustments are made by the person currently occupying the space instead on one general setpoint. This is a means for a cycling amongst different HVAC systems attempting to meet various setpoints throughout the year, independent of heating or cooling season. Therefore, a DDC system providing the Owner with full control over the HVAC equipment within the building appears to be a nice fit.

This ECM includes installing a Building Automation system with Direct Digital Controls (DDC) wired through an Ethernet backbone and front end controller within the Municipal Building only. The system will include new thermostat controllers for all indoor air-handling systems and the rooftop unit, in addition to each piece of equipment being wired back to a front end controller and computer interface. With the communication between the devices and the front end computer interface, the Owner will be able to take advantage of equipment scheduling for occupied and unoccupied periods based on the actual occupancy of the facility. Due to the fact that the Municipal Building has diverse hours of occupancy, including evening and weekend hours, having supervisory control over all of the equipment makes sense. The DDC system will also aid in the response time to service / maintenance issues when the facility is not under normal maintenance supervision, i.e. after-hours.

The new DDC system has the potential to provide substantial savings by controlling the HVAC systems as a whole and provide operating schedules and features such as space averaging, night set-back, temperature override control, etc. 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 referenced report:

- Energy Management and Control System Savings: 5%-15%.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 10% of the total energy cost for the facility.

The cost of a full DDC system with new field devices, controllers, computer, software, programming, etc. is approximately $3.00 per SF in accordance with recent Contractor pricing for systems of this magnitude. Savings from the implementation of this ECM will be from the

reduced energy consumption currently used by the HVAC system by proper control of schedule and temperatures via the DDC system.

Cost of complete DDC System = ($3.00/SF x 6,816 SF) = $20,448

Heating Season Heating Degree Days = 4,888 HDD
Average Cost of Gas = $1.54 / Therm

Cooling Season Full Load Cooling Hrs. = 800 hrs / yr
Average Cost of Electricity = $0.167 / kWh

Note: Degree Days and Full Load Hours referenced from ASHRAE Weather Data for Newark, NJ.

Energy Savings Calculations:

10% Savings on Heating Calculations

$$Heat\ Load = \frac{Heat\ Loss\left(\frac{Btu}{Hr\ SF}\right) \times Area\ (SF)}{1000\left(\frac{Btu}{kBtu}\right)}$$

$$Heat\ Load = \frac{35\left(\frac{Btu}{Hr\ SF}\right) \times 6{,}816\ (SF)}{1000\left(\frac{Btu}{kBtu}\right)} = 238.6\left(\frac{kBtu}{Hr}\right)$$

$$Est\ Heat\ Cons. = \frac{Heat\ Load\left(\frac{kBtu}{Hr}\right) \times Heat\ Deg\ Days \times 24\ Hrs \times Correction\ Factor}{Design\ Temp\ Difference(^{\circ}F) \times Efficiency(\%) \times Fuel\ Heat\ Value\left(\frac{kBtu}{Therm}\right)}$$

$$Est\ Heat\ Cons. = \frac{238.6\left(\frac{kBtu}{Hr}\right) \times 4{,}888\ (HDD) \times 24\ Hrs \times 0.6}{65\ (^{\circ}F) \times 81\% \times 100\left(\frac{kBtu}{Therm}\right)} = 3{,}189.8(Therms)$$

$$Savings. = Heat\ Cons.(Therms) \times 10\%\ Savings \times Ave\ Gas\ Cost\left(\frac{\$}{Therm}\right)$$

$$Savings. = 3{,}189.8\,(Therms) \times 10\% \times 1.54\left(\frac{\$}{Therm}\right) = \underline{\$491}$$

10% Savings on Cooling Calculations**:**

$$Est\ Cool\ Cons. = \frac{Cool\ Load\,(Tons) \times 12{,}000\left(\frac{Btu}{Ton\ Hr}\right) \times Full\ Load\ Cooling\ Hrs.}{Ave\ Energy\ Efficiency\ Ratio\left(\frac{Btu}{Wh}\right) \times 1000\left(\frac{Wh}{kWh}\right)}$$

$$Est\ Cool\ Cons. = \frac{20\,(Tons) \times 12{,}000\left(\frac{Btu}{Ton\ Hr}\right) \times 800\ Hrs.}{10.0\left(\frac{Btu}{Wh}\right) \times 1000\left(\frac{Wh}{kWh}\right)} = 19{,}200(kWh)$$

$$Savings. = Cool\ Cons.(kWh) \times 10\%\ Savings \times Ave\ Elec\ Cost\left(\frac{\$}{kWh}\right)$$

$$Savings. = 19{,}200\,(kWh) \times 10\% \times 0.167\left(\frac{\$}{kWh}\right) = \underline{\$320}$$

Total Annual Energy Savings = \$491 + \$320 = <u>\$811</u> per year

It is pertinent to note that electric demand savings were unable to be estimated. Also, incentives for the installation of the DDC system are not currently available and maintenance savings could not be adequately calculated because information was not available to baseline the savings.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$20,448
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$20,448
Annual Energy Savings ($ / yr):	$811
Annual Maintenance Savings ($ / yr):	$0
Annual Cost Savings ($ / yr):	$811
Simple Payback (yrs):	*25.2*
Simple Return On Investment (%):	*(41%)*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Energy Savings ($):	*$12,165*
Simple Lifetime Maintenance Savings ($):	*$0*

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

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

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof would be necessary before the installation of PV panels is considered). The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around $350, this value was used in our financial calculations. This equates to $0.35 per kWh generated.

