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I. EXECUTIVE SUMMARY

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

Franklin Township
Borough Hall
46 Main Street,
Franklin, NJ,

Municipal Contact Person: Richard R. Wolak
Facility Contact Person: Marguerite L. Nemeth

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	\$ 18,520
Natural Gas	\$ 9,783
Total	\$ 28,304

The potential annual energy cost savings for each energy conservation measure (ECM) and renewable energy measure (REM) are shown below in Table 1. Be aware that the ECM's and REM' are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE level 2 audit. The cost and savings for each measure is $\pm 20\%$. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Table 1
Financial Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST^A	ANNUAL SAVINGS^B	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
ECM #1	HVAC Scheduling Adjustments	\$400	\$2,849	0.1	10584.9%
ECM #2	Control Upgrades for Hot Water Equipment	\$3,600	\$2,120	1.7	783.3%
ECM #3	Lighting Upgrades	\$798	\$606	1.3	936.5%
ECM #4	Boiler Replacement	\$27,940	\$2,825	9.9	51.6%
ECM #5	Condensing Units Replacement	\$23,756	\$2,325	10.2	46.8%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST	ANNUAL SAVINGS	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
REM #1	PV Solar System	\$190,440	\$11,723	16.2	23.1%
Notes: A. Cost takes into consideration applicable NJ Smart Start TM incentives. B. Savings takes into consideration applicable maintenance savings.					

The estimated demand and energy savings for each ECM and REM is shown below in Table 2. The descriptions in this table correspond to the ECM's and REM's listed in Table 1.

Table 2
Estimated Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	HVAC Scheduling Adjustments	0	8,964	1,023
ECM #2	Control Upgrades for Hot Water Equipment	0	0	1,638
ECM #3	Lighting Upgrades	1	2,660	0
ECM #4	Boiler Replacement	0		2,173
ECM #5	Condensing Units Replacement	11	13,760	0
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	PV Solar System	21.2	22587	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: Adjust HVAC Schedules
- ECM #2: Install digital thermostats for unit heaters and hot water baseboard heaters
- ECM #3: Lighting Upgrades
- ECM #4: Install high efficiency condensing boiler

Although ECM #5 provides an approximately 10 years payback term, it is not recommended to proceed with the unit replacements since the current refrigerant (R22) in these systems are being phased out. Replacing these units with new refrigerants require replacement of the major components of air handling units, fittings, piping and ductwork.

In addition to the ECMs, there are low cost 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. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.
4. Confirm that outside air dampers on the air handling units are functioning properly.
5. Periodically check boiler combustion air damper operation and ensure it is not stuck open or closed at any time.
6. Organize employee energy awareness campaign in order to promote energy efficiency in the office

The Franklin Borough Town Hall is an office building with typical operation hours. HVAC schedules at this facility can be optimized to best suit office hours while minimizing system operation during un-occupied times. This can be achieved via simple adjustments to the existing thermostats to activate some of the advanced energy savings features. In addition, the existing boiler operation represents a potential for energy reduction. There is potential for energy savings via night time temperature set-back in winter months by installing programmable thermostats to the baseboard heaters in the offices and unit heaters in the storage areas. The boiler is configured to run all winter long to provide fairly constant temperature hot water for the baseboards and preheat coils in the air handling units. Energy savings can be achieved by allowing temperatures

in the spaces to drift down a few degrees below occupied set-point. This way the boiler will fire less often during the un-occupied times.

HVAC equipment replacements are usually difficult to justify with the energy savings alone. Due to the age of the existing standard air cooled condensing units, the energy savings pays for the unit replacement within 9.3 years. A reasonable payback for the replacement of condensing units to new higher energy efficiency units is more easily achieved compared to other systems since the equipment is a packaged system with available off-the-shelf replacement units without any custom alterations. With the added incentive for increased reliability and due to the existing equipment's age and condition, this option is recommended to be considered despite the fact that the payback is over 9 years. Same as the condensing units, the hot water boiler in this facility can be replaced with a more efficient unit. Since the efficiency rating of the current unit is very low, the payback for a replacement unit is under 10 years.

Lighting retrofits are a simple and effective approach to reduce energy use. The majority of the lighting fixtures in this facility are fitted with efficient fluorescent lamps. There are only a few older and inefficient fixtures in various low use areas such as basement, third floor storage area, elevator car and the elevator lobby areas. Lighting upgrades include simple upgrades such as replacing screw-in incandescent light bulbs as well as replacing pendant fluorescent fixtures.

Opportunity for a solar photovoltaic panel installation is investigated as a renewable energy measure for this facility. According to preliminary analysis a 21 kW solar panel array can be installed on the roof to supplement approximately 20% of the total electric need of this facility. Analysis indicates that the payback term for this project is over 15 years. Although it may not be as financially attractive as desired, many of this type of long payback term green technology projects are implemented by enthusiastic building owners, municipalities and facility managers by utilizing creative financing methods.

II. INTRODUCTION

The comprehensive energy audit covers the 9,670 square foot Town Hall Municipal Building, which includes the courthouse and support offices.

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

The Energy Use Index (EUI) is established for the building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft²/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTU's and dividing by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. A low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance therefore a high potential for energy savings.

