ENERGY AUDIT – DRAFT REPORT

HOBOKEN
Multi Service Building

120-134 Grand Street
Hoboken, NJ 07030
ATTN: Anthony Arnone

CEG PROPOSAL NO. 9C08143

CONCORD ENGINEERING GROUP

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I. EXECUTIVE SUMMARY

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

Hoboken
Multi Service Building
120-134 Grand Street (130 Grand Street)
Hoboken, NJ 07030

Facility Contact Person: Anthony Arnone

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy's mission, 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	$63,398
Natural Gas	$8,903
Fuel Oil	$28,420
Total	$100,722

The potential annual energy cost savings are shown below in Table 1. <u>Be aware that the measures are not additive because of the interrelation of several of the measures.</u> The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE RETURN ON INVESTMENT
1	Interior Lighting Upgrades	$428	$98	4.78	21.3%
2	Compact Fluorescent Lights	$12	$29	0.41	244%
3	Exit Sign Upgrade	$280	$235	1.67	59.9%
4	Interior Lighting Controls	$2,970	$529	5.61	17.8%
5	High-Efficiency Split and Packaged Units (2) 20 Ton & (1) 30 Ton Split systems , (1) 20 Ton Packaged unit	$188,240	$950	198.2	.5
6	High-Efficiency Split AC Unit	$450	$2	225.0	.44
7	Boiler Replacement – Like Kind	$37,751	$3,187	11.85	8.4%
8	Boiler Replacement – High Efficiency Upgrade	$98,001	$12,204	8.0	12.5%
9	Domestic Water Heater Replacement	$9,838	$407	24.2	4.1

The estimated demand and energy savings are 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			
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)	NATURAL GAS (MBH)	FUEL OIL #2 (MBH)
1	Interior Lighting Upgrades	0.25	639.6	-	-
2	Compact Fluorescent Lights	0.16	426.4	-	-
3	Exit Sign Upgrade	0.15	1349	-	-
4	Interior Lighting Controls	1.42	3,700	-	-
5	High-Efficiency Split and Packaged Units (2) 20 Ton & (1) 30 Ton Split systems , (1) 20 Ton Packaged unit	3.7	6,658	-	-
6	High-Eff. Window AC Unit	-	13	-	-
7	Boiler Replacement – Like Kind	-	-	-	1003.8
8	Boiler Replacement – High Efficiency Upgrade	-	-	(1,127,537) Increase	8950.7
9	Domestic Water Heater Replacement	-	-	23,260	-

Recommendation:

Concord Engineering Group strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under ten (10) years. The potential energy and cost savings from these ECM's are too great to pass upon. The following Energy Conservation Measures are recommended for the Hoboken, Multi Service Building:

- **ECM #1:** Interior Lighting Upgrades
- **ECM #2:** Compact Fluorescent Lights
- **ECM #3:** Exit Sign Upgrade
- **ECM#4:** Interior Lighting Controls
- **ECM#8:** Boiler Replacement – High Efficiency Upgrade

Concord Engineering Group recommends that consideration be given to the implementation of all ECM's where equipment is substantially past its useful life. Equipment that is substantially past its useful life typically is inefficient, has higher maintenance costs and is more susceptible to mechanical failure. This equipment does not meet the criteria of simple payback at or under ten years on energy savings alone. Additional consideration should be given to maintenance costs, reliability as well as the length of time the owner expects to own and maintain the building. Concord Engineering Group recommends the following ECM for implementation based on useful life expectancy:

- **ECM #5:** High-Efficiency Rooftop Units
- **ECM#9:** Domestic Water Heater Replacement

Concord Engineering Group has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. This solar energy system is viable for the Multi Service building. CEG recommends the Owner review the implementation in addition to the funding options noted in Section X. The simple payback for either of the two funding options is 11.7 years.

II. INTRODUCTION

This comprehensive energy audit covers the 40,000 square foot Hoboken, Multi Service Building facility that includes the boiler room, offices, storage rooms, day care, kitchen, lobby, clinic areas, exam rooms, hallways, files, electrical room, elevator hall, rest room and nurse station, etc.

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

Electric

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from January-07 to December-07. Public Service Electric and Gas Company (PSE&G) provides electricity to the facility under the General Lighting and Power Service (GLP) rate. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the most current rate structure available.

Natural Gas

Table 4 and Figure 2 show the natural gas energy usage for the surveyed facility from January-07 to December-07. The utility bill for December-07 was not available and an average of January-07 and November-07 was assumed for December-07. PSE&G charges a rate per therm for delivery of the natural gas via their pipelines to the burners under their General Service (GSGH) rate.

Fuel Oil

Appendix A includes a fuel oil annual summary from January-07 through May-08. Data was provided by the Hoboken City Hall Purchasing Department for Fiscal Year 2008. The data details the delivery of number 2 fuel oil to the Multi Service Building totaling 8950.7 gallons delivered.

Description	Average
Electricity	14.3¢ /kWh
Natural Gas	$1.34 /Therm
Fuel Oil – No. 2	$3.1752 / gallon

Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-07	24,480	54.0	$2,763
Feb-07	25,680	54.0	$2,912
Mar-07	24,000	55.2	$2,797
Apr-07	23,160	54.0	$2,705
May-07	22,440	62.4	$2,671
Jun-07	44,280	128.4	$6,907
Jul-07	57,240	141.6	$9,456
Aug-07	66,360	134.4	$10,652
Sep-07	57,240	132.0	$9,474
Oct-07	46,320	130.8	$6,310
Nov-07	27,120	106.0	$3,580
Dec-07	25,800	80.0	$3,172
Totals	**444,120**	**141.6 Max**	**$63,398**

AVERAGE DEMAND	**94.4**	**KW average**
AVERAGE RATE	**$0.143**	**$/kWh**

Figure 1
Electricity Usage Profile

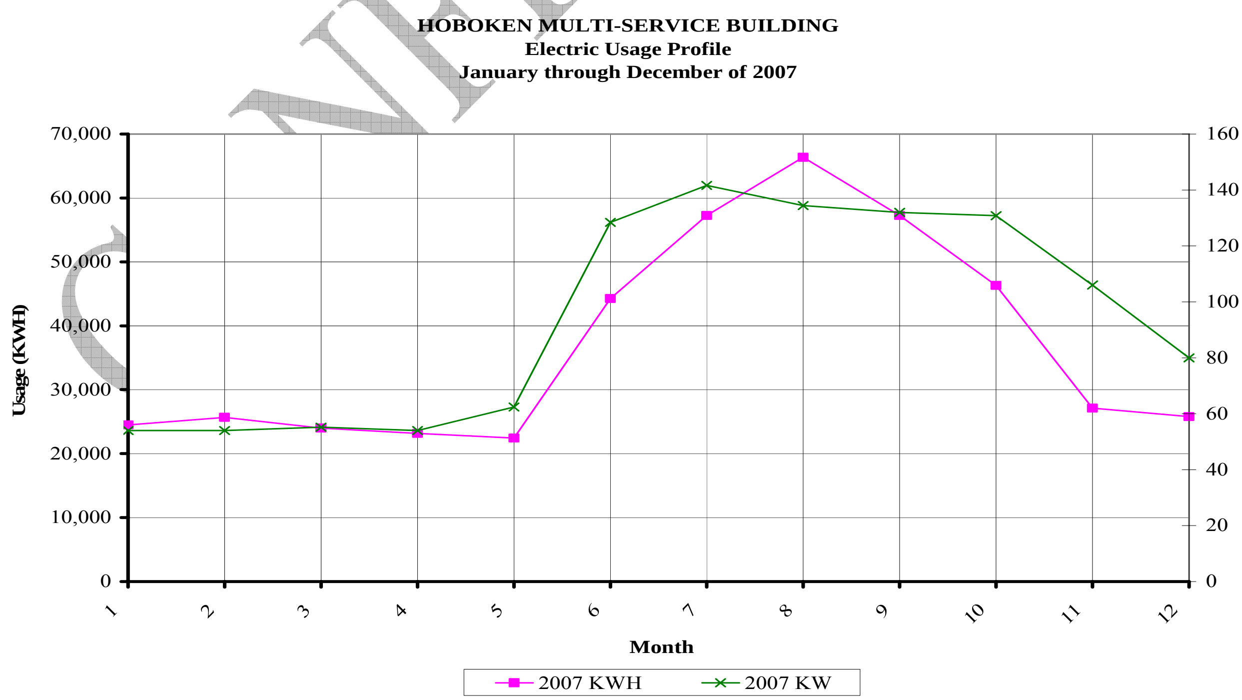
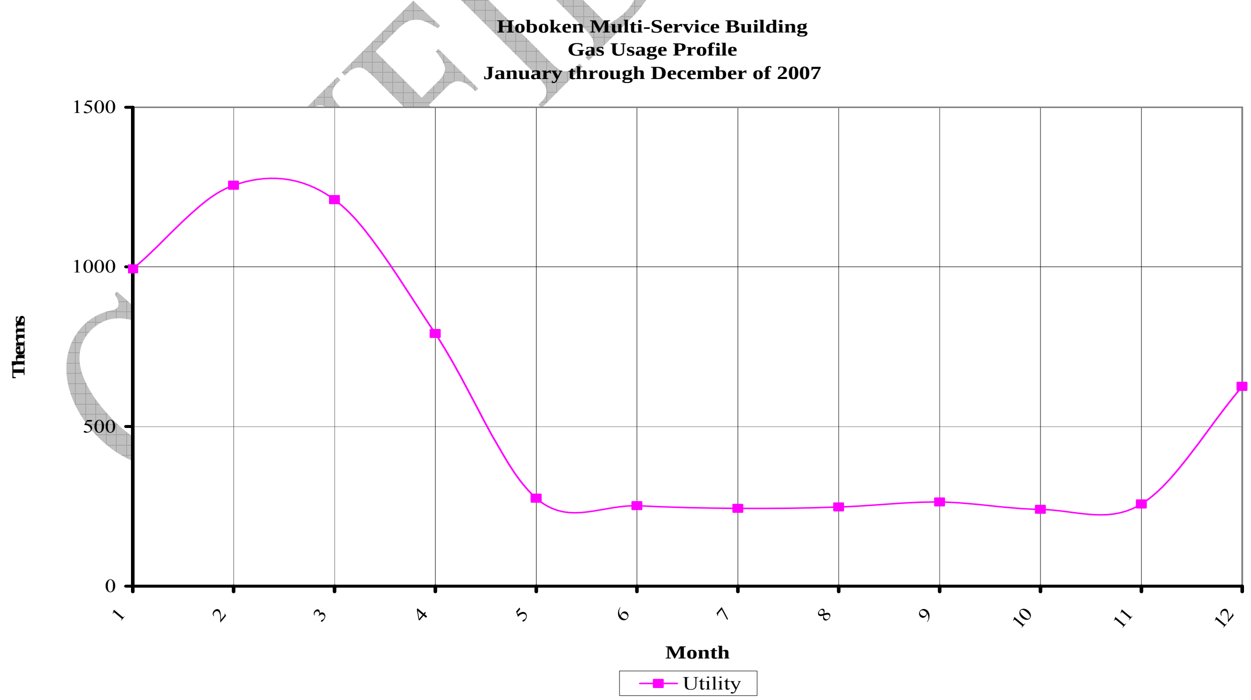


Table 4
Natural Gas Billing Data

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Jan-07	994.00	$1,386.23
Feb-07	1255.69	$1,620.49
Mar-07	1210.56	$1,693.36
Apr-07	791.08	$1,072.39
May-07	274.93	$374.94
Jun-07	252.18	$345.19
Jul-07	243.23	$326.39
Aug-07	248.14	$312.07
Sep-07	263.66	$308.44
Oct-07	240.32	$280.54
Nov-07	257.11	$326.62
Dec-07	625.55	$856.50
TOTALS	**6656.45**	**$8,903.16**
AVERAGE RATE:	**$1.34**	**$/THERM**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's energy utilization per square foot of building. This calculation is completed by converting all utility usage (gas, electric, oil) consumed by a building over a specified time period, typically 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 amongst building of similar type. The EUI for this facility is calculated as follows:

$$Building\ EUI = \frac{(Electric\ Usage\ in\ kBtu/h + Gas\ Usage\ in\ kBtu/h + Heating\ Oil\ kBtu/h)}{Building\ Square\ Footage}$$

Electric = ((444,120 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu/h / 1 kBtu/h)
= 1,516,226 kBtu/h

Gas = ((6,656.45 therms) * (100,000 Btu/h / 1 Therm)) / (1000 Btu/h / 1 kBtu/h) = 665,645 kBtu/h

Heating Oil = ((8950.7 gallons) * (139,400 Btu/h / 1 Gallon)) / (1000 Btu/h / 1 kBtu/h)

Heating Oil = 1,247,728 kBtu/h

$$Building\ EUI = \frac{(1{,}516{,}226\ kBtu/h + 665{,}645\ kBtu/h + 1{,}247{,}728\ kBtu/h)}{40{,}000\ SF} = \frac{3{,}429{,}598\ kBtu/h}{40{,}000\ SF}$$

Hoboken Multi Service Building EUI = 85.74 kBtu/SF

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 you to track and assess 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 more emphasis is being placed throughout multiple arenas on carbon reduction, greenhouse gas emissions and other environmental impacts.

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

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

Username: hobokencity

Password: lgeaceg2009

Security Question: What is your birth city?

Security answer: hoboken city

Specific building types are detailed on the ENERGY STAR website. The Hoboken, Multi Service Building is more than 50% recreational and is designated as RECREATIONAL. Recreational facilities are not given an Energy Performance Rating. Despite this Portfolio Manager calculates the building EUI. The EUI is an important tool that can be sued to track the energy efficiency if the building. Baselines for improvement can be set that the municipality can strive to meet. CEG strongly urges Hoboken to keep their Portfolio Manager account up to date to monitor the performance of the building.

Refer to Appendix D for detailed energy benchmarking report entitled “STATEMENT OF ENERGY PERFORMANCE.”

V. FACILITY DESCRIPTION

The Hoboken Multi Service Building consists of the boiler room, offices, storage rooms, day care, kitchen, lobby, clinic areas, exam rooms, hallways, files, electrical room, elevator hall, rest room and nurse station; totaling approximately 40,000 SF. The brick/block facility was built in 1973. The facility is occupied 50 hours a week.

Heating System

The Multi Service Building is mainly heated by hot air systems. A Fraser Johnston, 30 year old, nominal 20 Ton cooling roof top air conditioning unit with 400,000 BTUH input natural gas furnaces serves the Second Floor Gym. A Trane rooftop Climate Changer air handling unit, 35 year old, nominal 30 Ton cooling serves the Second Floor offices with 560,000 hot water heating coil. A Trane rooftop Climate Changer air handling unit, 35 year old is serving the Second Floor that is running but no information on this unit could be obtained. The unit is assumed to be 20 Ton nominal cooling and have 400,000 BTUH heating hot water coils. A Trane indoor Climate Changer air handling unit, 35 year old is serving the First Floor that is running but no information on this unit could be obtained. The unit is assumed to be 20 Ton nominal cooling and have 400,000 BTUH heating hot water coils. There are four (4) heating hot water blower coils under the gym windows. It was reported that the Gym hydronic base board radiation is no longer in use.

Heat is provided by a H.B Smith 3500 Mills 9-section, natural gas-fired, 2,064,000 BTUH output maximum, water boiler in the basement with a rated efficiency of 76%. The boiler is approximately 36 years old and has a 35 year service life. The following equipment are on the heating hot water system:

a) 1st Floor perimeter radiation

b) 2nd Floor perimeter radiation

c) Gym hot water blower coil units

d) Two old unknown air handling units (assumed).

e) 2nd Floor Gym Air Handling

Domestic Hot Water

Domestic hot water for the restrooms is provided by a Rheem/Ruud Universal, natural gas domestic water heater, 35-gallon capacity rated at 199,900 Btuh input. It is assumed to be 12 years old with approximately no useful service life remaining.

Cooling System

The Multi Service Building is cooled by a Fraser Johnston, 30 year old, nominal 20 Ton cooling roof top air conditioning unit serving the Second Floor Gym. A Trane rooftop Climate Changer air handling unit, 35 year old, nominal 30 Ton cooling serves the Second Floor offices. A Trane rooftop Climate Changer air handling unit, 35 year old is serving the Second Floor that is running but no information on this unit could be obtained. The unit is assumed to be 20 Ton nominal cooling. A Trane indoor Climate Changer air handling unit, 35 year old is serving the First Floor that is running but no information on this unit could be obtained. The unit is assumed to be 20 Ton nominal cooling. Two condensing units appear to be the same age as the unknown air handling units. The condensing units do not appear to be in use because the coils and large wiring has been removed. The Notary Public office has a GE window air conditioner. Cooling units utilize R-22 refrigerant.

Lighting

Most of the Multi Service Building is lit via 2-foot by 4-foot, 4 foot long industrial or 4-foot by 1-foot fixtures having two (2) T-8 fluorescent lamps and electronic ballast. The Electrical room has 2-foot by 4-foot fixtures having two (2) T-12 fluorescent lamps and magnetic ballast. A Storage room has one 8-foot, 2 lamp T-12 fluorescent industrial fixture with a magnetic ballast. The Rec Hall Storage and Rec. Department Storage are lit via 100 W incandescent lights. The Nurse Station and Storage are lit via 2-foot by 2-foot fixtures with fluorescent U-tube T-8 lamps and electronic ballast. The exit signs throughout the facility contain incandescent lamps and consume an estimated 30 watts of electricity per exit sign.

VI. MAJOR EQUIPMENT LIST

Following the completion of the field survey a detailed equipment list was created. The equipment within this list is considered major energy consuming equipment whose replacement could yield substantial energy savings. In addition, 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 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.

Table 5
Existing Equipment Listing

Cooling Equipment							
Description	**Qty**	**Cooling Capacity (Tons)**	**Cooling Capacity (BTUH)**	**Fuel Type**	**Approx. Age (yrs)**	**ASHRAE Service Life (yrs)**	**Remaining Life (yrs)**
Trane Climate Changer	**1**	**30**	**372,000**	**ELECTRIC**	**35**	**15**	**(-20)**
Model DBUC-T240N400E	**1**	**20**	**240,000**	**ELECTRIC**	**30**	**15**	**(-15)**
Trane Climate Changer	**1**	**20***	**240,000***	**ELECTRIC**	**35**	**15**	**(-20)**
Trane Climate Changer	**1**	**20***	**240,000***	**ELECTRIC**	**35**	**15**	**(-20)**
GE window unit	**1**	**1***	**12,000***	**ELECTRIC**	**20**	**15**	**(-5)**
* - Denotes capacity estimated due to information being unavailable.							

Table 6
Existing Equipment Listing

HEATING EQUIPMENT						
Description	**Qty**	**Rated Capacity(BTUH)**	**Fuel Type**	**Approx. Age (yrs)**	**ASHRAE Service Life (yrs)**	**Remaining Life (yrs)**
H.B.SMITH 3500 MILLS	**1**	**1,829**	**No. 2 Oil**	**36 ***	**35**	**(-1)**
* - Manufacture date estimated due to information being unavailable.						

Table 7
Existing Equipment Listing

DOMESTIC WATER HEATING SYSTEM						
Description	**Qty**	**Capacity**	**Fuel Type**	**Approx. Age (yrs)**	**ASHRAE Service Life (yrs)**	**Remaining Life (yrs)**
Rheem / Ruud Universal G37-200-1 **Water Heater**	**1**	**35 gallon**	**Natural Gas 199.9 MBH Input**	**12 ***	**12**	**0**
* - Manufacture date estimated due to information being unavailable.						

Note: Equipment noted as having a negative (#) remaining life is considered past its standard service life as described in 2007 ASHRAE Applications Handbook and is most likely a good candidate for replacement.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Interior Lighting Upgrades

Description:

Replacing the 8 foot, two lamp T12 lamp fluorescent fixture with new is a simple change that can provide substantial savings. A typical 8 foot, two lamp T12 fluorescent fixture has a total wattage of about 222 Watts. By replacing with two (2) new 1 foot x 4 foot fixtures that have T8 lamps, reflector and electronic ballasts the total wattage would be reduced to 122 Watts per fixture and the space light levels and light quality would increase by about 15% and 35%, respectively.

CEG recommends a 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 electronic ballasts. In addition to functional cost savings, the fixture replacement will also provide operational cost savings. The operational cost savings will be realized through the lesser number of lamps that will be required to be replaced per year. The expected lamp life of a T8 lamp, approximately 30,000 burn-hours, in comparison to the existing T12 lamps, approximately 20,000 burn-hours, will provide the Owner with fewer lamps to replace per year. Based on the operating hours of this facility, the owner will be changing approximately 33% less lamps per year.

This ECM shall replace all T12 fixtures throughout the facility with new T8 lay-in type fixtures where there are ceilings and pendant type where it is exposed to structure.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in Appendix D that outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

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

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

$$\text{Smart Start® } Incentive = (1 \times\ \$\,25) + (\ 2 \times\ \$\,30) = \$85$$

Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ \ lamps \times \%\ reduction \times \$\ \ per\ lamp)$$

$$Maintenance\ Savings = (10 \times 33\%\ reduction \times \$\ 2.00) = \$6.60$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$520
NJ Smart Start Equipment Incentive ($):	($85)
Net Installation Cost ($):	*$428*
Maintenance Savings ($ / yr):	*$7*
Energy Savings ($ / yr):	*$91*
Net Savings ($ / yr):	*$98*
Simple Payback (yrs):	*4.7*
Simple Return On Investment (%):	*21.3%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$2,450*

ECM #2: Install Compact Fluorescent Lamps

Description:

Compact fluorescent lamps (CFL's) were created to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: a 13-Watt CFL for a 40-Watt incandescent lamp, a 15-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 23-Watt CFL for a 100-Watt incandescent lamp.

The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures. This ECM involves replacing all incandescent lamps in the facility with energy efficient compact fluorescent lamps.

Energy Savings Calculations:

There are twenty-four (24) 40-Watt, twenty-four (24) 60-Watt and zero (3) 100-Watt incandescent lamps in the facility that can be upgraded to 13, 15 and 23 Watt CFL units respectively. The average operating hours for these lamps is estimated to be 2600.

<u>Energy cost savings</u>:

3 units * (100W – 23W)] 2600 hours * 1 kW/1,000 W * $0.143 kWh] = <u>$29/yr</u>

The installed cost of three (3) 23-Watt CFL's is $12. This cost takes into account the price of the lamp only as the owner's personnel can install these new lamps easily.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$12
NJ Smart Start Equipment Incentive ($):	-
Net Installation Cost ($):	$12
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$29*
Net Savings ($ / yr):	*$29*
Simple Payback (yrs):	*.41*
Simple Return On Investment (%):	*244%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$725*

ECM #3: Exit Sign Upgrade

Description:

Exit signs are lit all year long and are typically a forgotten energy hog. Exits signs have replacement lamps ranging from 4 volt, 3.6 watt to 120volt or 277 volt, 25 watt depending on the existing fixture. Exit signs are usually electrically powered using incandescent bulbs, compact fluorescent lamps (CFL) or light emitting diode (LED) arrays. Most LED exit signs and some CFL exit signs meet Energy Star requirements.

There is a LED Thermoplastic Universal Architectural Exit sign with battery back-up available that is relatively inexpensive that will replace existing exit signs to a more efficient fixture, meeting the Energy Star requirements. Typical replacements are 2 watt for green text or 4 watt for red text fixture.

Energy Savings Calculations:

There are seven (7) exit signs in the facility (assumed to be 26 watt due to inaccessibility) that can be upgraded to standard 120/277 volt input, high out-put LED 4 watt (red) or 2 watt (green) fixtures with the Thermoplastic Universal Architectural Exit sign with battery back-up. The operating hours for these fixtures is continuous all year long at 8760 hours per year.

<u>Energy cost savings</u>:

7 units * (26W – 4W)]* 8760 hours * 1 kW/1,000 W * $0.143 kWh] = <u>$193/yr</u>

The installed cost of each 4-Watt LED exit signs is $56.
7 units * $56 = <u>$392.</u>

There is a NJ Smart Start Equipment Incentive of $10 per new LED exit sign for buildings with ≥75kW demand.
7 units * $10 = <u>$70</u>

Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (14\,lamps \times 100\%\ reduction \times \$\,3.00\,perlamp) = \$42.00$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$392
NJ Smart Start Equipment Incentive ($):	($70)
Net Installation Cost ($):	*$280*
Maintenance Savings ($ / yr):	*$42*
Energy Savings ($ / yr):	*$193*
Net Savings ($ / yr):	*$235*
Simple Payback (yrs):	*1.67*
Simple Return On Investment (%):	*59.9%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$5,875*

ECM #4: Interior Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. Many times this is due to the idea that it is better to keep the lights on rather than to continuously switch them on and off. The on/off dilemma was studied and it was found that the best option is to turn the lights off whenever possible. Although this does reduce the lamp life, the energy savings far outweigh the lamp replacement costs. The cutoff for when to turn the lights off is around two minutes. If the lights can be off for only a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is all it would take. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G of the referenced standard, states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. CEG typically will recommend the installation of dual technology occupancy sensors in all boiler room, offices, storage rooms, day care kitchen, clinic areas, exam rooms, files, electrical room, and rest rooms, etc. In the Multi Service Building facility, this would equate to 54 spaces covering approximately 25,790 square feet.

CEG would recommend wall switches for individual rooms, ceiling mount sensors for large office areas or restrooms, and fixture mount box sensors for some applications as manufactured by Sensorswitch, Watt Stopper, etc.

Energy Savings Calculations:

From Appendix D of this report, we calculated the lighting power density (Watts/ft^2) of the boiler room, offices, storage rooms, day care kitchen, clinic areas, exam rooms, files, electrical room, and rest rooms, etc. the facility to be ±0.5518 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

Savings = 10% x 0.5518 Watts/SF x 25,790 SF x 2,600 hrs/yr x 1kWh/1000Watts.
Savings = 3,700 kWh x $0.143/kWh
Savings = <u>$529</u> per year

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

The SmartStart Buildings® incentive is $20 per control which equates to an installed cost of $55/unit. Total number of spaces to be retrofitted is 54.

Total cost to install sensors is $55/unit x 54 units = $2,970.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,050
NJ Smart Start Equipment Incentive ($):	($1,080)
Net Installation Cost ($):	*$2,970*
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$529*
Net Savings ($ / yr):	*$529*
Simple Payback (yrs):	*5.61*
Simple Return On Investment (%):	*17.8%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$13,225*

ECM #5: High-Efficiency Split System and Packaged Air Handling Units

Description:

The two roof top air handling units and one indoor air handling with direct expansion (DX) cooling with hot water heating split system units, as well as the Packaged DX cooling with natural gas heat unit are excellent candidates for replacement as they appear to be past their service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. Due to escalating owning and maintenance costs, these units should be replaced.

This measure would replace each air handling and condensing units with energy-efficient variable air volume air handler with DX cooling and hot water heating coil, variable air volume zone control dampers and an energy efficient condensing unit, by Trane or approved equivalent.

Energy Savings Calculations:

$$EnergySavings = \frac{[CoolingTons \times 12,000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{EER_{OLD}} - \frac{1}{EER_{NEW}}\right) \times Avg.LoadFactor \times Hrs.ofCooling$$

<u>Existing Trane 20-Ton CU (2 units)</u>

Rated Capacity = 20 Tons per unit
Condenser Section Efficiency = 9.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.143/kWh

<u>Proposed High-Efficiency 20-Ton Condensing Unit (2 units)</u>

Rated Capacity = 20 Tons per Unit
New Cooling Unit Efficiency = 11.6 EER

$$EnergySavings = \frac{[20Tons \times 12,000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{9} - \frac{1}{11.6}\right) \times 0.15 \times 1800 = 1,614\,kWh/yr$$ per unit

<u>Total Energy Cost Savings</u> = (1,614) kWh/yr. x $0.143/kWh = <u>$230</u> per year per unit

<u>Existing Trane 30-Ton CU (1 unit)</u>

Rated Capacity = 30 Tons per unit
Condenser Section Efficiency = 9.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.143/kWh

Proposed High-Efficiency 30-Ton Condensing Unit (1 unit)

Rated Capacity = 30 Tons per Unit
New Cooling Unit Efficiency = 11.2 EER

$$EnergySavings = \frac{[30Tons \times 12{,}000 Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{9} - \frac{1}{11.2}\right) \times 0.15 \times 1800 = 2{,}121 kWh/yr$$

Total Energy Cost Savings = (2,121) kWh/yr. x \$0.143/kWh = \$303 per year

Existing Fraser Johnston 20-Ton Packaged Roof Top Unit (1 unit)

Rated Capacity = 20 Tons
Condenser Section Efficiency = 9.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - \$0.143/kWh

Proposed High-Efficiency 20-Ton Packaged Rooftop Air Handling Unit (1 unit)

Rated Capacity = 20 Tons per Unit
New Cooling Unit Efficiency = 11 EER

$$EnergySavings = \frac{[20Tons \times 12{,}000 Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{9} - \frac{1}{11}\right) \times 0.15 \times 1800 = 1{,}309 kWh/yr \text{ per unit}$$

Total Energy Cost Savings = (1,309) kWh/yr. x \$0.143/kWh = \$187 per year per unit

Installation costs for the three (3) rooftop split system Air handling units (20 Ton + 20 Ton + 30 Ton) and three (3) condensing unit replacements with matching capacity are estimated at \$157,500. The installation cost for the one (1) 20 Ton packaged unit with gas heat replacement is estimated at \$43,500. It is pertinent to note that this estimate includes the demolition of the existing units and dunnage modifications (if required).

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the rooftop unit replacement falls under the category "Unitary HVAC" and warrants an incentive based on efficiency (EER) at a certain cooling tonnage.

$$\text{Smart Start® } Incentive\,(UnitaryHVAC / SplitSystems : 20-30\ Tons) = (Cooling\,Tons \times \quad Incentive)$$
$$= 3units(20 Tons \times \$79 / Ton) + 1unit(30Tons \times \$79 / Ton) = \$7{,}110$$

$$\text{Smart Start® } VariableFrequencyDrive = \$155 / HP \text{ x 7.5 HP x 4 units} = \$4{,}650$$

$$\text{Smart Start® } Incentive\ DualEnthalpyEconomizerControls = \$250 \text{ x 4 units} = \$1{,}000$$

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$201,000
NJ Smart Start Equipment Incentive ($):	($12,760)
Net Installation Cost ($):	*$188,240*
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$950*
Net Savings ($ / yr):	*$950*
Simple Payback (yrs):	*198.2*
Simple Return On Investment (%):	*.5%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Savings ($):	*$14,250*

ECM #6: High-Efficiency Window AC Unit

Description:

The cooling only window air conditioning unit located over the server room is an excellent candidate for replacement. This unit is assumed to be a 1994 vintage unit. This window unit is beyond its service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. Due to escalating owning and maintenance costs, this unit should be replaced.

This measure would replace this unit with a more energy-efficient window DX cooling unit, by GE or approved equivalent.

Energy Savings Calculations:

$$EnergySavings = \frac{[CoolingTons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{EER_{OLD}} - \frac{1}{EER_{NEW}}\right) \times Avg.LoadFactor \times Hrs.ofCooling$$

<u>Existing GE 1-Ton window System (1 Unit)</u>

Rated Capacity = 1 Tons per unit
Unit Efficiency = 9.7 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.143/kWh

<u>Proposed High-Efficiency 1-Ton Window Unit</u>

Rated Capacity = 1 Tons per Unit
New Cooling Unit Efficiency = 10.1 EER

$$EnergySavings = \frac{[1Tons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{9.7} - \frac{1}{10.1}\right) \times 0.15 \times 1800 = 13 \;\; kWh/yr$$

<u>Total Energy Cost Savings</u> = (13) kWh x $0.143/kWh = <u>$2</u> per year

The installation cost for the 1 ton window AC replacement is estimated at $450.

From Appendix C, the window unit replacement falls under the category “Unitary HVAC” and would warrant an incentive based on efficiency (14.0 EER) at a less than 5.4 cooling tonnage. Window units are not available with an adequately high EER and are therefore can not meet the requirements for the incentive.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$450
NJ Smart Start Equipment Incentive ($):	($0)
Net Installation Cost ($):	*$450*
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$2*
Net Savings ($ / yr):	*$2*
Simple Payback (yrs):	*225*
Simple Return On Investment (%):	*.44%*
Estimated ECM Lifetime (yr):	*10*
Simple Lifetime Savings ($):	*$20*

ECM #7: Boiler Replacement – Like Kind

Description:

The Hoboken Multi Service Building is heated by one (1) HB Smith Mills 3500-O-9 Oil-fired, 9 section, 2,064 MBh hot water boiler which presently is about 81% efficient. As an energy conservation measure, the Concord team recommends this boiler be replaced by one (1) HB Smith 28HEW9RTS sectional boiler with a Power Flame Model C2-OB, oil Burner or equivalent with an efficiency of 86.1%.

<u>Existing Heating Hot Water Boiler:</u>

Rated Capacity = 2,064 MBh (No. 2 Fuel Oil)

Combustion Efficiency = 81%
Age & Radiation Losses = 5%
Thermal Efficiency = 76%

<u>Replacement Boiler:</u>

High-Efficiency Sectional

Rated Capacity = 2,249 MBh (No. 2 Fuel Oil)

Combustion Efficiency = 86.1%
Radiation Losses = 0.5%
Thermal Efficiency = 85.6%

<u>Operating Data:</u>

Heating Season Fuel Consumption = 8,950.7 gallons of oil (based on Fuel Oil billing data)
Average Cost of #2 Fuel Oil = $3.1752/gallon

Energy Savings Calculations:

Energy Savings = Old Boiler Energy Input x ((New Boiler Efficiency – Old Boiler) / New Boiler Efficiency))

$$\text{Energy Savings} = 8{,}950.7 \text{ Gallons} \times \frac{(85.6\% - 76\%)}{(85.6\%)} = 1{,}003.8 \text{ Gallons}$$

Energy Cost Savings = Annual Energy Savings x $/Gallon

= 1,003.8 Gallons x $3.1752/Gallon = $3,187/ yr.

Installed cost of a HB Smith 28HEW9RTS sectional boiler with a Power Flame Model C2-OB, oil Burner including removal of existing unit, all piping changes and controls = $40,000.

Smart Start Incentive = $1.00/MBh x 2,249/installed MBh = $2,249.

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$40,000
NJ Smart Start Equipment Incentive ($):	($2,249)
Net Installation Cost ($):	*$37,751*
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$3,187*
Net Savings ($ / yr):	*$3,187*
Simple Payback (yrs):	*11.85*
Simple Return On Investment (%):	*8.4%*
Estimated ECM Lifetime (yr):	*35*
Simple Lifetime Savings ($):	*$111,545*

ECM #8: Boiler Replacement – High Efficiency Upgrade

Description:

This ECM is similar to ECM #7 but replaces the boiler with a high efficiency condensing hot water boiler. The Hoboken Multi Service Building is heated by one (1) HB Smith Mills 3500-O-9 Oil-fired, 9 section, 2,064 MBh hot water boiler which presently is about 81% efficient. As an energy conservation measure, the Concord team recommends this boiler be replaced by one (1) HydroTherm KN-20 condensing boilers or equivalent with an efficiency of 84.6%. There is potential for these boilers to operate at 87% efficiency with lower system return water temperatures. This, however, would impact the connected equipment (air handling units and baseboard radiation) and an engineer should be consulted before changing the heating loop temperature difference. This ECM will consider the original system loop temperature difference of 30°F (180°F -150°F).

<u>Existing Heating Hot Water Boiler:</u>

Rated Capacity = 2,064 MBh (No. 2 Fuel Oil)

Combustion Efficiency = 81%
Age & Radiation Losses = 5%
Thermal Efficiency = 76%

<u>Replacement Boiler:</u>

High-Efficiency Condensing Boiler

Rated Capacity = 1,9990 MBh (Natural Gas)

Combustion Efficiency = 84.6%
Radiation Losses = 0.5%
Thermal Efficiency = 84.1%

<u>Operating Data:</u>

Heating Season Fuel Consumption = 8,950.7 gallons of oil (based on Fuel Oil billing data). The high efficiency boiler retro fit is natural gas fired only. Natural Gas is a cleaner burning fuel increasing equipment life and requires less maintenance. This application also takes advantage of the lower cost of natural gas as compared to #2 fuel oil. The following calculation converts the above mentioned quantity of fuel oil to its equivalent quantity of natural gas.

((8,950.7 gallons of oil) x (139,400 Btu/gal)) / (100,000 Btu/1 Therm of natural gas)
= 12,477 Therms

Average Cost of Natural Gas = $1.338/Therm

Energy Savings Calculations:

Energy Savings = Old Boiler Energy Input x ((New Boiler Efficiency – Old Boiler) / New Boiler Efficiency))

$$\text{Energy Savings} = 12{,}477 \text{ Therms} \times \frac{(84.1\% - 76\%)}{(84.1\%)} = 1{,}202 \text{ Therms}$$

Energy Cost Savings = Annual Energy Savings x $/Gallon

Energy Cost Savings = 1,202 Therms x $1.338/Therm = $1,608/ yr.

Savings from the conversion from fuel oil to natural gas will also occur. The following calculation converts energy savings from natural gas to the equivalent amount of fuel oil.

Equivalent Fuel Oil = ((1,202 Therms) x (100,000 Btu/Therm of natural gas)) / (139,400 Btu/gal of fuel oil) = 862.2 Gallons of fuel oil

8,950.7 gallons (used) – 862.2 gallons (saved) = 8,088.5 Gallons used (fuel oil equivalent to natural gas used in savings calculation)

Refer to Appendix H for a detailed fuel oil conversion to natural gas calculation.

Fuel Conversion Savings = $10,596

Total Energy Savings = Energy Cost Savings + Fuel Conversion Savings = $1,608 + $10,596
Total Energy Savings = $12,204

Installed cost of two (2) Hydro Therm KN-20 Condensing Boiler including removal of existing unit, all piping changes and controls = $100,000.

Smart Start Incentive = $1.00/MBh x 1,999/installed MBh = $1,999

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$100,000
NJ Smart Start Equipment Incentive ($):	($1,999)
Net Installation Cost ($):	*$98,001*
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$12,204*
Net Savings ($ / yr):	*$12,204*
Simple Payback (yrs):	*8.03*
Simple Return On Investment (%):	*12.5%*
Estimated ECM Lifetime (yr):	*35*
Simple Lifetime Savings ($):	*$427,140*

ECM #9: Domestic Water Heater Replacement

Description:

The existing domestic hot water heater is a Rheem Ruud Universal 199,900 BTUH input Natural Gas Heater and has a 80% thermal efficiency. The nameplate recovery rate is 194 gallons per hour at 75% thermal efficiency.

This energy conservation measure will replace the existing natural gas 35-gallon capacity domestic water heater with a 95% thermal efficient A.O. Smith Cyclone BTH-199NG gas fired domestic hot water heater with 100-gallon storage capacity or equivalent. This ECM requires coordination with the utility due to increase in natural gas demand for the facility. CEG advises the owner to contact the utility provider regarding the installation of this ECM.

Energy Savings Calculations:

Existing Natural Gas DW Heater

Rated Capacity = 199.9 MBH input; 35 gallons storage

Combustion Efficiency = 80%
Age & Radiation Losses = 5%
Thermal Efficiency = 75%

Proposed Natural Gas-Fired, High-Efficiency DW Heater

Rated Capacity = 199.9 MBH input; 100 gallons storage

Thermal Efficiency = 95%
Radiation Losses = 0.5%
Net Efficiency = 94.5%

Operating Data for DW Heater

Estimated Daily DWH Load = (200 occupants x 1.8 gal/day) / 8 hrs. = 45 gal/h

DW Heater Operating Hrs/Yr. = 736 Hrs.

Natural Gas Consumption = 736.9 hrs x 199,900 BTU/Hr x 1 Therm/ 100,000 BTU/Hr
Natural Gas Consumption = 1473 Therms

Energy Savings = Old Water Heater Energy Input x ((New Water Heater Efficiency – Old Water Heater) / New Water Heater Efficiency))

$$\text{Energy Savings} = 1{,}473 \text{ Therms} \times \frac{(94.5\% - 75\%)}{(94.5\%)} = 304 \text{ Therms}$$

Average Cost of Natural Gas = $1.34/Therm

Yearly Savings = 304 Therm x $1.34/ Therm = $407/year

Cost of Commercial Domestic Water Heater, 2-year warranty extension (years 4 and 5) and Installation = $10,238

Simple Payback = $10,238 / $491.67 = 24.2 years

Smart Start Incentive = $2.00/MBh x $199.9 /installed MBh = $400.

Energy Savings Summary:

ECM #9 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$10,238
NJ Smart Start Equipment Incentive ($):	($400)
Net Installation Cost ($):	*$9,838*
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$407*
Net Savings ($ / yr):	*$407*
Simple Payback (yrs):	*24.17*
Simple Return On Investment (%):	*4.1%*
Estimated ECM Lifetime (yr):	*12*
Simple Lifetime Savings ($):	*$4,884*

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 Hoboken, and concluded that there is potential for solar and wind 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 9,000 S.F. can be utilized for a PV system on the Multi Service Building. A depiction of the area utilized is shown in Appendix G. Using this square footage it was determined that a system size of 140.99 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 220,021 KWh annually, reducing the overall utility bill by 49.54% percent. A detailed financial analysis can be found in Appendix E. 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.

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. 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	INTERNAL RATE OF RETURN
Self-Finance	11.7 Years	8.6%
Direct Purchase	11.7 Years	7.5%

Wind energy production is another option available through the Renewable Energy Incentive Program. Small wind turbines can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG has reviewed the applicability of wind energy for Multi Service Building and has determined it is not a viable option. There is not enough free land available on the site to accommodate the installation of a wind turbine.

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 Section III, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for June 2007 through May 2008.

Electricity:
Section IV, Figure 1 demonstrates a very typical cooling load profile (May -October). There is an extreme summer peak in August which is consistent with summertime cooling. It is evident that there is an extreme reduction in the consumption January through May and November, December. The summertime peak is more than likely due to air increased air conditioning loads originating from the 25 ton, 30 ton, the Trane Climate Changer 20 ton unit and indoor Trane Climate Changer 20 Ton unit. These units are very old and therefore very inefficient, using much energy.