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 2,340 SF can be utilized for a PV system; 1,620 SF atop the Municipal Building and 720 SF atop the DPW Garage. A depiction of the area utilized is shown in Renewable / Distributed Energy Measures Calculation appendix. Using this square footage it was determined that a system size of 36.8 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 57,428 kWh annually, reducing the overall utility bill by approximately 50% 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 solar panel system analysis is based on Sun Power SPR-230 panels. The panel efficiency is 18% with an inverter efficiency of 95%. This region allows for a typical range of sunlight between 4.5 and 4.9 hours per day. The calculations are based on an average 4.68 hours per day. The operating hours are calculated based on 351 days per year accounting for two weeks per year of service down time. The calculations are also based on a solar PV system which utilizes the New Jersey guidelines for net metering. Net metering allows excess energy generated at production peaks to flow onto the grid. The excess energy is metered and subtracted from the facility's total energy usage on an annual basis. Due to this allowance the system design excludes the use of inefficient battery storage.

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with 95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront via one of the methods noted in the Installation Funding Options section below. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

Table 10
Financial Summary – Photovoltaic System

PAYMENT TYPE	SIMPLE PAYBACK	SIMPLE ROI	INTERNAL RATE OF RETURN
Self-Finance	11.2 Years	8.9%	23.2%
Direct Purchase	11.2 Years	8.9%	8.1%

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

The resultant Internal Rate of Return indicates that if the Owner was able to "self-finance" the solar project, the project would be slightly more beneficial to the Owner. However, if the Owner was able to work out a Power Purchase Agreement with a third-party and agree upon a decent base energy rate for kilowatt hour production, the "direct purchase" option could also, prove to be a beneficial route.

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

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

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

Electricity:

The Electric Usage Profile demonstrates a fairly flat load profile. The summer (June-August) demonstrates increased consumption typical to air conditioning load. There is a fairly steady yearlong electric load most likely attributable to the facility lighting, the electric heater in the Basement air-handling unit, and the electric unit heaters. A flat load profile will allow for more competitive energy prices when shopping for alternative suppliers. It is pertinent to note that based on the studied data, there was an unusual maximum consumption for electricity in January and unusual minimum consumption in October. The maximum consumption in January could be due to the electric heater for the Basement air-handling unit operating and possibly extended hours of operation for the Municipal Building and Garage. The electric consumption minimum in October should be further reviewed by the Owner as there is no clear cause for this occurrence.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical natural gas (heat load) profile. The summer months demonstrate very low consumption, May through September. There is an increase in consumption October through March. Gas heat exchangers in the rooftop unit and indoor air-handling unit in addition to the domestic hot water heater are responsible for the natural gas load.

Tariff Analysis:

Electricity:

This facility receives electrical service through Jersey Central Power & Light (JCP&L) on a GSS (General Service Secondary) rate. Service classification GS is available for general service purposes on secondary voltages not included under Service Classifications RS, RT, RGT or GST. This facility's rate is a 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 Basic Generation service from the utility. Therefore, they will pay according to the BGS default service. The Delivery Service includes the following charges: Customer Charge, Supplemental Customer Charge, Distribution Charge (kW

Demand), kWh Charge, Non-utility Generation Charge, TEFA, SBC, SCC, Standby Fee and RGGI.

Natural Gas:

This Facility receives natural gas service through Elizabethtown Gas Company on a GDS (General Delivery Service) Rate. The utility tariff rate GDS is available to those customers who require standard natural gas service. This service is a continuous service with the following monthly charges: Service Charge, Distribution Charge and Commodity Charge as determined by Rider "A", and Monthly Service Charge.

Imbalances occur when Third Party Suppliers are used to supply natural gas, full-delivery is not made, and when a new supplier is contracted or the customer returns to the utility. It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used. Otherwise, imbalances can occur, jeopardizing economics and scheduling.

Recommendations:

CEG recommends East Amwell review the possibilities of utilizing third party suppliers (TPS) for both their electric and natural gas commodity. However, due to the energy consumption of the buildings within the Municipal Complex, the Township will be most beneficial entering into a consortium where the electric and natural gas usages can be aggregated with facilities of similar type. The primary area for potential improvement is seen in the electric costs. The average price per kWh (kilowatt hour) for the Municipal Complex based on 1-year historical average price is $.167/kWh (this is the average "price to compare" if the client intends to shop for energy). The average price per decatherm for natural gas is $ 15.4 / dth (dth, is the common unit of measure). Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. The Township could see improvement in its energy costs if it were to take advantage of these current market prices quickly, before energy increases. Based on annual historical consumption and current electric rates, the Township could see an improvement in its electric costs of up to 20% annually. (Note: Savings were calculated using Average Annual Consumption and a variance to a Fixed Average One-Year commodity contract). CEG recommends aggregating the entire electric load with a consortium to gain the most optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a "managed approach".

CEG's secondary recommendation coincides with the natural gas costs. Based on the current market, East Amwell could improve its natural gas costs by up to 25%. CEG recommends that East Amwell receive further advisement on these prices through an Energy Advisor. The Township should also consider procuring energy (natural gas) through alternative supply sources.

