ENERGY AUDIT – FINAL REPORT

BRANCHBURG TOWNSHIP
MUNICIPAL BLDG.

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CEG PROJECT NO. 9C09060

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I. EXECUTIVE SUMMARY

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

Branchburg Township
Town Hall Municipal Building
1077 US Highway 202 North
Branchburg, NJ 08876

Municipal Contact Person: John Gregory
Facility Contact Person: Tom Mantz

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	$ 78,988
Natural Gas	$ 3,425
Total	$ 82,414

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
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST[A]	ANNUAL SAVINGS[B]	SIMPLE PAYBACK (YEARS)	SIMPLE ROI
1	Lighting Upgrade – General	$19,499	$4,068	4.8	20.9%
2	Lighting Controls	$2,908	$1,244	2.3	42.8%
3	HVAC Rooftop Unit Replacement	$34,520	$1,337	25.7	3.9%
4	HVAC System Controls	$57,176	$11,911	4.8	20.8%
5	Solar PV – Direct Purchase	$238,050	$21,175	11.24	8.9%

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

ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELEC. DEMAND (KW)	ELEC. CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Lighting Upgrade – General	11.48	24,354	-
2	Lighting Controls	-	7,631	-
3	HVAC Rooftop Unit Replacement	8.38	6,703	163.5
4	HVAC DDC System	3.6	133,047	(-3725)
5	Solar Photovoltaic Panel Upgrade	26.45	41,276	-

*Elec. Demand Savings are calculated for cooling season only. Elec. consumption savings are totaled annually.

Concord Engineering Group (CEG) recommends proceeding with the implementation of all ECM's that provide a calculated simple payback at or under seven (7) years. The following Energy Conservation Measures are recommended for the facility:

- **ECM #1:** Lighting Upgrade
- **ECM #2:** Lighting Controls
- **ECM #4:** HVAC System Controls

Although ECM #3 does not provide a payback less than 7 years, it is recommended to proceed with the installation of an efficient rooftop unit as suggested in ECM #3 (or equal) for the courtroom, since the existing rooftop unit is past its expected lifespan.

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

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

II. INTRODUCTION

The comprehensive energy audit covers the 14,294 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/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 SmartStart 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 costs and savings are applied and a simple payback and simple return on investment (ROI) is calculated. The simple payback is based on the years that it takes for the savings to pay back the net installation cost (Net Installation divided by Net Savings.) A simple return on investment is calculated as the percentage of the net installation cost that is saved in one year (Net Savings divided by Net Installation.)

A simple life-time calculation is shown for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The energy savings is extrapolated throughout the life-time of the ECM. The total energy savings is calculated as the total life-time multiplied by the yearly savings.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

The electric usage profile (below) 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. Public Service Electric and Gas (PSE&G) provides natural gas to the facility under the Basic General Supply Service (GSGH) rate structure. 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 provide, the average cost for utilities at this facility is as follows:

Description	Average
Electricity	16.3¢ / kWh
Natural Gas	$1.49 / Therm

Table 3
Electricity Billing Data

Utility Provider: JCP&L, General Service Secondary 3 Phase (Meter # G16675287)			
MONTH OF USE	**CONSUMPTION KWH**	**DEMAND**	**TOTAL BILL**
May-08	43,360	97.6	$7,051
Jun-08	57,200	128.2	$10,048
Jul-08	65,840	128.2	$11,432
Aug-08	37,040	122.2	$6,757
Sep-08	30,720	99.5	$4,816
Oct-08	28,960	72.7	$4,418
Nov-08	35,200	73.8	$5,327
Dec-08	39,920	79.1	$6,272
Jan-09	41,120	82.6	$6,506
Feb-09	36,880	77.6	$5,834
Mar-09	27,280	66.7	$4,294
Apr-09	40,400	80.8	$6,233
Totals	**483,920**	**128.2 Max**	**$78,988**
AVERAGE DEMAND 92.4 KW average			
AVERAGE RATE $0.163 $/kWh			

Figure 1
Electricity Usage Profile

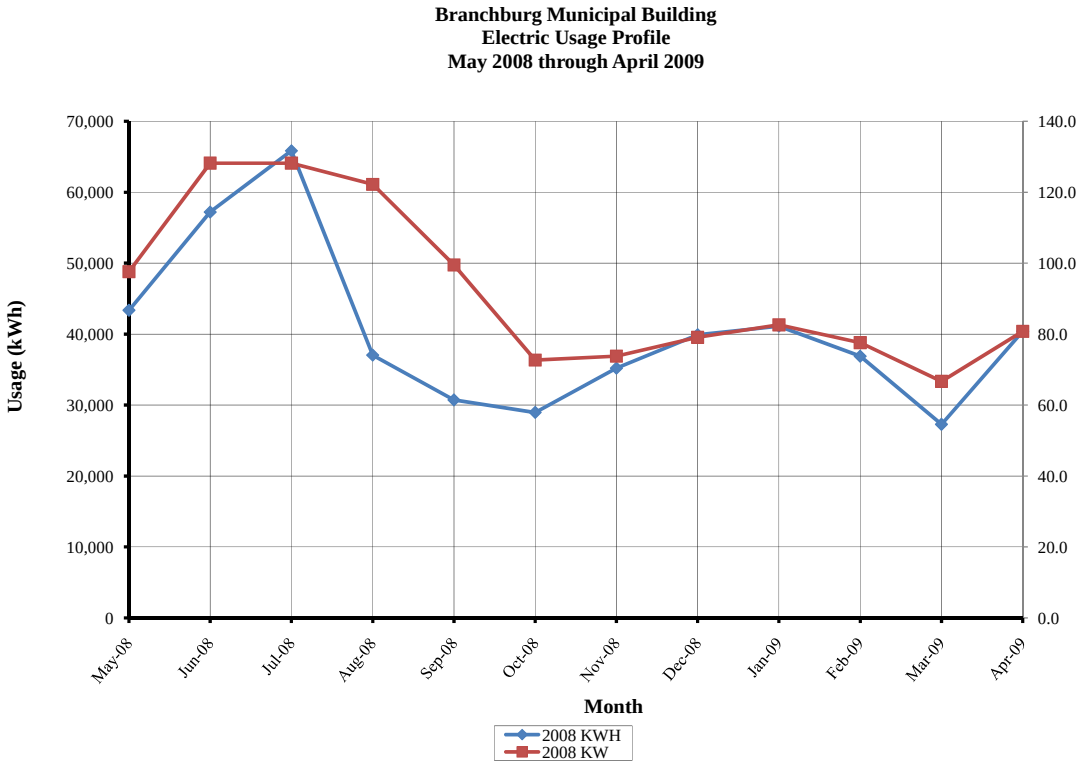
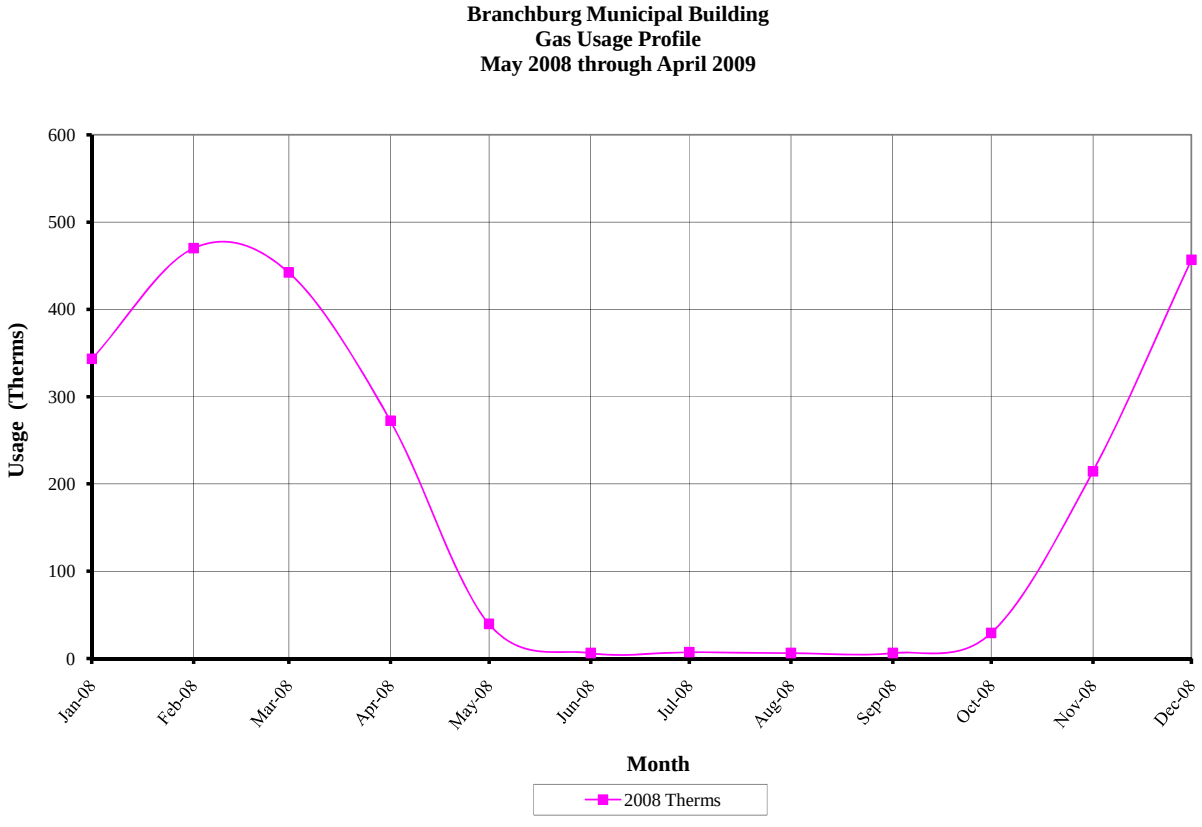


Table 4
Natural Gas Billing Data

Utility Provider: PSE&G, Rate - GSGH, (Meter # 2303806)		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Jan-08	343.27	$484.60
Feb-08	470.10	$684.24
Mar-08	442.39	$692.65
Apr-08	272.32	$426.71
May-08	39.61	$76.42
Jun-08	6.25	$21.06
Jul-08	7.31	$23.79
Aug-08	6.29	$20.30
Sep-08	6.29	$19.07
Oct-08	29.27	$49.71
Nov-08	214.51	$301.23
Dec-08	456.84	$625.55
TOTALS	**2294.45**	**$3,425.33**
AVERAGE RATE:	**$1.49**	**$/THERM**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

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

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

The site and source EUI for this facility is calculated as follows. (See Table 5 for details):