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

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

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

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

III. METHOD OF ANALYSIS

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

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

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

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

ECM Calculation Equations:

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

$$\text{Simple Lifetime Savings} = (\text{Yearly Savings} \times \text{ECM Lifetime})$$

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

$$\text{Lifetime Maintenance Savings} = (\text{Yearly Maintenance Savings} \times \text{ECM Lifetime})$$

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

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

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

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

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

The gas usage profile shows the actual natural gas energy usage for the facility. Elizabethtown Gas Service delivers natural gas to the facility which is supplied by a third party, Metromedia Energy. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

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

<u>Description</u>	<u>Average</u>
Electricity	16.9¢ / kWh
Natural Gas	\$1.30 / Therm

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY			
Utility Provider: JCP&L, General Service Secondary 3 phase Rate: JC_GS1_01F Meter No: G15076327 Customer ID No: 0801493022 Third Party Utility Provider: None TPS Meter / Acct No: --			
MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Aug-08	11,520	40.1	\$2,114
Sep-08	9,960	37.9	\$1,799
Oct-08	9,680	29.4	\$1,499
Nov-08	9,160	27.9	\$1,425
Dec-08	9,480	26.7	\$1,522
Jan-09	7,920	23.8	\$1,305
Feb-09	8,600	23.8	\$1,404
Mar-09	8,000	28.6	\$1,311
Apr-09	8,400	36.1	\$1,412
May-09	8,600	32.9	\$1,420
Jun-09	9,560	33.0	\$1,724
Jul-09	8,680	33.4	\$1,586
Totals	109,560	40.1 Max	\$18,520
AVERAGE DEMAND 31.1 KW average AVERAGE RATE \$0.169 \$/kWh			

Figure 1

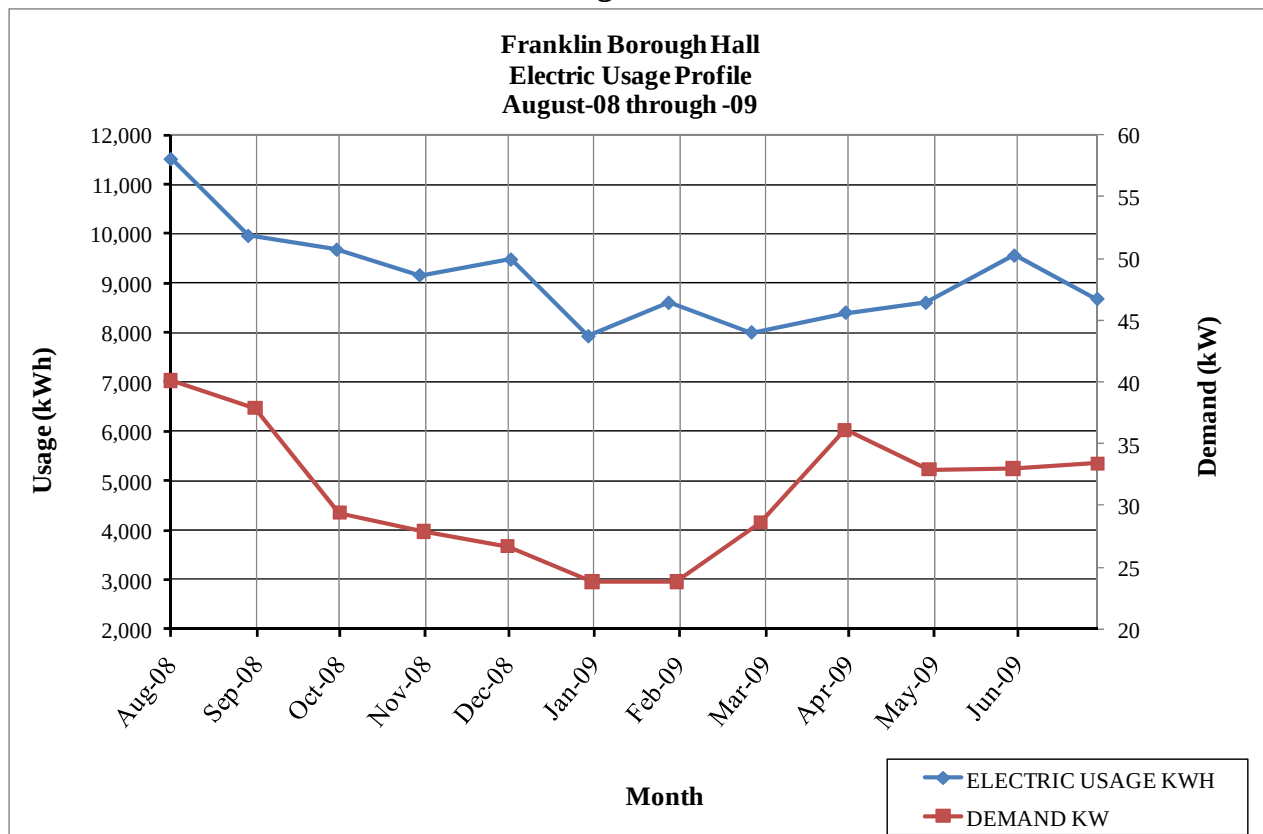
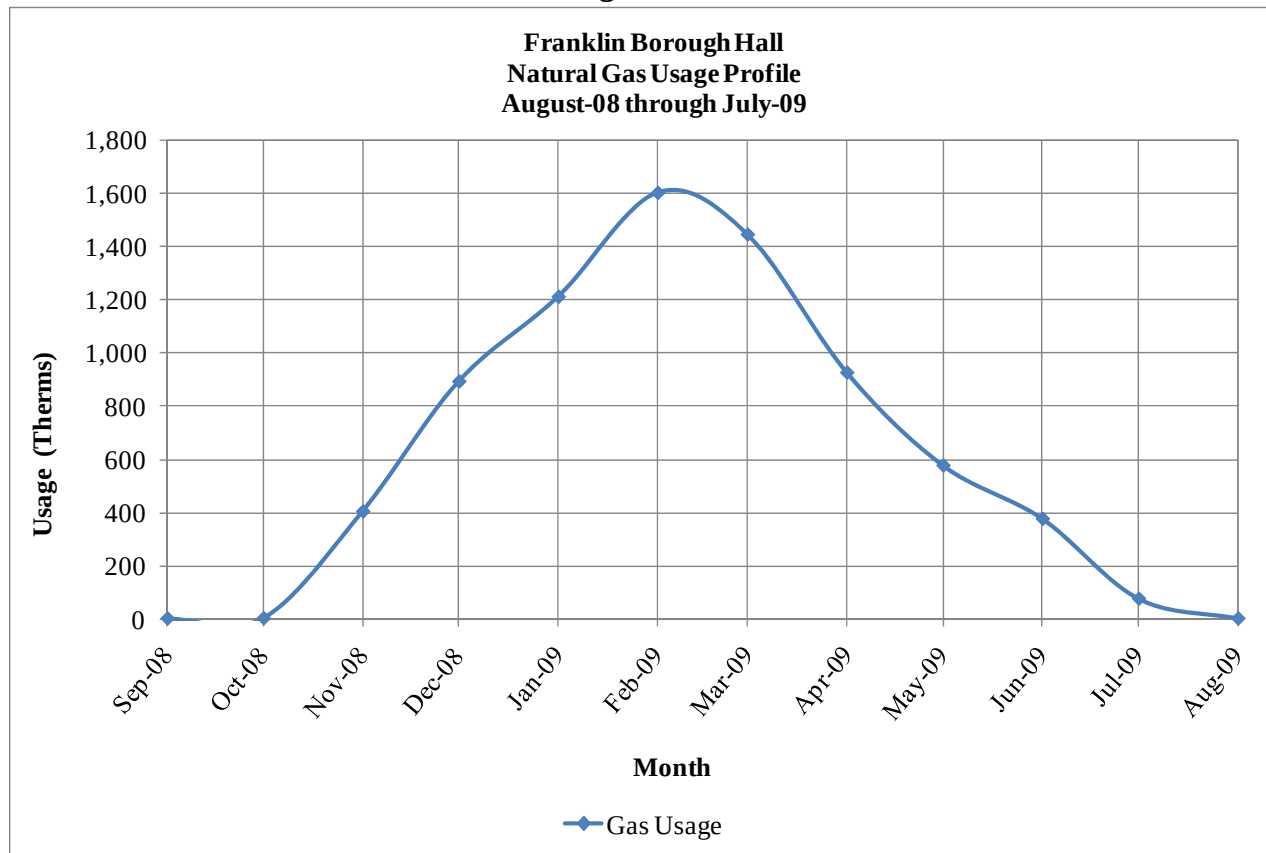