CEG also recommends that the municipality schedule a meeting with the current utility providers to review their utility charges and current tariff structures for electricity and natural gas. This meeting would provide insight regarding alternative procurement options that are currently

available. Through its meeting with the Local Distribution Company (LDC), the municipality can learn more about the competitive supply process. East Amwell can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu. East Amwell should consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the information for ongoing demand-side management projects. Furthermore, special attention should be given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with the utility representative. The Township should ask the utility representative about alternative billing options, such as consolidated billing when utilizing the service of a Third Party Supplier. Finally, if the supplier for energy (natural gas) is changed, closely monitor balancing, particularly when the contract is close to termination. This could be performed with the aid of an "energy advisor".

X. INSTALLATION FUNDING OPTIONS

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

i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and 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.

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

XI. ADDITIONAL RECOMMENDATIONS

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

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

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

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

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

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

East Amwell Municipal Complex

ECM 1 Lighting Upgrade - Offices / Courts

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Retrofit	LS	$11,694	$0	$0	$11,694
Total Cost			$0	$0	$11,694
Utility Incentive - NJ Smart Start					($2,525)
Total Cost Less Incentive					$9,169

ECM 2 Lighting Upgrade - Garage

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Retrofit	LS	$4,620	$0	$0	$4,620
Total Cost			$0	$0	$4,620
Utility Incentive - NJ Smart Start					($615)
Total Cost Less Incentive					$4,005

ECM 3 Lighting Upgrade - Trailer

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Retrofit	LS	$1,220	$0	$0	$1,220
Total Cost			$0	$0	$1,220
Utility Incentive - NJ Smart Start					($270)
Total Cost Less Incentive					$950

ECM 4 Furnace Replacement - Garage

	Qty	Unit Cost $	Material $	Labor $	Total $
IR Heaters	2	$1,275	$850	$425	$2,550
Gas Piping Modifications - LS	1	$2,250	$1,500	$750	$2,250
Total Cost			$2,350	$1,175	$4,800
Utility Incentive - NJ Smart Start					$0
Total Cost Less Incentive					$4,800

ECM 5 Daylighting System - Garage

	Qty	Unit Cost $	Material $	Labor $	Total $
Solatube Daylighting System	LS	$20,300	$0	$0	$20,300
Total Cost			$0	$0	$20,300
Utility Incentive - NJ Smart Start ($20 per Sensor)					$0
Total Cost Less Incentive					$20,300

ECM 6 DDC System - Office / Courts

	Qty	Unit Cost $	Material $	Labor $	Total $
DDC Control System	LS	$20,448	$0	$0	$20,448
Total Cost			$0	$0	$20,448
Utility Incentive - NJ Smart Start					$0
Total Cost Less Incentive					$20,448

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of January, 2009:

Electric Chillers

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

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

Unitary AC and Split Systems	$73 - $93 per ton
Air-to-Air Heat Pumps	$73 - $92 per ton
Water-Source Heat Pumps	$81 per ton
Packaged Terminal AC & HP	$65 per ton
Central DX AC Systems	$40- $72 per ton
Dual Enthalpy Economizer Controls	$250

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

Gas Fired Boilers < 300 MBH	$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	$1.75 per MBH
Gas Fired Boilers ≥1500 - ≤ 4000 MBH	$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	$300 - $400 per unit

Variable Frequency Drives

Variable Air Volume	$65 - $155 per hp
Chilled-Water Pumps	$60 per hp
Compressors	$5,250 to $12,500 per drive

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	$50 per unit
Gas-Fired Water Heaters >50 gallons	$1.00 - $2.00 per MBH
Gas-Fired Booster Water Heaters	$17 - $35 per MBH

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 - $30 per fixture, (depending on quantity)
Hard-Wired Compact Fluorescent	$25 - $30 per fixture
Metal Halide w/Pulse Start	$25 per fixture
LED Exit Signs	$10 - $20 per fixture
T-5 and T-8 High Bay Fixtures	$16 - $284 per fixture

Lighting Controls – Occupancy Sensors

Wall Mounted	$20 per control
Remote Mounted	$35 per control
Daylight Dimmers	$25 per fixture
Occupancy Controlled hi-low Fluorescent Controls	$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	$75 per fixture controlled
Daylight Dimming	$75 per fixture controlled

Other Equipment Incentives

Performance Lighting	$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
East Amwell Municipal Building and Garage

Building ID: 1789560
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: September 21, 2009

Facility	Facility Owner	Primary Contact for this Facility
East Amwell Municipal Building and Garage 1070 US Route 202 Ringoes, NJ 08551	East Amwell Township 1070 Route 202 Rngoes, NJ 08551	Timothy Matheny 1070 US Route 202 Ringoes, NJ 08551

Year Built: 1946
Gross Floor Area (ft²): 9,516

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	388,763
Natural Gas (kBtu)[4]	394,080
Total Energy (kBtu)	782,843

Energy Intensity[5]

Site (kBtu/ft²/yr)	82
Source (kBtu/ft²/yr)	180

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	80

Electric Distribution Utility
Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	77
National Average Source EUI	182
% Difference from National Average Source EUI	-1%
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
Raymond Johnson
520 S Burnt Mill Road
Voorhees, NJ 08043

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	East Amwell Municipal Building and Garage	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	1070 US Route 202, Ringoes, NJ 08551	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		☐
Municipal Building (Office)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	8,516 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	45 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	25	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100. The normal worker density ranges between 0.3 and 10 workers per 1000 square feet (92.8 square meters)		☐
Number of PCs	15	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?		☐
Municipal Garage (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑

Gross Floor Area	1,000 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.		
Number of PCs	0 (Optional)	Is this the number of personal computers in the space?		
Weekly operating hours	45 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		
Workers on Main Shift	8 (Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

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

Fuel Type: Electricity		
Meter: Municipal Building Electric (kWh (thousand Watt-hours)) **Space(s):** Municipal Building **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
12/01/2008	12/31/2008	9,340.00
11/01/2008	11/30/2008	7,760.00
10/01/2008	10/31/2008	5,760.00
09/01/2008	09/30/2008	8,400.00
08/01/2008	08/31/2008	10,480.00
07/01/2008	07/31/2008	10,320.00
06/01/2008	06/30/2008	10,880.00
05/01/2008	05/31/2008	7,320.00
04/01/2008	04/30/2008	7,360.00
03/01/2008	03/31/2008	10,840.00
02/01/2008	02/29/2008	7,760.00
01/01/2008	01/31/2008	10,920.00
Municipal Building Electric Consumption (kWh (thousand Watt-hours))		**107,140.00**
Municipal Building Electric Consumption (kBtu (thousand Btu))		**365,561.68**
Meter: Municipal Garage Electric (kWh (thousand Watt-hours)) **Space(s):** Municipal Garage **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
12/01/2008	12/31/2008	1,200.00
11/01/2008	11/30/2008	240.00
10/01/2008	10/31/2008	160.00
09/01/2008	09/30/2008	160.00
08/01/2008	08/31/2008	400.00
07/01/2008	07/31/2008	240.00
06/01/2008	06/30/2008	160.00
05/01/2008	05/31/2008	160.00
04/01/2008	04/30/2008	160.00
03/01/2008	03/31/2008	480.00
02/01/2008	02/29/2008	1,280.00
01/01/2008	01/31/2008	2,160.00
Municipal Garage Electric Consumption (kWh (thousand Watt-hours))		**6,800.00**

Municipal Garage Electric Consumption (kBtu (thousand Btu))	**23,201.60**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))	**388,763.28**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?	☐

Fuel Type: Natural Gas

Meter: Municipal Building Gas (therms)
Space(s): Municipal Building

Start Date	End Date	Energy Use (therms)
12/01/2008	12/31/2008	664.30
11/01/2008	11/30/2008	519.30
10/01/2008	10/31/2008	204.70
09/01/2008	09/30/2008	85.80
08/01/2008	08/31/2008	27.20
07/01/2008	07/31/2008	16.60
06/01/2008	06/30/2008	25.90
05/01/2008	05/31/2008	66.30
04/01/2008	04/30/2008	260.90
03/01/2008	03/31/2008	501.60
02/01/2008	02/29/2008	750.50
01/01/2008	01/31/2008	817.70

Municipal Building Gas Consumption (therms)	**3,940.80**
Municipal Building Gas Consumption (kBtu (thousand Btu))	**394,080.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**394,080.00**
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 as the PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
East Amwell Municipal Building and Garage
1070 US Route 202
Ringoes, NJ 08551

Facility Owner
East Amwell Township
1070 Route 202
Rngoes, NJ 08551

Primary Contact for this Facility
Timothy Matheny
1070 US Route 202
Ringoes, NJ 08551

General Information

East Amwell Municipal Building and Garage	
Gross Floor Area Excluding Parking: (ft^2)	9,516
Year Built	1946
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Municipal Building	
Space Type	Office
Gross Floor Area(ft^2)	8,516
Weekly operating hours	45
Workers on Main Shift	25
Number of PCs	15
Percent Cooled	50% or more
Percent Heated	50% or more

Municipal Garage	
Space Type	Other - Service (Vehicle Repair/Service, Postal Service)
Gross Floor Area(ft^2)	1,000
Number of PCs[o]	0
Weekly operating hours[o]	45
Workers on Main Shift[o]	8

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2008)	**Baseline** (Ending Date 12/31/2008)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft^2)	82	82	51	N/A	77
Source (kBtu/ft^2)	180	180	111	N/A	182
Energy Cost					
$/year	$ 25,075.00	$ 25,075.00	$ 15,538.15	N/A	$ 23,468.76
$/$ft^2$/year	$ 2.64	$ 2.64	$ 1.64	N/A	$ 2.47
Greenhouse Gas Emissions					
$MtCO_2e$/year	80	80	50	N/A	75
$kgCO_2e/ft^2$/year	8	8	5	N/A	7

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

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

"East Amwell Municipal Building, Garage and Trailer"

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Municipal Building Basement Mech Rm	Municipal Building	A.O. Smith	1	FCG 40 248	GB03-1334428-248	38	38.9	40	80%	Natural Gas	6	12	6	No Recirculating Pump

Air Handling Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil Type	Cooling Eff. (EER)	Cooling Capacity	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Municipal Building Basement Mech Room	Courtroom	Carrier	1	58PAV155-20	2299A04969	DX Evaporator Coil	See AC Condenser Below		Gas Heating	154	124	81%	Natural Gas	115	1	14	12	18	6	
Municipal Building Basement	Basement	Lennox	1	CB29M31-1P	5801C07842	DX Evaporator Coil	See AC Condenser Below		Electric Resistance	-	4,400 {15 kW}	-	Electric	240	1	52	8	18	10	*Dehumidification Cycle
Municipal Building Roof	Office	Lennox	1	TGA150S2BH1Y	5608D01220	DX	9.5	12.5 Tons	Gas Heating	240	192	80%	Natural Gas	208-230	3	65	1	15	14	*Single Enthalpy Economizer; CV Fan Operation