Natural Gas:
Section IV, Figure 2 demonstrates a typical heating load (January-April, December), and complimentary cooling load (May –October). The spike in natural gas consumption takes place in February, which Consistent with heating profiles. There is a clear separation between summer and winter loads consistent with energy commodities traded on the New York Mercantile Exchange. Heating loads carry a much higher average cost because of the higher demand for natural gas to heat during the winter. This facility is heated by a series of very and very old large, natural gas-fired units. The hot water is also supplied but natural gas supplied units.

Tariff Analysis:

Electricity:
The Multi-Service Facility receives electrical service through Public Service Electric and Gas Company (PSE&G) on a GLP (General Lighting and Power Service) rate. This utility tariff is for delivery service for general purposes at secondary distribution voltages. The Delivery Schedule has the following charges: Societal Benefits Charge, Non-utility Generation Charge, Securitization Charge, System Control Charge, Customer Account Services Charge, Standby Fee, Base Rate Distribution Adjustment Charge, Solar Pilot Recovery Charge and RGGI Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS).

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 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) of from Public Services Basic Gas Supply Service default service as detailed in the rate schedule.

This rate schedules have 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). It is pertinent to 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.

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.

From review of the information provided, it appears that Hoboken can improve its average natural gas costs by between 20-25%.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within City of Hoboken. CEG's primary observation is seen in the electric costs. The average price per kWh (kilowatt hour) for all buildings based on 1-year historical costs is $.15/kWh (kWh is the common unit of electric measure). The average price per decatherm for natural gas is $ 13.71dth (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. Hoboken could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on annual historical consumption (January through December 2007) and current electric rates, an annual savings of over $100,000 per year (Note: Savings were calculated using Hoboken's Average Annual Consumption of kWh and a variance to a fixed 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 Hoboken's natural gas costs. Based on the current market, Hoboken could improve its natural gas costs by approximately 25% annually. CEG recommends further advisement on these prices. The City should also consider procuring energy (natural gas) through alternative supply sources. CEG recommends energy advisory services.
CEG also recommends that the city schedule a meeting with their 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 city will learn more about the competitive supply process. Hoboken can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, they should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if Hoboken frequently changes or plans on changing its supplier for energy (natural gas), it needs to closely monitor balancing, particularly when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the 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.

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

C. Maintain all weather stripping on windows and doors.

D. Use cog-belts instead of v-belts on all belt-driven fans, etc. These can reduce electrical consumption of the motor by 2-5%.

E. Reduce lighting in specified areas where the foot candle levels are above 70 in private offices and above 30 in corridor, lobbies, etc.

F. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ.

G. Recalibrate existing sensors serving the office spaces

H. Install a Vending Miser system to turn off the vending machines in the lunch room when not in use.

I. Clean all light fixtures to maximize light output.

J. Confirm that outside air economizers on the rooftop units are functioning properly to take advantage of free cooling.

Electric Cost Summary
PSE&G

Project #9C08143
Multi Service Center 130 Grand St. Hoboken, NJ **2007**
Account # 21 324 079 59
Meter # 778002924

Month	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	**Total**	
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0	
KWH	24,480	25,680	24,000	23,160	22,440	44,280	57,240	66,360	57,240	46,320	27,120	25,800	444,120	
KW	54	54	55	54	62	128	142	134	132	131	106	80	142	Max
Monthly Load Factor	61%	71%	58%	60%	48%	48%	54%	66%	60%	48%	36%	43%	54%	
Electric Delivery, $	$ 761	$ 785	$ 754	$ 738	$ 755	$ 2,696	$ 3,213	$ 3,393	$ 3,106	$ 1,569	$ 1,047	$ 904	$19,721	
Delivery $/kwh	$0.031	$0.031	$0.031	$0.032	$0.034	$0.061	$0.056	$0.051	$0.054	$0.034	$0.039	$0.035	$0.044	
Electric Supply, $	$ 2,001	$ 2,127	$ 2,043	$ 1,967	$ 1,917	$ 4,211	$ 6,244	$ 7,259	$ 6,368	$ 4,741	$ 2,534	$ 2,268	$43,677	
Supply $/kwh	$0.082	$0.083	$0.085	$0.085	$0.085	$0.095	$0.109	$0.109	$0.111	$0.102	$0.093	$0.088	$0.098	
Total Cost, $	$2,763	$2,912	$2,797	$2,705	$2,671	$6,907	$9,456	$10,652	$9,474	$6,310	$3,580	$3,172	$63,398	
$/KWH	$0.113	$0.113	$0.117	$0.117	$0.119	$0.156	$0.165	$0.161	$0.166	$0.136	$0.132	$0.123	**$0.143**	

.=Utility information estimated. Utility bill not provided by owner.

Summary of Natural Gas Cost
PSE&G
Project #9C08143

Multi Service Building 130 Grand St. Hoboken, NJ **2007**
Account # 21 324 079 59
Meter # 1477132

Month	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	**Total**	
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31		
Therms (Burner Tip)	994.0	1255.7	1210.6	791.1	274.9	252.2	243.2	248.1	263.7	240.3	257.1	625.6	6656.5	
Total Distribution Cost	$379	$489	$474	$253	$95	87.6	$85	$86	$91	$84	$89	$234	2,446	Utility Charge
Cost per Therm	$0.381	$0.389	$0.391	$0.320	$0.344	$0.347	$0.349	$0.348	$0.346	$0.348	$0.346	$0.374	$0.367	
Total Commodity Cost	$1,007	$1,132	$1,219	$819	$280	257.6	$242	$226	$217	$197	$238	$623	6,457	Current Charge
Cost per Therm	$1.01	$0.90	$1.01	$1.04	$1.02	$1.02	$0.99	$0.91	$0.82	$0.82	$0.92	$1.00	$0.97	
Total Cost	$1,386	$1,620	$1,693	$1,072	$375	$345	$326	$312	$308	$281	$327	$857	$8,903	
Cost per Therm	$1.395	$1.291	$1.399	$1.356	$1.364	$1.369	$1.342	$1.258	$1.170	$1.167	$1.270	$1.369	**$1.338**	

.=Utility information estimated. Utility bill not provided by owner.

START DATE	END DATE	CONSUMPTION (GALLONS)	TOTAL BILL	TOTAL GALLONS	AVERAGE FUEL COST	TOTAL
1/1/2007	1/24/2007	1068.4	$3,307.88	1068.4	$3.10	$3,307.88
1/25/2007	2/21/2007	2084.2	$6,343.11	2084.2	$3.04	$6,343.11
2/22/2007	3/20/2007	1472.7	$4,966.05	1472.7	$3.37	$4,966.05
3/21/2007	5/8/2007	823.1	$3,129.66	823.1	$3.80	$3,129.66
5/9/2007	7/8/2007	0.0	$0.00	0.0	-	$0.00
7/9/2007	9/8/2007	0.0	$0.00	0.0	-	$0.00
9/9/2007	11/5/2007	0.0	$0.00	0.0	-	$0.00
11/06/07	11/08/07	380.4	$1,125.41	1032.7	$3.03	$3,128.26
11/09/07	11/15/07	102.9	$311.48			
11/16/07	11/22/07	208.1	$621.91			
11/23/07	11/28/07	341.3	$1,069.46			
11/29/07	12/03/07	351.7	$1,068.64	2469.6	$3.06	$7,545.47
12/04/07	12/06/07	269.2	$804.50			
12/07/07	12/13/07	319.3	$957.42			
12/14/07	12/20/07	490.1	$1,503.14			
12/21/07	12/23/07	495.6	$1,518.02			
12/24/07	12/27/07	123.0	$376.75			
12/28/07	12/30/07	247.6	$775.11			
12/31/07	01/03/08	173.1	$541.89			
01/04/08	01/10/08	318.1	$1,024.44	1068.4	$3.10	$3,307.88
01/11/08	01/15/08	126.7	$387.77			
01/16/08	01/21/08	316.9	$975.42			
01/22/08	01/24/08	306.7	$920.25			
01/25/08	01/28/08	358.5	$1,063.13	2084.2	3.04	$6,343.11
01/29/08	01/31/08	320.6	$965.17			
02/01/08	02/04/08	167.0	$504.17			
02/05/08	02/11/08	294.3	$872.31			
02/12/08	02/18/08	493.0	$1,524.85			
02/19/08	02/21/08	450.8	$1,413.48			
02/22/08	02/25/08	283.2	$914.45	1472.7	3.37	$4,966.05
02/26/08	02/28/08	264.1	$865.98			
02/29/08	03/03/08	258.3	$863.76			
03/04/08	03/06/08	200.1	$674.64			
03/07/08	03/10/08	120.3	$422.43			
03/11/08	03/13/08	213.0	$747.95			
03/14/08	03/20/08	133.7	$476.84			
03/21/08	03/27/00	291.3	$1,045.48	823.1	3.80	$3,129.66
03/28/00	03/31/08	138.9	$516.22			
04/01/08	04/03/08	105.2	$516.22			
04/04/08	04/14/08	108.0	$376.97			
04/15/08	05/08/08	179.7	$674.77			
Fuel Oil Summary 11/06/2007 THROUGH 5/8/2008				**8950.7**	**3.1752**	**$28,420.43**

- DENOTES DATA FROM 2008 USED AS 2007 DATA TO GENERATE ENERGY STAR REPORT.

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

Hoboken Multi Service Building

ECM 1 Lighting Upgrade

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Retrofit	LS	$520	$0	$0	$520
Total Cost			$0	$0	$520
Utility Incentive - NJ Smart Start (1-2 lamp fixture $25, 3-4 lamp fixture $30)					($85)
Total Cost Less Incentive					$435

ECM 2 Compact Flourescent Lighting

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Retrofit	LS	$12	$0	$0	$12
Total Cost			$0	$0	$12
Utility Incentive - NJ Smart Start (New Fixture:1-2 lamp fixture $25, 3-4 lamp fixture $30)					$0
Total Cost Less Incentive					$12

ECM 3 Exit Sign Replacement

	Qty	Unit Cost $	Material $	Labor $	Total $
Exit Sign - LED	7	$56			$392
Total Cost			$0	$0	$392
Utility Incentive - NJ Smart Start ($10/new LED exit Sign)					($70)
Total Cost Less Incentive					$322

ECM 4 Interior Lighting Controls

	Qty	Unit Cost $	Material $	Labor $	Total $
Dual - Technology Sensor	54	$75	$1,620	$2,430	$4,050
Total Cost			$1,620	$2,430	$4,050
Utility Incentive - NJ Smart Start ($20 per Sensor)					($1,080)
Total Cost Less Incentive					$2,970

ECM 5 High-Efficiency Roof Top Air Handling Units

	Qty	Unit Cost $	Material $	Labor $	Total $
20 Ton Split System	2	$45,000	$0	$0	$90,000
30 Ton Split System	1	$67,500	$0	$0	$67,500
20 Ton Packaged Unit with Nat. Gas Heat	1	$43,500	$0	$0	$43,500
Total Cost			$0	$0	$201,000
Smart Start® Incentive ($79/Ton)	90				($7,110)
Smart Start® Incentive- Variable Frequency Drive ($155/HP)*7.5 HP	4				($4,650)
Smart Start® Incentive Dual Enthalpy Economizer Controls ($250/unit)	4.00				($1,000)
Utility Incentive - N/A					$0
Total Cost Less Incentive					$188,240

ECM 6 High Efficiency Window AC Upgrade

	Qty	Unit Cost $	Material $	Labor $	Total $
New 1-Ton Window AC System	1	$450	$0	$0	$450
Total Cost					$450
Smart Start® Incentive ($92/Ton)	1				($92)
Total Cost Less Incentive					$358

ECM 7 Boiler Replacement - Like Kind

	Qty	Unit Cost $	Material $	Labor $	Total $
HB Smith model 28HEW9RTS	1	$40,000	$0	$0	$40,000
Total Cost			$0	$0	$40,000
Smart Start® Incentive ($1.00/MBH)	2249				($2,249)
Utility Incentive - N/A					$0
Total Cost Less Incentive					$37,751

ECM 8 Boiler Replacement - High Efficiency Upgrade

	Qty	Unit Cost $	Material $	Labor $	Total $
HydroTherm model KN-20	2	$50,000	$0	$0	$100,000
Total Cost			$0	$0	$100,000
Smart Start® Incentive ($1.00/MBH)	1999				($1,999)
Utility Incentive - N/A					$0
Total Cost Less Incentive					$98,001

ECM 9 Domestic Water Heater Replacement

	Qty	Unit Cost $	Material $	Labor $	Total $
A.O. Smith Cyclone BTH-199NG	1	$10,238	$0	$0	$10,238
Total Cost			$0	$0	$10,238
Smart Start® Incentive ($2.00/MBH)	200				($400)
Utility Incentive - N/A					$0
Total Cost Less Incentive					$9,838

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APPENDIX C - FACILITY DATA FORM

Complete one Facility Data Form for __each__ building. If you are seeking to energy audit multiple buildings, complete one Facility Data Form for each.

FACILITY INFORMATION

Please complete the information below for this specific facility that is seeking enrollment in the Program.

Facility Name & Address Hoboken Multi Service Center, 120-134 Grand Street, Hoboken, NJ 07030	
Facility's Description The Hoboken Multi-Service Center houses the City of Hoboken's Senior Citizen Program and Vital Statistics Office. There are also 3 tenants - Hoboken Family Planning, HOPES, Inc. and the Hudson County Community Action Group. (the building is commonly referred to as "124 Grand Street")	
Total Square Footage 40,000	**Year Built** 1973
Number of Hours Occupied per Week 45	**Number of Employees** 58

ENERGY DATA

Please complete the energy information below for the most recent 12 month period available. In order to gain a complete picture of the facility's energy use, be sure to include all types of energy used by the facility. Do not include vehicle fuel.

The Data Below is for the 12 Month Period: 1 / / 07 to 12 / / 07

ELECTRICITY

Electric Utility Name & Account Number(s) Public Service Electric & Gas Account # 2132407959	
Annual kWh Use	**Annual Electricity Cost** Gas & Electric $87,566.84
Max Summer kW	**Max Winter kW**

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NATURAL GAS

Natural Gas Utility Name & Account Number(s)	
Public Service Electric & Gas Account #2132407959	
Annual Use in Therms	**Annual Natural Gas Cost**

FUEL OIL

Fuel Oil Utility Name & Account Number(s)	
Metro Fuel Account No. 583410	
Annual Use in Gallons	**Annual Fuel Oil Cost**
	28,420.44

PROPANE

Propane Utility Name & Account Number(s)	
N/A	
Annual Use in Gallons	**Annual Propane Cost**

OTHER

In this section please indicate any other fuel type that the facility uses, such as: solar energy, wind energy, bio-fuel, cogeneration, fuel cells.

Other Fuel Type:	
N/A	
Annual Energy Use (indicate units)	**Annual Energy Cost**

STAFF USE ONLY

Date Received: ______________	Project No.: ______________

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Multi-Service Center

Building ID: 1774443
For 12-month Period Ending: December 31, 2007[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 15, 2009

Facility
Multi-Service Center
130 Grand St.
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
James Ronga
94 Washington Street
Hoboken, NJ 07030

Year Built: 1973
Gross Floor Area (ft²): 40,000

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

Site Energy Use Summary[3]	
Electricity (kBtu)	1,515,337
Natural Gas (kBtu)[4]	665,650
Fuel Oil (No. 2) (kBtu)	1,224,284
Total Energy (kBtu)	3,405,271
Energy Intensity[5]	
Site (kBtu/ft²/yr)	85
Source (kBtu/ft²/yr)	175
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	364
Electric Distribution Utility	
PSE&G - Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	65
National Average Source EUI	136
% Difference from National Average Source EUI	29%
Building Type	Recreation

Stamp of Certifying Professional

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

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

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

Certifying Professional
Raymond Johnson
520 S. Burnt Mill Rd
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	Multi-Service Center	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Recreation	Is this an accurate description of the space in question?		☐
Location	130 Grand St., Hoboken, NJ 07030	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		☐

Multi-Service Center (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	40,000 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Number of PCs	37 (Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	45 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	58 (Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		☐

ENERGY STAR® Data Checklist
for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity		
Meter: Multi-Service Center Electric (kWh) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (kWh)**
12/01/2007	12/31/2007	25,800.00
11/01/2007	11/30/2007	27,120.00
10/01/2007	10/31/2007	46,320.00
09/01/2007	09/30/2007	57,240.00
08/01/2007	08/31/2007	66,360.00
07/01/2007	07/31/2007	57,240.00
06/01/2007	06/30/2007	44,280.00
05/01/2007	05/31/2007	22,440.00
04/01/2007	04/30/2007	23,160.00
03/01/2007	03/31/2007	24,000.00
02/01/2007	02/28/2007	25,680.00
01/01/2007	01/31/2007	24,480.00
Multi-Service Center Electric Consumption (kWh)		**444,120.00**
Multi-Service Center Electric Consumption (kBtu)		**1,515,337.44**
Total Electricity Consumption (kBtu)		**1,515,337.44**
Is this the total Electricity consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Multi-Service Center Gas (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
12/01/2007	12/31/2007	625.60
11/01/2007	11/30/2007	257.10
10/01/2007	10/31/2007	240.30
09/01/2007	09/30/2007	263.70
08/01/2007	08/31/2007	248.10
07/01/2007	07/31/2007	243.20
06/01/2007	06/30/2007	252.20
05/01/2007	05/31/2007	274.90
04/01/2007	04/30/2007	791.10

03/01/2007	03/31/2007	1,210.60
02/01/2007	02/28/2007	1,255.70
01/01/2007	01/31/2007	994.00
Multi-Service Center Gas Consumption (therms)		**6,656.50**
Multi-Service Center Gas Consumption (kBtu)		**665,650.00**
Total Natural Gas Consumption (kBtu)		**665,650.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

Fuel Type: Fuel Oil (No. 2)		
Meter: Multi Service Fuel Oil (Gallons) **Space(s):** Multi-Service Center		
Start Date	**End Date**	**Energy Use (Gallons)**
11/06/2007	11/28/2007	1,032.70
09/09/2007	11/05/2007	0.00
07/09/2007	09/08/2007	0.00
05/09/2007	07/08/2007	0.00
03/21/2007	05/08/2007	823.10
02/22/2007	03/20/2007	1,472.70
01/25/2007	02/21/2007	2,084.20
01/01/2007	01/24/2007	1,068.40
Multi Service Fuel Oil Consumption (Gallons)		**6,481.10**
Multi Service Fuel Oil Consumption (kBtu)		**907,352.70**
Total Fuel Oil (No. 2) Consumption (kBtu)		**907,352.70**
Is this the total Fuel Oil (No. 2) consumption at this building including all Fuel Oil (No. 2) 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.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Multi-Service Center
130 Grand St.
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
James Ronga
94 Washington Street
Hoboken, NJ 07030

General Information

Multi-Service Center	
Gross Floor Area Excluding Parking: (ft^2)	40,000
Year Built	1973
For 12-month Evaluation Period Ending Date:	December 31, 2007

Facility Space Use Summary

Multi-Service Center	
Space Type	Other - Recreation
Gross Floor Area(ft^2)	40,000
Number of PCs^o	37
Weekly operating hours^o	45
Workers on Main Shift^o	58

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2007)	**Baseline** (Ending Date 12/31/2007)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft^2)	85	85	0	N/A	65
Source (kBtu/ft^2)	175	175	0	N/A	136
Energy Cost					
$/year	$ 101,402.64	$ 101,402.64	N/A	N/A	$ 77,424.78
$/ft^2/year	$ 2.54	$ 2.54	N/A	N/A	$ 1.94
Greenhouse Gas Emissions					
MtCO$_2$e/year	364	364	0	N/A	278
kgCO$_2$e/ft^2/year	9	9	0	N/A	7

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

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

"Hoboken Multiservice Building"

Boiler

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
BOILER ROOM		HB SMITH	1	3500 MILLS	10-94-3115-H		2064		No.2 OIL	36	35	(-1)	9 section water boiler; (2) 200 gallon above ground oil tanks

Boiler - Burner

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Vintage	Efficiency (%)	Fuel (GPH)	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
BOILER ROOM		POWER FLAME	1	C2-O		1820 MIN / 2660 MAX			No.2 OIL 13-19		18		1 HP BLOWER MOTOR

Domestic Water Heater

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	Service Life	Remaining Life	Notes
BOILER ROOM		Rheem / Ruud Universal	1	G37-200-1		199,900		35		NATURAL GAS	12	12	0	

Air Handling Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity (MBH)	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
ROOF	SECOND FLOOR	TRANE	1	CLIMATE CHANGER	K4A2531N	F30x99, R22		372	HW (180-150)		560		electric	208	3		2/1/1974 35 YEARS	15	(-20)	COOL: EAT 81.1/67, LAT 57/55.2, Heat: EAT 61.5, LAT 103, 37.3 GPM, 3.8 FT WATER, MIXING BOX OPENINGS TOP AND BACK, 7.5 hp,
ROOF	GYM- 2nd Floor	Fraser Johnston	1	DBUC-T240N400E	N66M008858			240	NATURAL GAS	400							Pre-1979 30 years	15	(-15)	REPLACED
ROOF	Second Floor	TRANE	1	CLIMATE CHANGER				240 assumed each	HW (180-150) assummed	400 assumed							35 years	15	(-20)	Data Unavailable
Basement	First Floor	TRANE	1	CLIMATE CHANGER				240 assumed each	HW (180-150) assummed	400 assumed							35 years	15	(-20)	Data Unavailable

AC Condensers

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Roof		unknown	2				9 EER	R-22			35	20	(-15)	Data unavailable - no coil or large wire.

Heating and Ventilation Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Vintage	Heating Coil	Capacity (Btu/h)	Fan HP	Fan RPM	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
GYM	JNDER WINDOW		4											36	20	(-16)	HW BLOWER COILS

PTAC - Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity - DX	Heating Capacity - HW	Fan HP	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
WINDOW	r. CITIZEN OFFIC	GE	1												

INVESTMENT GRADE LIGHTNG AUDIT

CONCORD ENGINEERING GROUP

CEG Job #: 9C08143
Project: Hoboken Energy Audit
Address: 120-134 Grand st. (124 Grand Street)
Hoboken, NJ 07030
Building SF: 40,000

Hoboken Multi Service Building

DATE: 07/07/2009
KWH COST: **$0.143**

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	CEG Type	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
1	A	Boiler Room	10	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.58	1508	$215.64		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
2	A	Boiler Room Office	2	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
3	B	Day Care Kitchen	3	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.17	452.4	$64.69		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
4	D	Day Care	28	4' x 1' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	1.62	4222.4	$603.80		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
5	B		10	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.58	1508	$215.64		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
6	B	Bathrooms	4	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.23	603.2	$86.26		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
7	B	Day Care "Dive for Office?"	1	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
8	B	Day Care Office	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
9	B	Day Care Lobby	3	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.17	452.4	$64.69		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
10	B	Day Care Office 2	1	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
11	B	Office of Stats and Board of Health	9	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.52	1357.2	$194.08		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
12	B	Office of Stats and B. of H. Vestibule	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
13	B	Hopes Office	4	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.23	603.2	$86.26		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
14	A	Hopes Storage	2	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00

15	A	Women's Restroom	1	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
16	B		2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
17	A	Men's Restroom	1	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
18	B		2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
19	B	Hall 1	26	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	1.51	3920.8	$560.67		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
20	A	Hall 2	1	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
21	E	Hopes Continued	12	2' x 4' 4 Lamp T-8, Prism Lens, Electronic Ballast	2600	109	1.31	3400.8	$486.31		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
22	D	Office 1	1	4' x 1' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
23	D	Office 2	1	4' x 1' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
24	B	Family Planning	15	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.87	2262	$323.47		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
25	B	....Office	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
26	B	....Clinic	6	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.35	904.8	$129.39		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
27	B	....Clinic copy	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
28	B	....Clinic 2	1	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
29	B	....Clinic 3	1	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
30	B	....Clinic 4	1	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00

31	B	....Clinic 5	1	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
32	B	Clinic Conference	4	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.23	603.2	$86.26		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
33	B	Exam 1	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
34	D		1	4' x 1' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
35	A		1	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
36	B	Exam 2	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
37	A		1	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
38	F	Storage	1	8' 2-LampT-12 No Lens Magnetic Ballast	2600	222	0.22	577.2	$82.54	2	2'x4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	61	0.122	317.2	$45.36	$120.00	$240.00	0.10	260	$37.18	6.46
39	B	Hall	10	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.58	1508	$215.64		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
40	B	Senior Citizen Hall	22	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	1.28	3317.6	$474.42		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
41	B	….Kitchen	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
42	D		2	4' x 1' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
43	B	….Office	12	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.70	1809.6	$258.77		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
44	D		3	4' x 1' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.17	452.4	$64.69		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
45	B	Elevator Hall	16	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.93	2412.8	$345.03		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
46	B	Gym Storage	4	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	8760	58	0.23	2032.32	$290.62		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
47	A	….Hall	2	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00

48	G	Electrical Room	2	2'x4' 4-Lamp T-12 Prism Lens Magnetic Ballast	2600	164	0.33	852.8	$121.95	2	2'x4' 3-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N 2GC8	91	0.182	473.2	$67.67	$140.00	$280.00	0.15	379.6	$54.28	5.16
49	B	N. Hudson Community Patron Center	10	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.58	1508	$215.64		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
50	B	….Office	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
51	B	….Files	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
52	B	….Lounge	5	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.29	754	$107.82		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
53	B	….Hall	6	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.35	904.8	$129.39		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
54	B	….Office	1	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.06	150.8	$21.56		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
55	B	….Exam 1	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
56	B	….Exam 2	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
57	B	….Exam 3	2	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.12	301.6	$43.13		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
58	A	Women's Restroom	7	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.41	1055.6	$150.95		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
59	A	Men's Restroom	6	4' , 2 Lamp T-8, No Lens, Electronic Ballast	2600	58	0.35	904.8	$129.39		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
60	B	Rec Hall	8	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.46	1206.4	$172.52		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
61	B	Rec Department	14	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	0.81	2111.2	$301.90		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
62	B	Day Care 5-13	25	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	1.45	3770	$539.11		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
63	B	Day Care 2-18	18	2' x 4' 2 Lamp T-8, Prism Lens, Electronic Ballast	2600	58	1.04	2714.4	$388.16		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
64	I	Nurse Station	2	2' x 2' U -Tube T-8	2600	73	0.15	379.6	$54.28		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
65	I	Storage	1	2' x 2' U -Tube T-8	2600	73	0.07	189.8	$27.14		No Change Required.		0	0	$0.00		$0.00	0.00	0	$0.00	0.00
		Totals	357				21.74	57950.52	8286.92	4			0.30	790.40	$113.03		$520.00	0.25	639.60	$91.46	5.69

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

Project Name: **LGEA Solar PV Project - Hoboken Multi Service Building**
Location: **Hoboken, NJ**
Description: **Photovoltaic System 95% Financing - 20 year**

Simple Payback Analysis

	Photovoltaic System 95% Financing - 20 year
Total Construction Cost	$1,268,910
Annual kWh Production	220,021
Annual Energy Cost Reduction	$31,463
Annual SREC Revenue	$77,007
First Cost Premium	**$1,268,910**
Simple Payback:	**11.70** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	240	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.143**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$63,446	0	0	0	$0	0	0	(63,446)	0
1	$0	220,021	$31,463	$0	$77,007	$83,474	$28,677	($3,681)	($67,126)
2	$0	218,921	$32,407	$0	$76,622	$81,401	$30,750	($3,122)	($70,248)
3	$0	217,827	$33,379	$0	$76,239	$79,178	$32,973	($2,533)	($72,781)
4	$0	216,738	$34,381	$0	$75,858	$76,794	$35,357	($1,913)	($74,694)
5	$0	215,654	$35,412	$2,221	$75,479	$74,238	$37,913	($3,482)	($78,176)
6	$0	214,576	$36,474	$2,210	$75,101	$71,498	$40,654	($2,786)	($80,962)
7	$0	213,503	$37,569	$2,199	$74,726	$68,559	$43,593	($2,056)	($83,018)
8	$0	212,435	$38,696	$2,188	$74,352	$65,407	$46,744	($1,292)	($84,310)
9	$0	211,373	$39,856	$2,177	$73,981	$62,028	$50,123	($492)	($84,801)
10	$0	210,316	$41,052	$2,166	$73,611	$58,405	$53,747	$345	($84,456)
11	$0	209,265	$42,284	$2,155	$73,243	$54,520	$57,632	$1,219	($83,237)
12	$0	208,218	$43,552	$2,145	$72,876	$50,353	$61,798	$2,133	($81,104)
13	$0	207,177	$44,859	$2,134	$72,512	$45,886	$66,265	$3,085	($78,019)
14	$0	206,141	$46,205	$2,123	$72,149	$41,096	$71,056	$4,079	($73,939)
15	$0	205,111	$47,591	$2,113	$71,789	$35,959	$76,192	$5,115	($68,824)
16	$0	204,085	$49,018	$2,102	$71,430	$30,451	$81,700	$6,195	($62,629)
17	$0	203,065	$50,489	$2,092	$71,073	$24,545	$87,607	$7,319	($55,311)
18	$0	202,049	$52,004	$2,081	$70,717	$18,212	$93,940	$8,488	($46,822)
19	$0	201,039	$53,564	$2,071	$70,364	$11,421	$100,730	$9,705	($37,117)
20	$0	200,034	$55,171	$2,060	$70,012	$4,139	$108,012	$10,971	($26,146)
21	$0	199,034	$56,826	$2,050	$69,662	$3,509	$99,296	$21,632	($4,514)
22	$0	198,038	$58,531	$2,040	$69,313	$2,402	$81,712	$41,691	$37,176
23	$0	197,048	$60,286	$2,030	$68,967	$0	$0	$127,224	$164,400
24	$0	196,063	$62,095	$2,019	$68,622	$0	$0	$128,698	$293,098
25	$0	195,083	$63,958	$2,009	$68,279	$0	$0	$130,228	$423,325
	Totals:	4,197,547	$845,424	$34,238	$1,469,141	$1,037,564	$1,205,464	$1,386,473	($480,236)

Net Present Value (NPV)	**$26,160**
Internal Rate of Return (IRR)	**8.6%**

Project Name: LGEA Solar PV Project - Hoboken Multi Service Building
Location: Hoboken, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

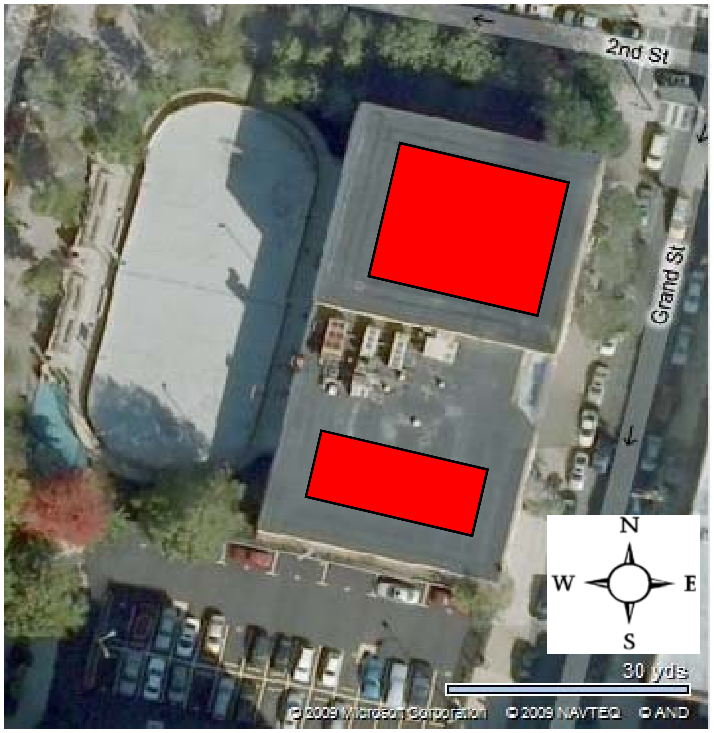
	Photovoltaic System - Direct Purchase
Total Construction Cost	$1,268,910
Annual kWh Production	220,021
Annual Energy Cost Reduction	$31,463
Annual SREC Revenue	$77,007
First Cost Premium	**$1,268,910**
Simple Payback:	**11.70** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.143**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Net Cash Flow	Cumulative Cash Flow
0	$1,268,910	0	0	0	$0	(1,268,910)	0
1	$0	220,021	$31,463	$0	$77,007	$108,471	($1,160,439)
2	$0	218,921	$32,407	$0	$76,622	$109,029	($1,051,410)
3	$0	217,827	$33,379	$0	$76,239	$109,618	($941,792)
4	$0	216,738	$34,381	$0	$75,858	$110,239	($831,553)
5	$0	215,654	$35,412	$2,221	$75,479	$108,670	($722,883)
6	$0	214,576	$36,474	$2,210	$75,101	$109,366	($613,518)
7	$0	213,503	$37,569	$2,199	$74,726	$110,095	($503,422)
8	$0	212,435	$38,696	$2,188	$74,352	$110,860	($392,562)
9	$0	211,373	$39,856	$2,177	$73,981	$111,660	($280,903)
10	$0	210,316	$41,052	$2,166	$73,611	$112,497	($168,406)
11	$0	209,265	$42,284	$2,155	$73,243	$113,371	($55,035)
12	$0	208,218	$43,552	$2,145	$72,876	$114,284	$59,249
13	$0	207,177	$44,859	$2,134	$72,512	$115,237	$174,486
14	$0	206,141	$46,205	$2,123	$72,149	$116,231	$290,716
15	$0	205,111	$47,591	$2,113	$71,789	$117,267	$407,983
16	$0	204,085	$49,018	$2,102	$71,430	$118,346	$526,329
17	$0	203,065	$50,489	$2,092	$71,073	$119,470	$645,799
18	$0	202,049	$52,004	$2,081	$70,717	$120,640	$766,439
19	$0	201,039	$53,564	$2,071	$70,364	$121,857	$888,296
20	$0	200,034	$55,171	$2,060	$70,012	$123,122	$1,011,418
21	$1	199,034	$56,826	$2,050	$69,662	$124,438	$1,135,855
22	$2	198,038	$58,531	$2,040	$69,313	$125,804	$1,261,660
23	$3	197,048	$60,286	$2,030	$68,967	$127,224	$1,388,883
24	$4	196,063	$62,095	$2,019	$68,622	$128,698	$1,517,581
25	$5	195,083	$63,958	$2,009	$68,279	$130,228	$1,647,809
	Totals:	4,197,547	$845,424	$34,238	$1,469,141	$2,916,719	$2,280,328
				Net Present Value (NPV)		**$1,647,834**	
				Internal Rate of Return (IRR)		**7.5%**	

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
Multi Service Building	9000	Sunpower SPR230	613	14.7	9,014	140.99	220,021	20,229	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.

Fuel Oil Conversion Savings

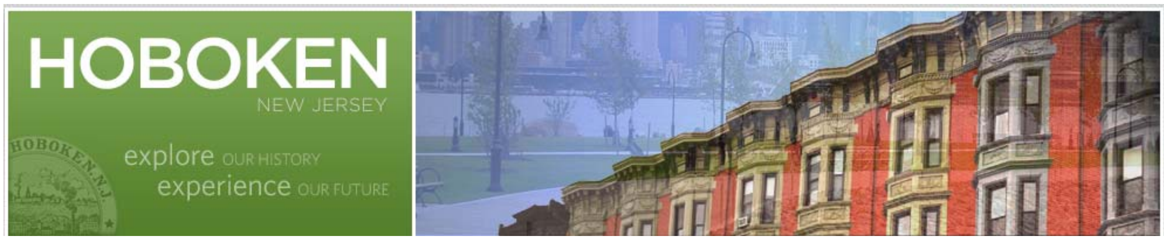
Hoboken Multi Service Building

Cost Benefit to convert to Natural Gas						
#2 Fuel Oil	139.4	MBtu/gal	$3.1752	per gal	$0.02278	per MBtu
Natural Gas	100	MBtu/therm	$1.338	per therm	$0.01338	per MBtu

Current Fuel Oil Usage		
Fuel Oil Annual Usage	8,088.5	Gallons
Fuel Oil Annual Usage	1,127,537	MBTU
Fuel Oil Annual Cost	$25,683	

Consumption of fuel with new more efficient equipment

Conversion to Natural Gas		
Natural Gas Annual Usage	1,127,537	MBTU
Natural Gas Annual Cost	$15,086	
Annual Conversion Savings	$10,596	



ENERGY AUDIT – DRAFT REPORT

HOBOKEN
PARKING GARAGE "B"

112-34 River Street
Hoboken, NJ 07030
ATTN: John Pope

CEG PROJECT NO. 9C08143

CONCORD ENGINEERING GROUP

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I. EXECUTIVE SUMMARY

This report presents the findings of an energy audit conducted at:

Hoboken Parking Garage "B"
112-34 River Street
Hoboken, NJ 07030

Municipal Contact Person: John Pope

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy's mission, 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 electrical energy cost at this facility is as follows:

Electricity $83,273

The potential annual energy cost savings for each of the alternative lighting retrofits are shown below in Table 1. The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST[A]	ANNUAL SAVINGS	SIMPLE PAYBACK	RETURN ON INVESTMENT
1	Office, Break Room, Maintenance Shop & Stairwell Lighting Upgrades	$8,428	$1,562	5.4	18.5%
2	Replace HID Fixtures with T5 Technology	$179,335	$32,055	5.6	17.8%
3	Replace HID Fixtures with Low-Bay LED Units	$465,062	$15,310	30.3	3.3%
4	Replace HID Fixtures with T8 Technology	$153,063	$36,361	4.2	23.8%
5	Replace HID Fixtures with Induction Fixtures	$241,800	$18,180	13.3	7.5%

Note A: Includes applicable incentive and maintenance savings

The estimated demand and energy savings are 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	
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)
1	Office, Break Room, Maintenance Shops & Stairwell Lighting Upgrades	1.7	11,574
2	Replace HID Fixtures with T5 Technology	27.0	236,529
3	Replace HID Fixtures with Low-Bay LED Units	12.9	112,969
4	Replace HID Fixtures with T8 Technology	30.6	268,301
5	Replace HID Fixtures with Induction Fixtures	15.3	134,151

Recommendations:

The following Energy Conservation Measures are recommended for the Hoboken Parking Garage "B" Facility:

- **ECM #1:** Office, Break Room, Maintenance Shops & Stairwell Lighting Upgrades
- **ECM #2:** Replace HID Fixtures with T5 Technology **OR**
- **ECM #4:** Replace HID Fixtures with T8 Technology

II. INTRODUCTION

This comprehensive energy audit covers the 51,400 square foot parking garage "B" facility complex that includes the parking garage building, maintenance shops, and lunchroom. The parking garage is constructed of pre-fabricated concrete sections and was constructed in 1973.

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

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from January-08 to December-08. Public Service Electric and Gas Company (PSE&G) provides electricity to the facility under the General Lighting and Power Service (GLP) Rate Schedule. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the most current rate structure available.

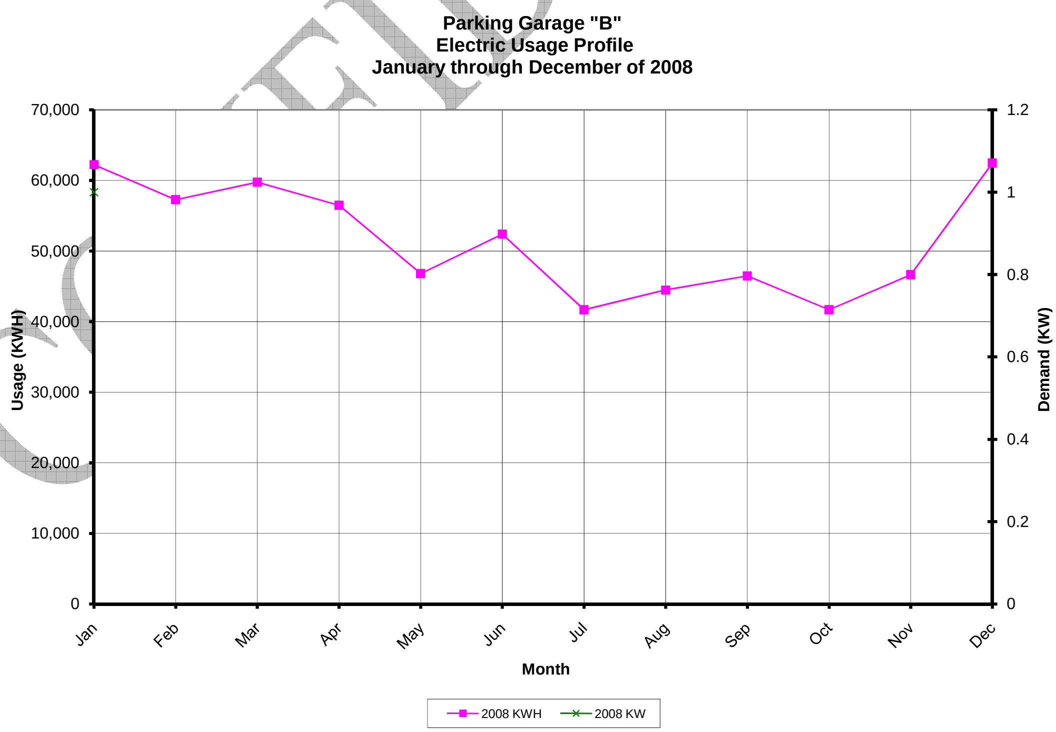
Description	Average
Electricity	13.5¢ / kWh

Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND**	TOTAL BILL
1/08	62,240		$7,199
2/08	57,280		$6,744
3/08	59760		$7,151
4/08	56,480		$6,607
5/08	46,800		$5,477
6/08	52,400		$7,538
7/08	41680		$7,041
8/08	44,480		$7,602
9/08	46,480		$8,019
10/08	41,680		$6,129
11/08	46,640		$6,048
12/08	62,480		$7,718
Totals	**618,400**		**$83,273**

** Electric Demand (kW) not provided by Owner.

Figure 1
Electricity Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building’s energy utilization per square foot of building. This calculation is completed by converting all utility usage (gas, electric, oil) consumed by a building over a specified time period, typically 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 amongst building of similar type. The EUI for this facility is calculated as follows:

$$Building\ EUI = \frac{Electric\ Usage\ in\ kBtu}{Building\ Square\ Footage}$$

Electric = ((618,400 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu/h / 1 kBtu/h)
= 2,111,218 kBtu

$$Building\ EUI = \frac{2{,}111{,}218\ kBtu}{51{,}400\ SF}$$

Parking Garage “B” EUI = 41.1 kBtu/SF

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: hobokencity
Password: lgeaceg2009

Security Question: What city were you born in?
Security Answer: “hoboken city”

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
Garage “B”	N/A	50

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

V. FACILITY DESCRIPTION

The 51,400 square foot parking garage "B" facility complex includes the parking garage building, maintenance shop, and lunchroom. The parking garage is constructed of pre-fabricated concrete sections and was constructed in 1973. The garage is open 24/7 all year round.