Table 4
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: Elizabethtown Gas Rate: 203 Meter No: 0C932773 Point of Delivery ID: 7521790711 Third Party Utility Provider: Metromedia Energy TPS Meter No: -		
MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Sep-08	0.00	\$69.03
Oct-08	1.00	\$89.93
Nov-08	403.00	\$579.76
Dec-08	891.90	\$1,189.86
Jan-09	1,210.30	\$1,780.92
Feb-09	1,601.60	\$2,262.73
Mar-09	1,444.70	\$1,710.15
Apr-09	925.10	\$966.68
May-09	575.50	\$558.43
Jun-09	375.00	\$380.79
Jul-09	74.60	\$129.62
Aug-09	0.00	\$65.56
TOTALS	7,502.70	\$9,783.46
AVERAGE RATE: \$1.304 \$/THERM		

Figure 2

B. Energy Use Index (EUI)

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

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

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

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

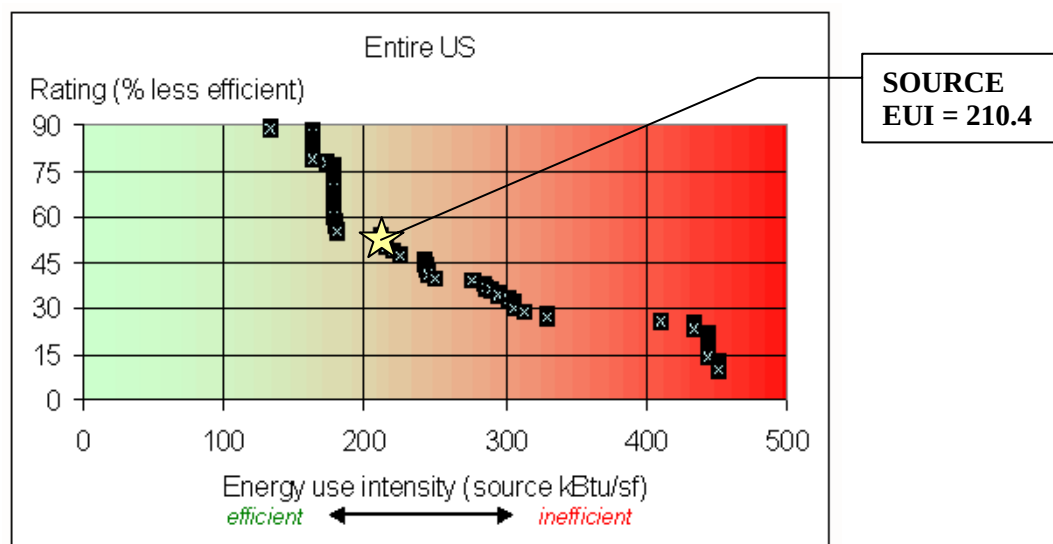
$$\text{Building Source EUI} = \frac{(\text{Electric Usage in kBtu} \times \text{SS Ratio} + \text{Gas Usage in kBtu} \times \text{SS Ratio})}{\text{Building Square Footage}}$$

Table 5
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	109560			374,038	3.340	1,249,286
NATURAL GAS		7503		750,270	1.047	785,533
FUEL OIL			0.0	0	1.010	0
PROPANE			0.0	0	1.010	0
TOTAL				1,124,308		2,034,819
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA	9,670 SQUARE FEET					
BUILDING SITE EUI	116.27 kBtu/SF/YR					
BUILDING SOURCE EUI	210.43 kBtu/SF/YR					

Figure 3 below depicts a national EUI grading for the source use of *Public Order and Safety Buildings*.