AC Condensers

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Grade; Outside Municipal Building	Paired with Court Room AHU	Lennox	1	13ACD-060-230-01	5806C52002	5 Tons	13 SEER	R-22	208-230	1	3	20	17	
Grade; Outside Municipal Building	Paired with Basement AHU	Lennox	1	AC13-030-230-02	5806K14747	2.5 Tons	13 SEER	R-22	208-230	1	3	20	17	

Heating and Ventilation Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Heating Coil	Input Capacity (MBH)	Output Capacity (MBH)	Combustion Efficiency	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Garage Ceiling	Garage	Lennox	1	L Series	A-61	Gas Htx	100	80	80.0%	115	1	10	48	18	(30)	*Partial Model Information Obtained from Equipment; Age Approximated for Both Furnaces
Garage Ceiling	Garage	Reznor	1	UDAP V3 Tcore	-	Gas Htx	120	99.6	83.0%	115	1	5.1	5	18	13	

Window A/C Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity - DX	Heating Capacity - HW	Fan HP	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Trailer	Trailer	Westinghouse	2	-	-	1 Ton	N/A	-	115	1	<15	15	10	(5)	

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENGINEERING GROUP

CEG Job #: 9C09056
Project: East Amwell TWP
Address: 1070 Route 202/31
City: Ringoes, NJ 08551
Building SF: 9,516

"East Amwell Municipal Building"

DATE: 9/23/2009
KWH COST: $0.167

ECM#1: LIGHTING UPGRADE -OFFICES / COURTS

EXISTING LIGHTING										PROPOSED LIGHTING										SAVINGS			
Line No.	CEG Type	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	-	Stairwell	3	4' 4-Lamp T-8 Recessed Prsimatic Lens 32 W	3432	109	0.33	1122.26	$187.42	3	No Change Required (N.C.R)	109	0.33	1122.26	$187.42	$0.00	$0.00	0.00	0	$0.00	0.00
2	-		1	LED Exit Sign	8760	4	0.00	35.04	$5.85	1	N.C.R.	4	0.00	35.04	$5.85	$0.00	$0.00	0.00	0	$0.00	0.00
3	-	Filing Room	6	4' 4-Lamp T-8 Recessed Prismatic Lens 32 W	3432	109	0.65	2244.53	$374.84	6	N.C.R.	109	0.65	2244.53	$374.84	$0.00	$0.00	0.00	0	$0.00	0.00
4	-		2	60 W Incandescent	848	60	0.12	101.76	$16.99	2	18W CFL	18	0.04	30.528	$5.10	$5.75	$11.50	0.08	71.232	$11.90	0.97
5	-	IT Room	1	4' 2-Lamp T-8 Recessed Prismatic Lens 32 W	3432	58	0.06	199.056	$33.24	1	N.C.R.	58	0.06	199.056	$33.24	$0.00	$0.00	0.00	0	$0.00	0.00
6	-	Mech Room	1	100 W Incandescent	3432	100	0.10	343.2	$57.31	1	23W CFL	23	0.02	78.936	$13.18	$7.65	$7.65	0.08	264.264	$44.13	0.17
7	-		1	4' 2-Lamp T-12 No Lens Industrial 34 W	3432	80	0.08	274.56	$45.85	1	4' 2-Lamp 32W T-8 Electronic Ballast; Metalux or equal	55	0.06	188.76	$31.52	$100.00	$100.00	0.03	85.8	$14.33	6.98
8	-	Basement	4	4' 4-Lamp T-8 Recessed Prismatic Lens 32 W	3432	109	0.44	1496.35	$249.89	4	N.C.R.	109	0.44	1496.35	$249.89	$0.00	$0.00	0.00	0	$0.00	0.00
9	-		1	4' 2-Lamp T-12 Recessed Prismatic Lens 34 W	3432	80	0.08	274.56	$45.85	1	4' 2-Lamp 32W T-8 Electronic Ballast; Metalux or equal	55	0.06	188.76	$31.52	$100.00	$100.00	0.03	85.8	$14.33	6.98
10	-		2	LED Exit Sign	8760	4	0.01	70.08	$11.70	2	N.C.R.	4	0.01	70.08	$11.70	$0.00	$0.00	0.00	0	$0.00	0.00
11	-	Office of Historic Preservation	1	4' 2-Lamp T-12 No Lens Industrial 34 W	3432	80	0.08	274.56	$45.85	1	4' 2-Lamp 32W T-8 Electronic Ballast; Metalux or equal	55	0.06	188.76	$31.52	$100.00	$100.00	0.03	85.8	$14.33	6.98
12	-	Church Closet	1	4' 2-Lamp T-12 No Lens Industrial 40 W	858	94	0.09	80.652	$13.47	1	4' 2-Lamp 32W T-8 Electronic Ballast; Metalux or equal	55	0.06	47.19	$7.88	$100.00	$100.00	0.04	33.462	$5.59	17.89
13	-	Basement Storage	3	4' 4-Lamp T-8 Recessed Prismatic Lens 32 W	858	109	0.33	280.566	$46.85	3	N.C.R.	109	0.33	280.566	$46.85	$0.00	$0.00	0.00	0	$0.00	0.00
14	-	Office of Emergency Management	1	4' 2-Lamp T-12 Recessed Industrial Prism 34 W	3432	80	0.08	274.56	$45.85	1	4' 2-Lamp 32W T-8 Electronic Ballast; Metalux or equal	55	0.06	188.76	$31.52	$100.00	$100.00	0.03	85.8	$14.33	6.98
15	-	Stairwell	1	4' 2-Lamp T-12 Prismatic Wrap Around Lens 34 W	3432	80	0.08	274.56	$45.85	1	4' 2-Lamp 32W T-8 Electronic Ballast; Metalux or equal	55	0.06	188.76	$31.52	$100.00	$100.00	0.03	85.8	$14.33	6.98
16	-		1	LED Exit Sign	8760	4	0.00	35.04	$5.85	1	N.C.R.	4	0.00	35.04	$5.85	$0.00	$0.00	0.00	0	$0.00	0.00
17	-	Courtroom Kitchen	4	4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	0.64	2196.48	$366.81	4	4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.32	1111.97	$185.70	$140.00	$560.00	0.32	1084.51	$181.11	3.09