Heating System

The Manager of the parking facility office is heated by a Berko electric wall-hung unit heater.

Domestic Hot Water

Domestic hot water for the parking garage restrooms is provided by a 20-gallon capacity electric hot water heater.

Cooling System

Cooling in the Manager of the parking facility office is performed by a GE thru-the-wall air conditioning unit rated at 12,000 BTUH.

Lighting

The parking decks are lit by High Intensity Discharge (HID) fixtures with 150-Watt HPS lamps. These lamps are rated for 24,000 hours, have an initial average lumen output of 14,400, and consume 188 Watts per fixture. The lenses are yellowed from heat, age, and dust in the parking decks. Light output has steadily decreased as the optical components became coated with a film of pollutants. The lighting fixtures are delivering substantially less than the rated average lumens for this type of fixture (estimated at 70% of 14,400 = 10,000 lumens per fixture).

The Manager's office is lit by three 2-foot x 4-foot lay-in fixtures containing two T-12 lamps and a magnetic ballast while the restrooms contain two such fixtures along with two four-lamp fixtures in the elevators, The maintenance shops are lit by twenty-one (21) 1' x 4' two T-12 lamps and magnetic ballast. The stairwells contain thirty-two (32) 70-Watt HPS wall-mounted light fixtures.

Standard switching is utilized and there are not other types of lighting controls present.

VI. MAJOR EQUIPMENT LIST

Hoboken Parking Garage "B" Lighting (150-Watt HPS)

Location	No. of Fixtures
1st Level	65
2nd Level	62
3rd Level	62
4th Level	62
5th Level	62
6th Level	62
7th Level	28
TOTAL:	**403 Fixtures**

VII. ENERGY CONSERVATION MEASURES

ECM #1: Office, Break Room, Maintenance & Stairwell Lighting Upgrades

Description:

New fluorescent lamps and ballasts are available as direct replacements for the existing lamps and ballasts. A simple change from the old to the new can provide substantial savings. A typical fixture with two, 4-foot lamps (34-Watt lamps) has a total wattage of 74 Watts. By retrofitting with new lamps and an electronic ballast, the total wattage would be reduced to about 55 Watts per fixture and the space light levels and light quality would increase by about 15% and 35%, respectively.

CEG recommends a retrofit of the existing fixtures within the Manager's office, restrooms, elevators, break room and maintenance shops containing T12 lamps and magnetic ballasts with T8 lamps and electronic ballasts. The new energy efficient, T8 fixtures will provide improved lighting and will save the Municipality on electrical costs due to the better performance of the electronic ballasts.

For the stairwells, the CEG energy audit team recommends replacing the existing fixtures with radial wrap fixtures and automated controls. These energy efficient radial wrap luminaries have a single low wattage 2-foot fluorescent lamp which is constantly on while the 4-foot lamp is controlled by an occupancy sensor. The basis of design is the RWS luminaire by Precision Fluorescent or equal. A 70-Watt HPS lighting fixture has a total of 78 full input watts while the RWS luminaire draws a total of 42 input watts.

Energy Savings Calculations:

There are thirty 2-lamp T-12 fixtures to be retrofitted which equate to energy cost savings as follows:

(74-55)Watts x 30 Fixtures x 2,600 hrs/yr x $0.135/ kWh = 1,482 kWh x $0.135 = $200/yr

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the retrofit of T-12 fixtures to T-8 with electronic ballasts warrants the following incentive: T-8 (1-2 lamp) = $10 per fixture

$$\text{Smart Start® } Incentive = (\#\ of\ 1-2\ lamp\ \ fixtures \times\ \$10)$$
$$\text{Smart Start® } Incentive = (30 \times\ \$10) = \$300$$

The T-12 retrofit labor/material cost is $84/fixture which equals a total cost of 30 x $84 = $2,520

Energy savings for the 70-Watt HPS fixture replacement =

(78-42) Watts x 32 fixtures x 8,760 hrs/yr x $0.135/kWh = 10,092 kWh x $0.135 = $1,362/yr
Total energy cost savings = $200 + $1,362 = $1,562

Smart Start ® Incentive = 32 fixtures x $16/fixture = $512

Total Smart Start ® Incentive = $300 + $512 = $812

The total cost of the new RWS luminaire installed is $210/fixture x 32 fixtures = $6,720

Total labor & material cost for this ECM = $2,520 + $6,720 = $9,240

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$9,240
NJ Smart Start Equipment Incentive ($):	($812)
Net Installation Cost ($):	$8,428
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$1,562*
Net Savings ($ / yr):	*$1,562*
Simple Payback (yrs):	*5.4*
Simple Return On Investment (%):	*18.5%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$39,050*

Parking Deck Lighting

The purpose of the balance of this section is to outline the lighting analysis performed to assist Hoboken with the selection of a lamp fixture for the public parking garages. CEG evaluated many lamp options and summarized below are the optimum lamp types balancing quality of illumination, efficiency, and cost. Metal Halide and Metal Halide Pulse Technology were not considered due to their low Mean Fixture Lumens/Watt (40 to 60 L/W). The high pressure sodium light fixtures presently in the parking garage have a Mean Fixture Lumens/Watt of 60 to 70 L/W. Parking Garage “B” was used as the model for the analysis since it represents a typical layout for the other parking garages.

ECM #2: Replace Parking Garage Fixtures with T5 Technology

Description:

The newest family of linear fluorescent lamps is the T5 line of lamps, which consist of standard and high-output (HO) T5 lamps. The high output T5 lamps are a form of 4-foot fluorescent lamps that give off roughly twice the light output of T8 lamps. The intense brightness of the T5HO lamp is ideal as a replacement for any High Intensity Discharge (HID) lighting source (such as the existing high-pressure sodium lamps). In addition, the T5HO lamp offers increased energy efficiency and better lumen maintenance. Lumen maintenance defines the extent to which the full light output of a lamp is retained over the life of the lamp. After one year of continuous burn, the output of a standard High-Pressure Sodium (HPS) lamp will have declined to 88% of full light output. A T5HO lamp with the same burn time will have retained 95% of full light output.

HID lamps can take several minutes to "re-strike" or come up to full brightness once energized (such as after a power failure). As such, they do not lend themselves to control by light sensors, occupancy sensors, or other on/off controls. The perimeter of each parking deck closest to the daylight openings should be put on daylight harvesting controls to save additional energy.

This ECM would replace each of the existing HPS fixtures with a twin lamp, vapor tight, 4-foot T5 light fixtures with T5HO lamps and a Mean Fixture Lumens/Watt of 75+. The perimeter fixtures near the daylight openings would be controlled by light sensors and have dimming ballasts. The CEG audit team used the Zumtobel Chiaro vapor tight fixture for our fluorescent lighting layout. The fixture has an option for 20% uplight and has a Cold Spot Optimizer to address cold weather performance.

Energy Savings Calculations:

Appendix D outlines the T5 System option cost/savings analysis.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$191,425
NJ Smart Start Equipment Incentive ($):	($12,090)
Net Installation Cost ($):	$179,335
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$32,055*
Net Savings ($ / yr):	*$32,055*
Simple Payback (yrs):	*5.6*
Simple Return On Investment (%):	*17.8%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$801,375*

ECM #3: Replace Parking Garage Fixtures with LED Technology

Description:

The use of LED's for general illumination is becoming more viable with increased lumen-per-watt output and better color rendering. New products are continually being introduced to the market. LED's provide high efficiency and superior life, and cold temperatures do not negatively impact performance.

This ECM would replace each of the existing HPS fixtures at each parking deck level with two, vapor tight, LED light fixtures with an input power of 78 watts per fixture and a lumen output of 4,700 per fixture. The CEG audit team used the Lighting Science Pyramid LowBay vapor tight fixture for our LED lighting layout. The fixture has 108 LED's per fixture, a 45º beam spread, clear lens and an operating temperature range from -40ºC to +45ºC.

Energy Savings Calculations:

Appendix E outlines the LED System option cost/savings analysis.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$499,720
NJ Smart Start Equipment Incentive ($):	($34,658)
Net Installation Cost ($):	$465,062
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$15,310*
Net Savings ($ / yr):	*$15,310*
Simple Payback (yrs):	*30.4*
Simple Return On Investment (%):	*3.3%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$382,750*

ECM #4: Replace Parking Garage Fixtures with T-8 Technology

Description:

T8HO fluorescent lamps provide a lumen per watt ration of 70+, good lamp life, and many options for color rendering properties. Caution must be used in using linear fluorescent lamps in outdoor applications. They operate best in the range of 40-80ºF. Below this range, there is a decrease in light output and difficulty in starting. CEG recommends the Zumtobel Cold Spot Optimizer (CSO) to address cold weather performance. The CSO ia an aluminum sleeve that regulates the temperature at the electrode end of the lamp.

This ECM would replace each of the existing HPS fixtures with a 3-lamp, vapor tight, 4-foot T8 light fixtures with T8HO lamps and a Mean Fixture Lumens/Watt of 70+. The perimeter fixtures near the daylight openings would be controlled by light sensors and have dimming ballasts. The CEG audit team used the Zumtobel Chiaro vapor tight fixture for our fluorescent lighting layout. The fixture has an option for 20% uplight and has a Cold Spot Optimizer to address cold weather performance.

Energy Savings Calculations:

Appendix F outlines the T8 System option cost/savings analysis.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$165,153
NJ Smart Start Equipment Incentive ($):	($12,090)
Net Installation Cost ($):	$153,063
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$36,361*
Net Savings ($ / yr):	*$36,361*
Simple Payback (yrs):	*4.2*
Simple Return On Investment (%):	*23.8%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$909,025*

ECM #5: Replace Parking Garage Fixtures with Induction Fluorescent Units

Description:

The induction fluorescent system utilizes a high frequency magnetic field to supply energy to the low pressure gas inside the lamp. The electromagnetic field is produced by a generator coupled to an antenna. Because the assembly does not include an electrode, the life of the system can be very long (80,000+ hours). The system provides constant light output, instant starting, and good performance at low ambient temperatures.

This ECM would replace each of the existing HPS fixtures with a vapor tight, low bay, 85-Watt induction fixtures with an input power of 150 watts per fixture and a lumen output of 11,000 lumens per fixture. The CEG audit team used the Lithonia PGR Series Garage Lighting fixture for the lighting layout.

Energy Savings Calculations:

Appendix G outlines the Induction Fluorescent System option cost/savings analysis.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$241,800
NJ Smart Start Equipment Incentive ($):	-
Net Installation Cost ($):	$241,800
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$18,180*
Net Savings ($ / yr):	*$18,180*
Simple Payback (yrs):	*13.3*
Simple Return On Investment (%):	*7.5%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$454,500*

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 Hoboken Garage B, 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 is 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. Presently, the average value per credit is around $400, this value was used in our financial calculations. This equates to $0.40 per kWh generated.

CEG has reviewed the existing roof area of the parking garage being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of approximately 2,500 S.F. can be utilized for a PV system at this facility. A depiction of the area utilized is shown in Appendix H. Using this square footage, it was determined that a system size of 43 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 65,500 KWh annually, reducing the overall utility bill by 10% percent. A detailed financial analysis can be found in Appendix H. This analysis illustrates the payback of the system over a 20 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

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 20 years. Direct purchase involves the local government paying for 100% of the total project cost upfront. 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 and internal rate of return for the respective method of payment:

PAYMENT TYPE	SIMPLE PAYBACK	INTERNAL RATE OF RETURN
Self-Finance	12.2	9.9%
Direct Purchase	12.2	7.0%

Wind energy production is another option available through the Renewable Energy Incentive Program. Small wind turbines can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG has reviewed the applicability of wind energy for this facility and has determined it is not a viable option. The electrical demand for this facility is not high enough to justify the cost of a wind turbine installation.

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 Section III, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for June 2007 through May 2008.

<u>Electricity:</u>

Section IV, Figure 1 demonstrates a very typical Parking Garage load profile, which is very consistent or flat (base-loaded). Lighting tends to be the main source of consumption. Lighting tends to be on most if not all of the day.

<u>Natural Gas:</u>

This facility does not use natural gas service.

Tariff Analysis:

<u>Electricity:</u>

The Parking Garage-B receives electrical service through Public Service Electric and Gas Company (PSE&G) on a GLP (General Lighting and Power Service) rate and has Metered Demand. The meter for these types of facilities is typically a single source and service meter. This utility tariff is for delivery service for general purposes at secondary distribution voltages. The Delivery Schedule has the following charges: Societal Benefits Charge, Non-utility Generation Charge, Securitization Charge, System Control Charge, Customer Account Services Charge, Standby Fee, Base Rate Distribution Adjustment Charge, Solar Pilot Recovery Charge and RGGI Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS).

<u>Natural Gas:</u>

This facility does not use a natural gas service.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within City of Hoboken. CEG's primary observation is seen in the electric costs. The average price per kWh (kilowatt hour) for all buildings based on 1-year historical costs is $.15/kWh (kWh is the common unit of electric measure). The average price per decatherm for natural gas is $ 13.71dth

(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. Hoboken could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on annual historical consumption (January through December 2007) and current electric rates, an annual savings of over $100,000 per year (Note: Savings were calculated using Hoboken's Average Annual Consumption of kWh and a variance to a fixed 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 Hoboken's natural gas costs. Based on the current market, Hoboken could improve its natural gas costs by approximately 25% annually. CEG recommends further advisement on these prices. The City should also consider procuring energy (natural gas) through alternative supply sources. CEG recommends energy advisory services.

CEG also recommends that the city schedule a meeting with their 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 city will learn more about the competitive supply process. Hoboken can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, they should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if Hoboken frequently changes or plans on changing its supplier for energy (natural gas), it needs to closely monitor balancing, particularly when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

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

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

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

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

iv. *Lease/Purchase Agreement* – Investigate the possibility of a lease/purchase or lease/maintenance agreement with the manufacturer and/or installing contractor.

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 RECOMMENDATION

CEG recommends an application of a reflective white paint on the ceiling and vertical beam surfaces to increase the horizontal illumination levels by approximately two footcandles. The practical benefit to applying the paint system is increased ceiling illumination and increased vertical surface illumination above 5-feet. Both of these elements will increase the sense of personal security.

Electric Cost Summary

PSE&G (Rate - MD)

Parking Garage "B" **2008**

Account # 21 146 079 1 7

Meter #

Month	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	
KWH	62,240	57,280	59,760	56,480	46,800	52,400	41,680	44,480	46,480	41,680	46,640	62,480	618,400
Total Cost, $	$7,199	$6,744	$7,151	$6,607	$5,477	$7,538	$7,041	$7,602	$8,019	$6,129	$6,048	$7,718	$83,273
$/KWH	$0.1157	$0.1177	$0.1197	$0.1170	$0.1170	$0.1438	$0.1689	$0.1709	$0.1725	$0.1470	$0.1297	$0.1235	**$0.1347**

Electric Demand (kW) not provided by owner.

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

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

Electric Chillers

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

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

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

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

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

Variable Frequency Drives

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

Natural Gas Water Heating

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

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

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

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

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

Other Equipment Incentives

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

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

Hoboken Parking Garage "B"

Hoboken Garage "B" ECM #2 HID to 2L54T5HO VT	
Quantity of Lighting Fixtures/Lamps	403
Existing KW	75.8
Proposed KW	48.8
KW Saved	27.0
Annual KWH Saved	236,529
$/KWH	$0.135
Annual Energy Savings $	$32,055
Estimated Construction Cost $	$191,425
Utility Rebate $	$12,090
Net Construction Cost After Rebate $	$179,335
Simple Payback	5.59
Analysis Period	10.00
Energy Cost Escalation	3%
Discount Rate	5%
Net Present Value	$178,715
Internal Rate of Return	17.87%

Hoboken Garage "B" ECM #4 HID to 2L32T8HO VT	
Quantity of Lighting Fixtures/Lamps	403
Existing KW	75.8
Proposed KW	45.1
KW Saved	30.6
Annual KWH Saved	268,301
$/KWH	$0.135
Annual Energy Savings $	$36,361
Estimated Construction Cost $	$165,153
Utility Rebate $	$12,090
Net Construction Cost After Rebate $	$153,063
Simple Payback	4.21
Analysis Period	10.00
Energy Cost Escalation	2%
Discount Rate	5%
Net Present Value	$85,918
Internal Rate of Return	23.76%

Hoboken Garage "B" ECM #3 HID to LED Low Bay	
Quantity of Lighting Fixtures/Lamps	403
Existing KW	75.8
Proposed KW	62.9
KW Saved	12.9
Annual KWH Saved	112,969
$/KWH	$0.135
Annual Energy Savings $	$15,310
Estimated Construction Cost $	$499,720
Utility Rebate $	$34,658
Net Construction Cost After Rebate $	$465,062
Simple Payback	30.38
Analysis Period	10.00
Energy Cost Escalation	2%
Discount Rate	5%
Net Present Value	($685,300)
Internal Rate of Return	3.29%

Hoboken Garage "B" ECM #5 HID to 85 W Induction	
Quantity of Lighting Fixtures/Lamps	403
Existing KW	75.8
Proposed KW	60.5
KW Saved	15.3
Annual KWH Saved	134,151
$/KWH	$0.135
Annual Energy Savings $	$18,180
Estimated Construction Cost $	$241,800
Utility Rebate $	$0
Net Construction Cost After Rebate $	$241,800
Simple Payback	13.30
Analysis Period	10.00
Energy Cost Escalation	2%
Discount Rate	5%
Net Present Value	($223,515)
Internal Rate of Return	7.52%

Parking Garage "B" Lighting
ECM #2 Retrofit

	Existing Fixtures							Proposed Fixtures							
Location	**Description**	**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Present Avg. Lumens/Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**	**Description**		**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Avg. Lumens per Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**
1st Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	65	12,220	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	65	7,865
2nd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	62	7,502
3rd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	62	7,502
4th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	62	7,502
5th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	62	7,502
6th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	62	7,502
7th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	28	5,264	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	28	3,388
TOTALS:						403	75,764								48,763

Parking Garage "B" Lighting
ECM #2 Retrofit

	Fixtures Retrofitted									Unit Installation Cost								
Location	**Wattage Reduction**	**Average Burn Hours**	**Ave $/kwh**	**Ave. $/kW**	**Energy Savings, kWh**	**Energy Savings, $**	**Energy Savings, kW**	**Energy Savings, $**	**Qty**	**Material Each**	**Labor Each**	**Total Each**	**Total Materials**	**Total Labor**	**Total All**	**Rebate Estimate**	**Total Cost Less Rebate**	**Simple Payback**
1st Level Parking	4,355	8760	$0.1350	$4.58	38,150	$5,150	4.36	$20	65	$225.00	$250.00	$475.00	$14,625.00	$16,250.00	$30,875.00	$1,950.00	$28,925.00	5.59
2nd Level Parking	4,154	8760	$0.1350	$4.58	36,389	$4,913	4.15	$19	62	$225.00	$250.00	$475.00	$13,950.00	$15,500.00	$29,450.00	$1,860.00	$27,590.00	5.59
3rd Level Parking	4,154	8760	$0.1350	$4.58	36,389	$4,913	4.15	$19	62	$225.00	$250.00	$475.00	$13,950.00	$15,500.00	$29,450.00	$1,860.00	$27,590.00	5.59
4th Level Parking	4,154	8760	$0.1350	$4.58	36,389	$4,913	4.15	$19	62	$225.00	$250.00	$475.00	$13,950.00	$15,500.00	$29,450.00	$1,860.00	$27,590.00	5.59
5th Level Parking	4,154	8760	$0.1350	$4.58	36,389	$4,913	4.15	$19	62	$225.00	$250.00	$475.00	$13,950.00	$15,500.00	$29,450.00	$1,860.00	$27,590.00	5.59
6th Level Parking	4,154	8760	$0.1350	$4.58	36,389	$4,913	4.15	$19	62	$225.00	$250.00	$475.00	$13,950.00	$15,500.00	$29,450.00	$1,860.00	$27,590.00	5.59
7th Level Parking	1,876	8760	$0.1350	$4.58	16,434	$2,219	1.88	$9	28	$225.00	$250.00	$475.00	$6,300.00	$7,000.00	$13,300.00	$840.00	$12,460.00	5.59
TOTALS:	27,001				236,529	$31,931	27.00								$191,425.00	$12,090.00	$179,335.00	

ECM #2

Project Name: Hoboken Garage "B" ECM #2 HID to 2L54T5HO VT
Location: Hoboken, NJ
Description: Parking Garage Lighting Retrofit

Return on Investment Analysis

	Parking Garage Lighting Retrofit	Existing
Total Construction Cost	$191,425	$0
Annual Maintenance Cost	$2,539	$13,488
Annual Cost of Operation (Energy)	$57,890	$89,946
Utility Incentives or Credits	$12,090	$0

First Cost Premium: **$179,335**

Simplified Payback Calculation: **5.59** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	10	Financing Term (mths):	60
Depreciation Period (years):	39	Financing %:	5%
Tax Rate:	0.0%	Inflation Rate:	3.0%
Financing Rate:	5.00%	Energy Cost Escalation Rate:	3.0%
		Cost of Capital:	5.0%

Period	Additional Cash Outlay	Energy Savings	Additional Maint Costs	Additional Depreciation	Interest Expense	Pretax Income	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$170,368	0	0	0	0	0	0	(170,368)	0
1	$0	$32,055	($10,949)	$4,598	$412	$37,994	$1,619	$40,973	$40,973
2	$0	$33,017	($11,277)	$4,598	$329	$39,367	$1,702	$42,264	$83,237
3	$0	$34,007	($11,616)	$4,598	$242	$40,783	$1,789	$43,592	$126,830
4	$0	$35,027	($11,964)	$4,598	$150	$42,243	$1,880	$44,961	$171,791
5	$0	$36,078	($12,323)	$4,598	$54	$43,749	$1,977	$46,371	$218,162
6	$0	$37,161	($12,693)	$4,598	$0	$45,255	($0)	$49,853	$268,015
7	$0	$38,275	($13,074)	$4,598	$0	$46,751	($0)	$51,349	$319,364
8	$0	$39,424	($13,466)	$4,598	$0	$48,291	($0)	$52,890	$372,254
9	$0	$40,606	($13,870)	$4,598	$0	$49,878	($0)	$54,476	$426,730
10	$0	$41,825	($14,286)	$4,598	$0	$51,512	($0)	$56,111	$482,840
Totals:		$367,475	($125,518)	$45,983	$1,186	$445,824		$482,840	$2,510,196

Net Present Value (NPV)	**$178,715**
Internal Rate of Return (IRR)	**23.4%**

Parking Garage "B" Lighting
ECM #3 Retrofit

	Existing Fixtures							Proposed Fixtures						
Location	**Description**	**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Present Avg. Lumens/Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**	**Description**		**Avg. Rated Fixture Life, Hours**	**Avg. Lumens per Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**
1st Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	65	12,220	Remove Existing HID Low Bay Fixtures, Replace OFO with LED Low Bay Fixture	Lighting Science Pyramid LowBay PLB CW 4D CLR	50,000	4,700	78	130	10,140
2nd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with LED Low Bay Fixture	Lighting Science Pyramid LowBay PLB CW 4D CLR	50,000	4,700	78	124	9,672
3rd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with LED Low Bay Fixture	Lighting Science Pyramid LowBay PLB CW 4D CLR	50,000	4,700	78	124	9,672
4th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with LED Low Bay Fixture	Lighting Science Pyramid LowBay PLB CW 4D CLR	50,000	4,700	78	124	9,672
5th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with LED Low Bay Fixture	Lighting Science Pyramid LowBay PLB CW 4D CLR	50,000	4,700	78	124	9,672
6th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with LED Low Bay Fixture	Lighting Science Pyramid LowBay PLB CW 4D CLR	50,000	4,700	78	124	9,672
7th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	28	5,264	Remove Existing HID Low Bay Fixtures, Replace OFO with LED Low Bay Fixture	Lighting Science Pyramid LowBay PLB CW 4D CLR	50,000	4,700	78	56	4,368
TOTALS:						403	75,764							62,868

Parking Garage "B" Lighting
ECM #3 Retrofit

	Fixtures Retrofitted									Unit Installation Cost								
Location	**Wattage Reduction**	**Average Burn Hours**	**Ave $/kwh**	**Ave. $/kW**	**Energy Savings, kWh**	**Energy Savings, $**	**Energy Savings, kW**	**Energy Savings, $**	**Qty**	**Material Each**	**Labor Each**	**Total Each**	**Total Materials**	**Total Labor**	**Total All**	**Rebate Estimate**	**Total Cost Less Rebate**	**Simple Payback**
1st Level Parking	2,080	8760	$0.1350	$4.58	18,221	$2,460	2.08	$10	130	$495.00	$125.00	$620.00	$64,350.00	$16,250.00	$80,600.00	$5,590.00	$75,010.00	30.38
2nd Level Parking	1,984	8760	$0.1350	$4.58	17,380	$2,346	1.98	$9	124	$495.00	$125.00	$620.00	$61,380.00	$15,500.00	$76,880.00	$5,332.00	$71,548.00	30.38
3rd Level Parking	1,984	8760	$0.1350	$4.58	17,380	$2,346	1.98	$9	124	$495.00	$125.00	$620.00	$61,380.00	$15,500.00	$76,880.00	$5,332.00	$71,548.00	30.38
4th Level Parking	1,984	8760	$0.1350	$4.58	17,380	$2,346	1.98	$9	124	$495.00	$125.00	$620.00	$61,380.00	$15,500.00	$76,880.00	$5,332.00	$71,548.00	30.38
5th Level Parking	1,984	8760	$0.1350	$4.58	17,380	$2,346	1.98	$9	124	$495.00	$125.00	$620.00	$61,380.00	$15,500.00	$76,880.00	$5,332.00	$71,548.00	30.38
6th Level Parking	1,984	8760	$0.1350	$4.58	17,380	$2,346	1.98	$9	124	$495.00	$125.00	$620.00	$61,380.00	$15,500.00	$76,880.00	$5,332.00	$71,548.00	30.38
7th Level Parking	896	8760	$0.1350	$4.58	7,849	$1,060	0.90	$4	56	$495.00	$125.00	$620.00	$27,720.00	$7,000.00	$34,720.00	$2,408.00	$32,312.00	30.38
TOTALS:	12,896				112,969	$15,251	12.90								$499,720.00	$34,658.00	$465,062.00	

ECM #3

Project Name: Hoboken Garage "B" ECM #3 HID to LED Low Bay
Location: Hoboken, NJ
Description: Parking Garage Lighting Retrofit

Simple Payback Analysis

	Parking Garage Lighting Retrofit	Existing
Total Construction Cost	$499,720	$0
Annual Maintenance Cost	$63,545	$13,488
Annual Cost of Operation (Energy)	$74,348	$89,598
Utility Incentives or Credits	$34,658	$0

First Cost Premium: **$465,062**

Simplified Payback Calculation: **-13.36** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	10	Financing Term (mths):	120
Depreciation Period (years):	39	Financing %:	5%
Tax Rate:	0.0%	Inflation Rate:	2.0%
Financing Rate:	5.00%	Energy Cost Escalation Rate:	2.2%
		Cost of Capital:	5.0%

Period	Additional Cash Outlay	Energy Savings	Additional Maint Costs	Additional Depreciation	Interest Expense	Pretax Income	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$441,809	0	0	0	0	0	0	(441,809)	0
1	$0	$15,250	$50,057	$11,925	$1,121	($47,853)	$1,839	($37,767)	($37,767)
2	$0	$15,586	$51,058	$11,925	$1,027	($48,424)	$1,933	($38,432)	($76,199)
3	$0	$15,928	$52,079	$11,925	$928	($49,004)	$2,032	($39,111)	($115,310)
4	$0	$16,279	$53,121	$11,925	$824	($49,591)	$2,136	($39,802)	($155,112)
5	$0	$16,637	$54,183	$11,925	$715	($50,186)	$2,245	($40,506)	($195,618)
6	$0	$17,003	$55,267	$11,925	$600	($50,789)	$2,360	($41,224)	($236,842)
7	$0	$17,377	$56,372	$11,925	$479	($51,399)	$2,480	($41,955)	($278,797)
8	$0	$17,759	$57,500	$11,925	$352	($52,018)	$2,607	($42,700)	($321,497)
9	$0	$18,150	$58,650	$11,925	$219	($52,643)	$2,741	($43,460)	($364,956)
10	$0	$18,549	$59,823	$11,925	$79	($53,277)	$2,881	($44,233)	($409,190)
Totals:		$168,518	$548,112	$119,247	$6,343	($505,183)		($409,190)	($2,191,287)

Net Present Value (NPV): **($685,300)**

Internal Rate of Return (IRR): **#NUM!**

Hoboken Parking Garage "B" Lighting
ECM #4 Retrofit

	Existing Fixtures							Proposed Fixtures							
Location	**Description**	**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Present Avg. Lumens/Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**	**Description**		**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Avg. Lumens per Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**
1st Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	65	12,220	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	65	7,280
2nd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	62	6,944
3rd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	62	6,944
4th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	62	6,944
5th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	62	6,944
6th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	62	6,944
7th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	28	5,264	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	28	3,136
TOTALS:						403	75,764								45,136

Hoboken Parking Garage
ECM #4 Retrofit

	Fixtures Retrofitted									Unit Installation Cost								
Location	**Wattage Reduction**	**Average Burn Hours**	**Ave $/kwh**	**Ave. $/kW**	**Energy Savings, kWh**	**Energy Savings, $**	**Energy Savings, kW**	**Energy Savings, $**	**Qty**	**Material Each**	**Labor Each**	**Total Each**	**Total Materials**	**Total Labor**	**Total All**	**Rebate Estimate**	**Total Cost Less Rebate**	**Simple Payback**
1st Level Parking	4,940	8760	$0.1350	$4.58	43,274	$5,842	4.94	$23	65	$159.81	$250.00	$409.81	$10,387.65	$16,250.00	$26,637.65	$1,950.00	$24,687.65	4.21
2nd Level Parking	4,712	8760	$0.1350	$4.58	41,277	$5,572	4.71	$22	62	$159.81	$250.00	$409.81	$9,908.22	$15,500.00	$25,408.22	$1,860.00	$23,548.22	4.21
3rd Level Parking	4,712	8760	$0.1350	$4.58	41,277	$5,572	4.71	$22	62	$159.81	$250.00	$409.81	$9,908.22	$15,500.00	$25,408.22	$1,860.00	$23,548.22	4.21
4th Level Parking	4,712	8760	$0.1350	$4.58	41,277	$5,572	4.71	$22	62	$159.81	$250.00	$409.81	$9,908.22	$15,500.00	$25,408.22	$1,860.00	$23,548.22	4.21
5th Level Parking	4,712	8760	$0.1350	$4.58	41,277	$5,572	4.71	$22	62	$159.81	$250.00	$409.81	$9,908.22	$15,500.00	$25,408.22	$1,860.00	$23,548.22	4.21
6th Level Parking	4,712	8760	$0.1350	$4.58	41,277	$5,572	4.71	$22	62	$159.81	$250.00	$409.81	$9,908.22	$15,500.00	$25,408.22	$1,860.00	$23,548.22	4.21
7th Level Parking	2,128	8760	$0.1350	$4.58	18,641	$2,517	2.13	$10	28	$159.81	$250.00	$409.81	$4,474.68	$7,000.00	$11,474.68	$840.00	$10,634.68	4.21
TOTALS:	30,628				268,301	$36,221	30.63								$165,153.43	$12,090.00	$153,063.43	

ECM #4

Project Name: Hoboken Garage "B" ECM #4 HID to 2L32T8HO VT
Location: Hoboken, NJ
Description: Parking Garage Lighting Retrofit

Return on Investment Analysis

	Parking Garage Lighting Retrofit	Existing
Total Construction Cost	$165,153	$0
Annual Maintenance Cost	$2,539	$13,488
Annual Cost of Operation (Energy)	$53,378	$89,598
Utility Incentives or Credits	$12,090	$0

First Cost Premium: **$153,063**

Simplified Payback Calculation: **3.25** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	10	Financing Term (mths):	120
Depreciation Period (years):	39	Financing %:	0%
Tax Rate:	0.0%	Inflation Rate:	2.0%
Financing Rate:	5.00%	Energy Cost Escalation Rate:	2.2%
		Cost of Capital:	5.0%

Period	Additional Cash Outlay	Energy Savings	Additional Maint Costs	Additional Depreciation	Interest Expense	Pretax Income	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$153,063	0	0	0	0	0	0	(153,063)	0
1	$0	$36,220	($10,949)	$3,925	$7,378	$35,866	$12,103	$27,687	$27,687
2	$0	$37,017	($11,168)	$3,925	$6,759	$37,501	$12,723	$28,703	$56,391
3	$0	$37,831	($11,391)	$3,925	$6,108	$39,190	$13,374	$29,741	$86,131
4	$0	$38,663	($11,619)	$3,925	$5,424	$40,934	$14,058	$30,801	$116,932
5	$0	$39,514	($11,852)	$3,925	$4,705	$42,736	$14,777	$31,884	$148,816
6	$0	$40,383	($12,089)	$3,925	$3,949	$44,599	$15,533	$32,990	$181,807
7	$0	$41,272	($12,330)	$3,925	$3,154	$46,523	$16,328	$34,121	$215,927
8	$0	$42,180	($12,577)	$3,925	$2,319	$48,513	$17,163	$35,275	$251,202
9	$0	$43,108	($12,828)	$3,925	$1,441	$50,571	$18,041	$36,455	$287,657
10	$0	$44,056	($13,085)	$3,925	$518	$52,699	$18,964	$37,660	$325,317
Totals:		$400,245	($119,888)	$39,247	$41,753	$439,133		$325,317	$1,697,868

Net Present Value (NPV): **$85,918**
Internal Rate of Return (IRR): **15.6%**

Hoboken Parking Garage "B" Lighting
ECM #5 Retrofit

	Existing Fixtures							Proposed Fixtures							
Location	**Description**	**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Present Avg. Lumens/Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**	**Description**		**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Avg. Lumens per Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**
1st Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	65	12,220	Remove Existing HID Low Bay Fixtures, Replace OFO with Low Bay 85 W Induction Fixture	Lithonia Product # PGR-85IL-TVOLT-BDS-CR-LP	80,000	1	11,000	150	65	9,750
2nd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Low Bay 85 W Induction Fixture	Lithonia Product # PGR-85IL-TVOLT-BDS-CR-LP	80,000	1	11,000	150	62	9,300
3rd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Low Bay 85 W Induction Fixture	Lithonia Product # PGR-85IL-TVOLT-BDS-CR-LP	80,000	1	11,000	150	62	9,300
4th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Low Bay 85 W Induction Fixture	Lithonia Product # PGR-85IL-TVOLT-BDS-CR-LP	80,000	1	11,000	150	62	9,300
5th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Low Bay 85 W Induction Fixture	Lithonia Product # PGR-85IL-TVOLT-BDS-CR-LP	80,000	1	11,000	150	62	9,300
6th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	62	11,656	Remove Existing HID Low Bay Fixtures, Replace OFO with Low Bay 85 W Induction Fixture	Lithonia Product # PGR-85IL-TVOLT-BDS-CR-LP	80,000	1	11,000	150	62	9,300
7th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	28	5,264	Remove Existing HID Low Bay Fixtures, Replace OFO with Low Bay 85 W Induction Fixture	Lithonia Product # PGR-85IL-TVOLT-BDS-CR-LP	80,000	1	11,000	150	28	4,200
TOTALS:															60,450

Hoboken Parking Garage
ECM #5 Retrofit

	Fixtures Retrofitted									Unit Installation Cost								
Location	**Wattage Reduction**	**Average Burn Hours**	**Ave $/kwh**	**Ave. $/kW**	**Energy Savings, kWh**	**Energy Savings, $**	**Energy Savings, kW**	**Energy Savings, $**	**Qty**	**Material Each**	**Labor Each**	**Total Each**	**Total Materials**	**Total Labor**	**Total All**	**Rebate Estimate**	**Total Cost Less Rebate**	**Simple Payback**
1st Level Parking	2,470	8760	$0.1350	$4.58	21,637	$2,921	2.47	$11	65	$350.00	$250.00	$600.00	$22,750.00	$16,250.00	$39,000.00	$0.00	$39,000.00	13.30
2nd Level Parking	2,356	8760	$0.1350	$4.58	20,639	$2,786	2.36	$11	62	$350.00	$250.00	$600.00	$21,700.00	$15,500.00	$37,200.00	$0.00	$37,200.00	13.30
3rd Level Parking	2,356	8760	$0.1350	$4.58	20,639	$2,786	2.36	$11	62	$350.00	$250.00	$600.00	$21,700.00	$15,500.00	$37,200.00	$0.00	$37,200.00	13.30
4th Level Parking	2,356	8760	$0.1350	$4.58	20,639	$2,786	2.36	$11	62	$350.00	$250.00	$600.00	$21,700.00	$15,500.00	$37,200.00	$0.00	$37,200.00	13.30
5th Level Parking	2,356	8760	$0.1350	$4.58	20,639	$2,786	2.36	$11	62	$350.00	$250.00	$600.00	$21,700.00	$15,500.00	$37,200.00	$0.00	$37,200.00	13.30
6th Level Parking	2,356	8760	$0.1350	$4.58	20,639	$2,786	2.36	$11	62	$350.00	$250.00	$600.00	$21,700.00	$15,500.00	$37,200.00	$0.00	$37,200.00	13.30
7th Level Parking	1,064	8760	$0.1350	$4.58	9,321	$1,258	1.06	$5	28	$350.00	$250.00	$600.00	$9,800.00	$7,000.00	$16,800.00	$0.00	$16,800.00	13.30
TOTALS:	15,314				134,151	$18,110	15.31								$241,800.00	$0.00	$241,800.00	

ECM #5

Project Name: Hoboken Garage "B" ECM #5 HID to 85 W Induction
Location: Hoboken, NJ
Description: Parking Garage Lighting Retrofit

Simple Payback Analysis

	Parking Garage Lighting Retrofit	Existing
Total Construction Cost	$241,800	$0
Annual Maintenance Cost	$3,972	$13,488
Annual Cost of Operation (Energy)	$71,488	$89,598
Utility Incentives or Credits	$0	$0
First Cost Premium	**$241,800**	
Simplified Payback Calculation:	**13.30**	**Years**

Life Cycle Cost Analysis

Analysis Period (years):	10	Financing Term (mths):	120
Depreciation Period (years):	39	Financing %:	5%
Tax Rate:	0.0%	Inflation Rate:	2.0%
Financing Rate:	5.00%	Energy Cost Escalation Rate:	2.2%
		Cost of Capital:	5.0%

Period	Additional Cash Outlay	Energy Savings	Additional Maint Costs	Additional Depreciation	Interest Expense	Pretax Income	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$241,800	0	0	0	0	0	0	(241,800)	0
1	$0	$18,110	($9,516)	$6,200	$11,656	$9,771	$19,120	($3,150)	($3,150)
2	$0	$18,508	($9,707)	$6,200	$10,678	$11,338	$20,098	($2,561)	($5,711)
3	$0	$18,916	($9,901)	$6,200	$9,649	$12,967	$21,127	($1,960)	($7,670)
4	$0	$19,332	($10,099)	$6,200	$8,568	$14,662	$22,208	($1,345)	($9,015)
5	$0	$19,757	($10,301)	$6,200	$7,432	$16,426	$23,344	($718)	($9,734)
6	$0	$20,192	($10,507)	$6,200	$6,238	$18,261	$24,538	($77)	($9,811)
7	$0	$20,636	($10,717)	$6,200	$4,982	$20,170	$25,793	$577	($9,234)
8	$0	$21,090	($10,931)	$6,200	$3,663	$22,158	$27,113	$1,245	($7,989)
9	$0	$21,554	($11,150)	$6,200	$2,276	$24,228	$28,500	$1,928	($6,061)
10	$0	$22,028	($11,373)	$6,200	$818	$26,383	$29,958	$2,625	($3,436)
Totals:		$200,122	($104,201)	$62,000	$65,960	$176,364		($3,436)	($71,811)