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

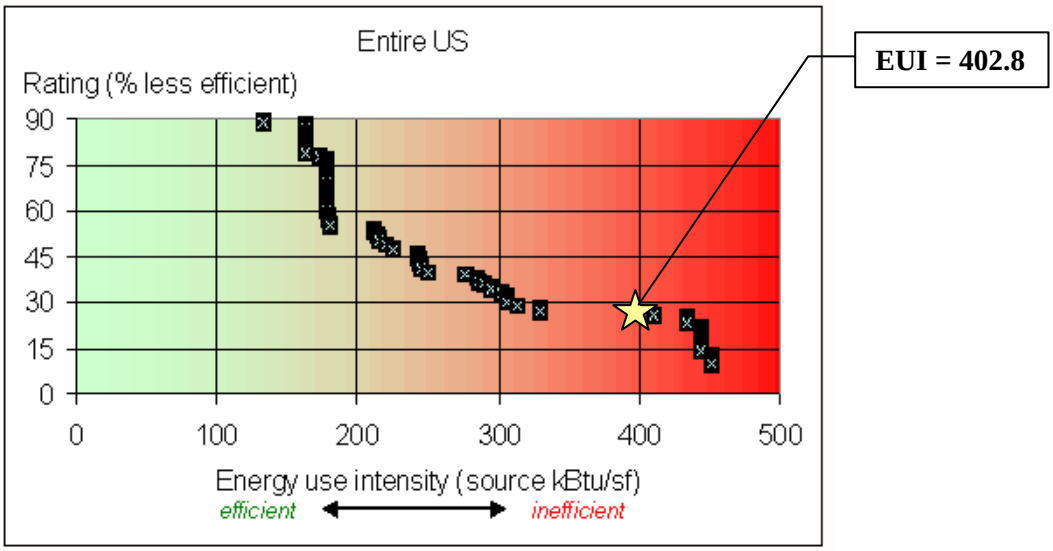
$$Building\ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ X\ SS\ Ratio + Gas\ Usage\ in\ kBtu\ X\ SS\ Ratio)}{Building\ Square\ Footage}$$

Table 5
Branchburg Municipal Building EUI Calculations

ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu	RATIO	kBtu
ELECTRIC	483,920			1,652,103	3.340	5,518,024
NATURAL GAS		2,294.45		229,445	1.047	240,229
FUEL OIL			0.00	0	1.010	0
PROPANE			0.00	0	1.010	0
TOTAL				1,881,548		5,758,252
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		14,294		SQUARE FEET		
BUILDING SITE EUI		131.63		kBtu/SF/YR		
BUILDING SOURCE EUI		**402.84**		**kBtu/SF/YR**		

Table 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 following is the user name and password for this account:

User Name:	branchburg
Password:	lgeaceg2009
Security Question:	What city were you born in?
Security Answer:	"branchburg"

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

FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Municipal Bldg	2	50

See the Statement of Energy Performance appendix for the detailed energy summary.

V. FACILITY DESCRIPTION

The 14,294 SF Municipal Building is a two story facility comprised of a courthouse and entry waiting area on the ground floor, and administration offices on the ground and basement floors. The typical hours of operation for this facility are between 8:00 am and 4:30 pm. The courthouse has night meetings roughly from 7:00 pm to 10:00 pm based on the townships schedule. Exterior walls are brick construction with minimum insulation typical of the time period. The amount of insulation within the wall is unknown. The windows throughout the facility are in good condition and appear to be maintained. Typical windows throughout the facility are double pane, ¼" clear glass with vinyl frames. Blinds are utilized through the facility per occupant comfort. The blinds are valuable because they help to reduce heat loss in the winter and reduce solar heat in the summer. The majority of the roof is standing seam metal roof system. A small portion of the roof is constructed of a built-up roof with light color stone covering, where all rooftop HVAC equipment is located. The amount of insulation below the roofing is unknown. The building was built in 1990 with no additions since the original construction.

HVAC Systems

The office administration area is conditioned by a central VAV rooftop unit made by York. The packaged rooftop unit includes a gas heat exchanger to pre-heat the primary supply air. Cooling is achieved with multiple scroll compressors for part load staging. The system includes terminal variable air volume (VAV) boxes with electric re-heat for office zoning. Local thermostats control each VAV box's airflow to regulate space temperature. VAV box re-heat is activated in the heating season where additional heating is required. Conditioned air is distributed to the courthouse through ductwork to ceiling and sidewall diffusers. Unit heaters are installed above the ceiling to assist the rooftop unit in the heating season by heating the plenum air returning to the central unit.

The central rooftop unit was recently replaced and in good condition, however the gas heat portion of the unit is not operation due to controls issues and communication between the rooftop unit and VAV boxes. The gas feed has been manually isolated to prevent malfunction. Many of the VAV boxes have been retrofitted with new damper actuators and control boards. The upgraded VAV box controls are not communicating with the rooftop unit preventing the operation of the gas burner. As a result the VAV box re-heat coils are the sole source of heat for the majority of the building. Some of the existing VAV boxes do not respond to local thermostat control resulting in hot / cool areas throughout the offices. Un-balanced duct distribution systems were observed further reducing controllability of zones serving multiple rooms.

The courthouse is conditioned by a packaged single zone constant volume rooftop unit made by McQuay. The rooftop unit includes a gas heat exchanger for heat. Cooling is achieved with multiple scroll compressors for part load staging. Conditioned air is distributed to the courthouse through ductwork and linear diffusers. A single thermostat controls the unit operation. The courthouse rooftop unit is old and in poor condition. The unit is not capable of maintaining temperature when the space is fully occupied.

The entrance area and conference room is conditioned by a packaged single zone constant volume rooftop unit made by Trane. The rooftop unit includes a gas heat exchanger for heat. Cooling is achieved with multiple scroll compressors for part load staging. Conditioned air is distributed to the space through ductwork and ceiling diffusers. A single thermostat controls the unit operation located in the conference room. The entrance / conference room rooftop unit is good condition.

The computer room is conditioned by a cooling only ductless split system made by Goodman. The computer room unit runs 24/7 to cool the municipal building servers. The unit is in good condition

The elevator machine room is conditioned by a cooling only ductless split system made by Mr. Slim. The unit is intended to provide cooling for the elevator hydraulic pump equipment as needed when the room gets too warm. The unit is not operational due to refrigerant leaks and old age of the system. Due to infrequent use of the elevator the machine room has not had problems overheating.

Entrance doorways are heated via electric cabinet heaters.

Exhaust System

Air is exhausted from the toilet rooms through the roof exhausters. Subsoil exhaust system is utilized to purge the ground below the basement slab for radon evacuation. The subsoil exhaust system runs 24/7. The toilet room exhaust fan is operated based on the facility occupancy schedule.

Domestic Hot Water

Domestic hot water for the restrooms and office lounge is provided by a 12 gallon Bradford White electric hot water heater, capacity of 3000 Watts. The domestic hot water is circulated throughout the building by a hot water re-circ pump. The circulation pump is controlled by an aqua stat. The domestic hot water piping insulation appeared to be in good condition.

Lighting

Typical lighting throughout building is fluorescent tube lay-in fixtures with T-12 lamps and magnetic ballasts. Storage rooms and closets lit with a mixture of incandescent lamps and compact fluorescent lamps. The parking lot is lit with light poles and high pressure sodium lamps.

VI. MAJOR EQUIPMENT LIST

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

Refer to the Major Equipment List Appendix for this facility.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrade – General

Description:

The lighting in the municipal building is primarily made up of fluorescent fixtures with T-12 lamps and magnetic ballasts. There are a few storage rooms and closets with incandescent lighting and compact fluorescent fixtures.

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) = $10 per fixture; T-5 or T-8 (3-4 lamp) = $20 per fixture.

$$\text{Smart Start®}\ Incentive = (\#\ of\ 1-2\ lamp\ \ fixtures \times\ \$10) + (\#\ of\ 3-4\ lamp\ \ fixtures \times\ \$20)$$

$$\text{Smart Start®}\ Incentive = (124 \times\ \$10) + (62 \times\ \$20) = \underline{\$2{,}480}$$

Replacement and Maintenance Savings are calculated as follows:

$$Savings = (reduction\ in\ lamps\ replaced\ \ per\ \ year) \times (repacment\ \$\ per\ lamp + Labor\ \$\ per\ lamp)$$

$$Savings = (14\ lamps\ \ per\ \ year) \times (\$2.00 + \$5.00) = \underline{\$98}$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$21,979
NJ Smart Start Equipment Incentive ($):	($2,480)
Net Installation Cost ($):	$19,499
Maintenance Savings ($ / yr):	*$98*
Energy Savings ($ / yr):	*$3970*
Net Savings ($ / yr):	*$4068*
Simple Payback (yrs):	*4.8*
Simple Return On Investment (%):	*20.9%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$101,700*

* ECM#1 Calculations DO NOT include lighting control changes implemented in ECM#2. If ECM#1 and #2 are implemented together the savings will be relatively lower than shown above.

ECM #2: Lighting Controls

Description:

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

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

ASHRAE Standard 90.1-2004, Appendix G is a reference standard for modeling building efficiency. The standard estimates that lighting controls provide a 10% reduction in lighting power usage for daytime occupancies in buildings over 5,000 SF, and 15% reduction in buildings under 5,000 SF. This ECM includes dual technology occupancy sensors in the courthouse, each private office, open office, conference room, restrooms, lunch room, storage rooms, and file room, as well as a photocell daylight sensor controlling the 1st floor rotunda lighting.

The ECM includes replacement of standard wall switches with sensors wall switches for individual rooms, ceiling mount sensors for large office areas or restrooms, and photocell sensors for the rotunda sky-lit accent lights. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent. See the "Investment Grade Lighting Audit" appendix for details.

The "Investment Grade Lighting Audit" appendix of this report includes the summary of lighting controls implemented in this ECM and outlines the proposed controls, costs, savings, and payback periods. The calculations adjust the lighting power usage by 10% for all areas that include occupancy sensor lighting controls and 20% for areas that include occupancy sensors as well as photocell daylight sensors.

Light Energy = 65,528 kWh/Yr. occupancy sensor controlled lighting
= 10,780 kWh/Yr. daylight sensor controlled lighting

Energy Savings Calculations:

$$Energy\ Savings = 10\% \times Occuapancy\ Sensored\ Light\ Energy\ (kWh/Yr) + \cdots$$
$$10\% \times Daylight\ and\ Occupancy\ Sensored\ Light\ Energy\ (kWh/Yr)$$

$$Energy\ Savings = 10\% \times 65{,}528\,(kWh) + 10\% \times 10{,}780(kWh) = 7{,}631\,(kWh)$$

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

$$Savings. = 7{,}631\,(kWh) \times 0.163\left(\frac{\$}{kWh}\right) = \$1{,}244$$

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is $75/unit including material and labor. Installation cost per daylight sensor is $238/unit

Installation Cost = $75 x 49 motion sensors + $238 x 1 Daylight Sensors = $3,913

From the NJ Smart Start appendix, the installation of a lighting control device warrants the following incentive: occupancy = $20 per fixture, daylight = $25 per fixture.

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ wall\ mount\ devices \times\ \$\ 20) = (49 \times \$20) = \$980$$
$$\text{Smart Start®}\ Incentive = (\#\ of\ \ day\ light\ devices \times\ \$\ 25) = (1 \times \$25) = \$25$$
$$\text{Smart Start®}\ Incentive = \$1005\ Total$$

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY*	
Installation Cost ($):	$3,913
NJ Smart Start Equipment Incentive ($):	($1,005)
Net Installation Cost ($):	*$2,908*
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$1,244*
Total Energy Savings ($ / yr):	*$1,244*
Simple Payback (yrs):	*2.3*
Simple Return On Investment (%):	*42.8%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Savings ($):	*$18,660*

* ECM#2 Calculations DO NOT include lighting changes implemented in ECM#1. If ECM#1 and #2 are implemented together the savings will be relatively lower than shown above.