18	-	Courtroom	26	2'X4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	4.16	14277.1	$2,384.28	26	2'X4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	2.11	7227.79	$1,207.04	$140.00	$3,640.00	2.05	7049.33	$1,177.24	3.09
19	-		4	LED Exit Sign	8760	4	0.02	140.16	$23.41	4	N.C.R.	4	0.02	140.16	$23.41	$0.00	$0.00	0.00	0	$0.00	0.00
20	-	Judge's Chambers	3	2'X2' U-Lamp T-12 Recessed Prismatic 34 W	3432	60	0.18	617.76	$103.17	3	2'x2' 3-Lamp 17W T-8 Prism Lens Electronic Ballast	47	0.14	483.912	$80.81	$95.00	$285.00	0.04	133.848	$22.35	12.75
21	-	Judge's Bathroom	1	2' 2-Lamp T-12 Wall Mounted Fixture 20 W	858	53	0.05	45.474	$7.59	1	2' 2-Lamp 17W T-8 Electronic Ballast; Metalux or equal	34	0.03	29.172	$4.87	$151.00	$151.00	0.02	16.302	$2.72	55.47
22	-	Judge's Office	3	4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	0.48	1647.36	$275.11	3	4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.24	833.976	$139.27	$140.00	$420.00	0.24	813.384	$135.84	3.09
23	-	Hallway	4	4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	0.64	2196.48	$366.81	4	4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.32	1111.97	$185.70	$140.00	$560.00	0.32	1084.51	$181.11	3.09
24	-		1	LED Exit Sign	8760	4	0.00	35.04	$5.85	1	N.C.R.	4	0.00	35.04	$5.85	$0.00	$0.00	0.00	0	$0.00	0.00
25	-	Fire Closet	1	75 W Incandescent	858	75	0.08	64.35	$10.75	1	18W CFL	18	0.02	15.444	$2.58	$7.65	$7.65	0.06	48.906	$8.17	0.94
26	-	Men's Bathroom	2	2'X4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	0.32	1098.24	$183.41	2	2'X4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.16	555.984	$92.85	$140.00	$280.00	0.16	542.256	$90.56	3.09
27	-	Women's Bathroom	2	2'X4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	0.32	1098.24	$183.41	2	2'X4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.16	555.984	$92.85	$140.00	$280.00	0.16	542.256	$90.56	3.09
28	-	Entrance	2	4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	0.32	1098.24	$183.41	2	4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.16	555.984	$92.85	$140.00	$280.00	0.16	542.256	$90.56	3.09
29	-		1	LED Exit Sign	8760	4	0.00	35.04	$5.85	1	N.C.R.	4	0.00	35.04	$5.85	$0.00	$0.00	0.00	0	$0.00	0.00
30	-		2	4' 2-Lamp T-12 Recessed Parabolic Lens 40 W	3432	94	0.19	645.216	$107.75	2	4' 2-Lamp 32W T-8 Electronic Ballast; Metalux or equal	55	0.11	377.52	$63.05	$100.00	$200.00	0.08	267.696	$44.71	4.47
31	-	Conference Room	5	4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	0.80	2745.6	$458.52	5	4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.41	1389.96	$232.12	$140.00	$700.00	0.40	1355.64	$226.39	3.09
32	-	Open Office Area #1	6	4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	0.96	3294.72	$550.22	6	4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.49	1667.95	$278.55	$140.00	$840.00	0.47	1626.77	$271.67	3.09
33	-	Tax Collector	1	4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	0.16	549.12	$91.70	1	4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.08	277.992	$46.42	$140.00	$140.00	0.08	271.128	$45.28	3.09
34	-	Open Office Area #2	13	4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	2.08	7138.56	$1,192.14	13	4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	1.05	3613.9	$603.52	$140.00	$1,820.00	1.03	3524.66	$588.62	3.09
35	-		3	LED Exit Sign	8760	4	0.01	105.12	$17.56	3	N.C.R.	4	0.01	105.12	$17.56	$0.00	$0.00	0.00	0	$0.00	0.00
36	-	Break Room	4	4' 4-Lamp T-12 Recessed Prismatic Lens 34 W	3432	160	0.64	2196.48	$366.81	4	4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.32	1111.97	$185.70	$140.00	$560.00	0.32	1084.51	$181.11	3.09
37	-		2	4' 2-Lamp T-12 Recessed Prismatic Lens 34 W	3432	80	0.16	549.12	$91.70	2	4' 2-Lamp 32W T-8 Electronic Ballast; Metalux or equal	55	0.11	377.52	$63.05	$100.00	$200.00	0.05	171.6	$28.66	6.98
38	-	Break Room Bathroom	1	2' 2-Lamp T-12 Wall Mounted Fixture 20 W	858	53	0.05	45.474	$7.59	1	2' 2-Lamp 17W T-8 Electronic Ballast; Metalux or equal	34	0.03	29.172	$4.87	$151.00	$151.00	0.02	16.302	$2.72	55.47
39	-		2	LED Exit Sign	8760	4	0.01	70.08	$11.70	2	N.C.R.	4	0.01	70.08	$11.70	$0.00	$0.00	0.00	0	$0.00	0.00