Figure 3
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: franklinboro
Password: lgeaceg2009

Security Question: What is your birth city?
Security Answer: "franklin"

The utility bills and other information gathered during the energy audit process are entered into the Portfolio Manager. The following is a summary of the results for the facility:

Table 6
ENERGY STAR Performance Rating

ENERGY STAR PERFORMANCE RATING		
FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Franklin Borough Hall	25	50

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

V. FACILITY DESCRIPTION

The 9,670 SF Municipal Building is a three story facility originally built in 1929. It went through an extensive renovation between 1997 and 1999. The building is comprised of administrative offices, municipal courthouse, storage areas and mechanical spaces.

The typical hours of operation for this facility are between 8:00 am and 4:00 pm Monday through Friday. The building is closed on weekends. The courthouse has night meetings roughly from 7:00 pm to 11:00 pm based on the townships schedule. Currently, court sessions are held two nights per week. In addition, town meetings are held in the conference room two nights per week.

Exterior walls are comprised of 4" brick veneer construction with fiberglass insulation and gypsum boards on the inside. Insulation thickness could not be verified. The windows throughout the facility are in good condition and appear to be well maintained. Typical windows throughout the facility are double pane, ¼" tinted glass with aluminum frames. Blinds are utilized through the facility for occupant comfort. The blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat gain in the summer.

The roof of the building was included in the 1997-1999 renovation. Old built-up roof was replaced while keeping the existing steel roof beams. The roof is covered with a rubber membrane. Currently, all the HVAC condensing units are located on the roof. The amount of insulation below the roofing is not known.

HVAC Systems

The air conditioning is provided with seven (7) air handling units (AHU) located in the basement and third floor of this building. Each AHU serves a single zone in the building. There are three zones in the first floor office areas and three zones in the second floor office area. The stairwells and bathrooms in the first and second floors make up the last zone.

Each AHU has a direct expansion refrigerant coil and a hot water pre-heat coil. AHUs distribute conditioned air to the seven zones in the building through constant volume duct network via ceiling and sidewall diffusers.

Direct expansion cooling is achieved with multiple remote condensing units located on the roof of this building. There are a total of eight (8) YORK condensing units on the roof. The capacities of the units vary between 2 to 4 tons. There is a total of 29 tons of cooling capacity in this building. The AHU-7 is supplied with two (2) condensing units. Two (2) of the condensing units were replaced recently with newer SEER 13 York condensing units due to compressor failure. The remaining six (6) units are original from the 1997-1999 restoration. They are older units with approximately 10 SEER (Seasonal Energy Efficiency Ratio).

Heating hot water is provided with a a 800,000 BTU/Hr Smith hot water boiler located in the basement. The boiler was converted from steam to hot water during the 1997 restoration. Hot water is circulated via two B&G circulation pumps. The boiler is approximately sixteen (16)

years old. Approximate efficiency of the boiler is 70%, which is below industry average for an application of this type.

Building perimeter heat is provided via hot water baseboard heaters. Hot water radiators along each office are equipped with 2 way valves, which are controlled via non programmable thermostats.

Modine horizontal hot water unit heaters are installed in the basement and third floor ceiling to provide heating in these areas in colder months.

HVAC System Controls

The Air Handling Units within the facility are controlled via Honeywell Temperature controllers with Honeywell T7300 programmable thermostats. The thermostat is interlocked with a Honeywell T775 temperature controller mounted next to each AHU to control the HVAC system for each zone. When the programmable thermostat switch to occupied mode, the AHU and the condensing unit are energized along with the motorized outside air dampers and a corresponding exhaust fan in the same zone. The T775 Temperature Controller also controls the 3-way hot water valve to preheat the supply air temperature in the heating season if the thermostat calls for heat.

The boiler in the facility is controlled via a Honeywell T775 controller. It appears to have a reset control based on outside air temperature. However, since the boiler is not a condensing type boiler, the reset temperature range is limited. The boiler does not appear to have a night set back. The hot water baseboard heaters in the facility are equipped with 3-way hot water valves which are controlled via built in thermostats or Honeywell T87 thermostats located remotely on an adjacent wall. The unit heaters in the facility are equipped with hot water zone valves connected to Honeywell T87 thermostats. When a thermostat makes contact, the corresponding unit heater fan turns on and the zone valve allows hot water through the unit. Neither thermostats in the offices nor the thermostats for the unit heaters in the storage rooms are equipped with night setback functionality.

Exhaust System

There are a total of six (6) exhaust fans in this facility. Air is exhausted from several office plenum locations and toilet rooms through the roof exhausters or side wall louvers. All six exhaust fans are interlocked with air handling unit operation.

Domestic Hot Water

Domestic hot water for the restrooms and office lounge is provided by a 40 gallon Bradford White electric hot water heater with a capacity of 4500 Watts. The domestic hot water is piped throughout the building without a circulation pump.

Lighting

Typical office lighting throughout building is efficient fluorescent tube lay-in fixtures with T-8 lamps and electronic ballasts. Compact florescent light fixtures are used in the corridors, courtroom, conference room and several other office spaces as the main source of lighting. Third floor main space is lit via pendant fluorescent fixtures with T-12 lamps and magnetic ballasts. Elevator area in the third floor is lit with incandescent lamps.

Refer to the **Lighting Equipment List Appendix** for the details about this facility.

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: HVAC Scheduling Adjustments

Description:

Typical office hours for the Borough of Franklin Town Hall are between 8:00 AM to 4:00 PM Monday through Friday. Municipal court room and the conference room in the building are open on several weekdays at night between 7:00 PM and 10:00 PM. There is no weekend operation.