ECM #3: HVAC Rooftop Unit Replacement – Courtroom Room

Description:

The Court Room is currently conditioned by a single zone, heating and cooling rooftop unit. The unit was made in 1989 by McQuay. The unit's cooling efficiency was 8.7 EER when new. Due to the age and wear, the estimated cooling efficiency is 8.0 EER today. The heating efficiency is estimated to be 70% efficient. The life span of a packaged rooftop unit is 15 years. This unit is 5 years past its life-span which means it is due to be replaced.

This ECM includes replacing the 20 ton rooftop unit with an energy efficient heating and cooling unit. The ECM calculations are based on a 20 ton McQuay rooftop model MPS020B or equal. Cooling efficiency of 11.1 EER and heating efficiency of 81%.

Heating Season Heating Degree Days =4,888 HDD
Average Cost of Gas = $1.49/Therm

Cooling Season Full Load Cooling Hrs. = 800 hrs/yr.
Average Cost of Electricity = $0.163/kWh

Total Rated Cooling Capacity = 20 Tons
Existing System Efficiency = 8.0 EER
Proposed System Efficiency = 11.1 EER

Energy Savings Calculations:

Cooling Savings Calculation:

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

$$EnergySavings = \frac{20\,(Tons) \times 12{,}000\left(\frac{Btu}{Ton\ hr}\right)}{1000\left(\frac{Wh}{kWh}\right)} \times \left(\frac{1}{8.0\left(\frac{Btu}{W}\right)} - \frac{1}{11.1\left(\frac{Btu}{W}\right)}\right) \times 800\ hours$$

$$= 6{,}703\ kWh$$

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

$$Demand\ Savings = \frac{6{,}703\,(kWh)}{800\ Hrs.} = 8.38\ KW$$

$$Cooling\ Cost\ Savings = 6{,}703\,(kWh) \times 0.163\left(\frac{\$}{kWh}\right) = \$1{,}093$$

Heating Savings Calculation:

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

$$Heat\ Load = \frac{35\left(\frac{Btu}{Hr\ SF}\right) \times 2{,}224\,(SF)}{1000\left(\frac{Btu}{kBtu}\right)} = 77.84\left(\frac{kBtu}{Hr}\right)$$

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

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

$$EnergySavings = \frac{77.84\left(\frac{kBtu}{Hr}\right) \times 4{,}888\,(HDD) \times 24\ Hrs \times 0.6}{65\,(^{\circ}F) \times 100\left(\frac{kBtu}{Therm}\right)} \times \left(\frac{1}{70\%} - \frac{1}{81\%}\right) \cdots$$

$$= 163.5\,(Therms)$$

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

$$Savings. = 163.5\,(Therms) \times 1.49\left(\frac{\$}{Therm}\right) = \$243.65$$

$$Total\ ECM\ \ Savings. = \$1{,}093 + \$243.65 = \$1336.65$$

Installation cost for the 20 ton rooftop units is estimated at $36,000. Note that this estimate includes the demolition of the existing units.

From the NJ Smart Start® Program appendix, the rooftop unit replacement falls under the category "Unitary AC" and warrants an incentive based on efficiency (EER) at a certain cooling tonnage. The program incentives are calculated as follows:

$$\text{Smart Start®}\ Incentive = (Cooling\ Tons \times\ \$/Ton\ Incentive)$$
$$= (20\ Tons \times \$79/Ton) = \$1580$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY*	
Installation Cost ($):	$36,000
NJ Smart Start Equipment Incentive ($):	($1,580)
Net Installation Cost ($):	*$34,420*
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$1,337*
Total Energy Savings ($ / yr):	*$1,337*
Simple Payback (yrs):	*25.7*
Simple Return On Investment (%):	*3.9%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Savings ($):	*$20,055*

ECM #4: HVAC System Controls

Description:

The central rooftop unit was replaced approximately one year ago. The system's gas heat was disabled due to control problems. The gas heat is not capable of running without the full volume of air passing through to keep the heat exchanger cool. The previous unit operated with gas heat because it was a constant volume unit with a bypass air path, therefore always maintaining full air volume. The new York unit has a variable speed fan that modulates the airflow based on the need of all the VAV boxes, however in heating mode it still requires full air volume to run the gas heat. Since the bypass path does not exist and the new unit cannot control the VAV box airflows, the result is the safeties preventing the unit from running. The rooftop unit is unable to control the VAV boxes and provide full airflow because the wiring to the front end is not there. The control issues only affect heating because the cooling is staged when there is reduced airflows. The gas heat does not have modulating capability.

This ECM includes installing a Building Automation system through Direct Digital Controls (DDC) wired through an Ethernet backbone and front end controller. The system will include new thermostat controllers for all VAV boxes, in addition to each VAV box being wired back to a front end controller and computer interface. The front end device will also communicate with the main rooftop unit. With the communication between the devices, the rooftop will be able to command the VAV boxes as needed to operate gas heat. Gas heat is less expensive than electric heat. The facility will see significant savings by having the rooftop unit utilize the gas heat exchanger instead of the electric heat in the VAV boxes.

In addition to the ability to operate gas heat, the DDC system has the potential to realize 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. Energy savings achieved for "Energy Management and Control Systems," average 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 $4.00 per SF. Savings from the implementation of this ECM will be from the reduced electric energy currently used to heat the building as well as HVAC system savings from energy management through the DDC system.

Cost of complete DDC System = ($4.00/SF x 14,294 SF) = $57,176.

Heating Season Heating Degree Days	=4,888 HDD
Average Cost of Gas	= $1.49/Therm

Cooling Season Full Load Cooling Hrs. = 800 hrs/yr.
Average Cost of Electricity = $0.163/kWh

Energy Savings Calculations:

10% Savings on Heating Calculations

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

$$Heat\ Load = \frac{35\left(\frac{Btu}{Hr\ SF}\right) \times 14{,}294\ (SF)}{1000\left(\frac{Btu}{kBtu}\right)} = 500.29\left(\frac{kBtu}{Hr}\right)$$

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

$$Est\ Heat\ Cons. = \frac{500.29\left(\frac{kBtu}{Hr}\right) \times 4{,}888\ (HDD) \times 24\ Hrs \times 0.6}{65\ (^\circ F) \times 81\% \times 100\left(\frac{kBtu}{Therm}\right)} = 6{,}688.3(Therms)$$

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

$$Savings. = 6{,}688.3\ (Therms) \times 10\% \times 1.49\left(\frac{\$}{Therm}\right) = \$996.56$$

10% Savings on Cooling Calculations**:**

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

$$Est\ Cool\ Cons. = \frac{30\ (Tons) \times 12{,}000\left(\frac{Btu}{Ton\ Hr}\right) \times 800\ Hrs.}{10.0\left(\frac{Btu}{Wh}\right) \times 1000\left(\frac{Wh}{kWh}\right)} = 28{,}800(kWh)$$

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

$$Savings. = 28{,}800\ (kWh) \times 10\% \times 0.163\left(\frac{\$}{kWh}\right) = \$469.44$$

Electric Heat Switched to Gas Heat Savings Calculations:

$$Est.\ Elec.\ Heat\ Cons. = \frac{Est.\ Gas\ Cons.\ (Therms) - Current\ Gas\ Cons.(Therms)}{\frac{Electric\ Efficiency\ (\%)}{Gas\ Efficiency\ (\%)}} \times \frac{100\left(\frac{kBtu}{Therm}\right)}{3.414\left(\frac{kBtu}{kWh}\right)}$$

$$Est.\ Elec.\ Heat\ Cons. = \frac{6688.3\ (Therms) - 2294.45\ (Therms)}{\frac{100\%}{81\%}} \times \frac{100\left(\frac{kBtu}{Therm}\right)}{3.414\left(\frac{kBtu}{kWh}\right)} = 104{,}247\ (kWh)$$

$$Est.\ Elec.\ Heat\ Cost = Cons.(kWh) \times Ave\ Elec.\ Cost\left(\frac{\$}{kWh}\right)$$

$$Est.\ Elec.\ Heat\ Cost = 104{,}247\ (kWh) \times 0.163\left(\frac{\$}{kWh}\right) = \$16{,}992.30$$

$$Est.\ Add.\ Gas\ Cons. = Est.\ Gas\ Cons.\ (Therms) - Current\ Gas\ Cons.(Therms)$$

$$Est.\ Add.\ Gas\ Cons. = 6688.3\ (Therms) - 2294.45\ (Therms) = 4{,}393.85\ (Therms)$$

$$Est.\ Add.\ Gas\ Cost = Cons.(Therms) \times Ave\ Gas\ Cost\left(\frac{\$}{Therm}\right)$$

$$Est.\ Add.\ Gas\ Cost = 4{,}393.85\ (Therms) \times 1.49\left(\frac{\$}{Therm}\right) = \$6{,}546.84$$

$$Elec\ Change\ to\ Gas\ Savings = Existing\ Elec\ Cost\ (\$) - Future\ Gas\ Cost(\$)$$

$$Elec\ to\ Gas\ Savings = \$16{,}992.30 - \$6{,}546.84 = \$10{,}445.46$$

$$Total\ ECM\ \ Savings = \$996.56 + \$469.44 + 10{,}445.46 = \$11{,}911.46$$

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY*	
Installation Cost ($):	$57,176
NJ Smart Start Equipment Incentive ($):	-
Net Installation Cost ($):	$57,176
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$11,911*
Total Energy Savings ($ / yr):	*$11,911*
Simple Payback (yrs):	*4.8*
Simple Return On Investment (%):	*20.8%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Savings ($):	*$178,665*

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 Branchburg NJ, 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 1680 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 26.45 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 41,276 KWh annually, reducing the overall utility bill by approximately 11.7% 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:

PAYMENT TYPE	SIMPLE PAYBACK	SIMPLE ROI	INTERNAL RATE OF RETURN
Self-Finance	11.2 Years	8.9%	12.5%
Direct Purchase	11.2 Years	8.9%	8.0%

*The solar energy measure is shown for reference in the executive summary ECM 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 Branchburg Municipal Building. 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 typical cooling load profile. The summer (May-August) demonstrates increased consumption typical to air conditioning load (as exemplified by several rooftop units). There is a fairly steady yearlong electric load most likely attributable to the split system Goodman unit that runs 24/7 in the computer room, the door heaters which are electric and the domestic hot water heater which is also electric. The major contributor to increased heating season electric load is due to the main central VAV system which is not functioning correctly. Since the rooftop unit gas is not operational, the VAV box electric re-heat coils are the only source of heat for the majority of the building. A flat load profile will allow for more competitive energy prices when shopping for alternative suppliers.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical natural gas (heat load) profile. The summer months demonstrate very low consumption (complimenting the cooling electric load), May through September. There is an increase in consumption January through March, and again October through December. Gas heat exchangers in the court room rooftop unit and entrance hallway rooftop unit are responsible for the natural gas load. If the central VAV system's gas heat exchanger becomes operational, a significant portion of the electric base load will be shifted to natural gas use in the heating season. A base-load shaping (flat) will secure more competitive energy prices when procuring through an alternative energy source.