40	-	Exterior Lighting	5	All Brite Metal Halide 175 W	4368	213	1.07	4651.92	$776.87	5	N.C.R.	213	1.07	4651.92	$776.87	$0.00	$0.00	0.00	0	$0.00	0.00
41	-		4	Lightalarm Emergency Lights 9 W	4368	9	0.04	157.248	$26.26	4	N.C.R.	9	0.04	157.248	$26.26	$0.00	$0.00	0.00	0	$0.00	0.00
		Totals	132				15.91	54080	$9,031.36	132			9.63	33106.2	$5,528.73		$11,693.80	6.28	20973.8	$3,502.63	3.34

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.
2. Hours of Operation based on information from Owner.

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENGINEERING GROUP

CEG Job #: 9C09056
Project: East Amwell TWP
Address: 1070 Route 202/31
City: Ringoes, NJ 08551
Building SF:

"East Amwell Garage"

DATE: 9/23/2009
KWH COST: $0.167

ECM#2: LIGHTING UPGRADE -GARAGE

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.		Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1		Garage	3	2'X8' 4-Lamp T-12 No Lens Industrial 95 W	2340	444	1.33	3116.88	$520.52	3	2'X4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.24	568.62	$94.96	$140.00	$420.00	1.09	2548.26	$425.56	0.99
2			3	8' 2-Lamp T-12 No Lens Industrial 95 W	2340	222	0.67	1558.44	$260.26	6	4' 2-Lamp 32W T-8 Electronic Ballast; Metalux or equal	55	0.33	772.2	$128.96	$100.00	$600.00	0.34	786.24	$131.30	4.57
3			3	4' 2-Lamp T-12 No Lens Industrial 34 W	2340	80	0.24	561.6	$93.79	3	4' 2-Lamp 32W T-8 Electronic Ballast; Metalux or equal	55	0.17	386.1	$64.48	$100.00	$300.00	0.08	175.5	$29.31	10.24
4			6	High Pressure Sodium 350 W	2340	464	2.78	6514.56	$1,087.93	6	2'X4' 4-Lamp 54W T-5HO Reflector/Elect Ballast; Metalux F-BAY or equal	229	1.37	3215.16	$536.93	$550.00	$3,300.00	1.41	3299.4	$551.00	5.99
5			2	LED Exit Sign	8760	4	0.01	70.08	$11.70	2	No Change Required	4	0.01	70.08	$11.70	$0.00	$0.00	0.00	0	$0.00	0.00
		Totals	17				5.03	11821.56	$1,974.20	20			2.12	5012.16	$837.03		$4,620.00	2.91	6809.4	$1,137.17	4.06

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.
2. Hours of Operation based on information from Owner.

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENGINERING GROUP

CEG Job #: 9C09056 **DATE:** 9/23/2009
Project: East Amwell TWP **"East Amwell Trailer"** **KWH COST:** $0.179
Address: 1070 Route 202/31
City: Ringoes, NJ 08551
Building SF: 552
ECM#3: LIGHTING UPGRADE -TRAILER

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	CEG Type	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1	-	Trailer	7	1'X8' 2-Lamp T-12 Industrial Wrap Around Lens 96 W	520	222	1.55	808.08	$144.65	7	2'X4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	81	0.57	294.84	$52.78	$140.00	$980.00	0.99	513.24	$91.87	10.67
2	-		1	2'X8' 2-Lamp T-12 Industrial Wrap Around Lens 96 W	520	222	0.22	115.44	$20.66	2	2'X4' 3-Lamp 32W T-8 Electronic Ballast; Metalux or equal	58	0.12	60.32	$10.80	$120.00	$240.00	0.11	55.12	$9.87	24.32
		Totals	8				1.78	923.52	$165.31	9			0.68	355.16	$63.57		$1,220.00	1.09	568.36	$101.74	11.99

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.
2. Hours of Operation based on information from Owner.
3. Recommendation of 2'X4' fixtures in lieu of 1'X4' fixtures will require change in orientation of new light fixtures. The new fixtures will need to be installed perpendicular to the Trailer length.