It is observed that the typical HVAC schedules for the offices are set between 6:00 AM and 5 PM through Honeywell T7300 thermostats. It is normal to start HVAC equipment 1 or 2 hours before the occupancy to warm-up or cool-down the building before occupancy starts. However, the thermostats at the Franklin Borough Hall are equipped with a feature called “intelligent recovery”. This feature is used when the thermostat switches from unoccupied mode to occupied mode. This feature starts the building at the optimum time to begin building warm-up or cool-down, and can vary depending on space temperature deviation from set-point. (*For more information see Honeywell T7300 Thermostat Manual*). In other words, the thermostats at this facility start the HVAC equipment even before 6:00 AM to reach target set-point at 6:00 AM. This results in extra operation of the HVAC units at unoccupied times and waste of energy.

CEG recommends setting thermostats to switch to occupied mode at 7:30 AM to unoccupied at 4:30 PM. Intelligent recovery feature will start the building a few hours early based on building load and the weather to have reached the set-points at 7:30 AM.

The end result of “Intelligent Recovery” is the correct temperature at the occupancy time without running extra hours. This increases energy savings while also providing increased user convenience.

The recommended thermostat set points for heating/cooling in the office spaces are as follows:

Occupied Heating =	70° F
Unoccupied Heating =	65° F
Occupied Cooling =	75° F
Unoccupied Cooling =	80° F

If the intelligent recovery function is not setup properly or cannot be setup for any reason, CEG recommends replacing the thermostats with new Honeywell T7350 (or similar) programmable thermostats. T7350 has additional features such as 365 day schedules (built-in holiday schedules), optional centralized controls via a computer through Honeywell RapidLink™ or Excel 15B interface devices.

Energy Savings Calculations:

Current HVAC hours: 6 AM – 5 PM. Total 11 Hours per day.

Annual electricity consumption used for HVAC: 60% (Assumed based on industry average)

Annual natural gas consumption used for HVAC: 100%
 Average HVAC time savings per work day: 1.5 Hours

Total Number of Work Weeks: 50
 Total Number of HVAC Hours: 2750
 Total Number of HVAC Hour savings: 375

$$\text{Electric Energy Savings} = 60\% \times 109,560 \text{ kWh} \times \frac{375}{2750} = 8,964 \text{ kWh}$$

$$\text{Electric Utility Cost Savings} = 8964 \text{ kWh} \times \$0.169 = \$1,515 \text{ (8\%)}$$

$$\text{Natural Gas Energy Savings} = 100\% \times 7,503 \text{ Therms} \times \frac{375}{2750} = 1023 \text{ Therms}$$

$$\text{Natural Gas Utility Cost Savings} = 1023 \text{ Therms} \times \$1.304 = \$1,334 \text{ (14\%)}$$

$$\text{Total Savings} = \$1,515 + \$1,334 = \$2,849$$

Cost of this ECM is approximately 4 hours labor at \$100/Hour rate.

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$400
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$400
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,849
Total Yearly Savings (\$/Yr):	\$2,849
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.1
Simple Lifetime ROI	10584.9%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$42,740
Internal Rate of Return (IRR)	712%
Net Present Value (NPV)	\$33,614.98

ECM #2: Control Upgrades for Hot Water Equipment

Description:

Throughout the building there are standard, manual wall thermostats for perimeter hot water baseboard heaters in the offices and unit heaters in the basement and the third floor storage area. These aged, indoor temperature controls are generally inaccurate due to temperature drift, age, and not having been re-calibrated. These units also do not have unoccupied setback features.

New programmable thermostats are available that utilize programming schedules for occupied and unoccupied times and can be set to vary space temperature at these respective times. In addition, the programmable thermostats can be used in conjunction with a motion sensor. When the space is not occupied the equipment can operate at the unoccupied set point. Once the space becomes occupied the motion sensor sends a signal to the thermostat to raise the temperature of the space to the occupied set point. This control system approach is ideal for facilities with low occupancy levels.

This energy conservation measure would replace the various HVAC unit thermostats with programmable 7-day thermostats with night time setback control. The recommended thermostat set points for heating in the offices are as follows:

Occupied Heating =	70° F
Unoccupied Heating =	65° F

The recommended thermostat set points for heating in the basement and third floor storage areas are as follows:

Occupied Heating =	65° F
Unoccupied Heating =	60° F

CEG recommends replacement of approximately twenty (20) existing thermostats that control the six (6) unit heaters in the building and the hot water baseboard heaters in the offices with Honeywell RTH7500D 7-day programmable thermostats or equivalent.

Energy Savings Calculations:

The energy savings of a 7-day programmable thermostat was calculated by using Energy Star Life Cycle Cost Estimate software for qualified programmable thermostats. The referenced calculator can be found at www.energystar.gov. Refer to Appendix G for the detailed calculation.

Calculated energy savings for heating = \$106.5/Unit x 20 units = \$2,130
Calculated energy savings for cooling = None

Cost of a 7-day programmable thermostat (installed) = \$180/unit x 20 units = \$3,600

Simple Payback = $\$3,600/\$2,130 = 1.7$ Years

A detailed energy savings calculation can be found in Appendix G that outlines the savings from the use of programmable thermostats.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$3,600
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$3,600
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,120
Total Yearly Savings (\$/Yr):	\$2,120
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.7
Simple Lifetime ROI	783.3%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$31,800
Internal Rate of Return (IRR)	59%
Net Present Value (NPV)	\$21,708.42

ECM #3: Lighting Upgrades

Description:

Most of the lights fixtures in this facility are mostly updated fluorescent fixtures. There are only a small number of light fixtures that may be replaced:

- The elevator car light bulbs are 50W halogen bulbs that can be replaced with equivalent R20 CFL (Compact Fluorescent Light) bulbs.
- There are 9 incandescent light bulbs in the 3rd floor that can be replaced with CFL bulbs.
- Rest of the third floor is lit by 4-foot pendant fixtures containing T12 fluorescent lamps and magnetic ballasts.

This ECM includes replacement of the existing incandescent light bulbs with CFLs and also 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.