Tariff Analysis:

Electricity:

This facility receives electrical service through 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 Public Service Electric and Gas Company (PSE&G) on a GSGH (General Service Gas-Heating) rate when not receiving commodity by a Third Party Supplier. The utility tariff rate (GSGH) is for General Service. This is a firm delivery service (higher level of delivery) for general purposes where 1) customer does not qualify for RSG (residential) and 2) customers usage does not exceed 3,000 therms in any month. Customers may either purchase gas supply from a Third Party (TPS) or from Public Services Basic Gas Supply Service default service as detailed in the rate schedule.

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

This rate schedule has a Delivery Charge Mechanism which includes: Balancing Charge, Societal Benefits Charge, Realignment Adjustment Charge, Margin Adjustment Charge, RGGI Charge and Customer Account Service Charge. The customer can elect to have the Supply Charge (Commodity Charge) serviced through the utility or by a Third Party Supplier (TPS). Note: Should the TPS not deliver, the customer may receive service from PSE&G under Emergency Sales Service. Emergency Sales Service carries an extremely high penalty cost of service. Should the TPS un-deliver to the utility on behalf of the client, the utility will automatically supply this default service to the client.

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

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within the Township. The primary area for potential improvement is seen in the electric costs. The average price per kWh (kilowatt hour) for all buildings based on 1-year historical average price is $.1374/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 $ 11.08 / 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 (May 2008 through April 2009) 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 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, Branchburg could improve its natural gas costs by up to 25%. CEG recommends that Branchburg 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. Branchburg can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu. Branchburg 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 units are functioning properly to take advantage of free cooling and avoid excess outside air during occupied periods.

In addition to the recommendations above, implementing Retro-Commissioning would be beneficial for this facility. Retro-Commissioning is a means to verify your current equipment is operating at its designed efficiency, capacity, airflow, and overall performance. Retro-Commissioning provides valuable insight into systems or components not performing correctly or efficiently. The commissioning process defines the original system design parameters and recommends revisions to the current system operating characteristics.

INSTALLATION COST AND REBATES

CONCORD ENGINEERING GROUP

Branchburg - Municipal Building

ECM 1: LIGHTING UPGRADE

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Fixture Replacement	LS	$21,979	-	-	$21,979
Utility Incentive - NJ Smart Start					($4,960)
Total Cost Less Incentive					$17,019

ECM 2: LIGHTING CONTROLS

	Qty	Unit Cost $	Material $	Labor $	Total $
Dual - Technology Sensor	49	$75	$1,125	$2,550	$3,675
Daylight Sensor	1	119.00	$119	$119	$238
Utility Incentive - NJ Smart Start					($1,005)
Total Cost Less Incentive					$2,908

ECM 3: HVAC ROOFTOP UNIT REPLACEMENT

	Qty	Unit Cost $	Material $	Labor $	Total $
20 Ton Rooftop Unit Replacement	1	$18,000	$18,000	$18,000	$36,000
Utility Incentive - NJ Smart Start					($1,580)
Total Cost Less Incentive					$34,420

ECM 4: HVAC SYSTEM CONTROLS

	Qty	Unit Cost $	Material $	Labor $	Total $
DDC Automation System	1	$57,176	-	-	$57,176
Utility Incentive - NJ Smart Start					$0
Total Cost Less Incentive					$57,176

ECM 5: SOLAR PV SYSTEM

	Qty	Unit Cost $	Material $	Labor $	Total $
Solar PV System	1	$238,050			$238,050
Utility Incentive - (see Renewable Energy Measures appendix for details)					-
Total Cost Less Incentive					$238,050

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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

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

"Branchburg Municipal Building"

Domestic Hot Water Heaters

Service	Location	Manufacturer	Type	Qty.	Model #	Serial #	Input (KW)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life
Office	Bsmt Closet	Bradford White	Electric	1	-	-	3	193	12	100%	Electric	5	10	5

Packaged AC Units

Service	Location	Manufacturer	Type	Qty.	Model #	Serial #	Cooling Type	Cooling Capacity	EER	Heating Type	Heating Capacity (Input)	Eff	Fan HP	Motor RPM	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Office	Roof	York	Packaged VAV	1	Y23AN44Q2KANAHA	NOH8176493	DX R-22	360 MBH	9.5	Gas	466 MBH	80.0%	15	-	480	3	1	15	14
Courtroom	Roof	McQuay	Packaged CV	1	R201ETLC	5UL83782-00	DX R-22	240 MBh	8.7	Gas	300 MBH	80.4%	-		480	3	20	15	(5)
Entrance	Roof	Trane	Packaged CV	1	YSC102A4EHA0000	505101702L	DX R-22	102 MBh	10.1	Gas	200 MBH	81.0%	2		480	3	5	15	10

*Equipment efficiencies listed above are based on new equipment product data.

Ductless Split Systems

Service	Location	Manufacturer	Type	Qty.	Model #	Serial #	Cooling Type	Cooling Capacity	SEER	Heating Type	Heating Capacity (Input)	Eff	Fan HP	Motor RPM	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
Elevator Room	AHU - Elevator Room	Mitsubishi Electric	Ductless Split System Cooling Only	1	PK-30AG.US	-	DX R-22	30 MBH	13	None	-	-	-	-	208	1	Unknown	15	-
	CU - Roof			1	PU-30G6.US	-							-	-	208	1	Unknown	15	-
Tele / Data Closet	AHU - Tele / Data	Goodman	Ductless Split System Cooling Only	1	WMC24-1A	-	DX R-23	24 MBH	10	None	-	-	-	-	208	1	Unknown	15	-
	CU - Grade			1	HDC24-1AB	-							-	-	208	1	Unknown	15	-

*Equipment efficiencies listed above are based on new equipment product data.

Variable Air Volume Boxes

Tag	Location	Manufacturer	Type	Qty.	Model #	Serial #	Size	CFM	Elec. Heat (KW)	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life
101	Bsmt Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	6	360	4	277	1	Unknown	20	-
102	Bsmt Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	10	1050	4	277	1	Unknown	20	-
103	Bsmt Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	6	480	3	277	1	Unknown	20	-
104	Bsmt Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	6	400	3	277	1	Unknown	20	-
105	Bsmt Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	8	800	5	277	1	Unknown	20	-
106	Bsmt Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	8	750	5	277	1	Unknown	20	-
107	Bsmt Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	6	300	3	277	1	Unknown	20	-
108	Bsmt Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	6	300	2	277	1	Unknown	20	-
201	1st Floor Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	6	535	3	277	1	Unknown	20	-
202	1st Floor Ceiling	-	Shut Off Style	1	SSD-II	-	8	600	-	277	1	Unknown	20	-
203	1st Floor Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	10	900	6	277	1	Unknown	20	-
204	1st Floor Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	8	600	5	277	1	Unknown	20	-
205	1st Floor Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	10	1000	6	277	1	Unknown	20	-
206	1st Floor Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	10	900	5	277	1	Unknown	20	-
207	1st Floor Ceiling	-	Shut Off Style	1	SSD-II	-	8	1000	-	277	1	Unknown	20	-
208	1st Floor Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	8	600	6	277	1	Unknown	20	-
209	1st Floor Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	8	580	4	277	1	Unknown	20	-
210	1st Floor Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	6	430	3	277	1	Unknown	20	-
211	1st Floor Ceiling	-	Fan Powered- Elec Heat	1	VVF-EH-II	-	6	400	4	277	1	Unknown	20	-

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Municipal Building

Building ID: 1816923
For 12-month Period Ending: November 30, 2008[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: August 27, 2009

Facility
Municipal Building
1077 US Highway 202 North
Branchburg, NJ 08876

Facility Owner
Township of Branchburg
1077 US Highway 202 North
Branchburg, NJ 08876

Primary Contact for this Facility
John Gregory
1077 US Highway 202 North
Branchburg, NJ 08876

Year Built: 1990
Gross Floor Area (ft²): 14,294

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

Site Energy Use Summary[3]

Natural Gas (kBtu)[4]	225,401
Electricity (kBtu)	1,695,689
Total Energy (kBtu)	1,921,090

Energy Intensity[5]

Site (kBtu/ft²/yr)	135
Source (kBtu/ft²/yr)	415

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	270

Electric Distribution Utility
Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	60
National Average Source EUI	185
% Difference from National Average Source EUI	125%
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
Ray 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	Municipal Building	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	1077 US Highway 202 North, Branchburg, NJ 08876	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		☐
Court Room (Courthouse)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	2,224 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	15 Hours	Is this the total number of hours per week that the Courthouse 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	5 (Default)	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.		☐
Number of PCs	0	Is this the number of personal computers in the Courthouse?		☐
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?		☐
Town Hall (Office)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑

Gross Floor Area	12,070 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	52 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	33	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	40	Is this the number of personal computers in the Office?		☐
Percent Cooled	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

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

Fuel Type: Electricity

Meter: Electric Meter (kWh (thousand Watt-hours))
Space(s): Entire Facility

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
10/02/2008	11/03/2008	28,960.00
09/04/2008	10/01/2008	30,720.00
08/05/2008	09/03/2008	37,040.00
07/03/2008	08/04/2008	65,840.00
06/03/2008	07/02/2008	57,200.00
05/02/2008	06/02/2008	43,360.00
04/03/2008	05/01/2008	32,480.00
03/04/2008	04/02/2008	36,880.00
02/02/2008	03/03/2008	43,760.00
01/03/2008	02/01/2008	44,400.00
12/04/2007	01/02/2008	45,680.00
Electric Meter Consumption (kWh (thousand Watt-hours))		**466,320.00**
Electric Meter Consumption (kBtu)		**1,591,083.84**
Total Electricity Consumption (kBtu)		**1,591,083.84**
Is this the total Electricity consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

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

Start Date	End Date	Energy Use (therms)
10/16/2008	11/17/2008	214.51
09/19/2008	10/16/2008	29.27
08/18/2008	09/19/2008	6.29
07/22/2008	08/18/2008	6.29
06/18/2008	07/22/2008	7.31
05/19/2008	06/18/2008	6.25
04/21/2008	05/19/2008	39.61
03/20/2008	04/21/2008	272.32
02/19/2008	03/20/2008	442.39
01/18/2008	02/19/2008	470.10

12/18/2007	01/18/2008	343.27
Gas Meter Consumption (therms)		**1,837.61**
Gas Meter Consumption (kBtu)		**183,761.00**
Total Natural Gas Consumption (kBtu)		**183,761.00**
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.	☐