Net Present Value (NPV)	**($223,515)**
Internal Rate of Return (IRR)	**#DIV/0!**

Project Name: LGEA Solar PV Project -Garage "B"
Location: Hoboken, NJ
Description: Photovoltaic System 95% Financing - 20 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 20 year
Total Construction Cost	$387,000
Annual kWh Production	65,504
Annual Energy Cost Reduction	$8,843
Annual SREC Revenue	$22,926
First Cost Premium	**$387,000**
Simple Payback:	**12.2** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	240	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.135**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$19,350	0	0	0	$0	0	0	(19,350)	0
1	$0	65,504	$8,843	$0	$22,926	$25,458	$8,746	($2,435)	($21,785)
2	$0	65,176	$9,108	$0	$22,812	$24,826	$9,378	($2,285)	($24,070)
3	$0	64,850	$9,382	$0	$22,698	$24,148	$10,056	($2,126)	($26,196)
4	$0	64,526	$9,663	$0	$22,584	$23,421	$10,783	($1,958)	($28,153)
5	$0	64,203	$9,953	$661	$22,471	$22,642	$11,563	($2,442)	($30,595)
6	$0	63,882	$10,251	$658	$22,359	$21,806	$12,399	($2,252)	($32,847)
7	$0	63,563	$10,559	$655	$22,247	$20,909	$13,295	($2,053)	($34,901)
8	$0	63,245	$10,876	$651	$22,136	$19,948	$14,256	($1,845)	($36,745)
9	$0	62,929	$11,202	$648	$22,025	$18,918	$15,287	($1,626)	($38,371)
10	$0	62,614	$11,538	$645	$21,915	$17,813	$16,392	($1,396)	($39,767)
11	$0	62,301	$11,884	$642	$21,805	$16,628	$17,577	($1,157)	($40,924)
12	$0	61,990	$12,241	$638	$21,696	$15,357	$18,848	($906)	($41,830)
13	$0	61,680	$12,608	$635	$21,588	$13,995	$20,210	($644)	($42,474)
14	$0	61,371	$12,986	$632	$21,480	$12,534	$21,671	($371)	($42,845)
15	$0	61,064	$13,376	$629	$21,373	$10,967	$23,238	($85)	($42,930)
16	$0	60,759	$13,777	$626	$21,266	$9,287	$24,917	$212	($42,718)
17	$0	60,455	$14,190	$623	$21,159	$7,486	$26,719	$522	($42,195)
18	$0	60,153	$14,616	$620	$21,054	$5,554	$28,650	$845	($41,350)
19	$0	59,852	$15,055	$616	$20,948	$3,483	$30,721	$1,182	($40,168)
20	$0	59,553	$15,506	$613	$20,844	$1,262	$32,942	$1,532	($38,636)
21	$0	59,255	$15,971	$610	$20,739	$1,070	$30,284	$4,746	($33,890)
22	$0	58,959	$16,451	$607	$20,636	$732	$24,921	$10,825	($23,065)
23	$0	58,664	$16,944	$604	$20,532	$0	$0	$36,872	$13,808
24	$0	58,371	$17,452	$601	$20,430	$0	$0	$37,281	$51,089
25	$0	58,079	$17,976	$598	$20,328	$0	$0	$37,705	$88,794
	Totals:	1,249,672	$237,614	$10,193	$437,385	$316,443	$367,650	$422,855	($632,766)
				Net Present Value (NPV)				**($7,451)**	
				Internal Rate of Return (IRR)				**5.6%**	

Project Name: LGEA Solar PV Project -Garage "B"
Location: Hoboken, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$387,000
Annual kWh Production	65,504
Annual Energy Cost Reduction	$8,843
Annual SREC Revenue	$22,926
First Cost Premium	**$387,000**
Simple Payback:	**12.2** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.135**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$387,000	0	0	0	$0	(387,000)	0
1	$0	65,504	$8,843	$0	$22,926	$31,769	($355,231)
2	$0	65,176	$9,108	$0	$22,812	$31,920	($323,311)
3	$0	64,850	$9,382	$0	$22,698	$32,079	($291,232)
4	$0	64,526	$9,663	$0	$22,584	$32,247	($258,985)
5	$0	64,203	$9,953	$661	$22,471	$31,763	($227,222)
6	$0	63,882	$10,251	$658	$22,359	$31,952	($195,270)
7	$0	63,563	$10,559	$655	$22,247	$32,151	($163,118)
8	$0	63,245	$10,876	$651	$22,136	$32,360	($130,758)
9	$0	62,929	$11,202	$648	$22,025	$32,579	($98,179)
10	$0	62,614	$11,538	$645	$21,915	$32,808	($65,371)
11	$0	62,301	$11,884	$642	$21,805	$33,048	($32,323)
12	$0	61,990	$12,241	$638	$21,696	$33,299	$975
13	$0	61,680	$12,608	$635	$21,588	$33,561	$34,536
14	$0	61,371	$12,986	$632	$21,480	$33,834	$68,370
15	$0	61,064	$13,376	$629	$21,373	$34,119	$102,490
16	$0	60,759	$13,777	$626	$21,266	$34,417	$136,906
17	$0	60,455	$14,190	$623	$21,159	$34,727	$171,634
18	$0	60,153	$14,616	$620	$21,054	$35,050	$206,684
19	$0	59,852	$15,055	$616	$20,948	$35,386	$242,070
20	$0	59,553	$15,506	$613	$20,844	$35,736	$277,806
21	$1	59,255	$15,971	$610	$20,739	$36,100	$313,907
22	$2	58,959	$16,451	$607	$20,636	$36,479	$350,386
23	$3	58,664	$16,944	$604	$20,532	$36,872	$387,258
24	$4	58,371	$17,452	$601	$20,430	$37,281	$424,539
25	$5	58,079	$17,976	$598	$20,328	$37,705	$462,245
	Totals:	1,249,672	$237,614	$10,193	$437,385	$849,245	$664,806
				Net Present Value (NPV)		**$462,270**	
				Internal Rate of Return (IRR)		**7.0%**	

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
Garage "B"	2484	Sunpower T5 Solar Roof Tile	108	23.0	2,484	43.00	65,504	3,564	17.31

SREC Value	$	0.400	per kWh
Electric Cost	$	0.160	per kWh

Notes:

1. Estimated kWH based on 4.68 hours full output per day per 350 day year. Actual kWH will vary day to day.
2. Estimated Inverter Efficiency of 95% and additional Electrical Losses of 2% (System Efficiency 93%)

STATEMENT OF ENERGY PERFORMANCE
Parking Garage B

Building ID: 1801510
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 27, 2009

Facility
Parking Garage B
112-34 River Street
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
John Pope
94 Washington Street
Hoboken, NJ 07030

Year Built: 1973
Gross Floor Area (ft^2): 0

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

Site Energy Use Summary[3]	
Electricity (kBtu)	2,109,981
Natural Gas (kBtu)[4]	0
Total Energy (kBtu)	2,109,981

Energy Intensity[5]	
Site (kBtu/ft^2/yr)	
Source (kBtu/ft^2/yr)	N/A

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	321

Electric Distribution Utility
PSE&G - Public Service Elec & Gas Co

National Average Comparison	
National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	
Building Type	Other

Stamp of Certifying Professional

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

Meets Industry Standards[6] **for Indoor Environmental Conditions:**	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
Raymond Johnson
520 S. Burnt Mill Rd
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	Parking Garage B	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Other	Is this an accurate description of the space in question?		☐
Location	112-34 River Street, Hoboken, NJ 07030	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		☐

Parking Garage B (Parking)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	359,800 Sq. Ft.	Is this the total square footage of the entire parking area (enclosed + nonenclosed + open floor area)?		☐
Enclosed Floor Area	359,800 Sq. Ft.	Is this the total square footage of the enclosed garage space? An enclosed garage is defined as having both sides and a roof.		☐
Non-Enclosed Floor Area (w/roof)	0 Sq. Ft.	Is this the total square footage of the nonenclosed garage space? This is typically defined as the portion of the garage above ground (contains no sides but is under a roof).		☐
Open Floor Area (w/o roof)	0 Sq. Ft.	Is this the total square footage of the nonenclosed parking area without a roof? This is typically defined as open parking lots or the very top level of an above ground parking garage.		☐
Weekly Hours of Access	168 Hours	Is this the total number of hours per week when it is possible for a vehicle to enter or exit?		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas 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))**
12/01/2008	12/31/2008	41,680.00
11/01/2008	11/30/2008	62,480.00
10/01/2008	10/31/2008	46,640.00
09/01/2008	09/30/2008	41,680.00
08/01/2008	08/31/2008	46,480.00
07/01/2008	07/31/2008	44,480.00
06/01/2008	06/30/2008	52,400.00
05/01/2008	05/31/2008	46,800.00
04/01/2008	04/30/2008	56,480.00
03/01/2008	03/31/2008	59,760.00
02/01/2008	02/29/2008	57,280.00
01/01/2008	01/31/2008	62,240.00
Electric Meter Consumption (kWh (thousand Watt-hours))		**618,400.00**
Electric Meter Consumption (kBtu)		**2,109,980.80**
Total Electricity Consumption (kBtu)		**2,109,980.80**
Is this the total Electricity consumption at this building including all Electricity 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.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Parking Garage B
112-34 River Street
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
John Pope
94 Washington Street
Hoboken, NJ 07030

General Information

Parking Garage B	
Gross Floor Area Excluding Parking: (ft²)	0
Year Built	1973
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

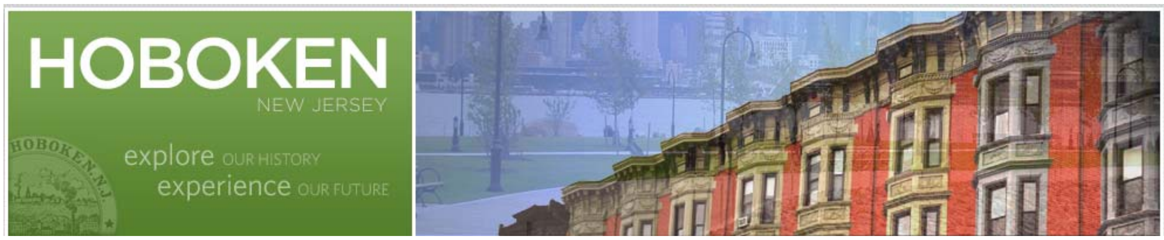
Parking Garage B	
Space Type	Parking
Gross Floor Area(ft²)	359,800
Enclosed Floor Area	359,800
Non-Enclosed Floor Area (w/roof)	0
Open Floor Area (w/o roof)	0
Weekly Hours of Access	168

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2008)	**Baseline**	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	N/A	N/A	N/A	N/A	104
Source (kBtu/ft²)	N/A	N/A	N/A	N/A	213
Energy Cost					
$/year	$ 117,415.00	N/A	N/A	N/A	N/A
$/ft²/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	321	N/A	N/A	N/A	N/A
$kgCO_2e$/ft²/year	N/A	N/A	N/A	N/A	N/A

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

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



ENERGY AUDIT – DRAFT REPORT

HOBOKEN
PARKING GARAGE "D"

210-222 River Street
Hoboken, NJ 07030
ATTN: John Pope

CEG PROJECT NO. 9C08143

CONCORD ENGINEERING GROUP

520 SOUTH BURNT MILL ROAD
VOORHEES, NJ 08043
TELEPHONE: (856) 427-0200
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WWW.CEG-INC.NET

CONTACT: RAYMOND JOHNSON
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rjohnson@ceg-inc.net

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

I. EXECUTIVE SUMMARY

This report presents the findings of an energy audit conducted at:

Hoboken Parking Garage “D”
210-222 River Street
Hoboken, NJ 07030

Municipal Contact Person: John Pope

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy’s mission, 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 electrical energy cost at this facility is as follows:

Electricity $51,429

The potential annual energy cost savings for each of the alternative lighting retrofits are shown below in Table 1. The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM’s)

ECM NO.	DESCRIPTION	COST[A]	ANNUAL SAVINGS	SIMPLE PAYBACK	SIMPE RETURN ON INVESTMENT
1	Lighting Upgrade in Office, Restrooms, and Elevators	$1,036	$220	4.7	21.3%
2	Replace HID Fixtures with T5 Technology	$98,790	$17,658	5.6	17.9%
3	Replace HID Fixtures with T8 Technology	$84,318	$20,030	4.2	23.8%
4	Stairwell Lighting Upgrade	$3,880	$851	4.6	21.7%

Note A: Includes applicable incentive and maintenance savings

The estimated demand and energy savings are 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	
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)
1	Lighting Upgrade in Office, Restrooms, and Elevators	0.2	1,629
2	Replace HID Fixtures with T5 Technology	14.9	130,296
3	Replace HID Fixtures with T8 Technology	16.9	147,799
4	Stairwell Lighting Upgrade	0.7	6,307

Recommendations:

The following Energy Conservation Measures are recommended for the Hoboken Parking Garage "D" Facility:

- **ECM #1:** Office/Maintenance Shops Lighting Upgrade
- **ECM #2:** Replace HID Fixtures with T5 Technology **OR**
- **ECM #3:** Replace HID Fixtures with T8 Technology
- **ECM #4:** Stairwell Lighting Upgrade

II. INTRODUCTION

This comprehensive energy audit covers the 33,016 square foot parking garage "D" facility complex that includes the parking garage decks, office, restrooms, and elevators. The parking garage is constructed of pre-fabricated concrete sections and was constructed in 1973.

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

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from January-08 to December-08. Public Service Electric and Gas Company (PSE&G) provides electricity to the facility under the General Lighting and Power Service (GLP) Rate Schedule. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the most current rate structure available.

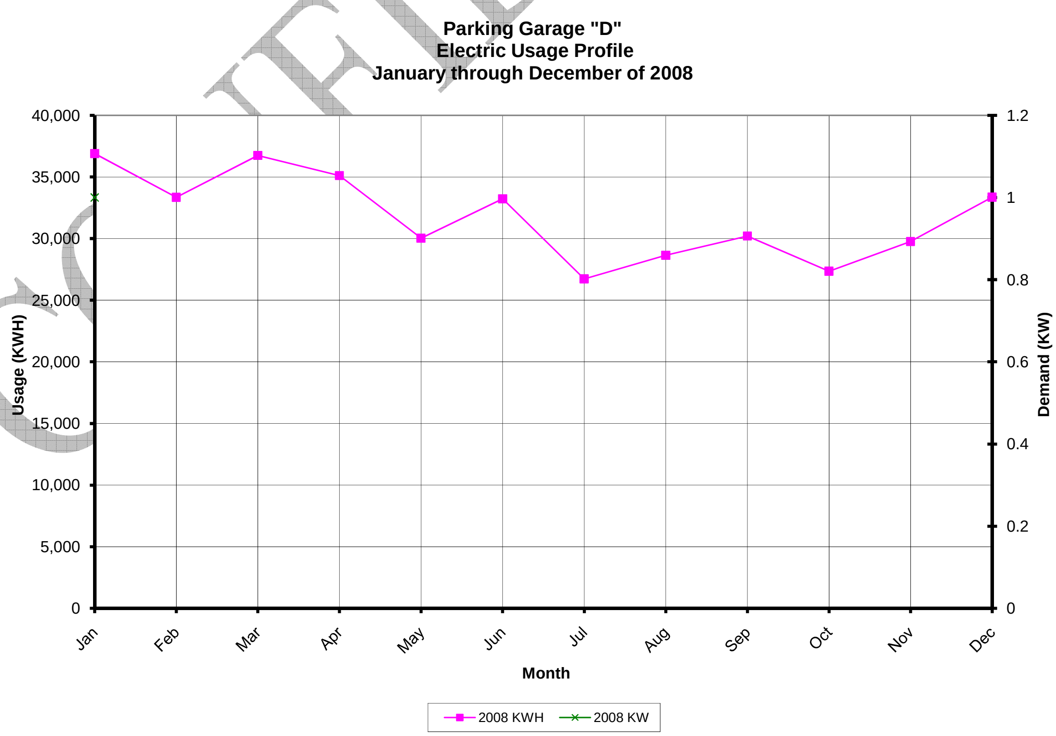
Description	Average
Electricity	13.5¢ / kWh

Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND**	TOTAL BILL
1/08	36,900		$4,272
2/08	33,345		$3,934
3/08	36,750		$4,377
4/08	35,115		$4,109
5/08	30,030		$3,505
6/08	33,225		$4,732
7/08	26,730		$4,490
8/08	28,650		$4,859
9/08	30,210		$5,175
10/08	27,360		$3,994
11/08	29,760		$3,822
12/08	33,360		$4,158
Totals	**381,435**		**$51,429**

** Electric Demand (kW) not provided by Owner.

Figure 1
Electricity Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building’s energy utilization per square foot of building. This calculation is completed by converting all utility usage (gas, electric, oil) consumed by a building over a specified time period, typically 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 amongst building of similar type. The EUI for this facility is calculated as follows:

$$Building\ EUI = \frac{Electric\ Usage\ in\ kBtu}{Building\ Square\ Footage}$$

Electric = ((381,435 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu/h / 1 kBtu/h)
= 1,302,219 kBtu

$$Building\ EUI = \frac{1{,}302{,}219\ kBtu}{33{,}016\ SF}$$

Parking Garage “D” EUI = 39.4 kBtu/SF

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: hobokencity
Password: lgeaceg2009

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

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
Garage "D"	N/A	50

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

V. FACILITY DESCRIPTION

The 33,016 square foot parking garage "D" facility complex includes the parking garage decks, office, elevators, and restrooms. The parking garage is composed of pre-fabricated concrete sections and was constructed in 1973. The garage is open 24/7 all year round.

Heating System

The parking facility office and pay booths are heated by Berko electric wall-hung unit heaters.

Domestic Hot Water

Domestic hot water for the parking garage restrooms is provided by a 30-gallon capacity electric hot water heater.

Cooling System

Cooling in the parking facility office is performed by a thru-the-wall air conditioning unit rated at 12,000 BTUH.

Lighting

The parking decks are lit by High Intensity Discharge (HID) fixtures with 150-Watt HPS lamps. These lamps are rated for 24,000 hours, have an initial average lumen output of 14,400, and consume 188 Watts per fixture. The lenses are yellowed from heat, age, and dust in the parking decks. Light output has steadily decreased as the optical components became coated with a film of pollutants. The lighting fixtures are delivering substantially less than the rated average lumens for this type of fixture (estimated at 70% of 14,400 = 10,000 lumens per fixture).

The office is lit by four 2-foot x 4-foot lay-in fixtures containing two T-12 lamps and a magnetic ballast. The restrooms contain two 2-foot x 4-foot lay-in fixtures containing two T-12 lamps and a magnetic ballast. The elevators contain a total of eight 2-foot x 4-foot lay-in fixtures containing one T-12 lamp and a magnetic ballast. The two stairwells contain a total of twenty (20) 70-Watt high pressure sodium wall-mounted fixtures.

Standard switching is utilized and there are not other types of lighting controls present.

The exit signs are the latest LED type.

VI. MAJOR EQUIPMENT LIST

Hoboken Parking Garage "D" Lighting (150-Watt HPS)

Location	No. of Fixtures
Basement	22
1st Level	56
2nd Level	48
3rd Level	48
4th Level	48
TOTAL:	**222 Fixtures**

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrades in Office, Restrooms, and Elevators

Description:

New fluorescent lamps and ballasts are available as direct replacements for the existing lamps and ballasts. A typical fixture with two, 4-foot lamps (34-Watt lamps) has a total wattage of 74 Watts. By retrofitting with new lamps and electronic ballast, the total wattage would be reduced to about 55 Watts per fixture and the space light levels and light quality would increase by about 15% and 35%, respectively. CEG recommends a retrofit of the existing fixtures containing T12 lamps and magnetic ballasts with T8 lamps and electronic ballasts.

Energy Savings Calculations:

There are six 2-lamp fixtures and eight 1-lamp fixtures to be retrofitted which equate to energy cost savings as follows:

[(74-55) Watts x 6 Fixtures + (37-28) Watts x 8] x 8,760 hrs/yr x $0.135/ kWh = 1,629 kWh x $0.135 = $220/yr

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix B, the retrofit of T-12 fixtures to T-8 with electronic ballasts warrants the following incentive: T-8 (1-2 lamp) = $10 per fixture

$$\text{Smart Start® } \mathit{Incentive} = \left(\#\ \mathit{of}\ 1-2\ \mathit{lamp}\ \ \mathit{fixtures} \times\ \$10\right)$$
$$\text{Smart Start® } \mathit{Incentive} = \left(14 \times\ \$10\right) = \$140$$

The retrofit labor & material cost is $84 / fixture which equals a total cost of 14 x $84 = $1,176

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,176
NJ Smart Start Equipment Incentive ($):	($140)
Net Installation Cost ($):	$1,036
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$220*
Net Savings ($ / yr):	*$220*
Simple Payback (yrs):	*4.7*
Simple Return On Investment (%):	*21.3%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$5,500*

Parking Deck Lighting

The purpose of the balance of this section is to outline the lighting analysis performed to assist Hoboken with the selection of a lamp fixture for this public parking garage. CEG evaluated many lamp options and summarized below are the optimum lamp types balancing quality of illumination, efficiency, and cost. LED and induction lighting technologies were not considered due to their unfavorable payback periods (expensive lighting technologies). Metal Halide and Metal Halide Pulse Technology were not considered due to their low Mean Fixture Lumens/Watt (40 to 60 L/W). The high pressure sodium light fixtures presently in the parking garage have a Mean Fixture Lumens/Watt of 60 to 70 L/W. Parking Garage "B" was used as the model for the analysis since it represents a typical layout for the other parking garages.

ECM #2: Replace Parking Garage Fixtures with T5 Technology

Description:

The newest family of linear fluorescent lamps is the T5 line of lamps, which consist of standard and high-output (HO) T5 lamps. The high output T5 lamps are a form of 4-foot fluorescent lamps that give off roughly twice the light output of T8 lamps. The intense brightness of the T5HO lamp is ideal as a replacement for any High Intensity Discharge (HID) lighting source (such as the existing high-pressure sodium lamps). In addition, the T5HO lamp offers increased energy efficiency and better lumen maintenance. Lumen maintenance defines the extent to which the full light output of a lamp is retained over the life of the lamp. After one year of continuous burn, the output of a standard High-Pressure Sodium (HPS) lamp will have declined to 88% of full light output. A T5HO lamp with the same burn time will have retained 95% of full light output.

HID lamps can take several minutes to "re-strike" or come up to full brightness once energized (such as after a power failure). As such, they do not lend themselves to control by light sensors, occupancy sensors, or other on/off controls. The perimeter of each parking deck closest to the daylight openings should be put on daylight harvesting controls to save additional energy.

This ECM would replace each of the existing HPS fixtures with a twin lamp, vapor tight, 4-foot T5 light fixtures with T5HO lamps and a Mean Fixture Lumens/Watt of 75+. The perimeter fixtures near the daylight openings would be controlled by light sensors and have dimming ballasts. The CEG audit team used the Zumtobel Chiaro vapor tight fixture for our fluorescent lighting layout. The fixture has an option for 20% uplight and has a Cold Spot Optimizer to address cold weather performance.

Energy Savings Calculations:

Appendix E outlines the T5 System option cost/savings analysis.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$105,450
NJ Smart Start Equipment Incentive ($):	($6,660)
Net Installation Cost ($):	$98,790
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$17,658*
Net Savings ($ / yr):	*$17,658*
Simple Payback (yrs):	*5.6*
Simple Return On Investment (%):	*17.9%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$441,450*

ECM #3: Replace Parking Garage Fixtures with T-8 Technology

Description:

T8HO fluorescent lamps provide a lumen per watt ration of 70+, good lamp life, and many options for color rendering properties. Caution must be used in using linear fluorescent lamps in outdoor applications. They operate best in the range of 40-80ºF. Below this range, there is a decrease in light output and difficulty in starting. CEG recommends the Zumtobel Cold Spot Optimizer (CSO) to address cold weather performance. The CSO is an aluminum sleeve that regulates the temperature at the electrode end of the lamp.

This ECM would replace each of the existing HPS fixtures with a 3-lamp, vapor tight, 4-foot T8 light fixtures with T8HO lamps and a Mean Fixture Lumens/Watt of 70+. The perimeter fixtures near the daylight openings would be controlled by light sensors and have dimming ballasts. The CEG audit team used the Zumtobel Chiaro vapor tight fixture for our fluorescent lighting layout. The fixture has an option for 20% uplight and has a Cold Spot Optimizer to address cold weather performance.

Energy Savings Calculations:

Appendix F outlines the T8 System option cost/savings analysis.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$90,978
NJ Smart Start Equipment Incentive ($):	($6,660)
Net Installation Cost ($):	$85,837
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$20,030*
Net Savings ($ / yr):	*$20,030*
Simple Payback (yrs):	*4.2*
Simple Return On Investment (%):	*23.8%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$500,750*

ECM #4: Stairwell Lighting Upgrade

Description:

The stairwells contain a total of twenty (20) 70-Watt High Pressure Sodium wall-mounted fixtures that light the stairs/landings. The lenses are yellowed from heat, age, and dust in the parking decks. Light output has steadily decreased as the optical components became coated with a film of pollutants. These fixtures use a total of 78 Watts of electricity and are very inefficient.

For the stairwells, the CEG energy audit team recommends replacing the existing fixtures with radial wrap fixtures and automated controls. These energy efficient radial wrap luminaries have a single low wattage 2-foot fluorescent lamp which is constantly on while the 4-foot lamp is controlled by an occupancy sensor. The basis of design is the RWS luminaire by Precision Fluorescent or equal. A 70-Watt HPS lighting fixture has a total of 78 full input watts while the RWS luminaire draws a total of 42 input watts.

Energy Savings Calculations:

Energy Cost Savings = 20 fixtures x [(78-42) Watts x 8,760 hrs/yr x $0.135] =

6,307 kWh x $0.135 = $851

Smart Start ® Incentive = 20 fixtures x $16/fixture = $320

The total cost of the new RWS luminaire installed is $210/fixture x 20 fixtures = $4,200

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,200
NJ Smart Start Equipment Incentive ($):	($320)
Net Installation Cost ($):	$3,880
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$851*
Net Savings ($ / yr):	*$851*
Simple Payback (yrs):	*4.6*
Simple Return On Investment (%):	*21.7%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$21,275*

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 Hoboken Garage D, and concluded the following:

- *Photovoltaic System*: CEG does not recommend the installation of a PV system for this facility due to the fact that the building is surrounded on three sides by taller high-rise apartment buildings that cast a shadow upon the roof area throughout most of the daylight hours.

- *Wind Energy*: CEG does not recommend the installation of a wind system because of lack of open spaces for such a system in the Hoboken area. The afore-mentioned characteristic does not lend itself to a successful wind energy application.

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 Section III, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for June 2007 through May 2008.

Electricity:

Section IV, Figure 1 demonstrates a very typical Parking Garage load profile, which is very consistent or flat (base-loaded). Lighting tends to be the main source of consumption. Lighting is generally on most if not all of the day.

Natural Gas:

This facility does not use natural gas service.

Tariff Analysis:

Electricity:

The Parking Garage-D receives electrical service through Public Service Electric and Gas Company (PSE&G) on a GLP (General Lighting and Power Service) rate. This utility tariff is for delivery service for general purposes at secondary distribution. The Delivery Schedule has the following charges: Societal Benefits Charge, Non-utility Generation Charge, Securitization Charge, System Control Charge, Customer Account Services Charge, Standby Fee, Base Rate Distribution Adjustment Charge, Solar Pilot Recovery Charge and RGGI Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS).

Natural Gas:

This facility does not use natural gas service.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within City of Hoboken. CEG's primary observation is seen in the electric costs. The average price per kWh (kilowatt hour) for all buildings based on 1-year historical costs is $.15/kWh (kWh is the common unit of electric measure). The average price per dekatherm for natural gas is $ 13.71dth (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. Hoboken could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on annual historical consumption (January through December 2007) and current electric rates, an annual savings of over $100,000 per year (Note: Savings were calculated using Hoboken's Average Annual Consumption of kWh and a variance to a fixed 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 Hoboken's natural gas costs. Based on the current market, Hoboken could improve its natural gas costs by approximately 25% annually. CEG recommends further advisement on these prices. The City should also consider procuring energy (natural gas) through alternative supply sources. CEG recommends energy advisory services.

CEG also recommends that the city schedule a meeting with their 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 city will learn more about the competitive supply process. Hoboken can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, they should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if Hoboken frequently changes or plans on changing its supplier for energy (natural gas), it needs to closely monitor balancing, particularly when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

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

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

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

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

iv. *Lease/Purchase Agreement* – Investigate the possibility of a lease/purchase or lease/maintenance agreement with the manufacturer and/or installing contractor.

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 RECOMMENDATION

CEG recommends an application of a reflective white paint on the ceiling and vertical beam surfaces to increase the horizontal illumination levels by approximately two foot-candles. The practical benefit to applying the paint system is increased ceiling illumination and increased vertical surface illumination above 5-feet. Both of these elements will increase the sense of personal security.

Electric Cost Summary
PSE&G (Rate - MD)

Parking Garage "D" **2008**

Account # 21 17 188 0 6
Meter #

Month	Jan-09	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0
KWH	36,900	33,345	36,750	35,115	30,030	33,225	26,730	28,650	30,210	27,360	29,760	33,360	381,435
Total Cost, $	$4,272	$3,934	$4,377	$4,109	$3,505	$4,732	$4,490	$4,859	$5,175	$3,994	$3,822	$4,158	$51,429
$/KWH	$0.1158	$0.1180	$0.1191	$0.1170	$0.1167	$0.1424	$0.1680	$0.1696	$0.1713	$0.1460	$0.1284	$0.1246	**$0.1348**

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

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

Electric Chillers

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

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

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

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

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

Variable Frequency Drives

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

Natural Gas Water Heating

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

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

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

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

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

Other Equipment Incentives

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

STATEMENT OF ENERGY PERFORMANCE
Parking Garage D

Building ID: 1801575
For 12-month Period Ending: January 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 27, 2009

Facility
Parking Garage D
210-222 River Street
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
John Pope
94 Washington Street
Hoboken, NJ 07030

Year Built: 1973
Gross Floor Area (ft²): 0

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

Site Energy Use Summary[3]	
Electricity (kBtu)	1,301,456
Natural Gas (kBtu)[4]	0
Total Energy (kBtu)	1,301,456
Energy Intensity[5]	
Site (kBtu/ft²/yr)	
Source (kBtu/ft²/yr)	N/A
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	198
Electric Distribution Utility	
PSE&G - Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	
Building Type	Other

Stamp of Certifying Professional

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

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

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

Certifying Professional
Raymond Johnson
520 S. Burnt Mill Rd
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	Parking Garage D	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Other	Is this an accurate description of the space in question?		☐
Location	210-222 River Street, Hoboken, NJ 07030	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		☐

Parking Garage D (Parking)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	198,096 Sq. Ft.	Is this the total square footage of the entire parking area (enclosed + nonenclosed + open floor area)?		☐
Enclosed Floor Area	165,080 Sq. Ft.	Is this the total square footage of the enclosed garage space? An enclosed garage is defined as having both sides and a roof.		☐
Non-Enclosed Floor Area (w/roof)	33,016 Sq. Ft.	Is this the total square footage of the nonenclosed garage space? This is typically defined as the portion of the garage above ground (contains no sides but is under a roof).		☐
Open Floor Area (w/o roof)	0 Sq. Ft.	Is this the total square footage of the nonenclosed parking area without a roof? This is typically defined as open parking lots or the very top level of an above ground parking garage.		☐
Weekly Hours of Access	168 Hours	Is this the total number of hours per week when it is possible for a vehicle to enter or exit?		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity		
Meter: Electricity (kWh (thousand Watt-hours)) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
01/01/2009	01/31/2009	36,900.00
12/01/2008	12/31/2008	33,360.00
11/01/2008	11/30/2008	29,760.00
10/01/2008	10/31/2008	27,360.00
09/01/2008	09/30/2008	30,210.00
08/01/2008	08/31/2008	28,650.00
07/01/2008	07/31/2008	26,730.00
06/01/2008	06/30/2008	33,225.00
05/01/2008	05/31/2008	30,030.00
04/01/2008	04/30/2008	35,115.00
03/01/2008	03/31/2008	36,750.00
02/01/2008	02/29/2008	33,345.00
Electricity Consumption (kWh (thousand Watt-hours))		**381,435.00**
Electricity Consumption (kBtu)		**1,301,456.22**
Total Electricity Consumption (kBtu)		**1,301,456.22**
Is this the total Electricity consumption at this building including all Electricity 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.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Parking Garage D
210-222 River Street
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
John Pope
94 Washington Street
Hoboken, NJ 07030

General Information

Parking Garage D	
Gross Floor Area Excluding Parking: (ft²)	0
Year Built	1973
For 12-month Evaluation Period Ending Date:	January 31, 2009

Facility Space Use Summary

Parking Garage D	
Space Type	Parking
Gross Floor Area(ft²)	198,096
Enclosed Floor Area	165,080
Non-Enclosed Floor Area (w/roof)	33,016
Open Floor Area (w/o roof)	0
Weekly Hours of Access	168

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 01/31/2009)	**Baseline**	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	N/A	N/A	N/A	N/A	104
Source (kBtu/ft²)	N/A	N/A	N/A	N/A	213
Energy Cost					
$/year	$ 51,427.00	N/A	N/A	N/A	N/A
$/ft²/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	198	N/A	N/A	N/A	N/A
$kgCO_2e/ft^2$/year	N/A	N/A	N/A	N/A	N/A

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

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

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

Hoboken Parking Garage "D"

Hoboken Garage "D" ECM #2 HID to 2L54T5HO VT	
Quantity of Lighting Fixtures/Lamps	222
Existing KW	41.7
Proposed KW	26.9
KW Saved	14.9
Annual KWH Saved	130,296
$/KWH	$0.135
Annual Energy Savings $	$17,658
Estimated Construction Cost $	$105,450
Utility Rebate $	$6,660
Net Construction Cost After Rebate $	$98,790
Simple Payback	5.59
Analysis Period	10.00
Energy Cost Escalation	2%
Discount Rate	5%
Net Present Value	$15,595
Internal Rate of Return	8.40%

Hoboken Garage "D" ECM #3 HID to 2L32T8HO VT	
Quantity of Lighting Fixtures/Lamps	222
Existing KW	41.7
Proposed KW	24.9
KW Saved	16.9
Annual KWH Saved	147,799
$/KWH	$0.135
Annual Energy Savings $	$20,030
Estimated Construction Cost $	$90,978
Utility Rebate $	$6,660
Net Construction Cost After Rebate $	$84,318
Simple Payback	4.21
Analysis Period	10.00
Energy Cost Escalation	2%
Discount Rate	5%
Net Present Value	$61,923
Internal Rate of Return	19.23%

Parking Garage "D" Lighting
ECM #2 Retrofit

	Existing Fixtures							Proposed Fixtures							
Location	Description	Avg. Rated Fixture Life, Hours	Lamps per Fixture	Present Avg. Lumens/Fixture	Watts	Qty of Fixtures	Total Watts	Description		Avg. Rated Fixture Life, Hours	Lamps per Fixture	Avg. Lumens per Fixture	Watts	Qty of Fixtures	Total Watts
Basement	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	22	4,136	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	22	2,662
1st Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	56	10,528	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	56	6,776
2nd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	48	5,808
3rd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	48	5,808
4th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	48	5,808
TOTALS:						222	41,736								26,862

Parking Garage "D" Lighting
ECM #2 Retrofit

	Fixtures Retrofitted									Unit Installation Cost								
Location	**Wattage Reduction**	**Average Burn Hours**	**Ave $/kwh**	**Ave. $/kW**	**Energy Savings, kWh**	**Energy Savings, $**	**Energy Savings, kW**	**Energy Savings, $**	**Qty**	**Material Each**	**Labor Each**	**Total Each**	**Total Materials**	**Total Labor**	**Total All**	**Rebate Estimate**	**Total Cost Less Rebate**	**Simple Payback**
Basement	1,474	8760	$0.1350	$4.58	12,912	$1,743	1.47	$7	22	$225.00	$250.00	$475.00	$4,950.00	$5,500.00	$10,450.00	$660.00	$9,790.00	5.59
1st Level Parking	3,752	8760	$0.1350	$4.58	32,868	$4,437	3.75	$17	56	$225.00	$250.00	$475.00	$12,600.00	$14,000.00	$26,600.00	$1,680.00	$24,920.00	5.59
2nd Level Parking	3,216	8760	$0.1350	$4.58	28,172	$3,803	3.22	$15	48	$225.00	$250.00	$475.00	$10,800.00	$12,000.00	$22,800.00	$1,440.00	$21,360.00	5.59
3rd Level Parking	3,216	8760	$0.1350	$4.58	28,172	$3,803	3.22	$15	48	$225.00	$250.00	$475.00	$10,800.00	$12,000.00	$22,800.00	$1,440.00	$21,360.00	5.59
4th Level Parking	3,216	8760	$0.1350	$4.58	28,172	$3,803	3.22	$15	48	$225.00	$250.00	$475.00	$10,800.00	$12,000.00	$22,800.00	$1,440.00	$21,360.00	5.59
TOTALS:	14,874				130,296	$17,590	14.87		222						$105,450.00	$6,660.00	$98,790.00	

ECM #2

Project Name: Hoboken Garage "D" ECM #2 HID to 2L54T5HO VT
Location: Hoboken, NJ
Description: Parking Garage Lighting Retrofit

Return on Investment Analysis

	Parking Garage Lighting Retrofit	Existing
Total Construction Cost	$105,450	$0
Annual Maintenance Cost	$1,399	$7,430
Annual Cost of Operation (Energy)	$31,767	$49,357
Utility Incentives or Credits	$6,660	$0

First Cost Premium: **$98,790**

Simplified Payback Calculation: **5.59** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	10	Financing Term (mths):	120
Depreciation Period (years):	39	Financing %:	5%
Tax Rate:	0.0%	Inflation Rate:	2.0%
		Energy Cost Escalation Rate:	2.2%
Financing Rate:	5.00%	Cost of Capital:	5.0%

Period	Additional Cash Outlay	Energy Savings	Additional Maint Costs	Additional Depreciation	Interest Expense	Pretax Income	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$93,851	0	0	0	0	0	0	(93,851)	0
1	$0	$17,590	($6,031)	$2,533	$4,333	$16,755	$7,108	$12,180	$12,180
2	$0	$17,977	($6,152)	$2,533	$3,969	$17,627	$7,472	$12,688	$24,868
3	$0	$18,372	($6,275)	$2,533	$3,587	$18,527	$7,854	$13,207	$38,075
4	$0	$18,777	($6,401)	$2,533	$3,185	$19,459	$8,256	$13,736	$51,811
5	$0	$19,190	($6,529)	$2,533	$2,763	$20,422	$8,678	$14,277	$66,088
6	$0	$19,612	($6,659)	$2,533	$2,319	$21,419	$9,122	$14,830	$80,919
7	$0	$20,043	($6,792)	$2,533	$1,852	$22,450	$9,589	$15,395	$96,313
8	$0	$20,484	($6,928)	$2,533	$1,362	$23,518	$10,079	$15,972	$112,285
9	$0	$20,935	($7,067)	$2,533	$846	$24,623	$10,595	$16,561	$128,846
10	$0	$21,396	($7,208)	$2,533	$304	$25,767	$11,137	$17,163	$146,008
	Totals:	$194,376	($66,043)	$25,331	$24,521	$210,567		$146,008	$757,394

Net Present Value (NPV)	**$15,595**
Internal Rate of Return (IRR)	**8.4%**

Hoboken Parking Garage "D" Lighting
ECM #3 Retrofit

	Existing Fixtures							Proposed Fixtures							
Location	**Description**	**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Present Avg. Lumens/Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**	**Description**		**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Avg. Lumens per Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**
Basement	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	22	4,136	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	22	2,464
1st Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	56	10,528	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	56	6,272
2nd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	48	5,376
3rd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	48	5,376
4th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	48	5,376
TOTALS:						222	41,736								24,864

Hoboken Parking Garage
ECM #3 Retrofit

		Fixtures Retrofitted									Unit Installation Cost								
Location		**Wattage Reduction**	**Average Burn Hours**	**Ave $/kwh**	**Ave. $/kW**	**Energy Savings, kWh**	**Energy Savings, $**	**Energy Savings, kW**	**Energy Savings, $**	**Qty**	**Material Each**	**Labor Each**	**Total Each**	**Total Materials**	**Total Labor**	**Total All**	**Rebate Estimate**	**Total Cost Less Rebate**	**Simple Payback**
Basement		1,672	8760	$0.1350	$4.58	14,647	$1,977	1.67	$8	22	$159.81	$250.00	$409.81	$3,515.82	$5,500.00	$9,015.82	$660.00	$8,355.82	4.21
1st Level Parking		4,256	8760	$0.1350	$4.58	37,283	$5,033	4.26	$19	56	$159.81	$250.00	$409.81	$8,949.36	$14,000.00	$22,949.36	$1,680.00	$21,269.36	4.21
2nd Level Parking		3,648	8760	$0.1350	$4.58	31,956	$4,314	3.65	$17	48	$159.81	$250.00	$409.81	$7,670.88	$12,000.00	$19,670.88	$1,440.00	$18,230.88	4.21
3rd Level Parking		3,648	8760	$0.1350	$4.58	31,956	$4,314	3.65	$17	48	$159.81	$250.00	$409.81	$7,670.88	$12,000.00	$19,670.88	$1,440.00	$18,230.88	4.21
4th Level Parking		3,648	8760	$0.1350	$4.58	31,956	$4,314	3.65	$17	48	$159.81	$250.00	$409.81	$7,670.88	$12,000.00	$19,670.88	$1,440.00	$18,230.88	4.21
TOTALS:		16,872				147,799	$19,953	16.87								$90,977.82	$6,660.00	$84,317.82	

ECM #3

Project Name: **Hoboken Garage "D" ECM #3 HID to 3L32T8HO VT**
Location: **Hoboken, NJ**
Description: **Parking Garage Lighting Retrofit**

Simple Payback Analysis

	Parking Garage Lighting Retrofit	Existing
Total Construction Cost	$90,978	$0
Annual Maintenance Cost	$7,430	$13,986
Annual Cost of Operation (Energy)	$29,404	$49,357
Utility Incentives or Credits	$6,660	$0

First Cost Premium: **$84,318**

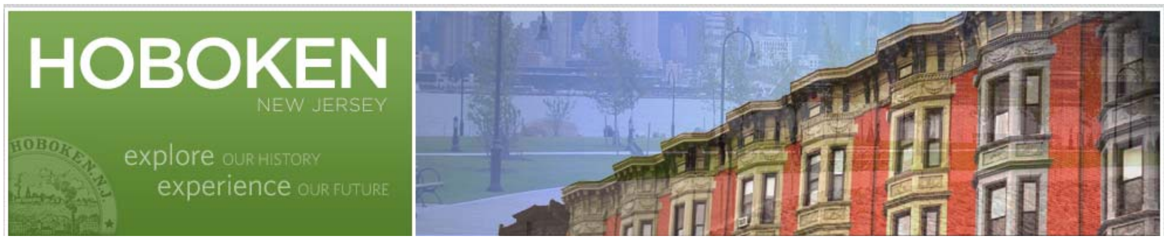
Simplified Payback Calculation: **4.21** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	10	Financing Term (mths):	120
Depreciation Period (years):	39	Financing %:	5%
Tax Rate:	0.0%	Inflation Rate:	2.0%
Financing Rate:	5.00%	Energy Cost Escalation Rate:	2.2%
		Cost of Capital:	5.0%

Period	Additional Cash Outlay	Energy Savings	Additional Maint Costs	Additional Depreciation	Interest Expense	Pretax Income	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$80,102	0	0	0	0	0	0	(80,102)	0
1	$0	$19,953	($6,556)	$2,162	$3,698	$20,649	$6,067	$16,744	$16,744
2	$0	$20,392	($6,687)	$2,162	$3,388	$21,529	$6,377	$17,314	$34,058
3	$0	$20,841	($6,821)	$2,162	$3,062	$22,438	$6,703	$17,896	$51,954
4	$0	$21,299	($6,957)	$2,162	$2,719	$23,376	$7,046	$18,491	$70,445
5	$0	$21,768	($7,096)	$2,162	$2,358	$24,344	$7,407	$19,099	$89,544
6	$0	$22,247	($7,238)	$2,162	$1,979	$25,344	$7,786	$19,720	$109,264
7	$0	$22,736	($7,383)	$2,162	$1,581	$26,376	$8,184	$20,354	$129,618
8	$0	$23,236	($7,531)	$2,162	$1,162	$27,443	$8,603	$21,002	$150,620
9	$0	$23,747	($7,681)	$2,162	$722	$28,545	$9,043	$21,664	$172,283
10	$0	$24,270	($7,835)	$2,162	$259	$29,683	$9,506	$22,340	$194,623
	Totals:	$220,488	($71,786)	$21,620	$20,929	$249,725		$194,623	$1,019,154

Net Present Value (NPV) **$61,923**
Internal Rate of Return (IRR) **19.2%**



ENERGY AUDIT – DRAFT REPORT

HOBOKEN
PARKING GARAGE "G"

310-322 River Street
Hoboken, NJ 07030
ATTN: John Pope

CEG PROJECT NO. 9C08143

CONCORD ENGINEERING GROUP

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I. EXECUTIVE SUMMARY

This report presents the findings of an energy audit conducted at:

Hoboken Parking Garage "G"
310-322 River Street
Hoboken, NJ 07030

Municipal Contact Person: John Pope

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy's mission, 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 electrical energy cost at this facility is as follows:

Electricity $51,697

The potential annual energy cost savings for each of the alternative lighting retrofits are shown below in Table 1. The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST[A]	ANNUAL SAVINGS	SIMPLE PAYBACK	SIMPLE RETURN ON INVESTMENT
1	Lighting Upgrade in Office, Restrooms, and Elevators	$1,036	$220	4.7	21.3%
2	Replace HID Fixtures with T5 Technology	$98,790	$17,658	5.6	17.9%
3	Replace HID Fixtures with T8 Technology	$84,318	$20,030	4.2	23.8%
4	Stairwell Lighting Upgrade	$3,880	$851	4.6	21.7%

Note A: Includes applicable incentive and maintenance savings

The estimated demand and energy savings are 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	
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)
1	Lighting Upgrade in Office, Restrooms, and Elevators	0.2	1,629
2	Replace HID Fixtures with T5 Technology	14.9	130,296
3	Replace HID Fixtures with T8 Technology	16.9	147,799
4	Stairwell Lighting Upgrade	0.7	6,307

<u>Recommendations:</u>

The following Energy Conservation Measures are recommended for the Hoboken Parking Garage "G" Facility:

- **ECM #1:** Office/Maintenance Shops Lighting Upgrade
- **ECM #2:** Replace HID Fixtures with T5 Technology **OR**
- **ECM #3:** Replace HID Fixtures with T8 Technology
- **ECM #4:** Stairwell Lighting Upgrade

II. INTRODUCTION

This comprehensive energy audit covers the 30,700 square foot parking garage "G" facility complex that includes the parking garage decks, stairwells, office, restrooms, and elevators. This parking garage is identical to Parking Garage "D" in number of lighting fixtures in the parking decks, office, restrooms, stairwells, and elevators. The parking garage is constructed of pre-fabricated concrete sections and was constructed in 1973 along with Parking Garage "D".