It must be noted that the third floor is essentially a storage area. Therefore, energy savings significantly depend on how frequently this area is used and how often the lights are left on.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the proposed retrofits, replacement 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.

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

$$\text{Smart Start}^{\circledast} \text{ Incentive} = (9 \times \$25) = \underline{\$225}$$

Replacement and Maintenance Savings are calculated as follows:

$$\text{Maintenance Savings} = (\# \text{ of lamps} \times \% \text{ reduction} \times \$ \text{ per lamp}) + \text{Installation Labor}$$

$$\text{Maintenance Savings} = (9 \times 33\% \text{ reduction} \times \$2.00) + (\$50 \text{ labor}) = \sim \underline{\$55}$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$1,023
NJ Smart Start Equipment Incentive (\$):	\$225
Net Installation Cost (\$):	\$798
Maintenance Savings (\$/Yr):	\$55
Energy Savings (\$/Yr):	\$551
Total Yearly Savings (\$/Yr):	\$606
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.3
Simple Lifetime ROI	936.5%
Simple Lifetime Maintenance Savings	\$825
Simple Lifetime Savings	\$8,268
Internal Rate of Return (IRR)	76%
Net Present Value (NPV)	\$6,439.40

ECM #4: Boiler Replacement

Description:

Heating is provided to the facility by an older, standard sectional hot water boiler. The boiler was originally setup as a steam boiler and converted to hot water during 1997 restoration. The 800 MBh Smith boiler has an estimated combustion efficiency of 70% for heating, when new. The HB Smith boiler is approximately 16 years old, although this unit has not surpassed its expected useful service life of thirty-five (35) years substantial energy savings will be realized through the replacement.

This energy conservation measure will replace the gas fired boiler serving the facility. Calculation is based on the following equipment: Aerco, Modulex MLX-606h condensing boiler or equivalent. The existing unit will be replaced with high energy efficient unit with capacity typical of the existing unit.

Energy Savings Calculations:

Existing 800 MBh Gas Fired Boiler:

Rated Capacity = 800 MBh Input, 560 MBh Output (Natural Gas)

Combustion Efficiency = 70%

Age & Radiation Losses = 5%

Thermal Efficiency = 65%

Replacement Gas Fired Boiler:

High-Efficiency Gas Fired Boiler

Rated Capacity = 606 MBh Input, 558 MBh Output (Natural Gas)

Combustion Efficiency = 92%

Radiation Losses = 0.5%

Thermal Efficiency = 91.5%

Operating Data:

Heating Season Fuel Consumption = 7,502 Therms of natural (based on natural gas billing data of the facility).

Heating Energy Savings = Fuel Consumption x (New Efficiency – Old Efficiency)

Heating Energy Savings = 7,502 Therms x ((91.5% - 65%) / (91.5%)) = 2173 Therms

Heating Cost savings

Heating Energy Cost Savings = Annual Energy Savings x \$/Therm

Heating Energy Cost Savings = 2173 Therms x \$1.30/Therm = \$2,825/ yr.

Installed cost of a new gas fired boiler is \$29,000.

Equipment Incentives:

Heating Smart Start Equipment Incentive = (\$1.75/MBh) = (606 MBh) x \$1.75 = \$1,061

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$29,000
NJ Smart Start Equipment Incentive (\$):	\$1,061
Net Installation Cost (\$):	\$27,940
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,825
Total Yearly Savings (\$/Yr):	\$2,825
Estimated ECM Lifetime (Yr):	15
Simple Payback	9.9
Simple Lifetime ROI	51.6%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	\$42,368
Internal Rate of Return (IRR)	6%
Net Present Value (NPV)	\$5,779.48

ECM #5: Condensing Units Replacement

Description:

Direct expansion cooling is provided to the air handlers by older York split condensing units. Six (6) of the existing condensing units are inefficient with an estimated seasonal energy efficiency ratio (SEER) of 10. The NJ State Energy Code (ASHRAE 90.1-2004) mandates a minimum energy efficiency of 12.0 SEER for units of this type. The existing split system unit is aged and is approaching its service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. The estimated service life for a condensing unit is twenty (20) years.

This energy conservation measure will replace the six (6) condensing units on the roof. Calculation is based on generic high efficiency condensing units. The existing units will be replaced with high energy efficient, units with capacities typical of the existing units and same refrigerant (R22).

It must be noted that manufacturing of the refrigerant gas R-22 is being phased out gradually. After 2010, HVAC manufacturers will continue to produce condensers and heat pumps using R22 only from pre-existing R22 supplies. The availability of R22 gas will decline over the next years and R22 equipment will be more expensive to maintain. Converting the split systems in this facility into the alternative R410 systems requires replacement of the condensing units, replacement of evaporator coils in the air handling units, refrigerant pipes, fittings and modifications of ductwork.

Cooling Energy Savings Calculations:

Below calculations are performed per 1.0 Refrigerant Ton (RT). Results are multiplied to get actual savings per each unit and capacity.

Existing Air Conditioning Units

Per 1 Refrigerant Ton (RT)

Condensing Unit Efficiency = 9 SEER

Cooling Season Hours of Operation = 1,500 hrs/yr.

Average Cost of Electricity = \$0.169/kWh

Proposed High-Efficiency Air Conditioning Unit

New Condensing Unit Efficiency = 15.0 SEER

$$\text{Energy Savings} = \frac{1 \text{ RT} \times 12,000 \frac{\text{BTU}}{\text{RT}}}{1000 \frac{\text{W}}{\text{kW}}} \times \left[\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}} \right] \times \text{Avg Load} \times \text{Hours}$$

$$\text{Energy Savings} = \frac{1 \text{ RT} \times 12,000 \frac{\text{BTU}}{\text{RT}}}{1000 \frac{\text{W}}{\text{kW}}} \times \left[\frac{1}{10 \text{ SEER}} - \frac{1}{15 \text{ SEER}} \right] \times 0.80 \times 1800 \text{ Hours}$$

$$\text{Energy Savings} = \frac{640 \text{ kWh}}{\text{Year} \times \text{RT}}$$

$$\text{Utility Cost Savings} = \frac{640 \text{ kWh}}{\text{Year} \times \text{RT}} \times \frac{\$0.169}{\text{kWh}} = \frac{\$108}{\text{Year} \times \text{RT}}$$

Below table summarizes above savings calculations.