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

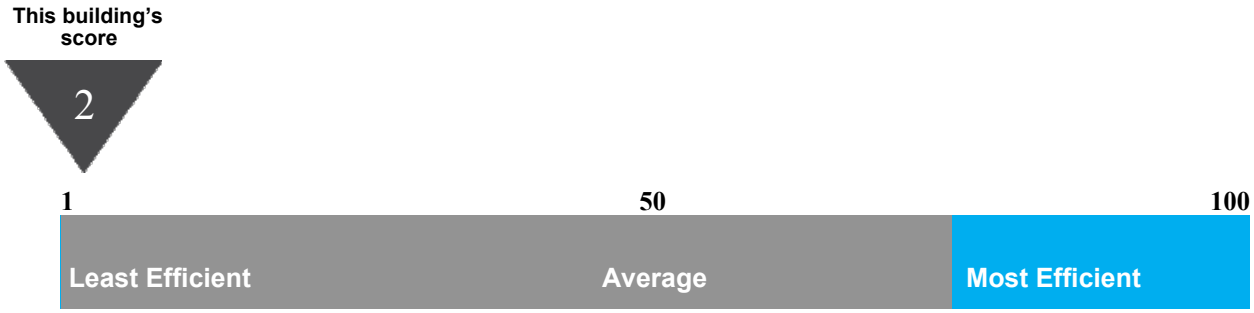
Statement of Energy Performance

2008

Municipal Building
1077 US Highway 202 North
Branchburg, NJ 08876

Portfolio Manager Building ID: 1816923

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



This building uses 415 kBtu per square foot per year.*

*Based on source energy intensity for the 12 month period ending November 2008

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

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

Date of certification

EPA United States Environmental Protection Agency

Date Generated: 08/27/2009

INVESTMENT GRADE LIGHTNG AUDIT

CONCORD ENGINEERING GROUP

CEG Job #: 9C08060
Project: Branchburg Municipal Building Energy Audit
Address: 1077 US Highway 202 North
Branchburg, NJ 08876
Building SF: 14,294

"Branchburg Municipal Building"

KWH COST: $0.163

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING											PROPOSED LIGHTING									SAVINGS			
Line No.	CEG Type	Fixture Location	No. Fixts	No. Lamps	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
1	G	Bsmt - Elevator Machine Room	1		2-Lamp CFL Recessed Can Fixture	552	30	0.03	16.56	$2.70	1	0	No Change	30	0.03	16.56	$2.70	$0.00	$0.00	0.00	0	$0.00	0.00
2	E	Bsmt - Service Corridor	6	2	2'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.48	1123.2	$183.08	6	2	2'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	61	0.37	856.44	$139.60	$120.00	$720.00	0.11	266.76	$43.48	16.56
3	E	Bsmt - Electric Room	2	2	2'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	552	80	0.16	88.32	$14.40	2	2	2'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	61	0.12	67.344	$10.98	$120.00	$240.00	0.04	20.976	$3.42	70.19
4	E	Bsmt - Tele / Data Rooom	2	2	2'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	552	80	0.16	88.32	$14.40	2	2	2'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	61	0.12	67.344	$10.98	$120.00	$240.00	0.04	20.976	$3.42	70.19
5	G	Bsmt - Rotunda Lobby	14		2-Lamp CFL Recessed Can Fixture	2340	30	0.42	982.8	$160.20	14	0	No Change	30	0.42	982.8	$160.20	$0.00	$0.00	0.00	0	$0.00	0.00
6	B	Bsmt - Men's Toilet	3	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.24	561.6	$91.54	3	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	55	0.17	386.1	$62.93	$100.00	$300.00	0.08	175.5	$28.61	10.49
	C		2	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	79	0.16	369.72	$60.26	2	2	2' - 2-Lamp 17W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF217	34	0.07	159.12	$25.94	$100.00	$200.00	0.09	210.6	$34.33	5.83
	D		1	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	42	0.04	98.28	$16.02	1	2	2' - 2-Lamp 17W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF217	34	0.03	79.56	$12.97	$100.00	$100.00	0.01	18.72	$3.05	32.77
7	B	Bsmt - Women's Toilet	3	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.24	561.6	$91.54	3	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	55	0.17	386.1	$62.93	$100.00	$300.00	0.08	175.5	$28.61	10.49
	C		2	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	79	0.16	369.72	$60.26	2	2	2' - 2-Lamp 17W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF217	34	0.07	159.12	$25.94	$100.00	$200.00	0.09	210.6	$34.33	5.83
	D		1	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	42	0.04	98.28	$16.02	1	2	2' - 2-Lamp 17W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF217	34	0.03	79.56	$12.97	$100.00	$100.00	0.01	18.72	$3.05	32.77
10	F	Bsmt - Computer Room	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608.4	$99.17	2	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	425.88	$69.42	$120.00	$240.00	0.08	182.52	$29.75	8.07
11	F	Bsmt - Enclosed Office #1	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608.4	$99.17	2	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	425.88	$69.42	$120.00	$240.00	0.08	182.52	$29.75	8.07
12	F	Bsmt - Open Office #1	11	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	1.43	3346.2	$545.43	11	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	1.00	2342.34	$381.80	$120.00	$1,320.00	0.43	1003.86	$163.63	8.07
	B		6	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.48	1123.2	$183.08	6	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	55	0.33	772.2	$125.87	$100.00	$600.00	0.15	351	$57.21	10.49
13	M	Bsmt - Storage closet	1		1-Lamp Incandescent Recessed Par Fixture	552	150	0.15	82.8	$13.50	1	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.03	14.352	$2.34	$11.67	$11.67	0.12	68.448	$11.16	1.05

14	F	Bsmt - Conference Room	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608.4	$99.17	2	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	425.88	$69.42	$120.00	$240.00	0.08	182.52	$29.75	8.07
	M		2		1-Lamp Incandescent Recessed Par Fixture	2340	150	0.30	702	$114.43	2	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.05	121.68	$19.83	$11.67	$23.34	0.25	580.32	$94.59	0.25
15	B	Bsmt - File Storage Room	32	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	2.56	5990.4	$976.44	32	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	55	1.76	4118.4	$671.30	$100.00	$3,200.00	0.80	1872	$305.14	10.49
16	I	Bsmt - Utility Closet	1		1-Lamp Incandescent Surface Fixture	552	60	0.06	33.12	$5.40	1	0	1-Lamp 15W CFL MaxLite M/N SKS15EAWW	20	0.02	11.04	$1.80	$4.92	$4.92	0.04	22.08	$3.60	1.37
17	F	Bsmt - Open Office #2	7	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.91	2129.4	$347.09	7	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.64	1490.58	$242.96	$120.00	$840.00	0.27	638.82	$104.13	8.07
	B		2	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.16	374.4	$61.03	2	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	55	0.11	257.4	$41.96	$100.00	$200.00	0.05	117	$19.07	10.49
18	F	Bsmt - Enclosed Office #2	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608.4	$99.17	2	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	425.88	$69.42	$120.00	$240.00	0.08	182.52	$29.75	8.07
19	G	Bsmt - Exit Corridor	5		2-Lamp CFL Recessed Can Fixture	2340	30	0.15	351	$57.21	5	0	No Change	30	0.15	351	$57.21	$0.00	$0.00	0.00	0	$0.00	0.00
20	B	Bsmt - Vault	6	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	552	80	0.48	264.96	$43.19	6	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	55	0.33	182.16	$29.69	$100.00	$600.00	0.15	82.8	$13.50	44.46
21	M	1st - Rotunda	4		1-Lamp Incandescent Recessed Par Fixture	2340	150	0.60	1404	$228.85	4	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.10	243.36	$39.67	$11.67	$46.68	0.50	1160.64	$189.18	0.25
	N		16		2-Lamp CFL & Metal Halide Surface Fixure	2340	222	3.55	8311.68	$1,354.80	16	0	No Change	222	3.55	8311.68	$1,354.80	$0.00	$0.00	0.00	0	$0.00	0.00
	O		1		1-Lamp Metal Halide Pendent Fixure	2340	455	0.46	1064.7	$173.55	1	0	No Change	455	0.46	1064.7	$173.55	$0.00	$0.00	0.00	0	$0.00	0.00
24	F	1st - Open Office	20	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	2.60	6084	$991.69	20	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	1.82	4258.8	$694.18	$120.00	$2,400.00	0.78	1825.2	$297.51	8.07
	B		14	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	1.12	2620.8	$427.19	14	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	55	0.77	1801.8	$293.69	$100.00	$1,400.00	0.35	819	$133.50	10.49
	G		7		2-Lamp CFL Recessed Can Fixture	2340	30	0.21	491.4	$80.10	7	0	No Change	30	0.21	491.4	$80.10	$0.00	$0.00	0.00	0	$0.00	0.00
27	M	1st - Storage	1		1-Lamp Incandescent Recessed Par Fixture	552	150	0.15	82.8	$13.50	1	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.03	14.352	$2.34	$11.67	$11.67	0.12	68.448	$11.16	1.05
28	L	1st - Break Room	4		1-Lamp Incandescent Recessed Par Fixture	2340	90	0.36	842.4	$137.31	4	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.10	243.36	$39.67	$11.67	$46.68	0.26	599.04	$97.64	0.48
	M		1		1-Lamp Incandescent Recessed Par Fixture	2340	150	0.15	351	$57.21	1	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.03	60.84	$9.92	$11.67	$11.67	0.12	290.16	$47.30	0.25
30	F	1st - Enclosed Office	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608.4	$99.17	2	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	425.88	$69.42	$120.00	$240.00	0.08	182.52	$29.75	8.07
31	F	1st - Tax Office	1	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.13	304.2	$49.58	1	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.09	212.94	$34.71	$120.00	$120.00	0.04	91.26	$14.88	8.07
32	F	1st - Gregory's Office	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608.4	$99.17	2	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	425.88	$69.42	$120.00	$240.00	0.08	182.52	$29.75	8.07
33	F	1st - Clerk's Office	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608.4	$99.17	2	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	425.88	$69.42	$120.00	$240.00	0.08	182.52	$29.75	8.07
34	F	1st - Administrator Office	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608.4	$99.17	2	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	425.88	$69.42	$120.00	$240.00	0.08	182.52	$29.75	8.07
35	F	1st - Violation Reception	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608.4	$99.17	2	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	425.88	$69.42	$120.00	$240.00	0.08	182.52	$29.75	8.07