Project Name: LGEA Solar PV Project - Municpal Complex
Location: East Amwell, NJ
Description: Photovoltaic System 95% Financing - 20 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 20 year
Total Construction Cost	$331,200
Annual kWh Production	57,428
Annual Energy Cost Reduction	$9,590
Annual SREC Revenue	$20,100
First Cost Premium	**$331,200**
Simple Payback:	**11.16** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	300	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.167**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/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	$16,560	0	0	0	$0	0	0	(16,560)	0
1	$0	57,428	$9,590	$0	$20,100	$21,872	$4,813	$3,005	($13,555)
2	$0	57,141	$9,878	$0	$19,999	$21,524	$5,161	$3,192	($10,364)
3	$0	56,855	$10,175	$0	$19,899	$21,151	$5,534	$3,388	($6,975)
4	$0	56,571	$10,480	$0	$19,800	$20,751	$5,935	$3,594	($3,382)
5	$0	56,288	$10,794	$580	$19,701	$20,322	$6,364	$3,230	($152)
6	$0	56,007	$11,118	$577	$19,602	$19,862	$6,824	$3,458	$3,306
7	$0	55,727	$11,452	$574	$19,504	$19,369	$7,317	$3,696	$7,002
8	$0	55,448	$11,795	$571	$19,407	$18,840	$7,846	$3,945	$10,947
9	$0	55,171	$12,149	$568	$19,310	$18,273	$8,413	$4,205	$15,152
10	$0	54,895	$12,513	$565	$19,213	$17,665	$9,021	$4,475	$19,627
11	$0	54,620	$12,889	$563	$19,117	$17,012	$9,673	$4,758	$24,385
12	$0	54,347	$13,275	$560	$19,022	$16,313	$10,373	$5,052	$29,436
13	$0	54,076	$13,674	$557	$18,926	$15,563	$11,122	$5,358	$34,794
14	$0	53,805	$14,084	$554	$18,832	$14,759	$11,926	$5,676	$40,470
15	$0	53,536	$14,506	$551	$18,738	$13,897	$12,789	$6,007	$46,477
16	$0	53,269	$14,942	$549	$18,644	$12,973	$13,713	$6,351	$52,828
17	$0	53,002	$15,390	$546	$18,551	$11,981	$14,704	$6,709	$59,537
18	$0	52,737	$15,852	$543	$18,458	$10,918	$15,767	$7,081	$66,618
19	$0	52,473	$16,327	$540	$18,366	$9,778	$16,907	$7,467	$74,085
20	$0	52,211	$16,817	$538	$18,274	$8,556	$18,130	$7,867	$81,952
21	$0	51,950	$17,321	$535	$18,183	$7,795	$16,667	$10,507	$92,459
22	$0	51,690	$17,841	$532	$18,092	$6,299	$13,715	$15,386	$107,845
23	$0	51,432	$18,376	$530	$18,001	$0	$0	$35,848	$143,693
24	$0	51,175	$18,928	$527	$17,911	$0	$0	$36,312	$180,004
25	$0	50,919	$19,495	$524	$17,822	$0	$0	$36,793	$216,797
	Totals:	1,095,608	$257,700	$8,936	$383,463	$331,381	$202,333	$232,715	$1,272,986
					Net Present Value (NPV)			**$50,153**	
					Internal Rate of Return (IRR)			**23.2%**	

Project Name: LGEA Solar PV Project - Municpal Complex
Location: East Amwell, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$331,200
Annual kWh Production	57,428
Annual Energy Cost Reduction	$9,590
Annual SREC Revenue	$20,100
First Cost Premium	**$331,200**
Simple Payback:	**11.16** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.167**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$331,200	0	0	0	$0	(331,200)	0
1	$0	57,428	$9,590	$0	$20,100	$29,690	($301,510)
2	$0	57,141	$9,878	$0	$19,999	$29,878	($271,632)
3	$0	56,855	$10,175	$0	$19,899	$30,074	($241,558)
4	$0	56,571	$10,480	$0	$19,800	$30,280	($211,279)
5	$0	56,288	$10,794	$580	$19,701	$29,915	($181,363)
6	$0	56,007	$11,118	$577	$19,602	$30,143	($151,220)
7	$0	55,727	$11,452	$574	$19,504	$30,382	($120,838)
8	$0	55,448	$11,795	$571	$19,407	$30,631	($90,207)
9	$0	55,171	$12,149	$568	$19,310	$30,890	($59,317)
10	$0	54,895	$12,513	$565	$19,213	$31,161	($28,156)
11	$0	54,620	$12,889	$563	$19,117	$31,443	$3,288
12	$0	54,347	$13,275	$560	$19,022	$31,737	$35,025
13	$0	54,076	$13,674	$557	$18,926	$32,043	$67,068
14	$0	53,805	$14,084	$554	$18,832	$32,362	$99,430
15	$0	53,536	$14,506	$551	$18,738	$32,693	$132,123
16	$0	53,269	$14,942	$549	$18,644	$33,037	$165,160
17	$0	53,002	$15,390	$546	$18,551	$33,395	$198,554
18	$0	52,737	$15,852	$543	$18,458	$33,766	$232,321
19	$0	52,473	$16,327	$540	$18,366	$34,152	$266,473
20	$0	52,211	$16,817	$538	$18,274	$34,553	$301,026
21	$1	51,950	$17,321	$535	$18,183	$34,969	$335,995
22	$2	51,690	$17,841	$532	$18,092	$35,400	$371,396
23	$3	51,432	$18,376	$530	$18,001	$35,848	$407,243
24	$4	51,175	$18,928	$527	$17,911	$36,312	$443,555
25	$5	50,919	$19,495	$524	$17,822	$36,793	$480,348
	Totals:	1,095,608	$257,700	$8,936	$383,463	$811,548	$632,226
				Net Present Value (NPV)		**$480,373**	
				Internal Rate of Return (IRR)		**8.1%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
East Amwell Municipal Building	2,340	Sunpower SPR230	160	14.7	2,353	36.80	57,428	5,280	15.64

.= Proposed PV Layout

Notes:

1. Estimated kWH based on 4.68 hours full output per day per 365 day year. Actual kWH will vary day to day.