Unit	Tonnage	Energy Savings kWh	Utility Cost Savings per Year	Installed Cost	Simple Payback
CU-2	2	1280	\$216	\$2,882	13.3
CU-3	4	2560	\$433	\$4,230	9.8
CU-4	4	2560	\$433	\$4,230	9.8
CU-5	4	2560	\$433	\$4,230	9.8
CU-6	3.5	2240	\$379	\$3,790	10.0
CU-7A	4	2560	\$433	\$4,230	9.8
Total	21.5	13760	\$2,325	\$23,590	10.1

Equipment Incentives:

Smart Start Equipment Incentive = (\$92/Ton) = (21.5 Tons x \$92) = \$1,978

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$25,734
NJ Smart Start Equipment Incentive (\$):	\$1,978
Net Installation Cost (\$):	\$23,756
Maintenance Savings (\$/Yr):	\$0
Energy Savings (\$/Yr):	\$2,325
Total Yearly Savings (\$/Yr):	\$2,325
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.2
Simple Lifetime ROI	46.8%
Simple Lifetime Maintenance Savings	\$0
Simple Lifetime Savings	\$34,882
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	\$4,004.95

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy measures (REM) for the municipality utilizing renewable technologies and concluded that there is potential for solar energy generation. The solar photovoltaic system calculation summary will be concluded as **REM#1** within this report.

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

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 1500 S.F. can be utilized for a PV system. A depiction of the area utilized is shown in **Renewable / Distributed Energy Measures Calculation Appendix**. Using this square footage it was determined that a system size of 21.2 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 22587 KWh annually, reducing the overall utility bill by approximately 20.6% percent. A detailed financial analysis can be found in the **Renewable / Distributed Energy Measures Calculation Appendix**. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

The proposed photovoltaic array layout is designed based on the specifications for the Sun Power SPR-230 panel. This panel has a "DC" rated full load output of 230 watts, and has a total panel conversion efficiency of 18%. Although panels rated at higher wattages are available through Sun Power and other various manufacturers, in general most manufacturers who produce commercially available solar panels produce a similar panel in the 200 to 250 watt range. This provides more manufacturer options to the public entity if they wish to pursue the proposed solar recommendation without losing significant system capacity.

The array system capacity was sized on available roof space on the existing facility. Estimated solar array generation was then calculated based on the National Renewable Energy Laboratory

PVWatts Version 1.0 Calculator. In order to calculate the array generation an appropriate location with solar data on file must be selected. In addition the system DC rated kilowatt (kW) capacity must be inputted, a DC to AC de-rate factor, panel tilt angle, and array azimuth angle. The DC to AC de-rate factor is based on the panel nameplate DC rating, inverter and transformer efficiencies (95%), mismatch factor (98%), diodes and connections (100%), dc and ac wiring (98%, 99%), soiling, (95%), system availability (95%), shading (if applicable), and age (new/100%). The overall DC to AC de-rate factor has been calculated at an overall rating of 81%. The PVWatts Calculator program then calculates estimated system generation based on average monthly solar irradiance and user provided inputs. The monthly energy generation and offset electric costs from the PVWatts calculator is shown in the **Renewable/Distributed Energy Measures Calculation Appendix**.

The proposed solar array is qualified by the New Jersey Board of Public Utilities Net Metering Guidelines as a Class I Renewable Energy Source. These guidelines allow onsite customer generation using renewable energy sources such as solar and wind with a capacity of 2 megawatts (MW) or less. This limits a customer system design capacity to being a net user and not a net generator of electricity on an annual basis. Although these guidelines state that if a customer does not generate (produce more electricity than they use), the customer will be credited those kilowatt-hours generated to be carried over for future usage on a month to month basis. Then, on an annual basis if the customer is a net generator the customer will then be compensated by the utility the average annual PJM Grid LMP price per kilowatt-hour for the over generation. Due to the aforementioned legislation, the customer is at limited risk if they generate more than they use at times throughout the year. With the inefficiency of today's energy storage systems, such as batteries, the added cost of storage systems is not warranted and was not considered in the proposed design.

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

Table 7
Financial Summary – Photovoltaic System

FINANCIAL SUMMARY – PHOTOVOLTAIC SYSTEM		
PAYMENT TYPE	SIMPLE PAYBACK	INTERNAL RATE OF RETURN
Self-Finance	16.25 Years	-3.2%
Direct Purchase	16.25 Years	4.3%

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

The results indicate that if the Owner was able to direct purchase the solar project, the project would yield a positive internal rate of return to the owner. In addition, in lieu of direct purchase, the owner could investigate alternative financing via a third party. By utilizing a Power Purchase Agreement with a third-party and an agreed upon base energy rate for kilowatt hour production, the owner could realize a more 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 shape throughout the year. This is not unusual based on the operation of the facility. The facility has typical hours of operation between 8:00 A.M. and 4:00 P.M. Monday through Friday. The building is closed on the weekends. The courthouse does have nightly meetings roughly from 7:00 to 11:00 P.M. on Tuesdays, based on the townships schedule. Court sessions are held two nights per week. In addition, town meetings are held two nights per week. This steady use of the facility has contributed to the steady load profile, especially in the summer. Summer, steady elevated load profiles (May –September) are also the result of cooling (air conditioning) loads. Air conditioning in this facility is provided by (7) seven, air handling units. There are also (8) eight, York condensing units on the roof. The capacities range from 2 to 4 tons. There is a total of 29 tons of cooling capacity in this facility. Also contributing to the steady electric load profile is the presence of a 40 gallon Bradford White electric hot water heater. This hot water heater supplies domestic hot water to the restrooms and lounge. Currently electric supply and delivery is supplied by JCP&L (Jersey Central Power and Light) on a GSS – 3 phase rate schedule. A flatter load profile of this type, will allow for more competitive energy prices when shopping for alternative energy suppliers.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical heating load profile. An increase in consumption is observed October through April during the standard heating season. Heating for this facility is supplied by a Smith hot water boiler located in the basement. Hot water is circulated by two B&G circulation pumps. The buildings perimeter heat is supplied by hot-water baseboard heaters. Modine horizontal hot water unit heaters are installed in the basement and third floor ceiling to provide heating in these areas in the colder months.