36	L	1st - Supply Closet	1		1-Lamp Incandescent Recessed Par Fixture	552	90	0.09	49.68	$8.10	1	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.03	14.352	$2.34	$11.67	$11.67	0.06	35.328	$5.76	2.03
37	G	1st - Main Corridor	17		2-Lamp CFL Recessed Can Fixture	2340	30	0.51	1193.4	$194.52	17	0	No Change	30	0.51	1193.4	$194.52	$0.00	$0.00	0.00	0	$0.00	0.00
	M		8		1-Lamp Incandescent Recessed Par Fixture	2340	150	1.20	2808	$457.70	8	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.21	486.72	$79.34	$11.67	$93.36	0.99	2321.28	$378.37	0.25
	L		2		1-Lamp Incandescent Recessed Par Fixture	2340	90	0.18	421.2	$68.66	2	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.05	121.68	$19.83	$11.67	$23.34	0.13	299.52	$48.82	0.48
40	G	1st - Entry Vestibule #1	2		2-Lamp CFL Recessed Can Fixture	2340	30	0.06	140.4	$22.89	2	0	No Change	30	0.06	140.4	$22.89	$0.00	$0.00	0.00	0	$0.00	0.00
	L		2		1-Lamp Incandescent Recessed Par Fixture	2340	90	0.18	421.2	$68.66	2	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.05	121.68	$19.83	$11.67	$23.34	0.13	299.52	$48.82	0.48
41	G	1st - Entry Vestibule #2	2		2-Lamp CFL Recessed Can Fixture	2340	30	0.06	140.4	$22.89	2	0	No Change	30	0.06	140.4	$22.89	$0.00	$0.00	0.00	0	$0.00	0.00
	L		2		1-Lamp Incandescent Recessed Par Fixture	2340	90	0.18	421.2	$68.66	2	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.05	121.68	$19.83	$11.67	$23.34	0.13	299.52	$48.82	0.48
44	B	1st - Men's toilet	2	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.16	374.4	$61.03	2	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	55	0.11	257.4	$41.96	$100.00	$200.00	0.05	117	$19.07	10.49
	C		1	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	79	0.08	184.86	$30.13	1	2	2' - 2-Lamp 17W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF217	34	0.03	79.56	$12.97	$100.00	$100.00	0.05	105.3	$17.16	5.83
	D		2	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	42	0.08	196.56	$32.04	2	2	2' - 2-Lamp 17W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF217	34	0.07	159.12	$25.94	$100.00	$200.00	0.02	37.44	$6.10	32.77
45	B	1st - Women's toilet	2	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.16	374.4	$61.03	2	2	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	55	0.11	257.4	$41.96	$100.00	$200.00	0.05	117	$19.07	10.49
	C		1	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	79	0.08	184.86	$30.13	1	2	2' - 2-Lamp 17W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF217	34	0.03	79.56	$12.97	$100.00	$100.00	0.05	105.3	$17.16	5.83
	D		2	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	42	0.08	196.56	$32.04	2	2	2' - 2-Lamp 17W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF217	34	0.07	159.12	$25.94	$100.00	$200.00	0.02	37.44	$6.10	32.77
47	K	1st - Jan Closet	1		1-Lamp Incandescent Surface Fixture	552	75	0.08	41.4	$6.75	1	0	1-Lamp 20W CFL MaxLite M/N SKS20EAWW	23	0.02	12.696	$2.07	$5.75	$5.75	0.05	28.704	$4.68	1.23
48	N	1st - Court Room	15		2-Lamp CFL & Metal Halide Surface Fixure	780	222	3.33	2597.4	$423.38	15	0	No Change	222	3.33	2597.4	$423.38	$0.00	$0.00	0.00	0	$0.00	0.00
	O		4		1-Lamp Metal Halide Pendent Fixure	780	455	1.82	1419.6	$231.39	4	0	No Change	455	1.82	1419.6	$231.39	$0.00	$0.00	0.00	0	$0.00	0.00
	L		10		1-Lamp Incandescent Recessed Par Fixture	780	90	0.90	702	$114.43	10	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.26	202.8	$33.06	$11.67	$116.70	0.64	499.2	$81.37	1.43
	A		32	1	1'X4' 1-Lamp T-12 Industrial Strip Magnetic Ballast	780	50	1.60	1248	$203.42	32	1	1'X4' 1-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF	28	0.90	698.88	$113.92	$100.00	$3,200.00	0.70	549.12	$89.51	35.75
50	F	1st - Enclosed Office (next to court)	1	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.13	304.2	$49.58	1	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.09	212.94	$34.71	$120.00	$120.00	0.04	91.26	$14.88	8.07
51	F	1st - Enclosed Office (next to court)	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608.4	$99.17	2	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.18	425.88	$69.42	$120.00	$240.00	0.08	182.52	$29.75	8.07
52	F	1st - Enclosed Office (next to court)	1	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.13	304.2	$49.58	1	3	2'X4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.09	212.94	$34.71	$120.00	$120.00	0.04	91.26	$14.88	8.07
53	J	1st - Hallway	8		1-Lamp Incandescent Track Mount Fixture	2340	65	0.52	1216.8	$198.34	8	0	1-Lamp 20W CFL Recessed PAR-38 MaxLite M/N SKR3820FL	22	0.18	411.84	$67.13	$10.74	$85.92	0.34	804.96	$131.21	0.65
54	M	1st - Storage	1		1-Lamp Incandescent Recessed Par Fixture	552	150	0.15	82.8	$13.50	1	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.03	14.352	$2.34	$11.67	$11.67	0.12	68.448	$11.16	1.05

55	M	1st - Storage	1		1-Lamp Incandescent Recessed Par Fixture	552	150	0.15	82.8	$13.50	1	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.03	14.352	$2.34	$11.67	$11.67	0.12	68.448	$11.16	1.05
56	J	1st - Conference Room	8		1-Lamp Incandescent Track Mount Fixture	2340	65	0.52	1216.8	$198.34	8	0	1-Lamp 20W CFL Recessed PAR-38 MaxLite M/N SKR3820FL	22	0.18	411.84	$67.13	$10.74	$85.92	0.34	804.96	$131.21	0.65
	M		4		1-Lamp Incandescent Recessed Par Fixture	2340	150	0.60	1404	$228.85	4	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.10	243.36	$39.67	$11.67	$46.68	0.50	1160.64	$189.18	0.25
	A		12	1	1'X4' 1-Lamp T-12 Industrial Strip Magnetic Ballast	2340	50	0.60	1404	$228.85	12	1	1'X4' 1-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N SNF	28	0.34	786.24	$128.16	$100.00	$1,200.00	0.26	617.76	$100.69	11.92
59	L	Outside - Front Canopy #1	2		1-Lamp Incandescent Recessed Par Fixture	3640	90	0.18	655.2	$106.80	2	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.05	189.28	$30.85	$11.67	$23.34	0.13	465.92	$75.94	0.31
60	L	Outside - Front Canopy #2	2		1-Lamp Incandescent Recessed Par Fixture	3640	90	0.18	655.2	$106.80	2	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.05	189.28	$30.85	$11.67	$23.34	0.13	465.92	$75.94	0.31
61	L	Outside - Building Lighting	10		1-Lamp Incandescent Recessed Par Fixture	3640	90	0.90	3276	$533.99	10	0	1-Lamp 23W CFL Recessed PAR-38 MaxLite M/N SKR3823FL	26	0.26	946.4	$154.26	$11.67	$116.70	0.64	2329.6	$379.72	0.31
62	P	Outside - Parking Lot Lighting	21		1-Lamp Metal Halide Pole Fixure	3640	125	2.63	9555	$1,557.47	21	0	No Change	125	2.63	9555	$1,557.47	$0.00	$0.00	0.00	0	$0.00	0.00
		Totals	378	90				38.25	79,669.38	$12,986.11	378	90			26.78	55,314.90	$9,016.33		$21,979.37	11.48	24,354.48	$3,969.78	5.54

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 - Office: 2210 hours, Outside 10 Hrs per day

3. Lamp totals only include T-12 tube replacment calculations

INVESTMENT GRADE LIGHTNG AUDIT

CONCORD ENGINEERING GROUP

CEG Job #: 9C08060
Project: Branchburg Municipal Building Energy Audit
Address: 1077 US Highway 202 North
Branchburg, NJ 08876
Building SF: 14294

"Branchburg Municipal Building"

KWH COST: $0.163

ECM #2: Lighting Controls

EXISTING LIGHTING											PROPOSED LIGHTING CONTROLS										SAVINGS			
Line No.	CEG Type	Fixture Location	No. Fixts	No. Lamps	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Lighting Controls Description	Watts Used	Total kW	Reduction (%)	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
1	G	Bsmt - Elevator Machine Room	1		2-Lamp CFL Recessed Can Fixture	552	30	0.03	17	$2.70	1	0	Dual technology occupancy sensor	30	0.03	10%	15	$2.43	$75.00	$75.00	0.00	1.656	$0.27	277.85
2	E	Bsmt - Service Corridor	6	2	2'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.48	1,123	$183.08	6	2	Dual technology occupancy sensor	80	0.48	10%	1,011	$164.77	$75.00	$75.00	0.00	112.32	$18.31	4.10
3	E	Bsmt - Electric Room	2	2	2'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	552	80	0.16	88	$14.40	2	2	Dual technology occupancy sensor	80	0.16	10%	79	$12.96	$75.00	$75.00	0.00	8.832	$1.44	52.10
4	E	Bsmt - Tele / Data Rooom	2	2	2'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	552	80	0.16	88	$14.40	2	2	Dual technology occupancy sensor	80	0.16	10%	79	$12.96	$75.00	$75.00	0.00	8.832	$1.44	52.10
5	G	Bsmt - Rotunda Lobby	14		2-Lamp CFL Recessed Can Fixture	2340	30	0.42	983	$160.20	14	0	Dual technology occupancy sensor	30	0.42	10%	885	$144.18	$75.00	$75.00	0.00	98.28	$16.02	4.68
6	B	Bsmt - Men's Toilet	3	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.24	562	$91.54	3	2	Dual technology occupancy sensor	80	0.24	10%	505	$82.39	$75.00	$75.00	0.00	56.16	$9.15	8.19
	C		2	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	79	0.16	370	$60.26	2	2		79	0.16	10%	333	$54.24		$0.00	0.00	36.972	$6.03	0.00
	D		1	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	42	0.04	98	$16.02	1	2		42	0.04	10%	88	$14.42		$0.00	0.00	9.828	$1.60	0.00
7	B	Bsmt - Women's Toilet	3	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.24	562	$91.54	3	2	Dual technology occupancy sensor	80	0.24	10%	505	$82.39	$75.00	$75.00	0.00	56.16	$9.15	8.19
	C		2	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	79	0.16	370	$60.26	2	2		79	0.16	10%	333	$54.24		$0.00	0.00	36.972	$6.03	0.00
	D		1	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	42	0.04	98	$16.02	1	2		42	0.04	10%	88	$14.42		$0.00	0.00	9.828	$1.60	0.00
8	F	Bsmt - Computer Room	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608	$99.17	2	3	Dual technology occupancy sensor	130	0.26	10%	548	$89.25	$75.00	$75.00	0.00	60.84	$9.92	7.56
9	F	Bsmt - Enclosed Office #1	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608	$99.17	2	3	Dual technology occupancy sensor	130	0.26	10%	548	$89.25	$75.00	$75.00	0.00	60.84	$9.92	7.56
10	F	Bsmt - Open Office #1	11	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	1.43	3,346	$545.43	11	3	Dual technology occupancy sensor	130	1.43	10%	3,012	$490.89	$75.00	$150.00	0.00	334.62	$54.54	2.75
	B		6	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.48	1,123	$183.08	6	2		80	0.48	10%	1,011	$164.77		$0.00	0.00	112.32	$18.31	0.00
11	M	Bsmt - Storage closet	1		1-Lamp Incandescent Recessed Par Fixture	552	150	0.15	83	$13.50	1	0	Dual technology occupancy sensor	150	0.15	10%	75	$12.15	$75.00	$75.00	0.00	8.28	$1.35	55.57
12	F	Bsmt - Conference Room	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608	$99.17	2	3	Dual technology occupancy sensor	130	0.26	10%	548	$89.25	$75.00	$75.00	0.00	60.84	$9.92	7.56
	M		2		1-Lamp Incandescent Recessed Par Fixture	2340	150	0.30	702	$114.43	2	0		150	0.30	10%	632	$102.98	$75.00	$75.00	0.00	70.2	$11.44	6.55