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

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from January-08 to December-08. Public Service Electric and Gas Company (PSE&G) provides electricity to the facility under the General Lighting and Power Service (GLP) Rate Schedule. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the most current rate structure available.

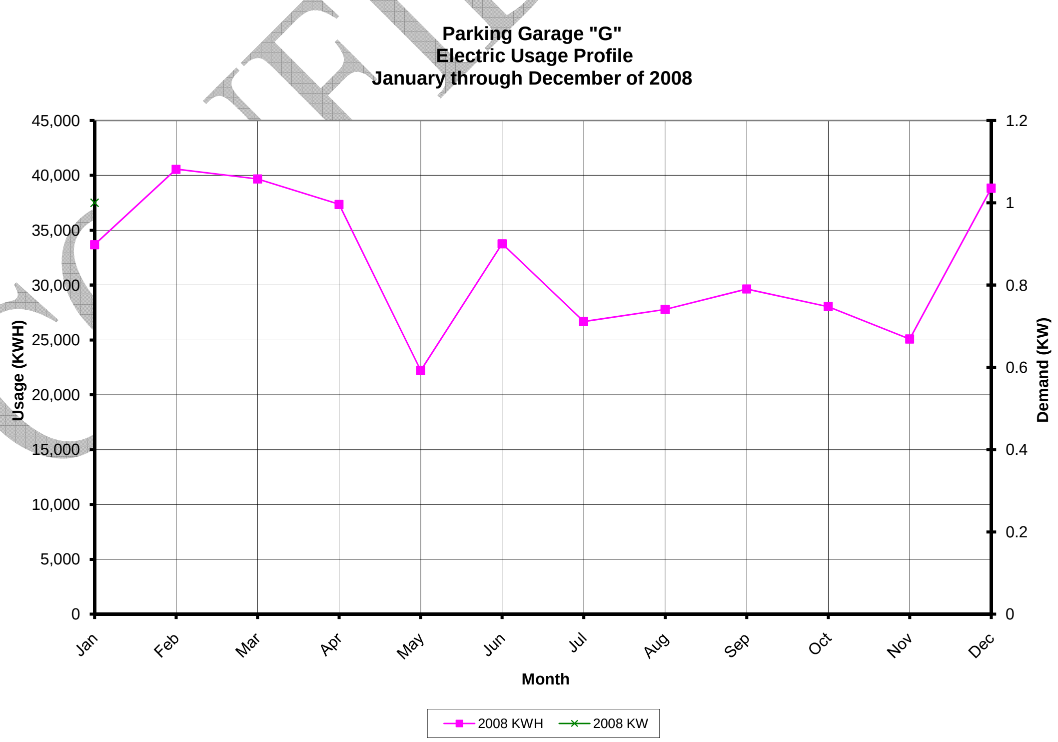
Description	Average
Electricity	13.5¢ / kWh

Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND**	TOTAL BILL
1/08	33,675		$3,912
2/08	40,560		$4,725
3/08	39,675		$4,690
4/08	37,350		$4,342
5/08	22,215		$2,684
6/08	33,765		$4,825
7/08	26,670		$4,510
8/08	27,780		$4,745
9/08	29,640		$5,098
10/08	28,035		$4,074
11/08	25,080		$3,293
12/08	38,835		$4,799
Totals	**383,280**		**$51,697**

** Electric Demand (kW) not provided by Owner.

Figure 1
Electricity Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's energy utilization per square foot of building. This calculation is completed by converting all utility usage (gas, electric, oil) consumed by a building over a specified time period, typically 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 amongst building of similar type. The EUI for this facility is calculated as follows:

$$Building\ \ EUI\ =\frac{Electric\ Usage\ in\ kBtu}{Building\ \ Square\ \ Footage}$$

Electric = ((383,280 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu/h / 1 kBtu/h)
= 1,308,518 kBtu

$$Building\ \ EUI\ =\frac{1{,}308{,}518\,kBtu}{30{,}700\ SF}$$

Parking Garage "G" EUI = 42.6 kBtu/SF

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: hobokencity
Password: lgeaceg2009

Security Question: What city were you born in?
Security Answer: “hoboken city”

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
Garage “G”	N/A	50

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

V. FACILITY DESCRIPTION

The 30,700 square foot parking garage "G" facility complex includes the parking garage decks, office, elevators, and restrooms. Parking garage "G" is identical to parking garage "D" in number of lighting fixtures. The parking garage is constructed of pre-fabricated concrete sections and was constructed in 1973 along with parking garage "D". Garage "G" is not a public garage since users pay on a monthly basis. The garage is open 24/7 all year round.

<u>Heating System</u>

The parking facility office and pay booths are heated by Berko electric wall-hung unit heaters.

<u>Domestic Hot Water</u>

Domestic hot water for the parking garage restrooms is provided by a 30-gallon capacity electric hot water heater.

<u>Cooling System</u>

Cooling in the parking facility office is performed by a thru-the-wall air conditioning unit rated at 12,000 BTUH.

<u>Lighting</u>

The parking decks are lit by High Intensity Discharge (HID) fixtures with 150-Watt HPS lamps. These lamps are rated for 24,000 hours, have an initial average lumen output of 14,400, and consume 188 Watts per fixture. The lenses are yellowed from heat, age, and dust in the parking decks. Light output has steadily decreased as the optical components became coated with a film of pollutants. The lighting fixtures are delivering substantially less than the rated average lumens for this type of fixture (estimated at 70% of 14,400 = 10,000 lumens per fixture).

The office is lit by four 2-foot x 4-foot lay-in fixtures containing two T-12 lamps and a magnetic ballast. The restrooms contain two 2-foot x 4-foot lay-in fixtures containing two T-12 lamps and a magnetic ballast. The elevators contain a total of eight 2-foot x 4-foot lay-in fixtures containing one T-12 lamp and a magnetic ballast. The two stairwells contain a total of twenty (20) 70-Watt high pressure sodium wall-mounted fixtures.

Standard switching is utilized and there are not other types of lighting controls present.

The exit signs are the latest LED type.

VI. MAJOR EQUIPMENT LIST

Hoboken Parking Garage "G" Lighting (150-Watt HPS)

Location	No. of Fixtures
Basement	22
1st Level	56
2nd Level	48
3rd Level	48
4th Level	48
TOTAL:	**222 Fixtures**

VII. ENERGY CONSERVATION MEASURES

ECM #1: Lighting Upgrades in Office, Restrooms, and Elevators

Description:

New fluorescent lamps and ballasts are available as direct replacements for the existing lamps and ballasts. A typical fixture with two, 4-foot lamps (34-Watt lamps) has a total wattage of 74 Watts. By retrofitting with new lamps and electronic ballast, the total wattage would be reduced to about 55 Watts per fixture and the space light levels and light quality would increase by about 15% and 35%, respectively. CEG recommends a retrofit of the existing fixtures containing T12 lamps and magnetic ballasts with T8 lamps and electronic ballasts.

Energy Savings Calculations:

There are six 2-lamp fixtures and eight 1-lamp fixtures to be retrofitted which equate to energy cost savings as follows:

[(74-55) Watts x 6 Fixtures + (37-28) Watts x 8] x 8,760 hrs/yr x $0.135/ kWh = 1,629 kWh x $0.135 = $220/yr

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix B, the retrofit of T-12 fixtures to T-8 with electronic ballasts warrants the following incentive: T-8 (1-2 lamp) = $10 per fixture

$$\text{Smart Start® } Incentive = \left(\#\ of\ 1-2\ lamp\ \ fixtures \times\ \$10\right)$$
$$\text{Smart Start® } Incentive = \left(14 \times\ \$10\right) = \$140$$

The retrofit labor/material cost is $84 / fixture which equals a total cost of 14 x $84 = $1,176

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,176
NJ Smart Start Equipment Incentive ($):	($140)
Net Installation Cost ($):	$1,036
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$220*
Net Savings ($ / yr):	*$220*
Simple Payback (yrs):	*4.7*
Simple Return On Investment (%):	*21.3%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$5,500*

Parking Deck Lighting

The purpose of the balance of this section is to outline the lighting analysis performed to assist Hoboken with the selection of a lamp fixture for this public parking garage. CEG evaluated many lamp options and summarized below are the optimum lamp types balancing quality of illumination, efficiency, and cost. LED and induction lighting technologies were not considered due to their unfavorable payback periods (expensive lighting technologies). Metal Halide and Metal Halide Pulse Technology were not considered due to their low Mean Fixture Lumens/Watt (40 to 60 L/W). The high pressure sodium light fixtures presently in the parking garage have a Mean Fixture Lumens/Watt of 60 to 70 L/W. Parking Garage "B" was used as the model for the analysis since it represents a typical layout for the other parking garages.

ECM #2: Replace Parking Garage Fixtures with T5 Technology

Description:

The newest family of linear fluorescent lamps is the T5 line of lamps, which consist of standard and high-output (HO) T5 lamps. The high output T5 lamps are a form of 4-foot fluorescent lamps that give off roughly twice the light output of T8 lamps. The intense brightness of the T5HO lamp is ideal as a replacement for any High Intensity Discharge (HID) lighting source (such as the existing high-pressure sodium lamps). In addition, the T5HO lamp offers increased energy efficiency and better lumen maintenance. Lumen maintenance defines the extent to which the full light output of a lamp is retained over the life of the lamp. After one year of continuous burn, the output of a standard High-Pressure Sodium (HPS) lamp will have declined to 88% of full light output. A T5HO lamp with the same burn time will have retained 95% of full light output.

HID lamps can take several minutes to "re-strike" or come up to full brightness once energized (such as after a power failure). As such, they do not lend themselves to control by light sensors, occupancy sensors, or other on/off controls. The perimeter of each parking deck closest to the daylight openings should be put on daylight harvesting controls to save additional energy.

This ECM would replace each of the existing HPS fixtures with a twin lamp, vapor tight, 4-foot T5 light fixtures with T5HO lamps and a Mean Fixture Lumens/Watt of 75+. The perimeter fixtures near the daylight openings would be controlled by light sensors and have dimming ballasts. The CEG audit team used the Zumtobel Chiaro vapor tight fixture for our fluorescent lighting layout. The fixture has an option for 20% uplight and has a Cold Spot Optimizer to address cold weather performance.

Energy Savings Calculations:

Appendix E outlines the T5 System option cost/savings analysis.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$105,450
NJ Smart Start Equipment Incentive ($):	($6,660)
Net Installation Cost ($):	$98,790
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$17,658*
Net Savings ($ / yr):	*$17,658*
Simple Payback (yrs):	*5.6*
Simple Return On Investment (%):	*17.9%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$441,450*

ECM #3: Replace Parking Garage Fixtures with T-8 Technology

Description:

T8HO fluorescent lamps provide a lumen per watt ration of 70+, good lamp life, and many options for color rendering properties. Caution must be used in using linear fluorescent lamps in outdoor applications. They operate best in the range of 40-80ºF. Below this range, there is a decrease in light output and difficulty in starting. CEG recommends the Zumtobel Cold Spot Optimizer (CSO) to address cold weather performance. The CSO is an aluminum sleeve that regulates the temperature at the electrode end of the lamp.

This ECM would replace each of the existing HPS fixtures with a 3-lamp, vapor tight, 4-foot T8 light fixtures with T8HO lamps and a Mean Fixture Lumens/Watt of 70+. The perimeter fixtures near the daylight openings would be controlled by light sensors and have dimming ballasts. The CEG audit team used the Zumtobel Chiaro vapor tight fixture for our fluorescent lighting layout. The fixture has an option for 20% uplight and has a Cold Spot Optimizer to address cold weather performance.

Energy Savings Calculations:

Appendix F outlines the T8 System option cost/savings analysis.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$90,978
NJ Smart Start Equipment Incentive ($):	($6,660)
Net Installation Cost ($):	$85,837
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$20,030*
Net Savings ($ / yr):	*$20,030*
Simple Payback (yrs):	*4.2*
Simple Return On Investment (%):	*23.8%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$500,750*

ECM #4: Stairwell Lighting Upgrade

Description:

The stairwells contain a total of twenty (20) 70-Watt High Pressure Sodium wall-mounted fixtures that light the stairs/landings. The lenses are yellowed from heat, age, and dust in the parking decks. Light output has steadily decreased as the optical components became coated with a film of pollutants. These lamps use 78 Watts of electricity and are very inefficient.

For the stairwells, the CEG energy audit team recommends replacing the existing fixtures with radial wrap fixtures and automated controls. These energy efficient radial wrap luminaries have a single low wattage 2-foot fluorescent lamp which is constantly on while the 4-foot lamp is controlled by an occupancy sensor. The basis of design is the RWS luminaire by Precision Fluorescent or equal. A 70-Watt HPS lighting fixture has a total of 78 full input watts while the RWS luminaire draws a total of 42 input watts.

Energy Savings Calculations:

Energy Cost Savings = 20 fixtures x [(78-42) Watts x 8,760 hrs/yr x $0.135] =

6,307 kWh x $0.135 = $851

Smart Start ® Incentive = 20 fixtures x $16/fixture = $320

The total cost of the new RWS luminaire installed is $210/fixture x 20 fixtures = $4,200

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,200
NJ Smart Start Equipment Incentive ($):	($320)
Net Installation Cost ($):	$3,880
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$851*
Net Savings ($ / yr):	*$851*
Simple Payback (yrs):	*4.6*
Simple Return On Investment (%):	*21.7%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$21,275*

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 Hoboken Garage G, and concluded the following:

- *Photovoltaic System*: CEG does not recommend the installation of a PV system for this facility due to the fact that the facility has much taller apartment buildings on two sides that cast a shadow upon the roof area throughout most of the day. In addition, the roof is utilized as a recreation and swimming pool area for the adjacent apartment buildings.

- *Wind Energy*: CEG does not recommend the installation of a wind system because of lack of open space for such a system in the Hoboken area. The afore-mentioned characteristic does not lend itself to a successful wind energy application.

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 Section III, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for June 2007 through May 2008.

Electricity:

Section IV, Figure 1 demonstrates a fairly typical Parking Garage load profile, which is consistent or flat (base-loaded). Lighting tends to be the main source of consumption. Lighting is generally on most if not all of the day.

Natural Gas:

This facility does not use natural gas service.

Tariff Analysis:

Electricity:

The Parking Garage-G receives electrical service through Public Service Electric and Gas Company (PSE&G) on a GLP (General Lighting and Power Service) rate on Measured Demand. This utility tariff is for delivery service for general purposes at secondary distribution. The Delivery Schedule has the following charges: Societal Benefits Charge, Non-utility Generation Charge, Securitization Charge, System Control Charge, Customer Account Services Charge, Standby Fee, Base Rate Distribution Adjustment Charge, Solar Pilot Recovery Charge and RGGI Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS).

Natural Gas:

This facility does not use natural gas service.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within City of Hoboken. CEG's primary observation is seen in the electric costs. The average price per kWh (kilowatt hour) for all buildings based on 1-year historical costs is \$.15/kWh (kWh is the common unit of electric measure). The average price per decatherm for natural gas is \$ 13.71dth (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. Hoboken could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on annual historical consumption (January through December 2007) and current electric rates, an annual savings of over $100,000 per year (Note: Savings were calculated using Hoboken's Average Annual Consumption of kWh and a variance to a fixed 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 Hoboken's natural gas costs. Based on the current market, Hoboken could improve its natural gas costs by approximately 25% annually. CEG recommends further advisement on these prices. The City should also consider procuring energy (natural gas) through alternative supply sources. CEG recommends energy advisory services.

CEG also recommends that the city schedule a meeting with their 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 city will learn more about the competitive supply process. Hoboken can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, they should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if Hoboken frequently changes or plans on changing its supplier for energy (natural gas), it needs to closely monitor balancing, particularly when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

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

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

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

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

iv. *Lease/Purchase Agreement* – Investigate the possibility of a lease/purchase or lease/maintenance agreement with the manufacturer and/or installing contractor.

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 RECOMMENDATION

CEG recommends an application of a reflective white paint on the ceiling and vertical beam surfaces to increase the horizontal illumination levels by approximately two footcandles. The practical benefit to applying the paint system is increased ceiling illumination and increased vertical surface illumination above 5-feet. Both of these elements will increase the sense of personal security.

Electric Cost Summary

PSE&G (Rate - MD)

Parking Garage "G" **2008**

Account # 27 158 060 1 8

Meter #

Month	Jan-09	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Total
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0
KWH	33,675	40,560	39,675	37,350	22,215	33,765	26,670	27,780	29,640	28,035	25,080	38,835	383,280
Total Cost, $	$3,912	$4,725	$4,690	$4,342	$2,684	$4,825	$4,510	$4,745	$5,098	$4,074	$3,293	$4,799	$51,697
$/KWH	$0.1162	$0.1165	$0.1182	$0.1162	$0.1208	$0.1429	$0.1691	$0.1708	$0.1720	$0.1453	$0.1313	$0.1236	**$0.1349**

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

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

Electric Chillers

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

Gas Cooling

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

Desiccant Systems

$1.00 per cfm – gas or electric

Electric Unitary HVAC

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

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

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

Variable Frequency Drives

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

Natural Gas Water Heating

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

Premium Motors

Three-Phase Motors	\$45 - \$700 per motor

Prescriptive Lighting

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

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

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

Other Equipment Incentives

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

STATEMENT OF ENERGY PERFORMANCE
Parking Garage G

Building ID: 1801681
For 12-month Period Ending: January 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 27, 2009

Facility
Parking Garage G
310-322 River Street
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
John Pope
94 Washington Street
Hoboken, NJ 07030

Year Built: 1973
Gross Floor Area (ft^2): 0

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

Site Energy Use Summary[3]	
Electricity (kBtu)	1,307,751
Natural Gas (kBtu)[4]	0
Total Energy (kBtu)	1,307,751
Energy Intensity[5]	
Site ($kBtu/ft^2/yr$)	
Source ($kBtu/ft^2/yr$)	N/A
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	199
Electric Distribution Utility	
PSE&G - Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	
Building Type	Other

Stamp of Certifying Professional

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

Meets Industry Standards[6] **for Indoor Environmental Conditions:**	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
Raymond Johnson
520 S. Burnt Mill Rd
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	Parking Garage G	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Other	Is this an accurate description of the space in question?		☐
Location	310-322 River Street, Hoboken, NJ 07030	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		☐

Parking Garage G (Parking)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	184,200 Sq. Ft.	Is this the total square footage of the entire parking area (enclosed + nonenclosed + open floor area)?		☐
Enclosed Floor Area	153,500 Sq. Ft.	Is this the total square footage of the enclosed garage space? An enclosed garage is defined as having both sides and a roof.		☐
Non-Enclosed Floor Area (w/roof)	30,700 Sq. Ft.	Is this the total square footage of the nonenclosed garage space? This is typically defined as the portion of the garage above ground (contains no sides but is under a roof).		☐
Open Floor Area (w/o roof)	0 Sq. Ft.	Is this the total square footage of the nonenclosed parking area without a roof? This is typically defined as open parking lots or the very top level of an above ground parking garage.		☐
Weekly Hours of Access	168 Hours	Is this the total number of hours per week when it is possible for a vehicle to enter or exit?		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity		
Meter: Electricity (kWh (thousand Watt-hours)) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
01/01/2009	01/31/2009	33,675.00
12/01/2008	12/31/2008	38,835.00
11/01/2008	11/30/2008	25,080.00
10/01/2008	10/31/2008	28,035.00
09/01/2008	09/30/2008	29,640.00
08/01/2008	08/31/2008	27,780.00
07/01/2008	07/31/2008	26,670.00
06/01/2008	06/30/2008	33,765.00
05/01/2008	05/31/2008	22,215.00
04/01/2008	04/30/2008	37,350.00
03/01/2008	03/31/2008	39,675.00
02/01/2008	02/29/2008	40,560.00
Electricity Consumption (kWh (thousand Watt-hours))		**383,280.00**
Electricity Consumption (kBtu)		**1,307,751.36**
Total Electricity Consumption (kBtu)		**1,307,751.36**
Is this the total Electricity consumption at this building including all Electricity 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.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Parking Garage G
310-322 River Street
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
John Pope
94 Washington Street
Hoboken, NJ 07030

General Information

Parking Garage G	
Gross Floor Area Excluding Parking: (ft²)	0
Year Built	1973
For 12-month Evaluation Period Ending Date:	January 31, 2009

Facility Space Use Summary

Parking Garage G	
Space Type	Parking
Gross Floor Area(ft²)	184,200
Enclosed Floor Area	153,500
Non-Enclosed Floor Area (w/roof)	30,700
Open Floor Area (w/o roof)	0
Weekly Hours of Access	168

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 01/31/2009)	**Baseline**	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	N/A	N/A	N/A	N/A	104
Source (kBtu/ft²)	N/A	N/A	N/A	N/A	213
Energy Cost					
$/year	$ 51,697.00	N/A	N/A	N/A	N/A
$/ft²/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	199	N/A	N/A	N/A	N/A
$kgCO_2e/ft^2$/year	N/A	N/A	N/A	N/A	N/A

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

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

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

Hoboken Parking Garage "G"

Hoboken Garage "G" ECM #2 HID to 2L54T5HO VT	
Quantity of Lighting Fixtures/Lamps	222
Existing KW	41.7
Proposed KW	26.9
KW Saved	14.9
Annual KWH Saved	130,296
$/KWH	$0.135
Annual Energy Savings $	$17,658
Estimated Construction Cost $	$105,450
Utility Rebate $	$6,660
Net Construction Cost After Rebate $	$98,790
Simple Payback	5.59
Analysis Period	10.00
Energy Cost Escalation	2%
Discount Rate	5%
Net Present Value	$15,595
Internal Rate of Return	8.40%

Hoboken Garage "G" ECM #3 HID to 2L32T8HO VT	
Quantity of Lighting Fixtures/Lamps	222
Existing KW	41.7
Proposed KW	24.9
KW Saved	16.9
Annual KWH Saved	147,799
$/KWH	$0.135
Annual Energy Savings $	$20,030
Estimated Construction Cost $	$90,978
Utility Rebate $	$6,660
Net Construction Cost After Rebate $	$84,318
Simple Payback	4.21
Analysis Period	10.00
Energy Cost Escalation	2%
Discount Rate	5%
Net Present Value	$61,923
Internal Rate of Return	19.23%

Parking Garage "G" Lighting
ECM #2 Retrofit

	Existing Fixtures							Proposed Fixtures								
Location	**Description**	**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Present Avg. Lumens/Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**	**Description**		**Avg. Rated Fixture Life, Hours**	**Lamps per Fixture**	**Avg. Lumens per Fixture**	**Watts**	**Qty of Fixtures**	**Total Watts**
Basement	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	22	4,136	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	22	2,662
1st Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	56	10,528	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	56	6,776
2nd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	48	5,808
3rd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	48	5,808
4th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T5 HO Fixtures	Sylvania Lamps FP54/841/HO/ECO Sylvania Ballast QTP2X54T5HO/UNV PSN La Mar Lighting Enclosure DV254H5UPCSS	25,000	2	8,100	121	48	5,808
TOTALS:						222	41,736								26,862

Parking Garage "G" Lighting
ECM #2 Retrofit

	Fixtures Retrofitted									Unit Installation Cost								
Location	**Wattage Reduction**	**Average Burn Hours**	**Ave $/kwh**	**Ave. $/kW**	**Energy Savings, kWh**	**Energy Savings, $**	**Energy Savings, kW**	**Energy Savings, $**	**Qty**	**Material Each**	**Labor Each**	**Total Each**	**Total Materials**	**Total Labor**	**Total All**	**Rebate Estimate**	**Total Cost Less Rebate**	**Simple Payback**
Basement	1,474	8760	$0.1350	$4.58	12,912	$1,743	1.47	$7	22	$225.00	$250.00	$475.00	$4,950.00	$5,500.00	$10,450.00	$660.00	$9,790.00	5.59
1st Level Parking	3,752	8760	$0.1350	$4.58	32,868	$4,437	3.75	$17	56	$225.00	$250.00	$475.00	$12,600.00	$14,000.00	$26,600.00	$1,680.00	$24,920.00	5.59
2nd Level Parking	3,216	8760	$0.1350	$4.58	28,172	$3,803	3.22	$15	48	$225.00	$250.00	$475.00	$10,800.00	$12,000.00	$22,800.00	$1,440.00	$21,360.00	5.59
3rd Level Parking	3,216	8760	$0.1350	$4.58	28,172	$3,803	3.22	$15	48	$225.00	$250.00	$475.00	$10,800.00	$12,000.00	$22,800.00	$1,440.00	$21,360.00	5.59
4th Level Parking	3,216	8760	$0.1350	$4.58	28,172	$3,803	3.22	$15	48	$225.00	$250.00	$475.00	$10,800.00	$12,000.00	$22,800.00	$1,440.00	$21,360.00	5.59
TOTALS:	14,874				130,296	$17,590	14.87								$105,450.00	$6,660.00	$98,790.00	

ECM #2

Project Name: Hoboken Garage "G" ECM #2 HID to 2L54T5HO VT
Location: Hoboken, NJ
Description: Parking Garage Lighting Retrofit

Return on Investment Analysis

	Parking Garage Lighting Retrofit	Existing
Total Construction Cost	$105,450	$0
Annual Maintenance Cost	$1,399	$7,430
Annual Cost of Operation (Energy)	$31,767	$49,357
Utility Incentives or Credits	$6,660	$0

First Cost Premium: **$98,790**

Simplified Payback Calculation: **5.59** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	10	Financing Term (mths):	120
Depreciation Period (years):	39	Financing %:	5%
Tax Rate:	0.0%	Inflation Rate:	2.0%
Financing Rate:	5.00%	Energy Cost Escalation Rate:	2.2%
		Cost of Capital:	5.0%

Period	Additional Cash Outlay	Energy Savings	Additional Maint Costs	Additional Depreciation	Interest Expense	Pretax Income	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$93,851	0	0	0	0	0	0	(93,851)	0
1	$0	$17,590	($6,031)	$2,533	$4,333	$16,755	$7,108	$12,180	$12,180
2	$0	$17,977	($6,152)	$2,533	$3,969	$17,627	$7,472	$12,688	$24,868
3	$0	$18,372	($6,275)	$2,533	$3,587	$18,527	$7,854	$13,207	$38,075
4	$0	$18,777	($6,401)	$2,533	$3,185	$19,459	$8,256	$13,736	$51,811
5	$0	$19,190	($6,529)	$2,533	$2,763	$20,422	$8,678	$14,277	$66,088
6	$0	$19,612	($6,659)	$2,533	$2,319	$21,419	$9,122	$14,830	$80,919
7	$0	$20,043	($6,792)	$2,533	$1,852	$22,450	$9,589	$15,395	$96,313
8	$0	$20,484	($6,928)	$2,533	$1,362	$23,518	$10,079	$15,972	$112,285
9	$0	$20,935	($7,067)	$2,533	$846	$24,623	$10,595	$16,561	$128,846
10	$0	$21,396	($7,208)	$2,533	$304	$25,767	$11,137	$17,163	$146,008
	Totals:	$194,376	($66,043)	$25,331	$24,521	$210,567		$146,008	$757,394

Net Present Value (NPV)	**$15,595**
Internal Rate of Return (IRR)	**8.4%**

Hoboken Parking Garage "G" Lighting
ECM #3 Retrofit

Location	Existing Fixtures: Description	Avg. Rated Fixture Life, Hours	Lamps per Fixture	Present Avg. Lumens/Fixture	Watts	Qty of Fixtures	Total Watts	Proposed Fixtures: Description		Avg. Rated Fixture Life, Hours	Lamps per Fixture	Avg. Lumens per Fixture	Watts	Qty of Fixtures	Total Watts
Basement	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	22	4,136	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	22	2,464
1st Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	56	10,528	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	56	6,272
2nd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	48	5,376
3rd Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	48	5,376
4th Level Parking	150 W High Pressure Sodium Low Bay	24,000	1	10,000	188	48	9,024	Remove Existing HID Low Bay Fixtures, Replace OFO with Vapor Tight 4' T8 HO Fixtures	Sylvania Lamps FO32/841/XP/ECO3 Sylvania Ballast QTP3X54T8/UNV ISH SC La Mar Lighting Enclosure VT232E8USASS	36,000	3	8,600	112	48	5,376
TOTALS:						222	41,736							222	24,864

Hoboken Parking Garage
ECM #3 Retrofit

Location	Fixtures Retrofitted									Unit Installation Cost								
	Wattage Reduction	Average Burn Hours	Ave $/kwh	Ave. $/kW	Energy Savings, kWh	Energy Savings, $	Energy Savings, kW	Energy Savings, $	Qty	Material Each	Labor Each	Total Each	Total Materials	Total Labor	Total All	Rebate Estimate	Total Cost Less Rebate	Simple Payback
Basement	1,672	8760	$0.1350	$4.58	14,647	$1,977	1.67	$8	22	$159.81	$250.00	$409.81	$3,515.82	$5,500.00	$9,015.82	$660.00	$8,355.82	4.21
1st Level Parking	4,256	8760	$0.1350	$4.58	37,283	$5,033	4.26	$19	56	$159.81	$250.00	$409.81	$8,949.36	$14,000.00	$22,949.36	$1,680.00	$21,269.36	4.21
2nd Level Parking	3,648	8760	$0.1350	$4.58	31,956	$4,314	3.65	$17	48	$159.81	$250.00	$409.81	$7,670.88	$12,000.00	$19,670.88	$1,440.00	$18,230.88	4.21
3rd Level Parking	3,648	8760	$0.1350	$4.58	31,956	$4,314	3.65	$17	48	$159.81	$250.00	$409.81	$7,670.88	$12,000.00	$19,670.88	$1,440.00	$18,230.88	4.21
4th Level Parking	3,648	8760	$0.1350	$4.58	31,956	$4,314	3.65	$17	48	$159.81	$250.00	$409.81	$7,670.88	$12,000.00	$19,670.88	$1,440.00	$18,230.88	4.21
TOTALS:	16,872				147,799	$19,953	16.87								$90,977.82	$6,660.00	$84,317.82	

ECM #3

Project Name: Hoboken Garage "G" ECM #3 HID to 3L32T8HO VT
Location: Hoboken, NJ
Description: Parking Garage Lighting Retrofit

Simple Payback Analysis

	Parking Garage Lighting Retrofit	Existing
Total Construction Cost	$90,978	$0
Annual Maintenance Cost	$7,430	$13,986
Annual Cost of Operation (Energy)	$29,404	$49,357
Utility Incentives or Credits	$6,660	$0

First Cost Premium: **$84,318**

Simplified Payback Calculation: **4.21** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	10	Financing Term (mths):	120
Depreciation Period (years):	39	Financing %:	5%
Tax Rate:	0.0%	Inflation Rate:	2.0%
Financing Rate:	5.00%	Energy Cost Escalation Rate:	2.2%
		Cost of Capital:	5.0%

Period	Additional Cash Outlay	Energy Savings	Additional Maint Costs	Additional Depreciation	Interest Expense	Pretax Income	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$80,102	0	0	0	0	0	0	(80,102)	0
1	$0	$19,953	($6,556)	$2,162	$3,698	$20,649	$6,067	$16,744	$16,744
2	$0	$20,392	($6,687)	$2,162	$3,388	$21,529	$6,377	$17,314	$34,058
3	$0	$20,841	($6,821)	$2,162	$3,062	$22,438	$6,703	$17,896	$51,954
4	$0	$21,299	($6,957)	$2,162	$2,719	$23,376	$7,046	$18,491	$70,445
5	$0	$21,768	($7,096)	$2,162	$2,358	$24,344	$7,407	$19,099	$89,544
6	$0	$22,247	($7,238)	$2,162	$1,979	$25,344	$7,786	$19,720	$109,264
7	$0	$22,736	($7,383)	$2,162	$1,581	$26,376	$8,184	$20,354	$129,618
8	$0	$23,236	($7,531)	$2,162	$1,162	$27,443	$8,603	$21,002	$150,620
9	$0	$23,747	($7,681)	$2,162	$722	$28,545	$9,043	$21,664	$172,283
10	$0	$24,270	($7,835)	$2,162	$259	$29,683	$9,506	$22,340	$194,623
	Totals:	$220,488	($71,786)	$21,620	$20,929	$249,725		$194,623	$1,019,154

Net Present Value (NPV) **$61,923**
Internal Rate of Return (IRR) **19.2%**

ENERGY AUDIT – DRAFT REPORT

HOBOKEN

Police Headquarters

106-124 Hudson St.
Hoboken, NJ 07030

ATTN: MR. JAMES J. RONGA

CEG PROPOSAL NO. 9C08143

CONCORD ENGINEERING GROUP

520 SOUTH BURNT MILL ROAD
VOORHEES, NJ 08043
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This report may contain proprietary, confidential or privileged information. If you have received this report in error, please notify the sender immediately. Thank you for your anticipated cooperation.

I. EXECUTIVE SUMMARY

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

Hoboken
Police Station
106-124 Hudson St.
Hoboken, NJ 07030

Facility Contact Person: Lt. Tory Pasculli

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy's mission, 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	$49,560
Natural Gas	$13,649
Total	$63,209

The potential annual energy cost savings are shown below in Table 1. Be aware that the measures are not additive because of the interrelation of several of the measures. The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE RETURN ON INVESTMENT
1	Interior Lighting Upgrades	$1,324	$165	8.31	12%
2	Install Compact Fluorescent Lamps	$30	$76	0.39	256%
3	Exit Sign Upgrade	$322	$235	1.67	59.8%
4	Interior Lighting Controls	$2,365	$255	9.27	10.8%
5	High-Efficiency Rooftop Units	$170,300	$454	312.5	.32%
6	High-Efficiency Split AC Unit	$16,062	$92	174.6	.57%
7	Boiler Replacement	$52,500	$2,424	21.66	4.6%
8	Domestic Water Heater Replacement	$6,425	$859	7.48	13.4%

The estimated demand and energy savings are 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		
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)	NATURAL GAS (MBH)
1	Interior Lighting Upgrades	0.22	1,004	-
2	Install Compact Fluorescent Lamps	0.17	1,647	-
3	Exit Sign Upgrade	0.15	1,349	
4	Interior Lighting Controls	-	280	-
5	High-Efficiency Rooftop Units	-	3,136	-
6	High-Efficiency Split AC Unit	-	636	-
7	Boiler Replacement	-	-	175,680
8	Domestic Water Heater Replacement	-	-	62,250

Recommendation:

Concord Engineering Group strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under ten (10) years. The potential energy and cost savings from these ECM's are too great to pass upon. The following Energy Conservation Measures are recommended for the Hoboken, Police Station:

- **ECM #1:** Interior Lighting Upgrades
- **ECM #2:** Install Compact Fluorescent Lamps
- **ECM #3:** Exit Sign Upgrade
- **ECM #4:** Interior Lighting Controls
- **ECM #8:** Domestic Water Heater Replacement – High Efficiency

Concord Engineering Group recommends that consideration be given to the implementation of all ECM's where equipment is substantially past its useful life. Equipment that is substantially past its useful life typically is inefficient, has higher maintenance costs and is more susceptible to mechanical failure. This equipment does not meet the criteria of simple payback at or under ten years on energy savings alone. Additional consideration should be given to maintenance costs, reliability and the length of time the owner expects to own and maintain the building. Concord Engineering Group recommends the following ECM for implementation based on useful life expectancy:

- **ECM #5:** High-Efficiency Rooftop Units
- **ECM #7:** Boiler Replacement – High Efficiency Upgrade

II. INTRODUCTION

This comprehensive energy audit covers the 23,242 square foot Hoboken, Police Station facility that includes the police headquarters, processing room, holding cells, Inspectoral Services, Bureau of I.D., Dispatch communications room, weight room, offices, locker rooms, server room, storage room, classroom, etc.

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

Electric

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from January-07 to December-07. The utility bill for December-07 was not available and an average of January-07 and November-07 was assumed for December-07. Public Service Electric and Gas Company (PSE&G) provides electricity to the facility under the General Lighting and Power Service (GLP) rate. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the most current rate structure available.

Natural Gas

Table 4 and Figure 2 show the natural gas energy usage for the surveyed facility from January-07 to December-07. The utility bill for December-07 was not available and an average of January-07 and November-07 was assumed for December-07. PSE&G charges a rate per therm for delivery of the natural gas via their pipelines to the burners under their Large Volume Gas (LVG) rate.