Natural gas Delivery-Service is provided by Elizabethtown Gas Company. Commodity Service is provided by a Third Party Supplier (TPS), Metromedia Energy. The weighted average cost per unit of the Metromedia Energy natural gas Commodity Service (price to compare), is \$13.04 / Dth (unit of measure). Please see recommendations for natural gas under the recommendations section. This consistent load profile is beneficial when looking at supply options with other Third Party Suppliers.

Tariff Analysis:

Electricity:

This facility receives electrical service through Jersey Central Power & Light (JCP&L) on a GSS (General Service Secondary – 3 Phase) rate. Service classification GSS is available for general service purposes on secondary voltages not included under Service Classifications RS, RT, RGT or GST. This facility's rate is a three phase service at secondary voltages. For electric supply (commodity), the customer uses the service of JCP&L. This facility uses the Delivery Service of the utility (JCP&L). The Delivery Service includes the following charges: Customer Charge, Supplemental Customer Charge, Distribution Charge (kW Demand), kWh Charge, Non-utility Generation Charge, TEFA, SBC, SCC, Standby Fee and RGGI. The Generation Service is provided by JCP&L under BGS (Basic Generation Service). BGS Energy and Reconciliation Charges are provided in Rider BGS-FP (fixed pricing) or BGS-CIEP (Commercial Industrial Energy Pricing). BGS also has a Transmission Charge.

Natural Gas:

This facility receives utility Delivery Service through Elizabethtown Gas Company (E'town). This facility receives natural gas Delivery Service on the GDS (General Delivery Service) rate schedule. This facility utilizes the Delivery Service from E'town while receiving Commodity service from a Third Party Supplier (TPS), Metromedia Energy.

The GDS rate schedule is applicable for General Delivery Service where Gas Company's facilities are suitable and the quantity of gas is available for the service desired. This is for continuous gas service, however customers may either purchase from a Third Party Supplier or from the utility Company's Rider "A", Basic Gas Supply Service (BGSS). The charges for this rate schedule are as follows: Service Charge, Demand Charge, Distribution Charge and Commodity Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS). Note: Should the TPS not deliver, the customer may receive service from Elizabethtown Gas Company under Standby Service, if the customer has made these arrangements.

Commodity Charges: Customer may choose to receive gas supply from either: A TPS or Elizabethtown Gas Company. This facility utilizes the services of a Third Party Supplier, Metromedia Energy.

Please see CEG recommendations below.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities. Potential savings can be seen equally in the electric costs and the natural gas costs. The average price per kWh (kilowatt hour) for The Town Hall is based on a historical 1-year weighted average fixed price from the utility JCP&L is \$.1410 / kWh (this is the fixed "price to compare" when shopping for energy procurement alternatives). The fixed weighted average price per decatherm for natural gas service in this facility, provided by Metromedia Energy (TPS) is \$ 13.04 / dth (dth, is the common unit of measure). The natural gas price is also the "price to compare".

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

Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. Franklin Borough could see improvement in its energy costs if it were to take advantage of these current market prices quickly, before energy prices increase. Based on electric supply from JCP&L and utilizing the historical consumption data provided (September 2008 through August 2009) and current electric rates, The Borough could see an improvement in its electric costs of up to 24 % annually. (Note: Savings were calculated using Average Annual Consumption and a variance to a Fixed Average One-Year commodity contract). CEG recommends aggregating the entire electric load to gain the most optimal energy costs. CEG recommends advisement for alternative sourcing and supply of energy on a “managed approach”.

CEG’s second recommendation coincides with the natural gas costs. CEG feels that the Town Hall could see an improvement of up to 31 % in its natural gas costs when compared to current market rates. The Borough procures its natural gas from Third Party Supplier (TPS) Metromedia Energy. CEG recommends the school receive further advisement on these prices through an energy advisor. They should also consider procuring energy (natural gas) through other alternative supply sources.

CEG also recommends scheduling a meeting with the current utility providers to review their utility charges and current tariff structures for electricity and natural gas. This meeting would provide insight regarding alternative procurement options that are currently available. Through its meeting with the Local Distribution Company (LDC), the municipality can learn more about the competitive supply process. The Borough can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu. They should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the information for ongoing demand-side management projects. Furthermore, special attention should be given to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with the utility representative. Franklin Borough should ask the utility representative about alternative billing options, such as consolidated billing when utilizing the service of a Third Party Supplier. Finally, if the supplier for energy (natural gas) is changed, closely monitor balancing, particularly when the contract is close to termination. This could be performed with the aid of an “energy advisor”.

X. INSTALLATION FUNDING OPTIONS

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

- i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. The “Energy Savings Improvement Program (ESIP)” law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.
- ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.
- iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as “power purchase agreements.” These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party’s work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

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 frequent air filter changes to decrease overall system power usage and maintain better IAQ.
- E. Confirm that outside air dampers on the air handling units are functioning properly.
- F. Periodically check boiler combustion air damper operation and ensure it is not stuck open or closed at any time.
- G. Organize employee energy awareness campaign in order to promote energy efficiency in the office