13	B	Bsmt - File Storage Room	32	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	2.56	5,990	$976.44	32	2	Dual technology occupancy sensor	80	2.56	10%	5,391	$878.79	$75.00	$75.00	0.00	599.04	$97.64	0.77
14	I	Bsmt - Utility Closet	1		1-Lamp Incandescent Surface Fixture	552	60	0.06	33	$5.40	1	0	Dual technology occupancy sensor	60	0.06	10%	30	$4.86	$75.00	$75.00	0.00	3.312	$0.54	138.93
15	F	Bsmt - Open Office #2	7	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.91	2,129	$347.09	7	3	Dual technology occupancy sensor	130	0.91	10%	1,916	$312.38	$75.00	$75.00	0.00	212.94	$34.71	2.16
	B		2	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.16	374	$61.03	2	2		80	0.16	10%	337	$54.92	$75.00	$75.00	0.00	37.44	$6.10	12.29
16	F	Bsmt - Enclosed Office #2	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608	$99.17	2	3	Dual technology occupancy sensor	130	0.26	10%	548	$89.25	$75.00	$75.00	0.00	60.84	$9.92	7.56
17	G	Bsmt - Exit Corridor	5		2-Lamp CFL Recessed Can Fixture	2340	30	0.15	351	$57.21	5	0	Dual technology occupancy sensor	30	0.15	10%	316	$51.49	$75.00	$75.00	0.00	35.1	$5.72	13.11
18	B	Bsmt - Vault	6	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	552	80	0.48	265	$43.19	6	2	Dual technology occupancy sensor	80	0.48	10%	238	$38.87	$75.00	$75.00	0.00	26.496	$4.32	17.37
19	M	1st - Rotunda	4		1-Lamp Incandescent Recessed Par Fixture	2340	150	0.60	1,404	$228.85	4	0	Dual technology occupancy sensor & photo cell	150	0.60	20%	1,123	$183.08	$313.00	$313.00	0.00	280.8	$45.77	6.84
	N		16		2-Lamp CFL & Metal Halide Surface Fixure	2340	222	3.55	8,312	$1,354.80	16	0		222	3.55	20%	6,649	$1,083.84		$0.00	0.00	1662.336	$270.96	0.00
	O		1		1-Lamp Metal Halide Pendent Fixure	2340	455	0.46	1,065	$173.55	1	0		455	0.46	20%	852	$138.84		$0.00	0.00	212.94	$34.71	0.00
20	F	1st - Open Office	20	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	2.60	6,084	$991.69	20	3	Dual technology occupancy sensor	130	2.60	10%	5,476	$892.52	$75.00	$150.00	0.00	608.4	$99.17	1.51
	B		14	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	1.12	2,621	$427.19	14	2		80	1.12	10%	2,359	$384.47		$0.00	0.00	262.08	$42.72	0.00
	G		7		2-Lamp CFL Recessed Can Fixture	2340	30	0.21	491	$80.10	7	0		30	0.21	10%	442	$72.09		$0.00	0.00	49.14	$8.01	0.00
21	M	1st - Storage	1		1-Lamp Incandescent Recessed Par Fixture	552	150	0.15	83	$13.50	1	0	Dual technology occupancy sensor	150	0.15	10%	75	$12.15	$75.00	$75.00	0.00	8.28	$1.35	55.57
22	L	1st - Break Room	4		1-Lamp Incandescent Recessed Par Fixture	2340	90	0.36	842	$137.31	4	0	Dual technology occupancy sensor	90	0.36	10%	758	$123.58	$75.00	$75.00	0.00	84.24	$13.73	5.46
	M		1		1-Lamp Incandescent Recessed Par Fixture	2340	150	0.15	351	$57.21	1	0		150	0.15	10%	316	$51.49		$0.00	0.00	35.1	$5.72	0.00
23	F	1st - Enclosed Office	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608	$99.17	2	3	Dual technology occupancy sensor	130	0.26	10%	548	$89.25	$75.00	$75.00	0.00	60.84	$9.92	7.56
24	F	1st - Tax Office	1	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.13	304	$49.58	1	3	Dual technology occupancy sensor	130	0.13	10%	274	$44.63	$75.00	$75.00	0.00	30.42	$4.96	15.13
25	F	1st - Gregory's Office	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608	$99.17	2	3	Dual technology occupancy sensor	130	0.26	10%	548	$89.25	$75.00	$75.00	0.00	60.84	$9.92	7.56
26	F	1st - Clerk's Office	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608	$99.17	2	3	Dual technology occupancy sensor	130	0.26	10%	548	$89.25	$75.00	$75.00	0.00	60.84	$9.92	7.56
27	F	1st - Administrator Office	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608	$99.17	2	3	Dual technology occupancy sensor	130	0.26	10%	548	$89.25	$75.00	$75.00	0.00	60.84	$9.92	7.56
28	F	1st - Violation Reception	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608	$99.17	2	3	Dual technology occupancy sensor	130	0.26	10%	548	$89.25	$75.00	$75.00	0.00	60.84	$9.92	7.56
29	L	1st - Supply Closet	1		1-Lamp Incandescent Recessed Par Fixture	552	90	0.09	50	$8.10	1	0	Dual technology occupancy sensor	90	0.09	10%	45	$7.29	$75.00	$75.00	0.00	4.968	$0.81	92.62
30	G	1st - Main Corridor	17		2-Lamp CFL Recessed Can Fixture	2340	30	0.51	1,193	$194.52	17	0	Dual technology occupancy sensor	30	0.51	10%	1,074	$175.07	$75.00	$150.00	0.00	119.34	$19.45	7.71
	M		8		1-Lamp Incandescent Recessed Par Fixture	2340	150	1.20	2,808	$457.70	8	0		150	1.20	10%	2,527	$411.93		$0.00	0.00	280.8	$45.77	0.00
	L		2		1-Lamp Incandescent Recessed Par Fixture	2340	90	0.18	421	$68.66	2	0		90	0.18	10%	379	$61.79		$0.00	0.00	42.12	$6.87	0.00
31	G	1st - Entry Vestibule #1	2		2-Lamp CFL Recessed Can Fixture	2340	30	0.06	140	$22.89	2	0	Dual technology occupancy sensor	30	0.06	10%	126	$20.60	$75.00	$75.00	0.00	14.04	$2.29	32.77
	L		2		1-Lamp Incandescent Recessed Par Fixture	2340	90	0.18	421	$68.66	2	0		90	0.18	10%	379	$61.79		$0.00	0.00	42.12	$6.87	0.00
32	G	1st - Entry Vestibule	2		2-Lamp CFL Recessed Can Fixture	2340	30	0.06	140	$22.89	2	0	Dual technology occupancy sensor	30	0.06	10%	126	$20.60	$75.00	$75.00	0.00	14.04	$2.29	32.77

	L	#2	2		1-Lamp Incandescent Recessed Par Fixture	2340	90	0.18	421	$68.66	2	0	Dual technology occupancy sensor	90	0.18	10%	379	$61.79		$0.00	0.00	42.12	$6.87	0.00
33	B	1st - Men's toilet	2	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.16	374	$61.03	2	2	Dual technology occupancy sensor	80	0.16	10%	337	$54.92	$75.00	$75.00	0.00	37.44	$6.10	12.29
	C		1	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	79	0.08	185	$30.13	1	2		79	0.08	10%	166	$27.12		$0.00	0.00	18.486	$3.01	0.00
	D		2	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	42	0.08	197	$32.04	2	2		42	0.08	10%	177	$28.84		$0.00	0.00	19.656	$3.20	0.00
34	B	1st - Women's toilet	2	2	1'X4' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	80	0.16	374	$61.03	2	2	Dual technology occupancy sensor	80	0.16	10%	337	$54.92	$75.00	$75.00	0.00	37.44	$6.10	12.29
	C		1	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	79	0.08	185	$30.13	1	2		79	0.08	10%	166	$27.12		$0.00	0.00	18.486	$3.01	0.00
	D		2	2	1'X2' 2-Lamp T-12 Industrial Strip Magnetic Ballast	2340	42	0.08	197	$32.04	2	2		42	0.08	10%	177	$28.84		$0.00	0.00	19.656	$3.20	0.00
35	K	1st - Jan Closet	1		1-Lamp Incandescent Surface Fixture	552	75	0.08	41	$6.75	1	0	Dual technology occupancy sensor	75	0.08	10%	37	$6.07	$75.00	$75.00	0.00	4.14	$0.67	111.14
36	N	1st - Court Room	15		2-Lamp CFL & Metal Halide Surface Fixure	780	222	3.33	2,597	$423.38	15	0	Dual technology occupancy sensor	222	3.33	10%	2,338	$381.04	$75.00	$150.00	0.00	259.74	$42.34	3.54
	O		4		1-Lamp Metal Halide Pendent Fixure	780	455	1.82	1,420	$231.39	4	0		455	1.82	10%	1,278	$208.26		$0.00	0.00	141.96	$23.14	0.00
	L		10		1-Lamp Incandescent Recessed Par Fixture	780	90	0.90	702	$114.43	10	0		90	0.90	10%	632	$102.98		$0.00	0.00	70.2	$11.44	0.00
	A		32	1	1'X4' 1-Lamp T-12 Industrial Strip Magnetic Ballast	780	50	1.60	1,248	$203.42	32	1		50	1.60	10%	1,123	$183.08		$0.00	0.00	124.8	$20.34	0.00
37	F	1st - Enclosed Office (next to court)	1	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.13	304	$49.58	1	3	Dual technology occupancy sensor	130	0.13	10%	274	$44.63	$75.00	$75.00	0.00	30.42	$4.96	15.13
38	F	1st - Enclosed Office (next to court)	2	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.26	608	$99.17	2	3	Dual technology occupancy sensor	130	0.26	10%	548	$89.25	$75.00	$75.00	0.00	60.84	$9.92	7.56
39	F	1st - Enclosed Office (next to court)	1	3	2'X4' 3-Lamp T-12 Parabolic Magnetic Ballast	2340	130	0.13	304	$49.58	1	3	Dual technology occupancy sensor	130	0.13	10%	274	$44.63	$75.00	$75.00	0.00	30.42	$4.96	15.13
40	J	1st - Hallway	8		1-Lamp Incandescent Track Mount Fixture	2340	65	0.52	1,217	$198.34	8	0	Dual technology occupancy sensor	65	0.52	10%	1,095	$178.50	$75.00	$75.00	0.00	121.68	$19.83	3.78
41	M	1st - Storage	1		1-Lamp Incandescent Recessed Par Fixture	552	150	0.15	83	$13.50	1	0	Dual technology occupancy sensor	150	0.15	10%	75	$12.15	$75.00	$75.00	0.00	8.28	$1.35	55.57
42	M	1st - Storage	1		1-Lamp Incandescent Recessed Par Fixture	552	150	0.15	83	$13.50	1	0	Dual technology occupancy sensor	150	0.15	10%	75	$12.15	$75.00	$75.00	0.00	8.28	$1.35	55.57
43	J	1st - Conference Room	8		1-Lamp Incandescent Track Mount Fixture	2340	65	0.52	1,217	$198.34	8	0	Dual technology occupancy sensor	65	0.52	10%	1,095	$178.50	$75.00	$75.00	0.00	121.68	$19.83	3.78
	M		4		1-Lamp Incandescent Recessed Par Fixture	2340	150	0.60	1,404	$228.85	4	0		150	0.60	10%	1,264	$205.97		$0.00	0.00	140.4	$22.89	0.00
	A		12	1	1'X4' 1-Lamp T-12 Industrial Strip Magnetic Ballast	2340	50	0.60	1,404	$228.85	12	1		50	0.60	10%	1,264	$205.97		$0.00	0.00	140.4	$22.89	0.00
44	L	Outside - Front Canopy #1	2		1-Lamp Incandescent Recessed Par Fixture	3640	90	0.18	655	$106.80	2	0	Existing photocell	90	0.18	0%	655	$106.80	$0.00	$0.00	0.00	0	$0.00	0.00
45	L	Outside - Front Canopy #2	2		1-Lamp Incandescent Recessed Par Fixture	3640	90	0.18	655	$106.80	2	0	Existing photocell	90	0.18	0%	655	$106.80	$0.00	$0.00	0.00	0	$0.00	0.00
46	L	Outside - Building Lighting	10		1-Lamp Incandescent Recessed Par Fixture	3640	90	0.90	3,276	$533.99	10	0	Existing photocell	90	0.90	0%	3,276	$533.99	$0.00	$0.00	0.00	0	$0.00	0.00
47	P	Outside - Parking Lot Lighting	21		1-Lamp Metal Halide Pole Fixure	3640	125	2.63	9,555	$1,557.47	21	0	Existing photocell	125	2.63	0%	9,555	$1,557.47	$0.00	$0.00	0.00	0	$0.00	0.00
		Totals	378	90				38.25	79,669.38	$12,986.11	378	90			38.25		72,038.54	$11,742.28		$3,913.00	0.00	7,630.84	$1,243.83	3.15