Description	Average
Electricity	14.5¢ /kWh
Natural Gas	$1.38 /Therm

Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-07	17,490	105.3	$2,271
Feb-07	3,990	36.3	$714
Mar-07	45,870	110.0	$5,138
Apr-07	18,420	36.9	$2,142
May-07	23,820	79.2	$2,845
Jun-07	28,740	108.3	$4,965
Jul-07	24,150	108.3	$4,892
Aug-07	46,800	112.2	$7,849
Sep-07	27,810	105.3	$5,368
Oct-07	35,370	105.9	$4,902
Nov-07	39,870	105.3	$4,892
Dec-07	28,680	105.3	$3,581
Totals	**341,010**	**112.2 Max**	**$49,560**

AVERAGE DEMAND 93.2 KW average
AVERAGE RATE $0.145 $/kWh

Figure 1
Electricity Usage Profile

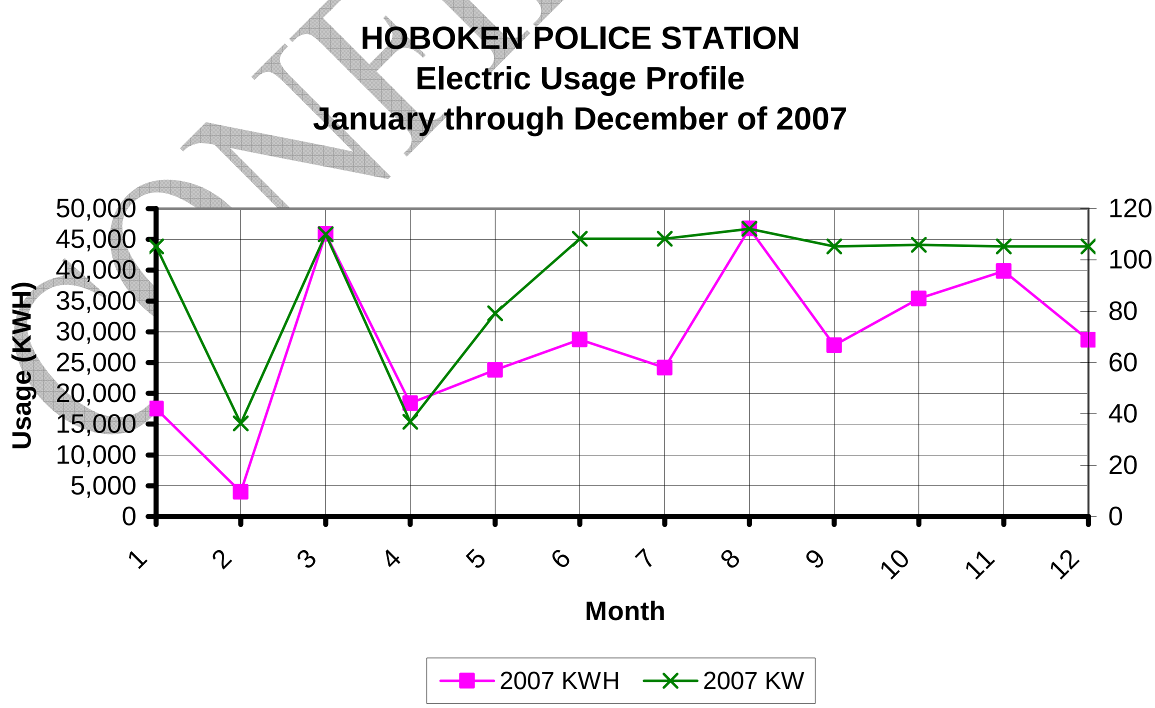
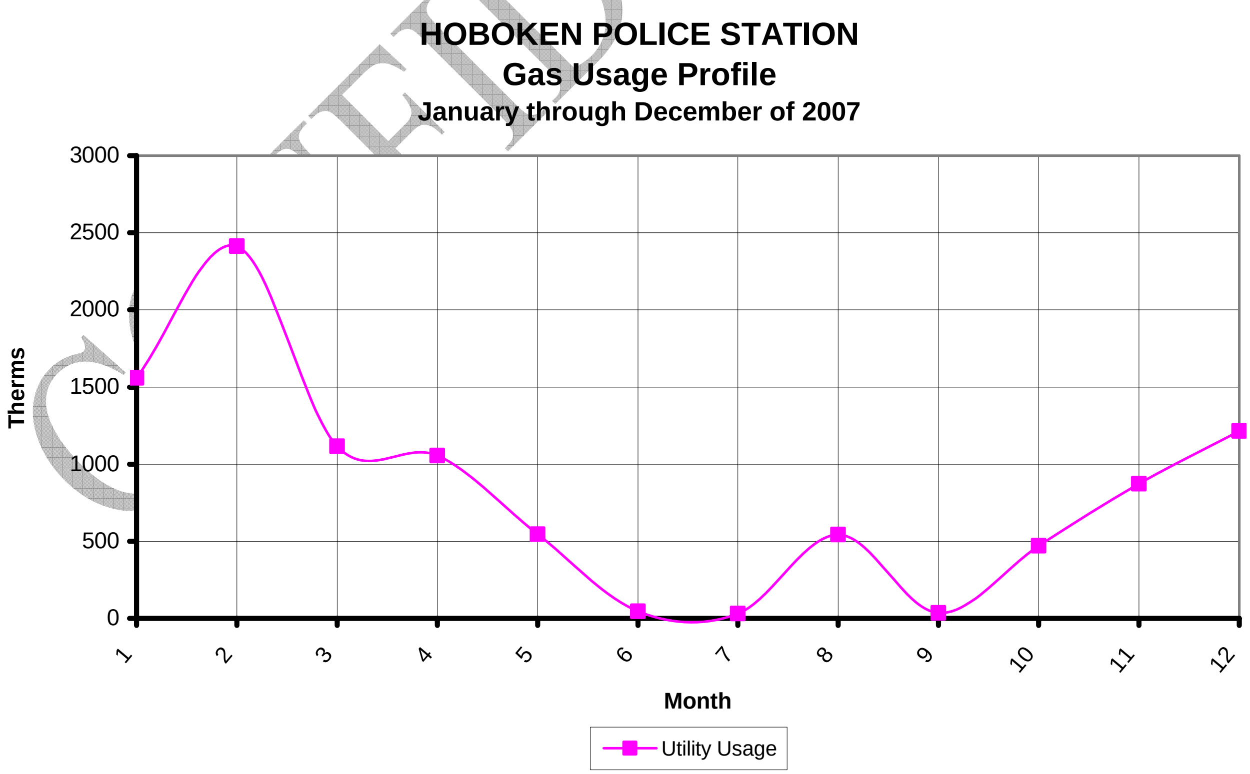


Table 4
Natural Gas Billing Data

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Jan-07	1558.56	$2,179.29
Feb-07	2414.06	$3,000.07
Mar-07	1115.47	$1,538.22
Apr-07	1055.83	$1,303.35
May-07	546.23	$710.63
Jun-07	44.95	$143.07
Jul-07	31.48	$126.52
Aug-07	543.61	$643.88
Sep-07	34.67	$124.52
Oct-07	470.75	$1,044.12
Nov-07	873.14	$1,163.60
Dec-07	1215.85	$1,671.45
TOTALS	**9904.59**	**$13,648.72**
AVERAGE RATE:	**$1.38**	**$/THERM**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's energy utilization per square foot of building. This calculation is completed by converting all utility usage (gas, electric, oil) consumed by a building over a specified time period, typically 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 amongst building of similar type. The EUI for this facility is calculated as follows:

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

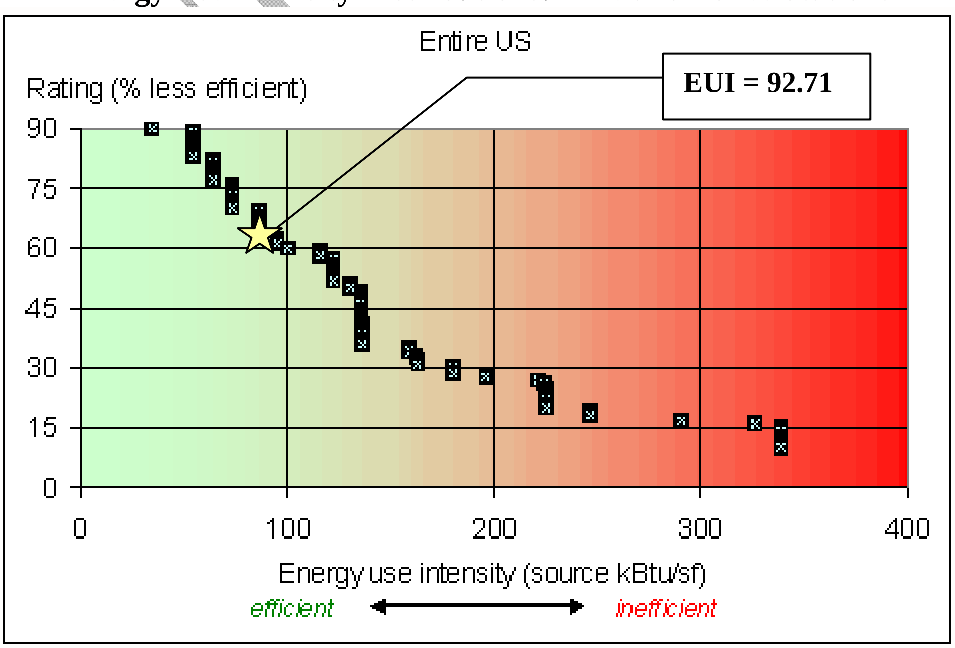
Electric = ((341,010 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu/h / 1 kBtu/h)
= 1,164,208 kBtu

Natural Gas = (9905 Therms) * (100,000 Btu/Therm) / 1000 BTU / kBTU= 990,459 kBtu

$$Building\ EUI = \frac{(1{,}164{,}208\ \ kBtu + 990{,}459\ kBtu)}{23{,}242\ SF} = \frac{2{,}154{,}667\ kBtu}{23{,}242\ SF}$$

Police Station EUI = 92.71 kBtu/SF

Figure 3
Energy Use Intensity Distributions: Fire and Police Stations



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 you to track and assess 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 more emphasis is being placed throughout multiple arenas on carbon reduction, greenhouse gas emissions and other environmental impacts.

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

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

Username: hobokencity

Password: lgeaceg2009

Security Question: What is your birth city?

Security answer: hoboken city

Specific building types are detailed on the ENERGY STAR website. Non-typical buildings are covered by an "Other" category. The Hoboken, Police Station falls under this "Other" category. The "Other" category is used if your building type or a section of the building is not represented by one of the specific categories. An Energy Performance Rating cannot be calculated if more than 10% of a building is classified as "Other." The majority of the Public Works Garage would be classified as "Other" and therefore cannot be given an Energy Performance Rating. Despite this Portfolio Manager calculates the building EUI. The EUI is an important tool that can be sued to track the energy efficiency if the building. Baselines for improvement can be set that the municipality can strive to meet. CEG strongly urges Hoboken to keep their Portfolio Manager account up to monitor the performance of the building.

V. FACILITY DESCRIPTION

The Hoboken Police Station consists of the police headquarters, processing room, holding cells, Inspectoral Services, Bureau of I.D., Dispatch communications room, weight room, offices, locker rooms, server room, storage room, and classroom; totaling approximately 23,242 SF. The brick/block facility was built in 1968. The facility is occupied 24 hours a day.

Heating System

The Police Station building is primarily heated by a H.B Smith 19 Series-11 sections, natural gas-fired, 917,000 BTUH input, hot water boiler in the basement with a rated efficiency of 75%. Four (4) zone pumps deliver hot water to coils in the following zones:

a) AHU-1

b) AHU-2

c) 1st Floor perimeter radiation

d) 2nd Floor perimeter radiation

Domestic Hot Water

Domestic hot water for the restrooms is provided by a State Sandblaster, natural gas domestic water heater, 40-gallon capacity rated at 199,999 Btuh input.

Cooling System

Cooling is provided by two (2) Trane Climate Changer, Multi-zone, rooftop split system units. Each system utilizes R-22 refrigerant for cooling and hot water for heating and has 27-Tons nominal cooling capacity. A 1.5-Ton split system, Sanyo model KMS1812, serves the server room. A 0.5-Ton split system, Sanyo KMS0712, serves the training room. A 3-Ton split system is assumed to serve the Captain's office. A GE Zoneline 3100 PTAC unit serves the holding cell area.

Lighting

The Boiler room, weight room and server room are lit via 1-tube, 8 foot long fluorescent T12 lamps and magnetic ballasts. Other areas are lit by 2-foot by 4-foot lay-in fixtures containing T8 fluorescent lamps and electronic ballasts. The vestibule and kitchen are lit by incandescent lamps. Standard switching is utilized and there are no other types of lighting controls present. The exit signs throughout the facility contain incandescent lamps and consume an estimated 30 watts of electricity per exit sign.

VI. MAJOR EQUIPMENT LIST

Following the completion of the field survey a detailed equipment list was created. The equipment within this list is considered major energy consuming equipment whose replacement could yield substantial energy savings. In addition, 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 if a manufacture's 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.

Table 4 thru 6
Existing Equipment Listing

Cooling Equipment							
Description	**Qty**	**Cooling Capacity (Tons)**	**Cooling Capacity (BTUH)**	**Fuel Type**	**Approx. Age (yrs)**	**ASHRAE Service Life (yrs)**	**Remaining Life (yrs)**
A-Trane Model No. CC SIZE 25	1	See A below	-	Electric	38	15	-23
B-Trane Model No. CC SIZE 25	1	See below	-	Electric	38	15	-23
A-Trane Model No. RA 400 3A	1	31.6	380,000	Electric	38	15	-23
B-Trane Model No. RA 400 3A	1	33.4	401,000	Electric	38	15	-23
Sanyo Model KMS0712	1	0.5	7,000	Electric	8 *	15	7
Sanyo Model KMS1812	1	1.5	18,000	Electric	8 *	15	7
Mitsubishi Model No.PUY-A36NHA	1	3	34,200	Electric	8 *	15	9

* - Manufacture date estimated due to information is unavailable.

HEATING EQUIPMENT						
Description	**Qty**	**Rated Capacity(BTUH)**	**Fuel Type**	**Approx. Age (yrs)**	**ASHRAE Service Life (yrs)**	**Remaining Life (yrs)**
H.B. Smith – Water Boiler	1	917,000	Natural Gas	38	35	(-3)

DOMESTIC WATER HEATING SYSTEM						
Description	**Qty**	**Capacity**	**Fuel Type**	**Approx. Age (yrs)**	**ASHRAE Service Life (yrs)**	**Remaining Life (yrs)**
State SBF8 0199NE Water Heater	1	40 gallon	Natural Gas	6 *	12	6

* - Manufacture date estimated due to information is unavailable.

Note: Equipment noted as having a negative (#) remaining life is considered past its standard service life as described in 2007 ASHRAE Applications Handbook and is most likely a good candidate for replacement.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Interior Lighting Upgrades

Description:

Replacing the 1 foot x 8 foot, one T12 lamp fluorescent fixtures with a new T8 fluorescent fixture is a simple change that can provide substantial savings. A typical 1 foot x 8 foot, one T12 lamp fluorescent fixture has a total wattage of about 125 Watts. By replacing it with two (2) new 1 foot x 4 foot fixture that have T8 lamps, reflector and electronic ballasts the total wattage would be reduced to 28 Watts per fixture and the space light levels and light quality would increase by about 15% and 35%, respectively.

CEG recommends a 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 electronic ballasts. In addition to functional cost savings, the fixture replacement will also provide operational cost savings. The operational cost savings will be realized through the lesser number of lamps that will be required to be replaced per year. The expected lamp life of a T8 lamp, approximately 30,000 burn-hours, in comparison to the existing T12 lamps, approximately 20,000 burn-hours, will provide the Owner with fewer lamps to replace per year. Based on the operating hours of this facility, the owner will be changing approximately 33% less lamps per year.

This ECM shall replace all T12 fixtures throughout the facility with new T8 lay-in type fixtures in locations where there are ceilings. In locations where there is no ceiling and is exposed to structure, a pendant type fixture should be installed.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in Appendix F that outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

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

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

$$\text{Smart Start® } Incentive = (7 \times \$25) + (0 \times \$30) = \$175$$

Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ lamps \times \%\ reduction \times \$\ per\ lamp)$$

$$Maintenance\ Savings = (7 \times 33\%\ reduction \times \$\ 2.00) = \$5$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,504
NJ Smart Start Equipment Incentive ($):	($175)
Net Installation Cost ($):	*$1,324*
Maintenance Savings ($ / yr):	*$5*
Energy Savings ($ / yr):	*$160*
Net Savings ($ / yr):	*$165*
Simple Payback (yrs):	*8.31*
Simple Return On Investment (%):	*12%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$4,125*

ECM #2: Install Compact Fluorescent Lamps

Description:

Compact fluorescent lamps (CFL's) were created to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: an 18-Watt CFL for a 60-Watt incandescent lamp, a 21-Watt CFL for a 75-Watt incandescent lamp, and a 23-Watt CFL for a 100-Watt incandescent lamp.

The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures.

This ECM involves replacing all incandescent lamps in the facility with energy efficient compact fluorescent lamps.

Energy Savings Calculations:

There are six (6) 60-Watt and zero (0) 100-Watt incandescent lamps in the facility that can be upgraded to 18 and 23 Watt CFL units respectively. The average operating hours for these lamps is estimated to be 2080.

<u>Energy cost savings</u>:

[6 units * (60W – 18W) + 0 units * (100W – 23W)] 2080 hours * 1 kW/1,000 W * $0.145/kWh] = <u>$76.00/yr</u>

The installed cost of six (6) 18-Watt and zero (0) 23-Watt CFL's is $30

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$30
NJ Smart Start Equipment Incentive ($):	-
Net Installation Cost ($):	*$30*
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$76*
Net Savings ($ / yr):	*$76*
Simple Payback (yrs):	*0.39*
Simple Return On Investment (%):	*256%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$1,900*

ECM #3: Exit Sign Upgrade

Description:

Exit signs are lit all year long and are typically a forgotten energy hog. Exits signs have replacement lamps ranging from 4 volt, 3.6 watt to 120volt or 277 volt, 25 watt depending on the existing fixture. Exit signs are usually electrically powered using incandescent bulbs, compact fluorescent lamps (CFL) or light emitting diode (LED) arrays. Most LED exit signs and some CFL exit signs meet Energy Star requirements.

There is a LED Thermoplastic Universal Architectural Exit sign with battery back-up available that is relatively inexpensive that will replace existing exit signs to a more efficient fixture, meeting the Energy Star requirements. Typical replacements are 2 watt for green text or 4 watt for red text fixture.

Energy Savings Calculations:

There are seven (7) exit signs in the facility (assumed to be 26 watt due to inaccessibility) that can be upgraded to standard 120/277 volt input, high out-put LED 4 watt (red) or 2 watt (green) fixtures with the Thermoplastic Universal Architectural Exit sign with battery back-up. The operating hours for these fixtures is continuous all year long at 8760 hours per year.

Energy cost savings:

7 units * (26W – 4W)]* 8760 hours * 1 kW/1,000 W * $0.143 kWh] = $193/yr

The installed cost of each 4-Watt LED exit signs is $56.
7 units * $56 = $392.

There is a NJ Smart Start Equipment Incentive of $10 per new LED exit sign for buildings with ≥75kW demand.
7 units * $10 = $70

Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (14 lamps \times 100\%\ reduction \times \$\ 3.00\ perlamp) = \$42.00$$

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$392
NJ Smart Start Equipment Incentive ($):	($70)
Net Installation Cost ($):	*$280*
Maintenance Savings ($ / yr):	*$42*
Energy Savings ($ / yr):	*$193*
Net Savings ($ / yr):	*$235*
Simple Payback (yrs):	*1.67*
Simple Return On Investment (%):	*59.8%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$5,875*

ECM #4: Interior Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. Many times this is due to the idea that it is better to keep the lights on rather than to continuously switch them on and off. The on/off dilemma was studied and it was found that the best option is to turn the lights off whenever possible. Although this does reduce the lamp life, the energy savings far outweigh the lamp replacement costs. The cutoff for when to turn the lights off is around two minutes. If the lights can be off for only a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is all it would take to employ an energy saving lighting control. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G of the referenced standard, states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. CEG recommends the installation of dual technology occupancy sensors in all private offices, classroom, restrooms, storage rooms, file rooms, boiler room, weight room, server room, Inspectoral Services, kitchen, locker rooms, etc. in the police station facility (43 spaces approximately 13,836 square feet).

CEG would recommend wall switches for individual rooms, ceiling mount sensors for large office areas or restrooms, and fixture mount box sensors for some applications as manufactured by Sensorswitch, Watt Stopper, etc.

Energy Savings Calculations:

From Appendix F of this report, we calculated the lighting power density (Watts/ft^2) of the private offices, conference rooms, restrooms, storage rooms, file rooms, (all areas with 2080 hours operation) etc. the facility to be ±0.61 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

Savings = 10% x 0.61Watts/SF x 13,836 SF x 2,080 hrs/yr. = 1755 kWh x $0.145/kWh

Savings = <u>$255</u> per year

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

The SmartStart Buildings® incentive is $20 per control which equates to an installed cost of $55/unit. Total number of spaces to be retrofitted is 9.

Total cost to install sensors is $55/unit x 43 units = $2365

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,225
NJ Smart Start Equipment Incentive ($):	($860)
Net Installation Cost ($):	*$2,365*
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$255*
Net Savings ($ / yr):	*$255*
Simple Payback (yrs):	*9.27*
Simple Return On Investment (%):	*10.8%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Savings ($):	*$3,825*

ECM #5: High-Efficiency Condensing Units (Multi zone split system)

Description:

The direct expansion (DX) cooling with hot water heating multi-zone rooftop split system units are excellent candidates for replacement. These units were shipped from the factory in January 1971. These rooftop units are well beyond their service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. Due to escalating owning and maintenance costs, these units should be replaced.

This measure would replace each air handling and condensing unit with an energy-efficient unit. The systems would have a variable air volume air handler with DX cooling and hot water heating coil, variable air volume zone control dampers and an energy efficient condensing unit by Trane or approved equivalent.

Energy Savings Calculations:

$$EnergySavings = \frac{[CoolingTons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{EER_{OLD}} - \frac{1}{EER_{NEW}} \right) \times Avg.LoadFactor \times Hrs.ofCooling$$

<u>Existing Trane 40-Ton CU (2 units)</u>

Rated Capacity = 40 Tons per unit
Condenser Section Efficiency = 9.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.145/kWh

<u>Proposed High-Efficiency 40-Ton Rooftop Unit</u>

Rated Capacity = 40 Tons per Unit
New Cooling Unit Efficiency = 10.1 EER

$$EnergySavings = \frac{[40Tons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{9} - \frac{1}{10.1} \right) \times 0.15 \times 1800 = 1{,}568\,kWh/yr \text{ per unit}$$

<u>Total Energy Cost Savings</u> = (1,568) kWh/yr. x $0.145/kWh = <u>$227</u> per year per unit

Installation costs for the two (2) rooftop Multi-zone split system Air handling units and two (2) condensing unit replacements are estimated at $174,000. It is pertinent to note that this estimate includes the demolition of the existing units and dunnage modifications (if required).

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the rooftop unit replacement falls under the category "Unitary HVAC" and warrants an incentive based on efficiency (EER) at a certain cooling tonnage.

$$\text{Smart Start® } Incentive\,(RTU - 40\,Tons) = (Cooling\,Tons \times \; RTU\;\; Incentive)$$
$$= 2(40\,Tons \times \$40/Ton) = \$3200$$

$$\text{Smart Start® } Incentive\ DualEnthalpyEconomizerControls = \$250\ \text{ x 2 units= \$500}$$

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$174,000
NJ Smart Start Equipment Incentive ($):	($3,700)
Net Installation Cost ($):	*$170,300*
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$454*
Net Savings ($ / yr):	*$454*
Simple Payback (yrs):	*312.5*
Simple Return On Investment (%):	*.32%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Savings ($):	*$6,810*

ECM #6: High-Efficiency Split AC Unit

Description:

The cooling only split rooftop unit located over the server room is an excellent candidate for replacement. This unit appears to be a 1994 vintage unit. This split rooftop unit is beyond its service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. Due to escalating owning and maintenance costs, this unit should be replaced.

This measure would replace this unit with a more energy-efficient split DX cooling unit, by Trane or approved equivalent.

Energy Savings Calculations:

$$EnergySavings = \frac{[CoolingTons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{EER_{OLD}} - \frac{1}{EER_{NEW}}\right) \times Avg.LoadFactor \times Hrs.ofCooling$$

<u>Existing Sanyo 0.75-Ton Split System (1 Unit)</u>

Rated Capacity = 0.75 Tons per unit
Condenser Section Efficiency = 7.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.145/kWh

<u>Proposed High-Efficiency 0.75-Ton Rooftop Unit</u>

Rated Capacity = 0.75 Tons per Unit
New Cooling Unit Efficiency = 14.0 EER

$$EnergySavings = \frac{[0.75Tons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{7} - \frac{1}{14}\right) \times 0.15 \times 1800 = 173 \;\; kWh/yr$$

<u>Total Energy Cost Savings</u> = (173) kWh x $0.145/kWh = <u>$25</u> per year

The installation cost for the ¾ ton split AC replacement is estimated at $3,390.

<u>Existing Sanyo 1.5-Ton Split System (1 Unit)</u>

Rated Capacity = 1.5 Tons per unit
Condenser Section Efficiency = 7.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.145/kWh

Proposed High-Efficiency 1.5-Ton Rooftop Unit

Rated Capacity = 1.5 Tons per Unit
New Cooling Unit Efficiency = 14.0 EER

$$EnergySavings = \frac{[1.5Tons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{7} - \frac{1}{14}\right) \times 0.15 \times 1800 = 347 \quad kWh/yr$$

Total Energy Cost Savings = (347) kWh x \$0.145/kWh = \$50 per year

The installation cost for the 1.5 ton split AC replacement is estimated at \$4,665.

Existing Mitsubishi Split 3-Ton AC Unit

Rated Capacity = 3 Tons per unit
Condenser Section Efficiency = 12.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - \$0.145/kWh

Proposed High-Efficiency 3-Ton Split AC Unit

Rated Capacity = 3 Tons per Unit
New Cooling Unit Efficiency = 14.0 EER

$$EnergySavings = \frac{[3Tons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{12} - \frac{1}{14}\right) \times 0.15 \times 1800 = 116 \quad kWh/yr$$

Energy Cost Savings = 116 kWh x \$0.145/kWh = \$17 per year

The installation cost for the 3 ton split AC replacement is estimated at \$8,490.

NJ Smart Start® Program Incentive is calculated as follows:

From Appendix C, the rooftop unit replacement falls under the category “Unitary HVAC” and warrants an incentive based on efficiency (EER) at a certain cooling tonnage.

$$\text{Smart Start® } Incentive\ (RTU - 3/4\ Tons) = (Cooling\ Tons \times\ RTU\ Incentive)$$
$$= (3/4\ Tons \times \$92/Ton) = \$69$$

$$\text{Smart Start® } Incentive\ (RTU - 1.5\ Tons) = (Cooling\ Tons \times\ RTU\ \ Incentive)$$
$$= (1.5\ Tons \times \$92 / Ton) = \$138$$

$$\text{Smart Start® } Incentive\ (RTU - 3\ Tons) = (Cooling\ Tons \times\ RTU\ \ Incentive)$$
$$= (3\ Tons \times \$92 / Ton) = \$276$$

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$16,545
NJ Smart Start Equipment Incentive ($):	($483)
Net Installation Cost ($):	*$16,062*
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$92*
Net Savings ($ / yr):	*$92*
Simple Payback (yrs):	*174.6*
Simple Return On Investment (%):	*.57%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Savings ($):	*$1,380*

ECM #7: Boiler Replacement – High Efficiency Upgrade

Description:

This ECM replaces the boiler with a high efficiency condensing hot water boiler. The Hoboken Police Station is heated by one (1) HB Smith 19 Series Natural Gas-fired, 11 sections, 917 MBh hot water boiler which presently is about 70% efficient. As an energy conservation measure, the Concord team recommends this boiler be replaced by one (1) Lochinvar SYNC model SBN 1000 condensing boilers or equivalent with an efficiency of 94.6%. There is potential for these boilers to operate at 98% efficiency with lower system return water temperatures. This, however, would impact the connected equipment (air handling units and baseboard radiation) and an engineer should be consulted before changing the heating loop temperature difference. This ECM will consider the original system loop temperature difference of 30°F (180°F -150°F).

<u>Existing Heating Hot Water Boiler:</u>

Rated Capacity = 917 MBh (Natural Gas)

Combustion Efficiency = 75%
Age & Radiation Losses = 5%
Thermal Efficiency = 70%

<u>Replacement Boiler:</u>

High-Efficiency Condensing Boiler

Rated Capacity = 1,000 MBh (Natural Gas)

Combustion Efficiency = 94.6%
Radiation Losses = 0.5%
Thermal Efficiency = 94.1%

<u>Operating Data:</u>

Annual Fuel Consumption of Natural Gas is calculated as:
917,000 BTU x 4935 HDD65 x 0.15 diversity / (100,000 Btu/1 Therm of natural gas)
= 6,859.09 Therms

Average Cost of Natural Gas = $1.38/Therm

Energy Savings Calculations:

Energy Savings = Old Boiler Energy Input x ((New Boiler Efficiency – Old Boiler) / New Boiler Efficiency))

$$\text{Energy Savings} = 6{,}859.1 \text{ Therms} \times \frac{(94.1\% - 70\%)}{(94.1\%)} = 1756.8 \text{ Therms}$$

Energy Cost Savings = Annual Energy Savings x $/Therm

Energy Cost Savings = 1,756.8 Therms x $1.38/Therm = $2,424/ yr.

Installed cost of one (1) Lochinvar SYNC model SBN 1000 Condensing Boiler including removal of existing unit, all piping changes and controls = $53,500.

Smart Start Incentive = $1.00/MBh x 1,000/installed MBh = $1,000

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$53,500
NJ Smart Start Equipment Incentive ($):	($1,000)
Net Installation Cost ($):	*$52,500*
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$2,424*
Net Savings ($ / yr):	*$2,424*
Simple Payback (yrs):	*21.66*
Simple Return On Investment (%):	*4.6%*
Estimated ECM Lifetime (yr):	*35*
Simple Lifetime Savings ($):	*$84,840*

ECM #8: Domestic Water Heater Replacement

Description:

The existing domestic hot water heater is a State model SBF80199NE with 199,900 BTUH input Natural Gas Heater and has a 80% thermal efficiency. The nameplate recovery rate is 184 gallons per hour at 75% thermal efficiency.

This energy conservation measure will replace the existing natural gas 35-gallon capacity domestic water heater with a 95% thermal efficient A.O. Smith Cyclone HE gas fired domestic hot water heater with 100-gallon storage capacity or equivalent. This ECM requires coordination with the utility due to increase in natural gas demand for the facility. CEG advises the owner to contact the utility provider regarding the installation of this ECM.

Energy Savings Calculations:

Existing Natural Gas DW Heater

Rated Capacity = 199.9 MBH input; 35 gallons storage

Combustion Efficiency = 80%
Age & Radiation Losses = 5%
Thermal Efficiency = 75%

Proposed Natural Gas-Fired, High-Efficiency DW Heater

Rated Capacity = 199.9 MBH input; 100 gallons storage

Thermal Efficiency = 95%
Radiation Losses = 0.5%
Net Efficiency = 94.5%

Operating Data for DW Heater

Estimated Daily DWH Load = (200 occupants x 0.4 gal/hour)x 0.5 Diversity = 40 gal/h

DW Heater Operating Hrs/Yr. = (40 gal/hr /230 gal/hr recovery) x 8760 hrs/yr = 1,523.5 Hrs/yr

Natural Gas Consumption = 1,523.5 hrs x 199,900 BTU/Hr x 1 Therm/ 100,000 BTU/Hr
Natural Gas Consumption = 3,045.5 Therms

Energy Savings = Old Water Heater Energy Input x ((New Water Heater Efficiency – Old Water Heater) / New Water Heater Efficiency))

$$\text{Energy Savings} = 3{,}045.5 \text{ Therms} \times \frac{(94.5\% - 75\%)}{(94.5\%)} = 622.5 \text{ Therms}$$

Average Cost of Natural Gas = $1.38/Therm

Yearly Savings = 622.5 Therm x $1.38/ Therm = $859/year

Cost of Commercial Domestic Water Heater, 2-year warranty extension (years 4 and 5) and Installation = $6,825

Smart Start Incentive = $2.00/MBh x $199.9 /installed MBh = $400.

Simple Payback = $6,425 / $859 = 7.48 years

Energy Savings Summary:

ECM #8 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,825
NJ Smart Start Equipment Incentive ($):	($400)
Net Installation Cost ($):	*$6,425*
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$859*
Net Savings ($ / yr):	*$859*
Simple Payback (yrs):	*7.48*
Simple Return On Investment (%):	*13.4%*
Estimated ECM Lifetime (yr):	*12*
Simple Lifetime Savings ($):	*$10,308*

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 Hoboken, and concluded that there is potential for solar and wind 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 732 S.F. can be utilized for a PV system on Police Station. A depiction of the area utilized is shown in Appendix G. Using this square footage it was determined that a system size of 11.5 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 17,946 KWh annually, reducing the overall utility bill by 5.26% percent. A detailed financial analysis can be found in Appendix E. 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.

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. 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	INTERNAL RATE OF RETURN
Self-Finance	11.65 Years	9%
Direct Purchase	11.65 Years	7.5%

Wind energy production is another option available through the Renewable Energy Incentive Program. Small wind turbines can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG has reviewed the applicability of wind energy for Police Station and has determined it is not a viable option. There is not enough free land available on the site to accommodate the installation of a wind turbine.

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 Section III, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for June 2007 through May 2008.

Electricity:
Section IV, Figure 1 demonstrates an erratic load profile. There is an extreme summer peak in August which is consistent with summertime cooling. But there is an equally extreme peak in March. The load profile gradually increases as the summer progresses to the peak in August. Most likely due to the Trane Climate Changers (27 ton each), the Sanyo 1.5 ton unit and the 3 ton split system cooling units. These units probably run most of the year as demonstrated by the high profile in October, November and March.

Natural Gas:
Section IV, Figure 2 demonstrates a more typical heating load (January-April, October, November, and December). The spike in natural gas consumption takes place in February, which is consistent with heating profiles. There is a clear separation between summer and winter loads consistent with energy commodities traded on the New York Mercantile Exchange. Heating loads carry a much higher average cost because of the higher demand for natural gas to heat during the winter. This facility is heated by a zoned, natural fired, not water system.

Tariff Analysis:

Electricity:
The Police Headquarters receives electrical service through Public Service Electric and Gas Company (PSE&G) on a GLP (General Lighting and Power Service) rate. This utility tariff is for delivery service for general purposes at secondary distribution voltages. The Delivery Schedule has the following charges: Societal Benefits Charge, Non-utility Generation Charge, Securitization Charge, System Control Charge, Customer Account Services Charge, Standby Fee, Base Rate Distribution Adjustment Charge, Solar Pilot Recovery Charge and RGGI Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS).

Natural Gas:
This facility receives natural gas service through Public Service Electric and Gas Company (PSE&G) on a LVG (Large Volume Service) rate when not receiving commodity by a Third Party Supplier. This tariff is for firm delivery service for general purposes. Customers may either purchase gas supply from a Third Party Supplier (TPS) or from Public Service Electric & Gas's Basic Gas Supply Service default service as detailed in the rate schedule.
This rate schedules have 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). It is pertinent to 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.

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.

From review of the information provided, it appears that Hoboken can improve its average natural gas costs by between 20-25%.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within City of Hoboken. CEG's primary observation is seen in the electric costs. The average price per kWh (kilowatt hour) for all buildings based on 1-year historical costs is $.15/kWh (kWh is the common unit of electric measure). The average price per decatherm for natural gas is $ 13.71dth (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. Hoboken could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on annual historical consumption (January through December 2007) and current electric rates, an annual savings of over $100,000 per year (Note: Savings were calculated using Hoboken's Average Annual Consumption of kWh and a variance to a fixed 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 Hoboken's natural gas costs. Based on the current market, Hoboken could improve its natural gas costs by approximately 25% annually. CEG recommends further advisement on these prices. The City should also consider procuring energy (natural gas) through alternative supply sources. CEG recommends energy advisory services.

CEG also recommends that the city schedule a meeting with their 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 city will learn more about the competitive supply process. Hoboken can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, they should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if Hoboken frequently changes or plans on changing its supplier for energy (natural gas), it needs to closely monitor balancing, particularly when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the 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.

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

C. Maintain all weather stripping on windows and doors.

D. Use cog-belts instead of v-belts on all belt-driven fans, etc. These can reduce electrical consumption of the motor by 2-5%.

E. Reduce lighting in specified areas where the foot candle levels are above 70 in private offices and above 30 in corridor, lobbies, etc.

F. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ.

G. Recalibrate existing sensors serving the office spaces

H. Install a Vending Miser system to turn off the vending machines in the lunch room when not in use.

I. Clean all light fixtures to maximize light output.

J. Confirm that outside air economizers on the rooftop units are functioning properly to take advantage of free cooling.

Electric Cost Summary
PSE&G

Project #9C08143
Police Headquarters 120 Hudson St. Hoboken, NJ **2007**
Account # 21 324 008 13
Meter # 678002338

Month	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	**Total**	
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	0	
KWH	17,490	3,990	45,870	18,420	23,820	28,740	24,150	46,800	27,810	35,370	39,870	28,680	341,010	
KW	105	36	110	37	79	108	108	112	105	106	105	105	112	Max
Monthly Load Factor	22%	16%	56%	69%	40%	37%	30%	56%	37%	45%	53%	37%	42%	
Electric Delivery, $	$ 805	$ 234	$ 1,456	$ 564	$ 851	$ 2,029	$ 1,898	$ 2,588	$ 1,969	$ 1,223	$ 1,335	$ 1,070	$16,021	
Delivery $/kwh	$0.046	$0.059	$0.032	$0.031	$0.036	$0.071	$0.079	$0.055	$0.071	$0.035	$0.033	$0.037	$0.047	
Electric Supply, $	$ 1,467	$ 479	$ 3,683	$ 1,578	$ 1,994	$ 2,936	$ 2,995	$ 5,262	$ 3,399	$ 3,679	$ 3,557	$ 2,512	$33,539	
Supply $/kwh	$0.084	$0.120	$0.080	$0.086	$0.084	$0.102	$0.124	$0.112	$0.122	$0.104	$0.089	$0.088	$0.098	
Total Cost, $	$2,271	$714	$5,138	$2,142	$2,845	$4,965	$4,892	$7,849	$5,368	$4,902	$4,892	$3,581	$49,560	
$/KWH	$0.130	$0.179	$0.112	$0.116	$0.119	$0.173	$0.203	$0.168	$0.193	$0.139	$0.123	$0.125	**$0.145**	

.=Utility information estimated. Utility bill not provided by owner.

Summary of Natural Gas Cost
PSE&G
Project #9C08143

Police Headquarters 120 Hudson St. Hoboken, NJ **2007**
Account # 21 319 008 13
Meter # 3163918

Month	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07	Dec-07	**Total**
Billing Days	31	28	31	30	31	30	31	31	30	31	30	31	
Therms (Burner Tip)	1558.6	2414.1	1115.5	1055.8	546.2	45.0	31.5	543.6	34.7	470.7	873.1	1215.8	9904.6
Total Distribution Cost	$628	$797	$412	$210	$154	97.1	$96	$153	$96	$605	$347	$487	4,082
Cost per Therm	$0.403	$0.330	$0.369	$0.199	$0.282	$2.160	$3.036	$0.282	$2.768	$1.286	$0.397	$0.401	$0.412
Total Commodity Cost	$1,551	$2,203	$1,126	$1,093	$557	46.0	$31	$490	$29	$439	$817	$1,184	9,566
Cost per Therm	$1.00	$0.91	$1.01	$1.04	$1.02	$1.02	$0.98	$0.90	$0.82	$0.93	$0.94	$0.97	$0.97
Total Cost	$2,179	$3,000	$1,538	$1,303	$711	$143	$127	$644	$125	$1,044	$1,164	$1,671	$13,649
Cost per Therm	$1.398	$1.243	$1.379	$1.234	$1.301	$3.183	$4.019	$1.184	$3.592	$2.218	$1.333	$1.375	**$1.378**

.=Utility information estimated. Utility bill not provided by owner.

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

Hoboken Police Station

ECM 1 Interior Lighting Upgrade

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Retrofit	LS	$1,504	$0	$0	$1,504
Total Cost			$0	$0	$1,504
Utility Incentive - NJ Smart Start (1-2 lamp fixture $25, 3-4 lamp fixture $30)					($175)
Total Cost Less Incentive					$1,329

ECM 2 Compact Flourescent Lighting

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Retrofit	LS	$30	$0	$0	$30
Total Cost			$0	$0	$30
Utility Incentive - NJ Smart Start (1-2 lamp fixture $25, 3-4 lamp fixture $30)					$0
Total Cost Less Incentive					$30

ECM 3 Exit Sign Replacement

	Qty	Unit Cost $	Material $	Labor $	Total $
Exit Sign - LED	7	$56			$392
Total Cost			$0	$0	$392
Utility Incentive - NJ Smart Start ($10/new LED exit Sign)					($70)
Total Cost Less Incentive					$322

ECM 4 Interior Lighting Controls

	Qty	Unit Cost $	Material $	Labor $	Total $
Dual - Technology Sensor	43	$75	$1,290	$1,935	$3,225
Total Cost			$1,290	$1,935	$3,225
Utility Incentive - NJ Smart Start ($20 per Sensor)					($860)
Total Cost Less Incentive					$2,365

ECM 5 High-Efficiency Condensing Units

	Qty	Unit Cost $	Material $	Labor $	Total $
40 Ton Split System	2	$87,000	$0	$0	$174,000
Total Cost			$0	$0	$174,000
Smart Start® Incentive ($40/Ton)	80				($3,200)
Smart Start® Incentive Dual Enthalpy Economizer	2.00				($500)
Utility Incentive - N/A					$0
Total Cost Less Incentive					$170,300

ECM 6 High Efficiency Split System AC Upgrade

	Qty	Unit Cost $	Material $	Labor $	Total $
New 3/4-Ton Split System AC System	1	$3,390	$0	$0	$3,390
New 1.5-Ton Split System AC System	1	$4,665	$0	$0	$4,665
New 3-Ton Split System AC System	1	$8,490	$0	$0	$8,490
Total Cost			$0	$0	$16,545
Smart Start® Incentive ($92/Ton)	5.25				($483)
Total Cost Less Incentive					$16,062

ECM 7 Boiler Replacement - High Efficiency

	Qty	Unit Cost $	Material $	Labor $	Total $
Lochinvar SYNC SBN 1000	1	$53,500	$0	$0	$53,500
Total Cost			$0	$0	$53,500
Smart Start® Incentive ($1.00/MBH)	1000				($1,000)
Utility Incentive - N/A					$0
Total Cost Less Incentive					$52,500

ECM 8 Domestic Water Heater Replacement

	Qty	Unit Cost $	Material $	Labor $	Total $
A.O. Smith Cyclone BTH-199NG	1	$6,825	$0	$0	$6,825
Total Cost			$0	$0	$6,825
Smart Start® Incentive ($2.00/MBH)	200				($400)
Utility Incentive - N/A					$0
Total Cost Less Incentive					$6,425

Concord Engineering Group, Inc.
520 BURNT MILL ROAD
VOORHEES, NEW JERSEY 08043
PHONE: (856) 427-0200
FAX: (856) 427-6508

SmartStart Building Incentives

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

Electric Chillers

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

Gas Cooling

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

Desiccant Systems

	\$1.00 per cfm – gas or electric

Electric Unitary HVAC

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

Ground Source Heat Pumps

Closed Loop & Open Loop	\$370 per ton

Gas Heating

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

Variable Frequency Drives

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

Natural Gas Water Heating

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

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

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

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

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

Other Equipment Incentives

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

STATEMENT OF ENERGY PERFORMANCE
Police Headquarters

Building ID: 1774157
For 12-month Period Ending: December 31, 2007[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: July 15, 2009

Facility
Police Headquarters
106-24 Hudson St.
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
James Ronga
94 Washington Street
Hoboken, NJ 07030

Year Built: 1968
Gross Floor Area (ft²): 23,242

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

Site Energy Use Summary[3]	
Electricity (kBtu)	1,163,526
Natural Gas (kBtu)[4]	990,460
Total Energy (kBtu)	2,153,986
Energy Intensity[5]	
Site (kBtu/ft²/yr)	93
Source (kBtu/ft²/yr)	212
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	230
Electric Distribution Utility	
PSE&G - Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	35%
Building Type	Fire Station/Police Station

Stamp of Certifying Professional

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

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

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

Certifying Professional
Raymond Johnson
520 S. Burnt Mill Rd
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	Police Headquarters	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Fire Station/Police Station	Is this an accurate description of the space in question?		☐
Location	106-24 Hudson St., Hoboken, NJ 07030	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		☐

Police HQ (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	23,242 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Number of PCs	41 (Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	168 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	177 (Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		☐

ENERGY STAR® Data Checklist
for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity		
Meter: Police HQ Electric (kWh) **Space(s):** Police HQ		
Start Date	**End Date**	**Energy Use (kWh)**
12/01/2007	12/31/2007	28,680.00
11/01/2007	11/30/2007	39,870.00
10/01/2007	10/31/2007	35,370.00
09/01/2007	09/30/2007	27,810.00
08/01/2007	08/31/2007	46,800.00
07/01/2007	07/31/2007	24,150.00
06/01/2007	06/30/2007	28,740.00
05/01/2007	05/31/2007	23,820.00
04/01/2007	04/30/2007	18,420.00
03/01/2007	03/31/2007	45,870.00
02/01/2007	02/28/2007	3,990.00
01/01/2007	01/31/2007	17,490.00
Police HQ Electric Consumption (kWh)		**341,010.00**
Police HQ Electric Consumption (kBtu)		**1,163,526.12**
Total Electricity Consumption (kBtu)		**1,163,526.12**
Is this the total Electricity consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: Police HQ Gas (therms) **Space(s):** Police HQ		
Start Date	**End Date**	**Energy Use (therms)**
12/01/2007	12/31/2007	1,215.80
11/01/2007	11/30/2007	873.10
10/01/2007	10/31/2007	470.70
09/01/2007	09/30/2007	34.70
08/01/2007	08/31/2007	543.60
07/01/2007	07/31/2007	31.50
06/01/2007	06/30/2007	45.00
05/01/2007	05/31/2007	546.20
04/01/2007	04/30/2007	1,055.80

03/01/2007	03/31/2007	1,115.50
02/01/2007	02/28/2007	2,414.10
01/01/2007	01/31/2007	1,558.60
Police HQ Gas Consumption (therms)		**9,904.60**
Police HQ Gas Consumption (kBtu)		**990,460.00**
Total Natural Gas Consumption (kBtu)		**990,460.00**
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.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility	**Facility Owner**	**Primary Contact for this Facility**
Police Headquarters 106-24 Hudson St. Hoboken, NJ 07030	City of Hoboken 94 Washington Street Hoboken, NJ 07030	James Ronga 94 Washington Street Hoboken, NJ 07030

General Information

Police Headquarters	
Gross Floor Area Excluding Parking: (ft^2)	23,242
Year Built	1968
For 12-month Evaluation Period Ending Date:	December 31, 2007

Facility Space Use Summary

Police HQ	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft^2)	23,242
Number of PCs°	41
Weekly operating hours°	168
Workers on Main Shift°	177

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2007)	**Baseline** (Ending Date 12/31/2007)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	93	93	0	N/A	78
Source (kBtu/ft²)	212	212	0	N/A	157
Energy Cost					
$/year	$ 63,208.00	$ 63,208.00	N/A	N/A	$ 53,196.20
$/ft²/year	$ 2.72	$ 2.72	N/A	N/A	$ 2.29
Greenhouse Gas Emissions					
$MtCO_2e$/year	230	230	0	N/A	194
$kgCO_2e/ft^2$/year	10	10	0	N/A	8

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

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

"Hoboken Police HQ"

Boiler

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
BOILER ROOM	BUILDING	H.B. Smith	1	19 SERIES-11 CRN# C3059 6	T-91 262	917	687.8	75	NATURAL GAS	17	35	18	Corrosion at Burner conn. Plate and at gas pipe at selonoid valve

Boiler - Burner

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Vintage	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
BOILER ROOM	BUILDING	Power Flame	1	JR50A-15	99202256	917	Sep-92	75	NATURAL GAS	17	21	4	Corrosion at Burner conn. Plate and at gas pipe at selonoid valve

Boiler - Pumps

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Volts	Phase	Approx. Age	ASHRAE Service Life	Notes
BOILER ROOM	HVAC-1 1ST FLOOR	ITT Bell & Gossett	1	FQD56A17D11002BP		1/4							10	
BOILER ROOM	HVAC-2 2ND FLOOR	ITT Bell & Gossett	1	FQD56A17D11002BP		1/4							10	
BOILER ROOM	1ST FLOOR RADIATION	ITT Bell & Gossett	1	FQD56A17D11002BP		1/4							10	
BOILER ROOM	2ND FLOOR RADIATION	ITT Bell & Gossett	1	FQD56A17D11002BP		1/4							10	

Domestic Hot Water Heater

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery (gal/h)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	Service Life	Remaining Life	Notes
BOILER ROOM	BUILDING	State	1	SBF8 0199NE	-	199,990	184	80	80	NATURAL GAS	10+	10	0	Model discontinued in late 90s

Air Handling Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (EER)	Cooling Capacity	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	GPM	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Roof		Trane	1	Climate Changer type L2-2S	K1B196351	DX, R22		490 TC / 325.5 SC	HOT WATER	-	427		43	208	3		38	15	(-23)	7 ZONES
Roof		Trane	1	Climate Changer type L2-2S	K1B196352	DX, R22		454 TC / 315 SC	HOT WATER	-	305		30	208	3		38	15	(-23)	6 ZONES

AC Condensers

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Roof		TRANE	1	RA 400 3A	621-634C 1B-122 74	27.1 TON		R-22	208-230	3	38	20	(-18)	
Roof		TRANE	1	RA 400 3A	621-634C 1B-122 78	26.2 TON		R-22	208-230	3	38	20	(-18)	

Split Systems and AC Condensers

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity	Eff.	Refrigerant	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
IN SERVICE TRAINING RM	IN SERVICE TRAINING RM	Sanyo	1	KMS 0712	-		10 SEER	R-22	-				15		
on grade at Bldg. rear	IN SERVICE TRAINING RM	Sanyo	1	*CO951*	-	9,500	10 SEER	R-22	115	1			15		
HOLDING CELL	HOLDING CELL	Sanyo	1	KMS 1812	-		10 SEER	R-22	-				15		
on grade at Bldg. rear	HOLDING CELL	Sanyo	1	CL1852	32451	17,000		R-22	208-230	1			15		
CHIEF'S OFFICE ?	CHIEF'S OFFICE ?	Mitsubishi	1	PKA-36FA	-			R-410A	-				15		
on grade at Bldg. rear	CHIEF'S OFFICE ?	Mitsubishi	1	PUY-A36 NHA	-	34,200	13.1 SEER	R-410A	208/230	1			15		

PTAC - Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity - DX	Heating Capacity - HW	Fan HP	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
HOLDING CELL	HOLDING CELL	GENERAL ELECTRIC	2	ZONELINE 3100	-	DX						41	15	(-26)	

INVESTMENT GRADE LIGHTNG AUDIT

CONCORD ENGINEERING GROUP

"Hoboken Police Head Quarters"

CEG Job #: 9C08143
Project: Hoboken Energy Audit
Address: 1st and Hudson Street
Hoboken, NJ 07030
Building SF: 23242

DATE: 06/17/2009
KWH COST: $0.145

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	CEG Type	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
1	A	Boiler Room	2	1 Lamp 8' T-12 No Lens	2080	125	0.25	520	$75.40	2	1'X4' 2-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Lithonia M/N 3889631	49	0.10	203.84	$29.56	$72.00	$144.00	0.15	316.16	$45.84	3.14
2	B		1	2 Lamp 4' T-8, No Lens, 32 watt, Electronic Ballast	2080	58	0.06	120.64	$17.49		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
3	B	Basement Hall	1	2 Lamp 4' T-8, No Lens, 32 watt, Electronic Ballast	8760	58	0.06	508.08	$73.67		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
4	D		2	1 Lamp 4' T-8, No Lens, Electronic Ballast	8760	28	0.06	490.56	$71.13		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
5	A	Weight Room	4	1 Lamp 8' T-12 No Lens	2080	125	0.50	1040	$150.80	4	1'X4' 2-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Lithonia M/N 3889631	49	0.20	407.68	$59.11	$320.00	$1,280.00	0.30	632.32	$91.69	13.96
6	A	Server Room	1	1 Lamp 8' T-12 No Lens	2080	125	0.13	260	$37.70	1	1'X4' 2-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Lithonia M/N 3889631	49	0.05	101.92	$14.78	$80.00	$80.00	0.08	158.08	$22.92	3.49
7	E	Inspectoral Services	6	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.35	723.84	$104.96		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
8	E	1st Floor Hall	6	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	8760	58	0.35	3048.48	$442.03		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
9	E	1st B-Room	2	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.12	241.28	$34.99		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
10	E	Office	8	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.46	965.12	$139.94		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
11	E	Office	3	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	5	0.02	31.2	$4.52		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
12	E	Office	4	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.23	482.56	$69.97		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
13	E	Office Hall	3	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	8760	58	0.17	1524.24	$221.01		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
14	E	2nd Floor Office Hall	3	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	8760	58	0.17	1524.24	$221.01		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
15	E	Office Fl. 2	8	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.46	965.12	$139.94		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
16	E	Office Fl. 2	3	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.17	361.92	$52.48		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
17	E	Office Fl. 2	4	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.23	482.56	$69.97		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
18	E	Lobby	16	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	8760	58	0.93	8129.28	$1,178.75		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00

19		Vestibule	4	60 W Incandescent	8760	60	0.24	2102.4	$304.85	4	COMPACT FLUORESCENT	18	0.07	630.72	$91.45	$4.96	$19.84	0.17	1471.68	$213.39	0.09
20	E	Office	4	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.23	482.56	$69.97		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
21	E	Process Room	4	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	8760	58	0.23	2032.32	$294.69		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
22	D	Process Room Hall	3	1 Lamp 4' T-8, No Lens, Electronic Ballast	8760	28	0.08	735.84	$106.70		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
23	D	Holding Cell	2	1 Lamp 4' T-8, No Lens, Electronic Ballast	8760	28	0.06	490.56	$71.13		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
24	F	Bureau of I.D.	20	2' x 2' 3 Lamp T-8, Prism Lens, Electronic Ballast	8760	47	0.94	8234.4	$1,193.99		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
25	F	Storage	1	2' x 2' 3 Lamp T-8, Prism Lens, Electronic Ballast	2080	47	0.05	97.76	$14.18		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
26	E		3	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	28	0.08	174.72	$25.33		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
27	G	Office 1	1	2' x 4' 4 Lamp T-8, Prism Lens, Electronic Ballast	2080	109	0.11	226.72	$32.87		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
28	F	Office 2	2	2' x 2' 3 Lamp T-8, Prism Lens, Electronic Ballast	2080	47	0.09	195.52	$28.35		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
29		Kitchen	2	60 W Incandescent	2080	60	0.12	249.6	$36.19	2	COMPACT FLUORESCENT	18	0.04	74.88	$10.86	$4.96	$9.92	0.08	174.72	$25.33	0.39
30	E	Front Desk	4	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	8760	58	0.23	2032.32	$294.69		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
31	F	Dispatch	5	2' x 2' 3 Lamp T-8, Prism Lens, Electronic Ballast	8760	47	0.24	2058.6	$298.50		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
32	F	Room adjacent to vestibule	1	2' x 2' 3 Lamp T-8, Prism Lens, Electronic Ballast	2080	47	0.05	97.76	$14.18		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
33	E	2nd Floor Lobby	11	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	8760	58	0.64	5588.88	$810.39		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
34	G		1	2' x 4' 4 Lamp T-8, Prism Lens, Electronic Ballast	8760	109	0.11	954.84	$138.45		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
35	E	Men's Locker Room	17	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.99	2050.88	$297.38		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
36	E	Restroom	2	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.12	241.28	$34.99		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
37	F		1	2' x 2' 3 Lamp T-8, Prism Lens, Electronic Ballast	2080	47	0.05	97.76	$14.18		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
38	E	Women's Locker Room	1	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.06	120.64	$17.49		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
39	F		2	2' x 2' 3 Lamp T-8, Prism Lens, Electronic Ballast	2080	47	0.09	195.52	$28.35		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
40	E	Office	5	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.29	603.2	$87.46		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
41	G	Classroom	8	2' x 4' 4 Lamp T-8, Prism Lens, Electronic Ballast	2080	109	0.87	1813.76	$263.00		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00

42	H	2nd Floor Hall	12	2' x 2' 2 Lamp T-8 U-Tube, Check Lens	8760	73	0.88	7673.76	$1,112.70		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
43	E	Supply	1	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.06	120.64	$17.49		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
44	H	Office Hall	4	2' x 2' 2 Lamp T-8 U-Tube, Check Lens	8760	73	0.29	2557.92	$370.90		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
45	E	Office 1	2	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.12	241.28	$34.99		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
46	E	Office 2	2	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.12	241.28	$34.99		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
47	E	Office 3	2	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.12	241.28	$34.99		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
48	E	Office 4	2	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.12	241.28	$34.99		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
49	E	Office 5	4	2 Lamp 2' x 4' T-8, Checked Lens, Electronic Ballast	2080	58	0.23	482.56	$69.97		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
50	H		2	2' x 2' 2 Lamp T-8 U-Tube, Check Lens	2080	73	0.15	303.68	$44.03		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
51	I	Chief	8	2' x 2' 2 Lamp T-8 Check Lens	2080	73	0.58	1214.72	$176.13		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
52			8	Hi - Hats	2080	65	0.52	1081.6	$156.83		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
53	B	Men''s room	1	2 Lamp 4' T-8, No Lens, 32 watt, Electronic Ballast	2080	58	0.06	120.64	$17.49		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
54	I		1	2' x 2' 2 Lamp T-8 Check Lens	2080	73	0.07	151.84	$22.02		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
55	B	Women's Room	1	2 Lamp 4' T-8, No Lens, 32 watt, Electronic Ballast	2080	58	0.06	120.64	$17.49		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
56	I		1	2' x 2' 2 Lamp T-8 Check Lens	2080	73	0.07	151.84	$22.02		No change recommended.		0.00	0	$0.00		$0.00	0.00	0	$0.00	0.00
57		**Totals**	232				14.11	67,241.92	$9,750.08	13			0.45	1,419.04	$205.76		$1,533.76	0.784	2752.96	$399.18	3.84

Project Name: LGEA Solar PV Project - Hoboken Police Station
Location: Hoboken, NJ
Description: Photovoltaic System 95% Financing - 20 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 20 year
Total Construction Cost	$103,500
Annual kWh Production	17,946
Annual Energy Cost Reduction	$2,602
Annual SREC Revenue	$6,281
First Cost Premium	**$103,500**
Simple Payback:	**11.65** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	240	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.145**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$5,175	0	0	0	$0	0	0	(5,175)	0
1	$0	17,946	$2,602	$0	$6,281	$6,809	$2,339	($264)	($5,439)
2	$0	17,857	$2,680	$0	$6,250	$6,640	$2,508	($218)	($5,657)
3	$0	17,767	$2,761	$0	$6,219	$6,458	$2,690	($169)	($5,826)
4	$0	17,678	$2,844	$0	$6,187	$6,264	$2,884	($117)	($5,942)
5	$0	17,590	$2,929	$181	$6,157	$6,055	$3,092	($244)	($6,186)
6	$0	17,502	$3,017	$180	$6,126	$5,832	$3,316	($186)	($6,372)
7	$0	17,415	$3,107	$179	$6,095	$5,592	$3,556	($125)	($6,496)
8	$0	17,328	$3,200	$178	$6,065	$5,335	$3,813	($61)	($6,558)
9	$0	17,241	$3,296	$178	$6,034	$5,059	$4,088	$5	($6,552)
10	$0	17,155	$3,395	$177	$6,004	$4,764	$4,384	$75	($6,477)
11	$0	17,069	$3,497	$176	$5,974	$4,447	$4,701	$148	($6,330)
12	$0	16,984	$3,602	$175	$5,944	$4,107	$5,041	$224	($6,106)
13	$0	16,899	$3,710	$174	$5,915	$3,743	$5,405	$303	($5,803)
14	$0	16,814	$3,821	$173	$5,885	$3,352	$5,796	$385	($5,418)
15	$0	16,730	$3,936	$172	$5,856	$2,933	$6,215	$472	($4,946)
16	$0	16,646	$4,054	$171	$5,826	$2,484	$6,664	$561	($4,385)
17	$0	16,563	$4,176	$171	$5,797	$2,002	$7,146	$655	($3,730)
18	$0	16,480	$4,301	$170	$5,768	$1,485	$7,662	$752	($2,979)
19	$0	16,398	$4,430	$169	$5,739	$932	$8,216	$853	($2,126)
20	$0	16,316	$4,563	$168	$5,711	$338	$8,810	$958	($1,168)
21	$0	16,234	$4,700	$167	$5,682	$286	$8,099	$1,829	$661
22	$0	16,153	$4,841	$166	$5,654	$196	$6,665	$3,467	$4,128
23	$0	16,072	$4,986	$166	$5,625	$0	$0	$10,446	$14,574
24	$0	15,992	$5,136	$165	$5,597	$0	$0	$10,568	$25,142
25	$0	15,912	$5,290	$164	$5,569	$0	$0	$10,695	$35,838
	Totals:	342,377	$69,922	$2,793	$119,832	$84,630	$98,325	$113,089	($24,152)

Net Present Value (NPV)	**$2,637**
Internal Rate of Return (IRR)	**9.0%**

Project Name: LGEA Solar PV Project - Hoboken Police Station
Location: Hoboken, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

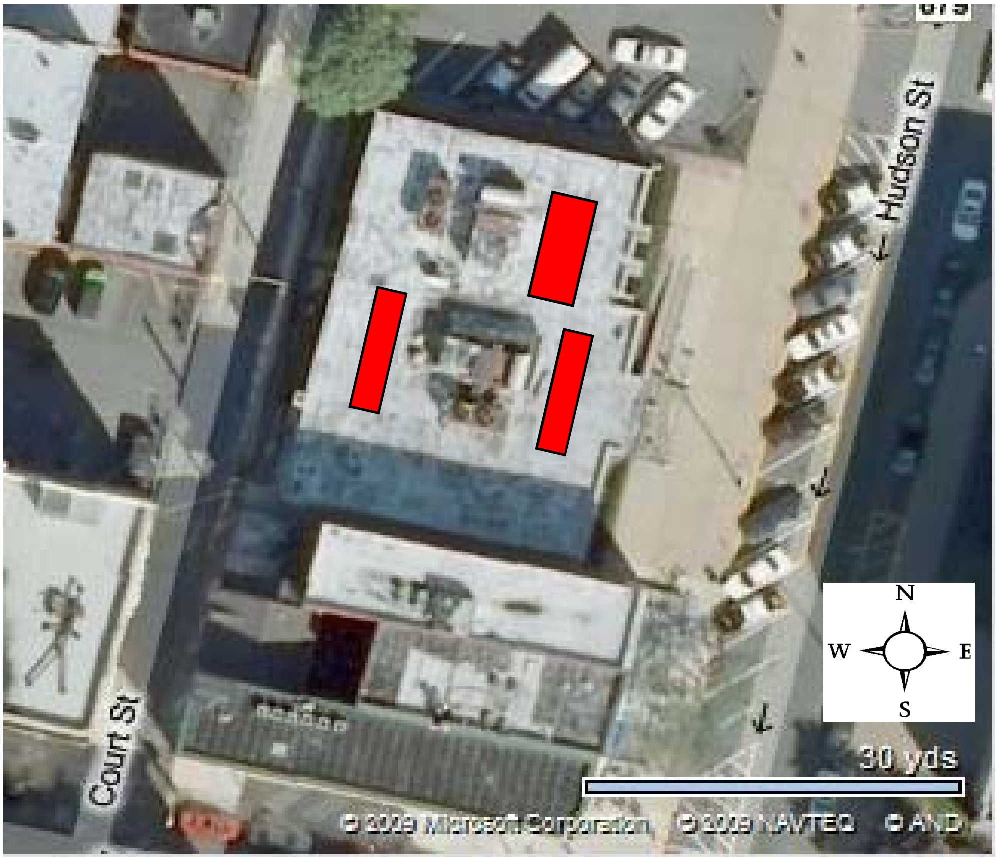
	Photovoltaic System - Direct Purchase
Total Construction Cost	$103,500
Annual kWh Production	17,946
Annual Energy Cost Reduction	$2,602
Annual SREC Revenue	$6,281
First Cost Premium	**$103,500**
Simple Payback:	**11.65** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.145**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$103,500	0	0	0	$0	(103,500)	0
1	$0	17,946	$2,602	$0	$6,281	$8,883	($94,617)
2	$0	17,857	$2,680	$0	$6,250	$8,930	($85,687)
3	$0	17,767	$2,761	$0	$6,219	$8,979	($76,707)
4	$0	17,678	$2,844	$0	$6,187	$9,031	($67,676)
5	$0	17,590	$2,929	$181	$6,157	$8,904	($58,772)
6	$0	17,502	$3,017	$180	$6,126	$8,962	($49,810)
7	$0	17,415	$3,107	$179	$6,095	$9,023	($40,787)
8	$0	17,328	$3,200	$178	$6,065	$9,087	($31,701)
9	$0	17,241	$3,296	$178	$6,034	$9,153	($22,547)
10	$0	17,155	$3,395	$177	$6,004	$9,223	($13,325)
11	$0	17,069	$3,497	$176	$5,974	$9,295	($4,029)
12	$0	16,984	$3,602	$175	$5,944	$9,371	$5,342
13	$0	16,899	$3,710	$174	$5,915	$9,451	$14,793
14	$0	16,814	$3,821	$173	$5,885	$9,533	$24,326
15	$0	16,730	$3,936	$172	$5,856	$9,619	$33,945
16	$0	16,646	$4,054	$171	$5,826	$9,709	$43,654
17	$0	16,563	$4,176	$171	$5,797	$9,802	$53,456
18	$0	16,480	$4,301	$170	$5,768	$9,899	$63,356
19	$0	16,398	$4,430	$169	$5,739	$10,000	$73,356
20	$0	16,316	$4,563	$168	$5,711	$10,106	$83,462
21	$1	16,234	$4,700	$167	$5,682	$10,215	$93,677
22	$2	16,153	$4,841	$166	$5,654	$10,328	$104,005
23	$3	16,072	$4,986	$166	$5,625	$10,446	$114,451
24	$4	15,992	$5,136	$165	$5,597	$10,568	$125,019
25	$5	15,912	$5,290	$164	$5,569	$10,695	$135,714
	Totals:	342,377	$69,922	$2,793	$119,832	$239,214	$186,962
				Net Present Value (NPV)		**$135,739**	
				Internal Rate of Return (IRR)		**7.5%**	

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
Police Station	732	Sunpower SPR230	50	14.7	735	11.50	17,946	1,650	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.

ENERGY AUDIT – DRAFT REPORT

HOBOKEN
Public Library

250 - 254 5th St.
Hoboken, NJ 07030
ATTN: Lina Podles

CEG PROPOSAL NO. 9C08143

CONCORD ENGINEERING GROUP

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I. EXECUTIVE SUMMARY

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

Hoboken
Public Library
250 - 254 5th St
Hoboken, NJ 07030

Facility Contact Person: Lina Podles

This audit was performed in connection with the New Jersey Clean Energy Local Government Energy Audit Program. These energy audits are conducted to promote the office of Clean Energy's mission, 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	$14,509
Natural Gas	$20,441
Total	$34,950

The potential annual energy cost savings are shown below in Table 1. Be aware that the measures are not additive because of the interrelation of several of the measures. The cost of each measure for this level of auditing is ± 20% until detailed engineering, specifications, and hard proposals are obtained.

Table 1
Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE RETURN ON INVESTMENT
1	Interior Lighting Upgrades	$12,714	$3,026	4.51	22%
2	Install Compact Fluorescent Lamps	$210	$945	.22	454.5%
3	Interior Lighting Controls	$275	$69	4	25%
4	High-Efficiency Air conditioning Units (Indoor Packaged system)	$14,100	$1,113	12.7	7.87%
5	High-Efficiency Rooftop Units	$7,050	$783	9	11.1%
6	Domestic Water Heater Replacement	$3,936	$124	32	3.1%
7	Boiler Replacement – High Efficiency	$43,648	$3,636	12	8.33%

The estimated demand and energy savings are 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		
		ELECT DEMAND (KW)	ELECT CONSUMPTION (KWH)	NATURAL GAS (MBH)
1	Interior Lighting Upgrades	6.29	18,971	-
2	Install Compact Fluorescent Lamps	1.96	5,908	-
3	Interior Lighting Controls	-	446	-
4	High-Efficiency Air conditioning Units (Indoor Packaged system)	-	3,614	-
5	High-Efficiency Rooftop Units	-	5,087	-
6	Domestic Water Heater Replacement	-	-	90.5
7	Boiler Replacement – High Efficiency	-	-	2,674

Recommendation:

Concord Engineering Group strongly recommends the implementation of all ECM's that provide a calculated simple payback at or under seven (7) years. The potential energy and cost savings from these ECM's are too great to pass upon. The following Energy Conservation Measures are recommended for the Hoboken, Public Library:

- **ECM #1:** Interior Lighting Upgrades
- **ECM #2:** Install Compact Fluorescent Lamps
- **ECM #3:** Interior Lighting Controls

Concord Engineering Group recommends that consideration be given to the implementation of all ECM's where equipment is substantially past its useful life. Equipment that is substantially past its useful life typically is inefficient, has higher maintenance costs and is more susceptible to mechanical failure. This equipment does not meet the criteria of simple payback at or under seven years on energy savings alone. Additional consideration should be given to maintenance costs, reliability as well as the length of time the owner expects to own and maintain the building. Concord Engineering Group recommends the following ECM for implementation based on useful life expectancy:

- **ECM #4:** High-Efficiency Indoor Packaged Units
- **ECM #5:** High-Efficiency Air conditioning Units (Indoor Packaged system)
- **ECM#6:** Domestic Water Heater Replacement
- **ECM#7:** Boiler Replacement – High Efficiency

Concord Engineering Group has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. This solar energy system is viable for the Public Library building. CEG recommends the Owner review the implementation in addition to the funding options noted in Section X. The simple payback for either of the two funding options is 11.44 years.

II. INTRODUCTION

This comprehensive energy audit covers the 6,575 square foot Hoboken, Public Library facility that includes the office, boiler room, storage room, kitchen hall, elevator lobby, rest room and library areas, etc. The building was built in 1895.

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

Electric

Table 3 and Figure 1 represent the electrical usage for the surveyed facility from August-06 to July-07. The utility bill for May-07 and July-07 were not available and an average of the adjacent months was assumed for these cases. Public Service Electric and Gas Company (PSE&G) provides electricity to the facility under the General Lighting and Power Service (GLP) rate. This electric rate has a component for consumption that is measured in kilowatt-hours (kWh). It is calculated by multiplying the wattage of the equipment times the hours that it operates. For example, a 1,000 Watt lamp operating for 5 hours would measure 5,000 Watt-hours. Since one kilowatt is equal to 1,000 Watts, the measured consumption would be 5 kWh. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the most current rate structure available.

Natural Gas

Table 4 and Figure 2 show the natural gas energy usage for the surveyed facility from August-06 to July-07. The utility bill for May-07 and July-07 were not available and an average of the adjacent months was assumed for these cases. PSE&G provides the natural gas to the facility under their Large Volume Gas (LVG) rate.

Description	Average
Electricity	15.4¢ /kWh
Natural Gas	$1.36 /Therm

Table 3
Electricity Billing Data

MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-07	6,040	20.8	$789
Feb-07	6,440	18.4	$768
Mar-07	6,040	20.0	$731
Apr-07	6,160	37.0	$748
May-08	9,403	51.6	$1,457
Jun-07	12,040	49.0	$2,072
Jul-08	11,470	43.2	$2,039
Aug-06	10,160	37.2	$1,874
Sep-06	8,600	33.6	$1,619
Oct-06	6,720	26.4	$978
Nov-06	5,680	19.6	$739
Dec-06	5,520	20.8	$696
Totals	**94,273**	**MAX 51.6**	**$14,509**

Figure 1
Electricity Usage Profile

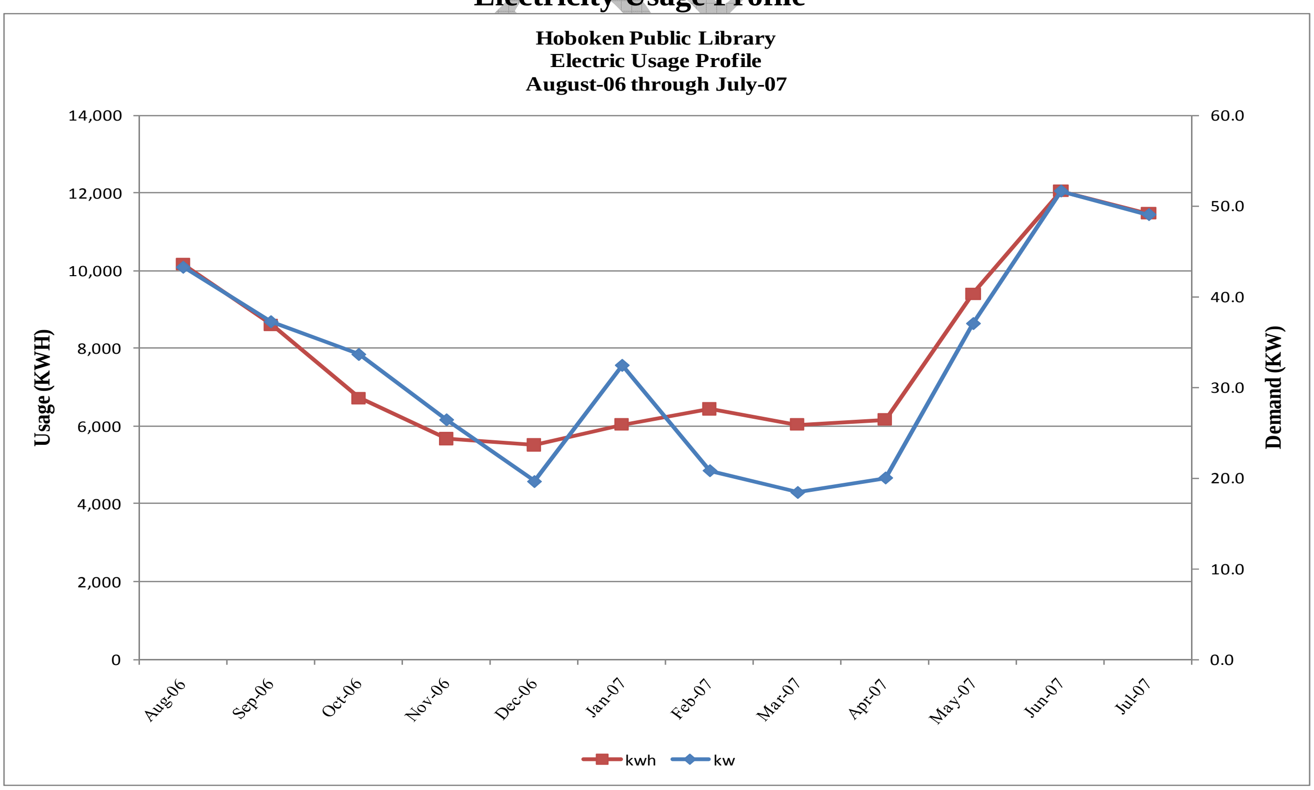
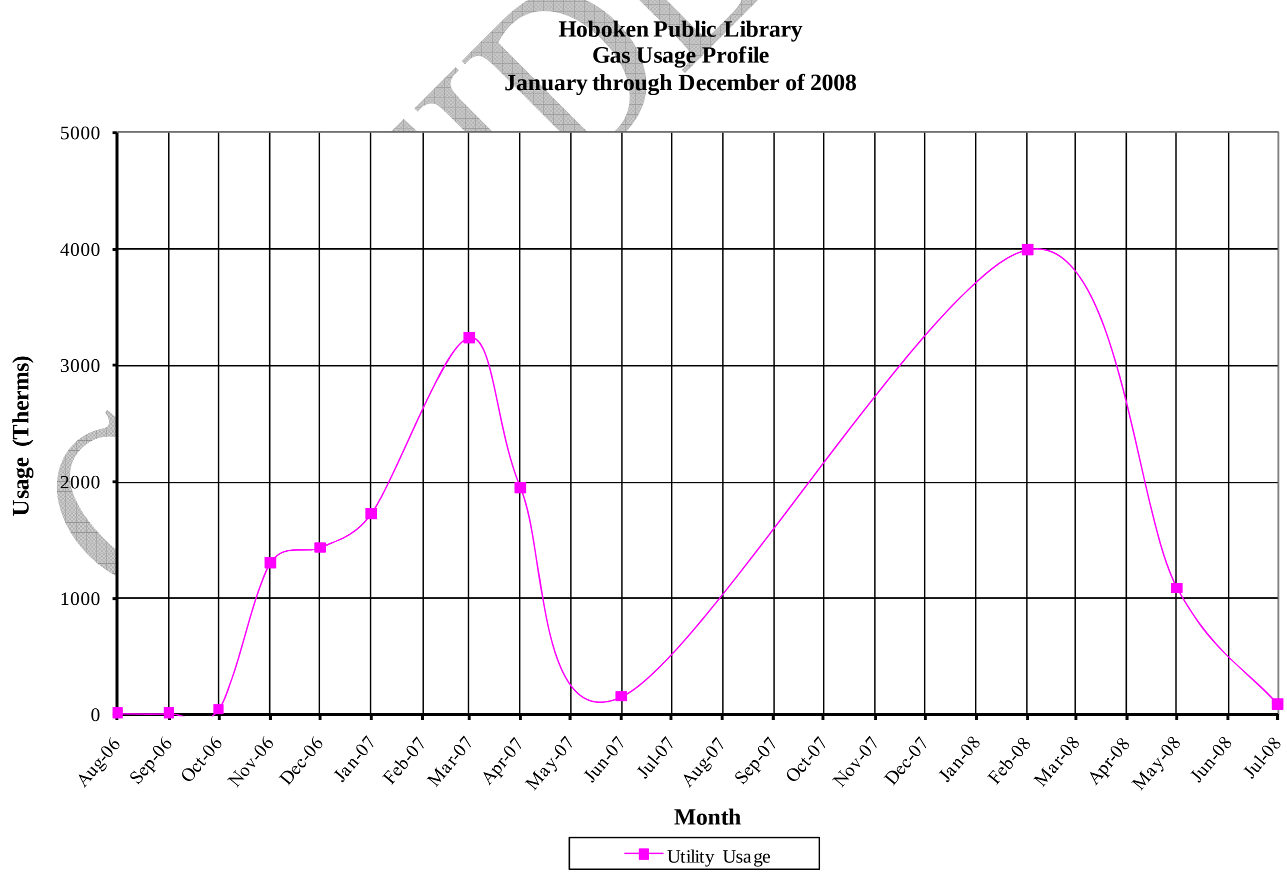


Table 4
Natural Gas Billing Data

MONTH OF USE	CONSUMPTION (THERMS)	TOTAL BILL
Jan-07	1,729.29	$2,618.84
Feb-08	3,994.14	$4,888.12
Mar-07	3,238.64	$4,418.32
Apr-07	1,952.60	$2,312.81
May-07	1,090.48	$1,334.85
Jun-07	158.01	$271.29
Jul-07	88.10	$189.74
Aug-06	12.62	$95.94
Sep-06	12.62	$96.91
Oct-06	49.32	$127.68
Nov-06	1,302.36	$1,746.58
Dec-06	1,436.35	$2,339.67
TOTALS	**15064.52**	**$20,440.75**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's energy utilization per square foot of building. This calculation is completed by converting all utility usage (gas, electric, oil) consumed by a building over a specified time period, typically 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 amongst building of similar type. The EUI for this facility is calculated as follows:

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

Electric = ((94,273 kWh) * (1000 W/kW) * (3.414 Btu/h / 1 W))/ (1000 Btu/h / 1 kBtu/h)
= 321,848 kBtu

Natural Gas = (15,064 Therms) * (100,000 Btu/Therm) / 1000 BTU / kBTU= 1,506,452 kBtu

$$Building\ \ EUI = \frac{(321{,}848\ \ kBtu + 1{,}506{,}452\ kBtu)}{6{,}575\ SF} = \frac{1{,}828{,}300\ kBtu}{6{,}575\ SF}$$

Public Library EUI = <u>278 kBtu/SF</u>

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 you to track and assess 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 more emphasis is being placed throughout multiple arenas on carbon reduction, greenhouse gas emissions and other environmental impacts.

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

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

Username: hobokencity

Password: lgeaceg2009

Security Question: What is your birth city?

Security answer: hoboken city

Specific building types are detailed on the ENERGY STAR website. Non-typical buildings are covered by an "Other" category. The Hoboken, Public Library falls under this "Other" category. The "Other" category is used if your building type or a section of the building is not represented by one of the specific categories. An Energy Performance Rating cannot be calculated if more than 10% of a building is classified as "Other." The majority of the Public Library would be classified as "Other" and therefore cannot be given an Energy Performance Rating. Despite this Portfolio Manager calculates the building EUI. The EUI is an important tool that can be sued to track the energy efficiency if the building. Baselines for improvement can be set that the municipality can strive to meet. CEG strongly urges Hoboken to keep their Portfolio Manager account up to monitor the performance of the building.

Refer to Appendix D for detailed energy benchmarking report entitled "STATEMENT OF ENERGY PERFORMANCE."

V. FACILITY DESCRIPTION

The Hoboken Public Library consists of the office, boiler room, storage room, kitchen hall, elevator lobby, rest room and library areas; totaling approximately 6,575 SF. The brick/block facility was built in 1895. The facility is occupied 58 hours a week.

<u>Heating System</u>

The Public Library building is mainly heated by a natural gas-fired H.B Smith 350 Mills boiler with a 2,400,000 BTUH maximum input. This is a steam boiler located in the basement with a rated efficiency of 75%. This boiler appears to be approximately thirty (30) plus years of age and is at the end of its useful service life. The steam that is produced via this boiler provides heating to many spaces within the library through cast-iron radiators.

A second boiler, also located in the basement, provides heating to other areas in the building not served by the steam boiler. The second boiler is manufactured by Peerless Boiler Co. and is a natural gas-fired heating hot water boiler with a 130,000 BTUH maximum input and an 82% rated efficiency. This boiler appears to be approximately fifteen (15) years of age and has an estimated nine (9) years of remaining service life. From discussions with the maintenance staff it was noted that both boilers are manually operated on and off. This method of control is not the most efficient and the review of control upgrades for the boilers are highly recommended.

<u>Domestic Hot Water</u>

Domestic hot water for the restrooms is provided by a State, natural gas fired domestic water heater, 50-gallon capacity rated at 40,000 Btuh input. The heater was manufactured in 2000 and has an estimated three (3) years remaining service life.

<u>Cooling System</u>

Cooling is provided by three (3) Carrier Room Top Horizontal indoor single packaged cooling units, utilizing R-22 refrigerant cooling with 2 units having electric heating coils. Two units are 5 Ton nominal and one is 7 Ton nominal. There are four (4) Trane, 1 Ton nominal Packaged Terminal air conditioners; one serving the Main Office, two serving the First Floor Stack area and one serving the First Floor Lobby.

<u>Lighting</u>

The Boiler room, Kitchen Hall, and Storage rooms are lit via 2-tube, 8 foot long fluorescent T12 lamps and magnetic ballasts. The Front Office and partial First and Second Floors are lit via 4-tube, 8 foot long fluorescent T12 lamps and magnetic ballasts. The Bathroom is lit via wall mounted 2 foot long fluorescent T12 lamps and magnetic ballast. The Third floor is lit by 2-foot by 4-foot lay-in fixtures containing T12 fluorescent lamps and magnetic ballasts. The elevator Lobby and some second floor fixtures are lit via 2-foot by 2-foot lay-in fixtures containing T8 fluorescent lamps and electronic ballasts. Part of the second floor is lit via 4-foot by 1-foot fluorescent T-8 lamps and electronic ballasts. Some of the Boiler room, Library and First floor areas are lit via incandescent lamps. Standard switching is utilized and there are no other types of lighting controls present. The exit signs throughout the facility contain incandescent lamps and consume an estimated 30 watts of electricity per exit sign.

VI. MAJOR EQUIPMENT LIST

Following the completion of the field survey a detailed equipment list was created. The equipment within this list is considered major energy consuming equipment whose replacement could yield substantial energy savings. In addition, 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 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.