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 - Office: 2210 hours, Outside 10 Hrs per day

3. Lamp totals only include T-12 tube replacment calculations

Project Name: LGEA Solar PV Project - Branchburg Municipal Building
Location: Branchburg, NJ
Description: Photovoltaic System 95% Financing - 25 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 25 year
Total Construction Cost	$238,050
Annual kWh Production	41,276
Annual Energy Cost Reduction	$6,728
Annual SREC Revenue	$14,447
First Cost Premium	**$238,050**
Simple Payback:	**11.24** Years

Life Cycle Cost Analysis

Analysis Period (years): 25
Financing Term (mths): 240
Average Energy Cost ($/kWh) **$0.163**
Financing Rate: 7.00%
Financing %: 95%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
SREC Value ($/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	$11,903	0	0	0	$0	0	0	(11,903)	0
1	$0	41,276	$6,728	$0	$14,447	$15,660	$5,380	$135	($11,768)
2	$0	41,070	$6,930	$0	$14,375	$15,271	$5,769	$265	($11,503)
3	$0	40,865	$7,138	$0	$14,303	$14,854	$6,186	$401	($11,102)
4	$0	40,660	$7,352	$0	$14,231	$14,407	$6,633	$543	($10,559)
5	$0	40,457	$7,572	$417	$14,160	$13,927	$7,113	$276	($10,283)
6	$0	40,255	$7,800	$415	$14,089	$13,413	$7,627	$434	($9,849)
7	$0	40,054	$8,034	$413	$14,019	$12,862	$8,178	$600	($9,249)
8	$0	39,853	$8,275	$410	$13,949	$12,271	$8,769	$773	($8,476)
9	$0	39,654	$8,523	$408	$13,879	$11,637	$9,403	$954	($7,522)
10	$0	39,456	$8,779	$406	$13,810	$10,957	$10,083	$1,142	($6,380)
11	$0	39,258	$9,042	$404	$13,740	$10,228	$10,812	$1,338	($5,042)
12	$0	39,062	$9,313	$402	$13,672	$9,446	$11,593	$1,543	($3,499)
13	$0	38,867	$9,593	$400	$13,603	$8,608	$12,432	$1,756	($1,744)
14	$0	38,673	$9,880	$398	$13,535	$7,710	$13,330	$1,978	$234
15	$0	38,479	$10,177	$396	$13,468	$6,746	$14,294	$2,208	$2,442
16	$0	38,287	$10,482	$394	$13,400	$5,713	$15,327	$2,448	$4,891
17	$0	38,095	$10,797	$392	$13,333	$4,605	$16,435	$2,698	$7,588
18	$0	37,905	$11,120	$390	$13,267	$3,417	$17,623	$2,957	$10,545
19	$0	37,715	$11,454	$388	$13,200	$2,143	$18,897	$3,226	$13,771
20	$0	37,527	$11,798	$387	$13,134	$777	$20,263	$3,506	$17,277
21	$0	37,339	$12,152	$385	$13,069	$658	$18,628	$5,549	$22,826
22	$0	37,152	$12,516	$383	$13,003	$451	$15,329	$9,357	$32,183
23	$0	36,967	$12,892	$381	$12,938	$0	$0	$25,449	$57,633
24	$0	36,782	$13,278	$379	$12,874	$0	$0	$25,773	$83,406
25	$0	36,598	$13,677	$377	$12,809	$0	$0	$26,109	$109,515
	Totals:	787,468	$180,785	$6,423	$275,614	$194,649	$226,147	$260,105	$255,337
				Net Present Value (NPV)			**$15,999**		
				Internal Rate of Return (IRR)			**12.5%**		

Project Name: LGEA Solar PV Project - Branchburg Municipal Building
Location: Branchburg, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

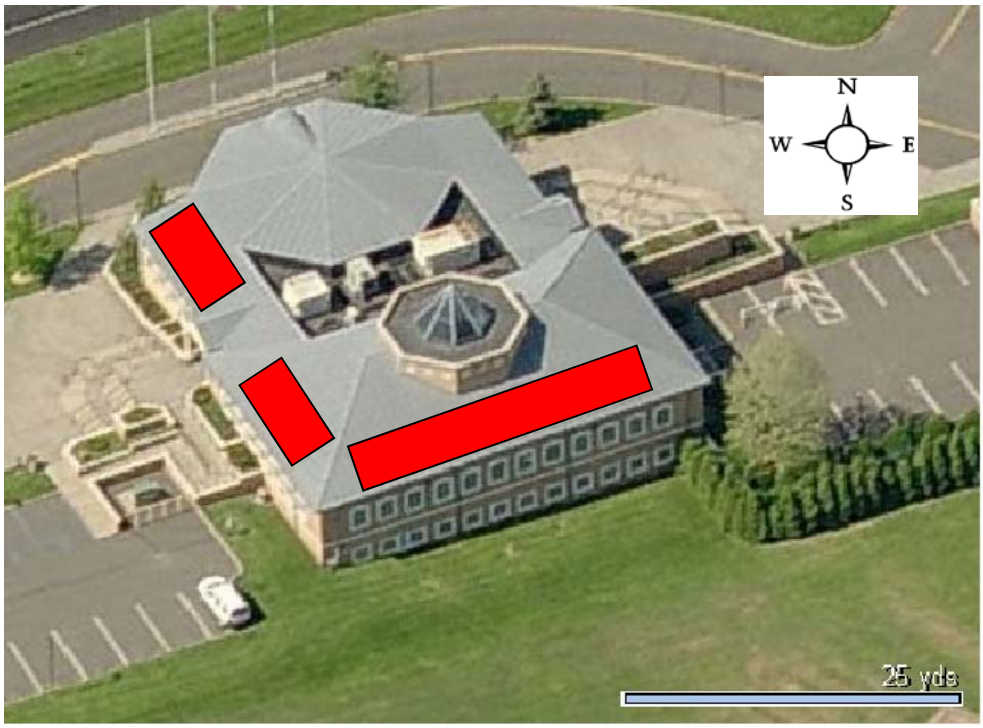
	Photovoltaic System - Direct Purchase
Total Construction Cost	$238,050
Annual kWh Production	41,276
Annual Energy Cost Reduction	$6,728
Annual SREC Revenue	$14,447
First Cost Premium	**$238,050**
Simple Payback:	**11.24** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.163**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$238,050	0	0	0	$0	(238,050)	0
1	$0	41,276	$6,728	$0	$14,447	$21,175	($216,875)
2	$0	41,070	$6,930	$0	$14,375	$21,304	($195,571)
3	$0	40,865	$7,138	$0	$14,303	$21,440	($174,130)
4	$0	40,660	$7,352	$0	$14,231	$21,583	($152,547)
5	$0	40,457	$7,572	$417	$14,160	$21,316	($131,231)
6	$0	40,255	$7,800	$415	$14,089	$21,474	($109,757)
7	$0	40,054	$8,034	$413	$14,019	$21,640	($88,117)
8	$0	39,853	$8,275	$410	$13,949	$21,813	($66,305)
9	$0	39,654	$8,523	$408	$13,879	$21,993	($44,311)
10	$0	39,456	$8,779	$406	$13,810	$22,182	($22,130)
11	$0	39,258	$9,042	$404	$13,740	$22,378	$248
12	$0	39,062	$9,313	$402	$13,672	$22,583	$22,831
13	$0	38,867	$9,593	$400	$13,603	$22,796	$45,627
14	$0	38,673	$9,880	$398	$13,535	$23,017	$68,644
15	$0	38,479	$10,177	$396	$13,468	$23,248	$91,892
16	$0	38,287	$10,482	$394	$13,400	$23,488	$115,380
17	$0	38,095	$10,797	$392	$13,333	$23,738	$139,118
18	$0	37,905	$11,120	$390	$13,267	$23,997	$163,115
19	$0	37,715	$11,454	$388	$13,200	$24,266	$187,381
20	$0	37,527	$11,798	$387	$13,134	$24,546	$211,926
21	$1	37,339	$12,152	$385	$13,069	$24,836	$236,762
22	$2	37,152	$12,516	$383	$13,003	$25,137	$261,899
23	$3	36,967	$12,892	$381	$12,938	$25,449	$287,348
24	$4	36,782	$13,278	$379	$12,874	$25,773	$313,121
25	$5	36,598	$13,677	$377	$12,809	$26,109	$339,230
Totals:		787,468	$180,785	$6,423	$275,614	$577,280	$449,976
				Net Present Value (NPV)		**$339,255**	
				Internal Rate of Return (IRR)		**8.0%**	

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
Branchburg Municipal Bldg	1680	Sunpower SPR230	115	14.7	1,691	26.45	41,276	3,795	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.