Table 4 thru 6
Existing Equipment Listing

Cooling Equipment							
Description	**Qty**	**Cooling Capacity (Tons)**	**Cooling Capacity (BTUH)**	**Fuel Type**	**Approx. Age (yrs)**	**ASHRAE Service Life (yrs)**	**Remaining Life (yrs)**
CARRIER Model 50BH-008-520	1	7	81,900	ELECTRIC	20	15	(-5)
CARRIER Model 50AH060500	1	5	58,500	ELECTRIC	20	15	(-5)
CARRIER Model 50AH060500	1	5	58,500	ELECTRIC	20	15	(-5)
TRANE Model PTED1201WAA	1	1	11,700	ELECTRIC	20	15	(-5)
TRANE Model PTED1201JAA	1	1	11,700	ELECTRIC	20	15	(-5)
TRANE Model PTED1201JAA	1	1	11,700	ELECTRIC	20	15	(-5)
TRANE Model PTED1201JAA	1	1	11,700	ELECTRIC	20	15	(-5)

HEATING EQUIPMENT						
Description	**Qty**	**Rated Capacity(BTUH)**	**Fuel Type**	**Approx. Age (yrs)**	**ASHRAE Service Life (yrs)**	**Remaining Life (yrs)**
H.B.SMITH 350 MILLS	**1**	**1,394**	**NATURAL GAS**	**30 ***	**30**	**0**
PEERLESS MCB-130	**1**	**-**	**NATURAL GAS**	**10 ***	**24**	**14**
*** - Manufacture date estimated due to information is unavailable.**						

DOMESTIC WATER HEATING SYSTEM						
Description	**Qty**	**Capacity**	**Fuel Type**	**Approx. Age (yrs)**	**ASHRAE Service Life (yrs)**	**Remaining Life (yrs)**
State PR650NBRT Water Heater	**1**	**50 gallon**	**Natural Gas 40 MBH Input**	**9 ***	**12**	**3**
*** - Manufacture date estimated due to information is unavailable.**						

Note: Equipment noted as having a negative (#) remaining life is considered past its standard service life as described in 2007 ASHRAE Applications Handbook and is most likely a good candidate for replacement.

Refer to Appendix E for the Major Equipment List.

VII. ENERGY CONSERVATION MEASURES

ECM #1: Interior Lighting Upgrades

Description:

Replacing the 1 foot x 8 foot, two T12 lamp fluorescent fixtures with new is a simple change that can provide substantial savings. A typical 1 foot x 8 foot, two T12 lamp fluorescent fixture has a total wattage of about 222 Watts. By replacing with two (2) new 1 foot x 4 foot fixture that have T8 lamps, reflector and electronic ballasts the total wattage would be reduced to 48 Watts per fixture and the space light levels and light quality would increase by about 15% and 35%, respectively.

CEG recommends a 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 electronic ballasts. In addition to functional cost savings, the fixture replacement will also provide operational cost savings. The operational cost savings will be realized through the lesser number of lamps that will be required to be replaced per year. The expected lamp life of a T8 lamp, approximately 30,000 burn-hours, in comparison to the existing T12 lamps, approximately 20,000 burn-hours, will provide the Owner with fewer lamps to replace per year. Based on the operating hours of this facility, the owner will be changing approximately 33% less lamps per year.

This ECM shall replace all T12 fixtures throughout the facility with new T8 lay-in type fixtures where there are ceilings and pendant type where it is exposed to structure.

Energy Savings Calculations:

A detailed Investment Grade Lighting Audit can be found in Appendix F that outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start® Program Incentives are calculated as follows:

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

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

$$\text{Smart Start® } Incentive = (122 \times \ \$\,25) + (\ 17 \times \ \$\,30) = \$3{,}560$$

Maintenance Savings are calculated as follows:

$$Maintenance\ Savings = (\#\ of\ \ lamps \times \%\ reduction \times \$\ \ per\ lamp)$$

$$Maintenance\ Savings = \left(312 \times 33\%\ reduction \times \$\ 2.00\right) = \$206$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$16,480
NJ Smart Start Equipment Incentive ($):	($3,560)
Net Installation Cost ($):	*$12,714*
Maintenance Savings ($ / yr):	*$206*
Energy Savings ($ / yr):	*$2,820*
Net Savings ($ / yr):	*$3,026*
Simple Payback (yrs):	*4.51*
Simple Return On Investment (%):	*22%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$75,650*

ECM #2: Install Compact Fluorescent Lamps

Description:

Compact fluorescent lamps (CFL's) were created to be direct replacements for the standard incandescent lamps which are common to table lamps, spot lights, hi-hats, bathroom vanity lighting, etc. The light output of the CFL has been designed to resemble the incandescent lamp. The color rendering index (CRI) of the CFL is much higher than standard fluorescent lighting, and therefore provides a much "truer" light. The CFL is available in a myriad of shapes and sizes depending on the specific application. Typical replacements are: a 13-Watt CFL for a 40-Watt incandescent lamp, a 15-Watt CFL for a 60-Watt incandescent lamp, an 18-Watt CFL for a 75-Watt incandescent lamp, and a 23-Watt CFL for a 100-Watt incandescent lamp.

The CFL is also available for a number of "brightness colors" that is indicated by the Kelvin rating. A 2700K CFL is the "warmest" color available and is closest in color to the incandescent lamp. CFL's are also available in 3000K, 3500K, and 4100K. The 4100K would be the "brightest" or "coolest" output. A CFL can be chosen to screw right into your existing fixtures, or hardwired into your existing fixtures.

This ECM involves replacing all incandescent lamps in the facility with energy efficient compact fluorescent lamps.

Energy Savings Calculations:

There are twenty-four (24) 40-Watt, twenty-four (24) 60-Watt and three (3) 100-Watt incandescent lamps in the facility that can be upgraded to 13, 15 and 23 Watt CFL units respectively. The average operating hours for these lamps is estimated to be 3016.

<u>Energy cost savings</u>:

[24 units * (40W – 13W) + 24 units * (60W – 15W) + 3 units * (100W – 23W)] 3016 hours * 1 kW/1,000 W * $0.16/kWh] = <u>$945.00/yr</u>

The installed cost of twenty-four (24) 13-Watt, twenty-four (24) 15-Watt and three (3) 23-Watt CFL's is $210.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$210
NJ Smart Start Equipment Incentive ($):	-
Net Installation Cost ($):	$210
Maintenance Savings ($ / yr):	-
Energy Savings ($ / yr):	*$945*
Net Savings ($ / yr):	*$945*
Simple Payback (yrs):	*0.22*
Simple Return On Investment (%):	*454.5%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$23,625*

ECM #3: Interior Lighting Controls

Description:

In some areas the lighting is left on unnecessarily. Many times this is due to the idea that it is better to keep the lights on rather than to continuously switch them on and off. The on/off dilemma was studied and it was found that the best option is to turn the lights off whenever possible. Although this does reduce the lamp life, the energy savings far outweigh the lamp replacement costs. The cutoff for when to turn the lights off is around two minutes. If the lights can be off for only a two minute interval, then it pays to shut them off.

Lighting controls come in many forms. Sometimes an additional switch is all it would take. Occupancy sensors detect motion and will switch the lights on when the room is occupied. They can either be mounted in place of the current wall switch, or they can be mounted on the ceiling to cover large areas. Lastly, photocells are a lighting control that sense light levels and will turn the lights off when there is adequate daylight. These are mostly used outside, but they are becoming much more popular in energy-efficient office designs as well.

To determine an estimated savings for lighting controls, we used ASHRAE 90.1-2004 (NJ Energy Code). Appendix G of the referenced standard, states that occupancy sensors have a 10% power adjustment factor for daytime occupancies for buildings over 5,000 SF. CEG recommends the installation of dual technology occupancy sensors in all office, boiler room, storage room, kitchen hall and rest room areas, etc. in the Public Library facility (5 spaces approximately 1,000 square feet).

CEG would recommend wall switches for individual rooms, ceiling mount sensors for large office areas or restrooms, and fixture mount box sensors for some applications as manufactured by Sensorswitch, Watt Stopper, etc.

Energy Savings Calculations:

From Appendix F of this report, we calculated the lighting power density (Watts/ft^2) of the private offices, conference rooms, restrooms, storage rooms; file rooms, etc. the facility to be ±1.48 Watts/SF. Ten percent of this value is the resultant energy savings due to installation of occupancy sensors:

Savings = 10% x 1.48Watts/SF x 1,000 SF x 3,016 hrs/yr. = 446 kWh x $0.154/kWh

Savings = <u>$69</u> per year

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

The SmartStart Buildings® incentive is $20 per control which equates to an installed cost of $55/unit. Total number of spaces to be retrofitted is 5.
Total cost to install sensors is $55/unit x 5 units = <u>$275</u>

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$375
NJ Smart Start Equipment Incentive ($):	($100)
Net Installation Cost ($):	*$275*
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$69*
Net Savings ($ / yr):	*$69*
Simple Payback (yrs):	*4*
Simple Return On Investment (%):	*25%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Savings ($):	*$1,725*

ECM #4: High-Efficiency Air conditioning Units (Indoor Packaged system)

Description:

The direct expansion (DX) cooling with electric heating horizontal indoor packaged systems are excellent candidates for replacement. These units are 19 years old and have approximately one (1) year of service life remaining as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. Due to escalating owning and maintenance costs, these units should be replaced.

This measure would replace each horizontal indoor packaged system with energy-efficient variable air volume air handler with DX cooling and electric heating, variable air volume zone control dampers and an energy efficient condensing unit, by Trane or approved equivalent.

Energy Savings Calculations:

$$EnergySavings = \frac{[CoolingTons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{EER_{OLD}} - \frac{1}{EER_{NEW}}\right) \times Avg.LoadFactor \times Hrs.ofCooling$$

<u>Existing Carrier 5-Ton Horizontal indoor package Cooling w/ Electric Heat (2 units)</u>

Rated Capacity = 5 Tons per unit
Condenser Section Efficiency = 7.1 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.154/kWh

<u>Proposed High-Efficiency 5-Ton Horizontal indoor package Cooling w/ Electric Heat (2 units)</u>

Rated Capacity = 5 Tons per Unit
New Cooling Unit Efficiency = 10.1 EER

$$EnergySavings = \frac{[5Tons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{7.1} - \frac{1}{10.1}\right) \times 0.8 \times 1800 = 3614.6\,kWh/yr \text{ per unit}$$

<u>Total Energy Cost Savings</u> = 3614.6 kWh/yr. x $0.154/kWh = <u>$557</u> per year per unit

= $557 x 2 Units = $1,113 per year.

Installation costs for the two (2) horizontal indoor packaged system replacements are estimated at $15,000. It is pertinent to note that this estimate includes the demolition of the existing units and dunnage modifications (if required).

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the rooftop unit replacement falls under the category "Unitary HVAC" and warrants an incentive based on efficiency (EER) at a certain cooling tonnage.

$$\text{Smart Start® } \mathit{Incentive}\,(\mathit{RTU} - 5\,\mathit{Tons}) = (\mathit{Cooling\,Tons} \times \ \mathit{RTU\ \ Incentive})$$
$$= 2(5\mathit{Tons} \times \$40/\mathit{Ton}) = \$400$$

$$\text{Smart Start® } \mathit{Incentive\ DualEnthalpyEconomizerControls} = \$250 \text{ x 2 units} = \$500$$

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$15,000
NJ Smart Start Equipment Incentive ($):	($900)
Net Installation Cost ($):	$14,100
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$1,113*
Net Savings ($ / yr):	*$1,113*
Simple Payback (yrs):	*12.7*
Simple Return On Investment (%):	*7.87%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Savings ($):	*$16,695*

ECM #5: High-Efficiency Rooftop Air Conditioning Unit

Description:

The direct expansion (DX) cooling with electric heating rooftop system is an excellent candidate for replacement. This unit is 19 years old and is four (4) years past its useful service life as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. Due to escalating owning and maintenance costs, this unit should be replaced.

This measure would replace the rooftop unit with energy-efficient variable air volume air handler with DX cooling and electric heating, variable air volume zone control dampers and an energy efficient condensing unit, by Trane or approved equivalent.

Energy Savings Calculations:

$$EnergySavings = \frac{[CoolingTons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{EER_{OLD}} - \frac{1}{EER_{NEW}}\right) \times Avg.LoadFactor \times Hrs.ofCooling$$

<u>Existing Carrier 5-Ton Rooftop Cooling w/ Electric Heat</u>

Rated Capacity = 5 Tons per unit
Condenser Section Efficiency = 8.0 EER
Cooling Season Hrs. of Operation = 1,800 hrs/yr.

Average Cost of Electricity - $0.154/kWh

<u>Proposed High-Efficiency 5-Ton Rooftop Single Zone Variable Speed Cooling w/ Electric Heat</u>

Rated Capacity = 5 Tons per Unit
New Cooling Unit Efficiency = 12.2 EER

$$EnergySavings = \frac{[5Tons \times 12{,}000\,Btu/ton]}{[1000W/kW]} \times \left(\frac{1}{7.1} - \frac{1}{12.2}\right) \times 0.8 \times 1800 = 5{,}087\,kWh/yr \text{ per unit}$$

<u>Total Energy Cost Savings</u> = 5,087 kWh/yr. x $0.154/kWh = <u>$783</u> per year per unit

Installation costs for the one (1) rooftop system replacements are estimated at $7,500. It is pertinent to note that this estimate includes the demolition of the existing units and roof curb modifications (if required).

NJ Smart Start® Program Incentives are calculated as follows:

From Appendix C, the rooftop unit replacement falls under the category "Unitary HVAC" and warrants an incentive based on efficiency (EER) at a certain cooling tonnage.

$$\text{Smart Start® } Incentive\,(RTU - 5\,Tons) = (Cooling\,Tons \times\ RTU\ \ Incentive)$$
$$= 1(5\,Tons \times \$40 / Ton) = \$200$$

$$\text{Smart Start® } Incentive\ DualEnthalpyEconomizerControls = \$250\ \text{ x 1 unit} = \$250$$

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,500
NJ Smart Start Equipment Incentive ($):	($450)
Net Installation Cost ($):	$7,050
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$783*
Net Savings ($ / yr):	*$783*
Simple Payback (yrs):	*9*
Simple Return On Investment (%):	*11.1%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Savings ($):	*$11,745*

ECM #6: Domestic Water Heater Replacement

Description:

The existing domestic hot water heater is a State Industries 40,000 BTUH input Natural Gas Heater and has a 80% thermal efficiency. The nameplate recovery rate is 41 gallons per hour at 75% thermal efficiency.

This energy conservation measure will replace the existing natural gas 50-gallon capacity residential grade domestic water heater with a 90% thermal efficient State Industries model SHE5076NE commercial grade gas fired domestic hot water heater with 50-gallon storage capacity or equivalent. This ECM requires coordination with the utility due to increase in natural gas demand for the facility. CEG advises the owner to contact the utility provider regarding the installation of this ECM.

Energy Savings Calculations:

Existing Natural Gas DW Heater

Rated Capacity = 40 MBH input; 35 gallons storage

Combustion Efficiency = 80%
Age & Radiation Losses = 5%
Thermal Efficiency = 75%

Proposed Natural Gas-Fired, High-Efficiency DW Heater

Rated Capacity = 76 MBH input; 50 gallons storage

Thermal Efficiency = 90%
Radiation Losses = 0.5%
Net Efficiency = 89.5%

Operating Data for DW Heater

Estimated Daily DWH Load = (78 occupants x 1.0 gal/day) / 8 hr/day= 9.75 gal/h

DW Heater Operating Hrs/Yr. = 735 Hrs.

Natural Gas Consumption = 735 hrs x 76,000 BTU/Hr x 1 Therm/ 100,000 BTU/Hr
Natural Gas Consumption = 558.6 Therms

Energy Savings = Old Water Heater Energy Input x ((New Water Heater Efficiency – Old Water Heater) / New Water Heater Efficiency))

Energy Savings = 558.6 Therms x $\frac{(89.5\% - 75\%)}{(89.5\%)}$ = 90.5 Therms

Average Cost of Natural Gas = $1.36/Therm

Yearly Savings = 90.5 Therm x $1.37/ Therm = $123/year

Cost of the Commercial Domestic Water Heater and Installation = $4,088

Simple Payback = $4,088 / $123 = 33 years

Smart Start Incentive = $2.00/MBh x $76 /installed MBh = $152.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,088
NJ Smart Start Equipment Incentive ($):	($152)
Net Installation Cost ($):	$3,936
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$124*
Net Savings ($ / yr):	*$124*
Simple Payback (yrs):	*32*
Simple Return On Investment (%):	*3.1%*
Estimated ECM Lifetime (yr):	*12*
Simple Lifetime Savings ($):	*$1,488*

ECM #7: Boiler Replacement – High Efficiency Upgrade

Description:

This ECM replaces the steam boiler with a high efficiency condensing steam boiler. The Hoboken Public Library is heated by one (1) HB Smith 350 Series Natural Gas-fired, 10 sections, 2,352 MBh input steam boiler which presently is about 70% efficient. As an energy conservation measure, the Concord team recommends this boiler be replaced by one (1) HB Smith model 28HE-S-10 steam boiler or equivalent with an efficiency of 83.5%.

Existing Heating Hot Water Boiler:

Rated Capacity = 2,352 MBh (Natural Gas)

Combustion Efficiency = 75%
Age & Radiation Losses = 5%
Thermal Efficiency = 70%

Replacement Boiler:

High-Efficiency Condensing Boiler

Rated Capacity = 2,513 MBh (Natural Gas)

Combustion Efficiency = 83.5%
Radiation Losses = 0.8%
Thermal Efficiency = 82.7%

Operating Data:

Annual Fuel Consumption of Natural Gas is calculated as:
2,352,000 BTU x 4935 HDD65 x 0.15 diversity / (100,000 Btu/1 Therm of natural gas)
= 17,410.7 Therms

Average Cost of Natural Gas = $1.38/Therm

Energy Savings Calculations:

Energy Savings = Old Boiler Energy Input x ((New Boiler Efficiency – Old Boiler) / New Boiler Efficiency))

$$\text{Energy Savings} = 17{,}410.7 \text{ Therms} \times \left(\frac{82.7\% - 70\%}{82.7\%}\right) = 2{,}673.7 \text{ Therms}$$

Energy Cost Savings = Annual Energy Savings x $/Therm

Energy Cost Savings = 2,673.7 Therms x $1.36/Therm = $3,636/ yr.

Installed cost of one (1) HB Smith model 28HE-S-10 steam boiler including removal of existing unit, all piping changes and controls = $46,000.

Smart Start Incentive = $1.00/MBh x 2,352/installed MBh = $2,352

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$46,000
NJ Smart Start Equipment Incentive ($):	($2,352)
Net Installation Cost ($):	$43,648
Maintenance Savings ($ / yr):	*$0*
Energy Savings ($ / yr):	*$3,636*
Net Savings ($ / yr):	*$3,636*
Simple Payback (yrs):	*12*
Simple Return On Investment (%):	*8.33%*
Estimated ECM Lifetime (yr):	*35*
Simple Lifetime Savings ($):	*$127,260*

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 Hoboken, and concluded that there is potential for solar and wind 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 990 S.F. can be utilized for a PV system on Public Library. A depiction of the area utilized is shown in Appendix G. Using this square footage it was determined that a system size of 15.64 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 24,407 KWh annually, reducing the overall utility bill by 26% percent. A detailed financial analysis can be found in Appendix E. 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.

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. 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	INTERNAL RATE OF RETURN
Self-Finance	11.44 Years	10.7%
Direct Purchase	11.44 Years	7.8%

Wind energy production is another option available through the Renewable Energy Incentive Program. Small wind turbines can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. CEG has reviewed the applicability of wind energy for the Public Library and has determined it is not a viable option. There is not enough free land available on the site to accommodate the installation of a wind turbine.

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 Section IV, Figures 1 and 2 included within this report to reference the respective electricity and natural gas usage load profile for June 2007 through May 2008.

Electricity:

Section IV, Figure 1 demonstrates a steady (base-load) profile. There is a slight increase throughout the summer (June-September) standard with a cooling or air-conditioning load profile. The load profile gradually increases as the summer progresses to the peak in July. The steady (base-load) electric profile will allow for lower energy costs when procuring from a Third Party Supplier.

Natural Gas:

Section IV, Figure 2 demonstrates a typical heating load (January-March, November, and December). The peak takes place in January which is consistent with heating profiles. There is a clear separation between summer and winter loads consistent with energy commodities traded on the New York Mercantile Exchange. Heating loads carry a much higher average cost because of the higher demand for natural gas to heat during the winter. This facility is heated by natural gas fired systems.

Tariff Analysis:

Electricity:

The Library receives electrical service through Public Service Electric and Gas Company (PSE&G) on a GLP (General Lighting and Power Service) rate. This utility tariff is for delivery service for general purposes at secondary distribution voltages. The Delivery Schedule has the following charges: Societal Benefits Charge, Non-utility Generation Charge, Securitization Charge, System Control Charge, Customer Account Services Charge, Standby Fee, Base Rate Distribution Adjustment Charge, Solar Pilot Recovery Charge and RGGI Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS).

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 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) of from Public Services Basic Gas Supply Service default service as detailed in the rate schedule.

This rate schedules have 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). It is pertinent to 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.

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.

From review of the information provided, it appears that Hoboken can improve its average natural gas costs by between 20-25%.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities within City of Hoboken. CEG's primary observation is seen in the electric costs. The average price per kWh (kilowatt hour) for all buildings based on 1-year historical costs is $.15/kWh (kWh is the common unit of electric measure). The average price per decatherm for natural gas is $ 13.71dth (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. Hoboken could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on annual historical consumption (January through December 2007) and current electric rates, an annual savings of over $100,000 per year (Note: Savings were calculated using Hoboken's Average Annual Consumption of kWh and a variance to a fixed 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 Hoboken's natural gas costs. Based on the current market, Hoboken could improve its natural gas costs by approximately 25% annually. CEG recommends further advisement on these prices. The City should also consider procuring energy (natural gas) through alternative supply sources. CEG recommends energy advisory services.

CEG also recommends that the city schedule a meeting with their 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 city will learn more about the competitive supply process. Hoboken can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu, and should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends special attention to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, they should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if Hoboken frequently changes or plans on changing its supplier for energy (natural gas), it needs to closely monitor balancing, particularly when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the 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%.

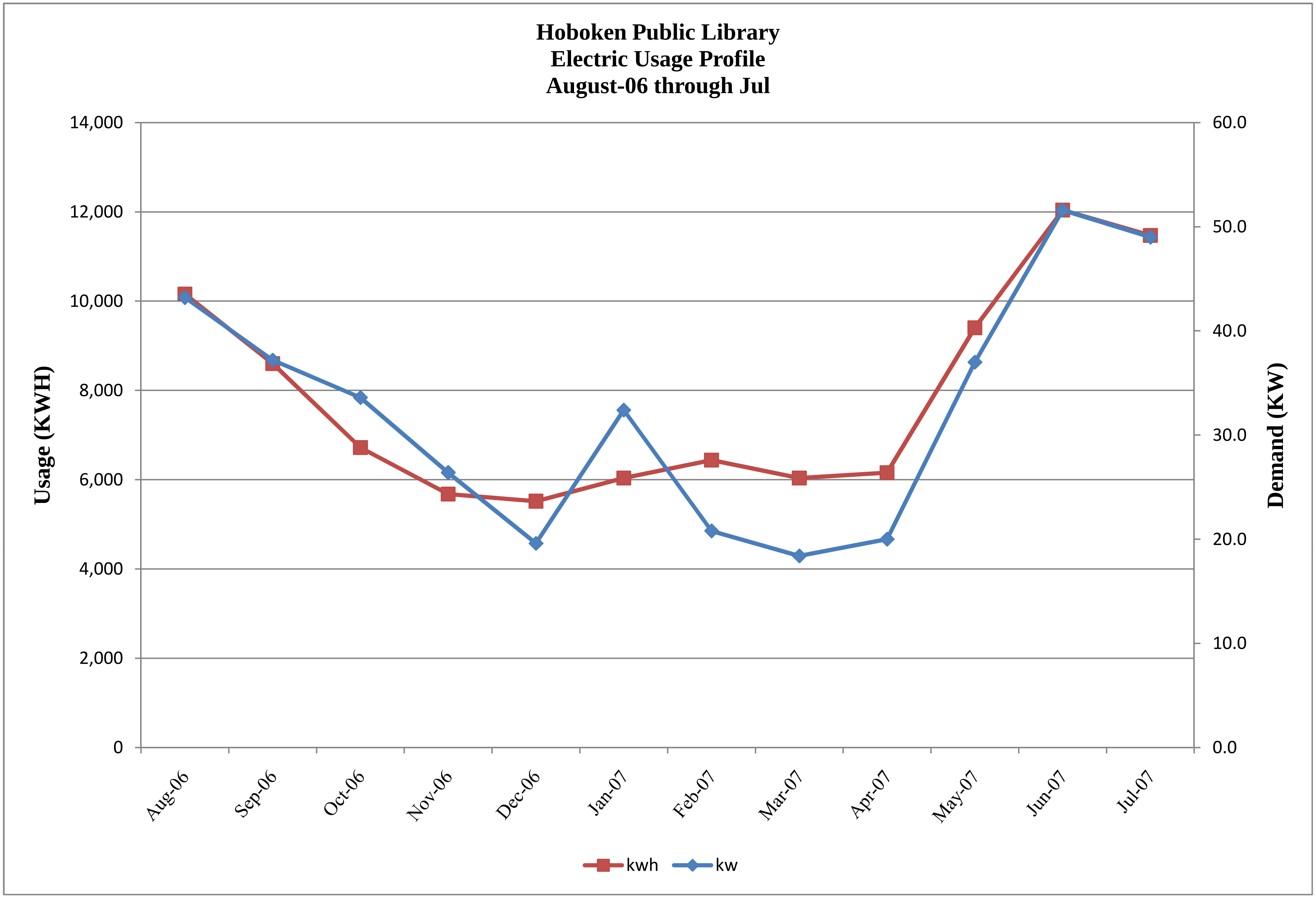
B. Maintain all weather stripping on windows and doors.

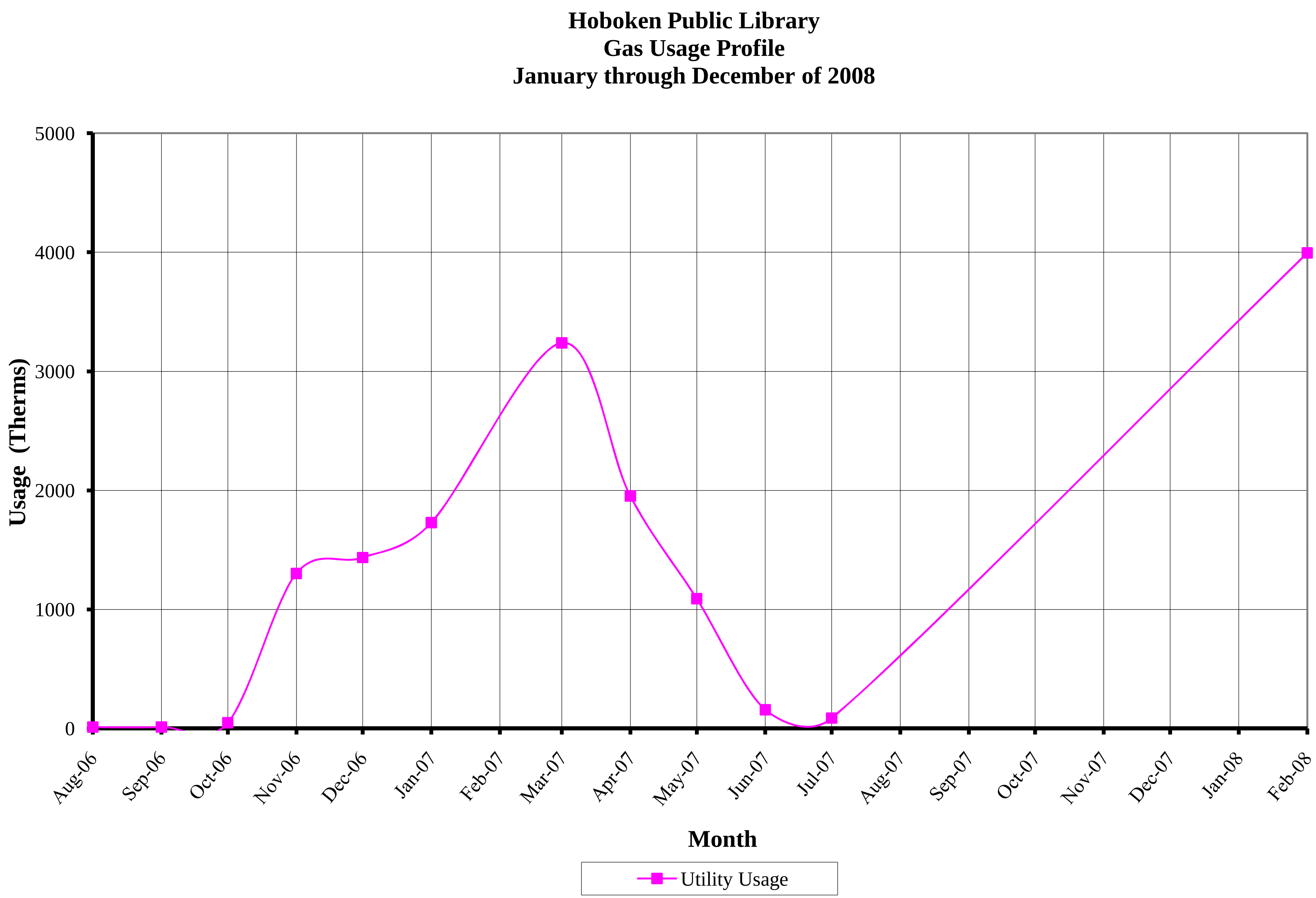
C. Use cog-belts instead of v-belts on all belt-driven fans, etc. These can reduce electrical consumption of the motor by 2-5%.

D. Provide more frequent air filter changes to decrease overall fan horsepower requirements and maintain better IAQ.

E. Recalibrate temperature sensors to provide more accurate control.

F. Clean all light fixtures to maximize light output.


Hoboken Public Library
Electric Usage Profile
August-06 through Jul
Usage (KWH)
Demand (KW)
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Aug-06
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
kwh
kw


Hoboken Public Library
Gas Usage Profile
January through December of 2008
Usage (Therms)
5000
4000
3000
2000
1000
0
Aug-06
Sep-06
Oct-06
Nov-06
Dec-06
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Month
Utility Usage

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

Hoboken Public Library

ECM 1 Interior Lighting Upgrade

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Retrofit	LS	$16,480	$0	$0	$16,480
Total Cost			$0	$0	$16,480
Utility Incentive - NJ Smart Start (1-2 lamp fixture $25, 3-4 lamp fixture $30)					($3,766)
Total Cost Less Incentive					$12,714

ECM 2 Compact Flourescent Lighting

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Retrofit	LS	$210	$0	$0	$210
Total Cost			$0	$0	$210

ECM 3 Interior Lighting Controls

	Qty	Unit Cost $	Material $	Labor $	Total $
Dual - Technology Sensor	5	$75	$150	$225	$375
Total Cost			$150	$225	$375
Utility Incentive - NJ Smart Start ($20 per Sensor)					($100)
Total Cost Less Incentive					$275

ECM 4 High-Efficiency Condensing Units

	Qty	Unit Cost $	Material $	Labor $	Total $
5 Ton Split System	2	$7,500	$0	$0	$15,000
Total Cost			$0	$0	$15,000
Smart Start® Incentive ($40/Ton)	10				($400)
Smart Start® Incentive Dual Enthalpy Economizer	2.00				($500)
Utility Incentive - N/A					$0
Total Cost Less Incentive					$14,100

ECM 5 High Efficiency Split System AC Upgrade

	Qty	Unit Cost $	Material $	Labor $	Total $
5 Ton Split System	1	$7,500	$0	$0	$7,500
Total Cost			$0	$0	$7,500
Smart Start® Incentive ($40/Ton)	5				($200)
Smart Start® Incentive Dual Enthalpy Economizer Controls ($250/unit)	1.00				($250)
Utility Incentive - N/A					$0
Total Cost Less Incentive					$7,050

ECM 6 Domestic Hot Water Heater Replacement

	Qty	Unit Cost $	Material $	Labor $	Total $
76 MBH Domestic Hot Water Heater	1	$4,088	$0	$0	$4,088
Total Cost			$0	$0	$4,088
Smart Start® Incentive ($2/MBH)	76				$152
Utility Incentive - N/A					$0
Total Cost Less Incentive					$3,936

ECM 7 Boiler Replacement - High Efficiency

	Qty	Unit Cost $	Material $	Labor $	Total $
High Efficiency Condensing Boiler	1	$46,000	$0	$0	$46,000
Total Cost			$0	$0	$46,000
Smart Start® Incentive ($2/MBH)	76				$2,352
Utility Incentive - N/A					$0
Total Cost Less Incentive					$43,648

Concord Engineering Group, Inc.

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

SmartStart Building Incentives

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

Electric Chillers

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

Gas Cooling

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

Desiccant Systems

	$1.00 per cfm – gas or electric

Electric Unitary HVAC

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

Ground Source Heat Pumps

Closed Loop & Open Loop	$370 per ton

Gas Heating

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

Variable Frequency Drives

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

Natural Gas Water Heating

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

Premium Motors

Three-Phase Motors	$45 - $700 per motor

Prescriptive Lighting

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

Lighting Controls – Occupancy Sensors

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

Lighting Controls – HID or Fluorescent Hi-Bay Controls

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

Other Equipment Incentives

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

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Hoboken Library

Building ID: 1835860
For 12-month Period Ending: July 31, 2007[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: August 24, 2009

Facility
Hoboken Library
250 - 254 5Th Street
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
John Pope
94 Washington Street
Hoboken, NJ 07030

Year Built: 1895
Gross Floor Area (ft^2): 6,575

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

Site Energy Use Summary[3]	
Natural Gas (kBtu)[4]	1,506,453
Electricity (kBtu)	321,659
Total Energy (kBtu)	1,828,112

Energy Intensity[5]	
Site (kBtu/ft^2/yr)	278
Source (kBtu/ft^2/yr)	403

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	129

Electric Distribution Utility
PSE&G - Public Service Elec & Gas Co

National Average Comparison	
National Average Site EUI	104
National Average Source EUI	246
% Difference from National Average Source EUI	64%
Building Type	Library

Stamp of Certifying Professional

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

Meets Industry Standards[6] **for Indoor Environmental Conditions:**	
Ventilation for Acceptable Indoor Air Quality	**N/A**
Acceptable Thermal Environmental Conditions	**N/A**
Adequate Illumination	**N/A**

Certifying Professional
Raymond Johnson
520 S. Burnt Mill Rd
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	Hoboken Library	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Library	Is this an accurate description of the space in question?		☐
Location	250 - 254 5Th Street, Hoboken, NJ 07030	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		☐

Hoboken Library (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	6,575 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Number of PCs	36 (Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	40 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	26 (Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity		
Meter: electric (kWh (thousand Watt-hours)) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
07/01/2007	07/31/2007	11,470.00
06/01/2007	06/30/2007	12,040.00
05/01/2007	05/31/2007	9,403.00
04/01/2007	04/30/2007	6,160.00
03/01/2007	03/31/2007	6,040.00
02/01/2007	02/28/2007	6,440.00
01/01/2007	01/31/2007	6,040.00
12/01/2006	12/31/2006	5,520.00
11/01/2006	11/30/2006	5,680.00
10/01/2006	10/31/2006	6,720.00
09/01/2006	09/30/2006	8,600.00
08/01/2006	08/31/2006	10,160.00
electric Consumption (kWh (thousand Watt-hours))		**94,273.00**
electric Consumption (kBtu)		**321,659.48**
Total Electricity Consumption (kBtu)		**321,659.48**
Is this the total Electricity consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: gas (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
07/01/2007	07/31/2007	88.10
06/01/2007	06/30/2007	158.01
05/01/2007	05/31/2007	1,090.48
04/01/2007	04/30/2007	1,952.60
03/01/2007	03/31/2007	3,238.64
02/01/2007	02/28/2007	3,994.14
01/01/2007	01/31/2007	1,729.29
12/01/2006	12/31/2006	1,436.35
11/01/2006	11/30/2006	1,302.36

10/01/2006	10/31/2006	49.32
09/01/2006	09/30/2006	12.62
08/01/2006	08/31/2006	12.62
gas Consumption (therms)		**15,064.53**
gas Consumption (kBtu)		**1,506,453.00**
Total Natural Gas Consumption (kBtu)		**1,506,453.00**
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.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Hoboken Library
250 - 254 5Th Street
Hoboken, NJ 07030

Facility Owner
City of Hoboken
94 Washington Street
Hoboken, NJ 07030

Primary Contact for this Facility
John Pope
94 Washington Street
Hoboken, NJ 07030

General Information

Hoboken Library	
Gross Floor Area Excluding Parking: (ft^2)	6,575
Year Built	1895
For 12-month Evaluation Period Ending Date:	July 31, 2007

Facility Space Use Summary

Hoboken Library	
Space Type	Other - Library
Gross Floor Area(ft^2)	6,575
Number of PCs°	36
Weekly operating hours°	40
Workers on Main Shift°	26

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 07/31/2007)	**Baseline** (Ending Date 07/31/2007)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	278	278	0	N/A	104
Source (kBtu/ft²)	403	403	0	N/A	246
Energy Cost					
$/year	$ 34,950.75	$ 34,950.75	N/A	N/A	$ 13,073.22
$/ft²/year	$ 5.32	$ 5.32	N/A	N/A	$ 1.99
Greenhouse Gas Emissions					
$MtCO_2e$/year	129	129	0	N/A	48
$kgCO_2e/ft^2$/year	20	20	0	N/A	7

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

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

MAJOR EQUIPMENT LIST

Concord Engineering Group

Hoboken Public Library

Boiler

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Output (MBh)	Minimum Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement Boiler Room	-	H.B.SMITH	1	350 MILLS	921669-H 921670-H	2,400	1,394.30	75	NATURAL GAS	30	30	0	
Basement Boiler Room	-	PEERLESS	1	MCB-130	-	-	-	-	NATURAL GAS	10	24	14	

Boiler - Burner

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Input (MBh)	Vintage	Efficiency (%)	Fuel	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
Basement Boiler Room	350 Mills Boiler	GORDON-PIAT	1	RO-G-15	AG775843	2,400 MAX	-	-	NATURAL GAS	20	21	1	

Boiler - Pumps

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	HP	RPM	GPM	Ft. Hd	Volts	Phase	Approx. Age	ASHRAE Service Life	Notes
Basement Boiler Room	Peerless Boiler	Bell & Gossett	1	-	-	1/2	-	-	-	-	-	-	-	Controlled by single zone honeywell T-stat

Domestic Water Heater

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Input (MBh)	Recovery at 90°F Rise (gal/hr)	Capacity (gal)	Efficiency (%)	Fuel	Approx. Age	Service Life	Remaining Life	Notes
BSMT MECH ROOM	-	STATE	1	PR650NBRT	M00130104	40	41	50	80%	NATURAL GAS	9 YEARS 12/2000	10	1	had 6 yr warranty

Air Handling Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Eff. (EER)	Cooling Capacity	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
3RD FL LIBRARY	-	CARRIER	1	50BH-006-520	-	8	60,000	Electrik 22.1 kW	75.4	-	-	ELECTRIC	230	3	-	19	15	-4	NOT OPERATIONAL
2ND FLOOR READING AREA	-	CARRIER	1	50AH060500	0590G14128	7.1	58,500	-	-	-	-	ELECTRIC	230	3	-	19	20	1	mfg: 1990
2ND FLOOR READING AREA-TOILET RM CEILING	-	CARRIER	1	50AH060500	0590G14128	7.1	58,500	-	-	-	-	ELECTRIC	230	3	-	19	20	1	mfg: 1990, NOT WORKING, NO NAME PLATE IS BEING REPAIRED, ASSUMED DATA

Unit Heaters and Cabinet Unit Heaters

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Heating Type	Heating Capacity (MBH)	CFM	RPM / HP	GPM	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
stairwell	stairwell	-	-	-	-	-	-	-	-	-	-	13	-	electric wall heater

PTAC - Units

Location	Area Served	Manufacturer	Qty.	Model #	Serial #	Cooling Capacity - DX	Heating Capacity - HW	Fan HP	Volts	Phase	Amps	Approx. Age	ASHRAE Service Life	Remaining Life	Notes
MAIN OFFICE	MAIN OFFICE	TRANE	1	PTED1201WAA	F02K22762A	1 TON	N/A	-	208/230	1	4.6/5.2	18	10	-8	1070/1045 W COOLING INPUT, 11.2 EER
1ST FLOOR LIBRARY STACK	1ST FLOOR LIBRARY STACK	TRANE	2	PTED1201JAA	F04E01940A	1 TON	5045/4140 WATTS	-	208/230	1	4.6/5.2	18	10	-8	1070/1045 W COOLING INPUT, 11.2 EER, 5045/4140 WATTS HEATING
1ST FLOOR LOBBY	1ST FLOOR LOBBY	TRANE	1	PTED1201JAA	F04E01897A	1 TON	5045/4140 WATTS	-	208/230	1	4.6/5.2	18	10	-8	1070/1045 W COOLING INPUT, 11.2 EER, 5045/4140 WATTS HEATING

GENERAL NOTES
1. ALL EQUIPMENT IS MANUALLY OPERATED (ON/OFF).
2. THERE ARE LEAKS AROUND PTAC UNITS AT FLASHING.
3. BOILERS ARE CONTROLLED BY HEAT ???? PANEL BUY MAINTENANCE USSUALLY TURNS ON/OFF.

INVESTMENT GRADE LIGHTNG AUDIT

CONCORD ENGINEERING GROUP

CEG Job #: 9C08143
Project: Hoboken Energy Audit
Address: 250 - 254 5th st
Hoboken, NJ 07030
Building SF: 6575

"Hoboken Public Library"

DATE: 07/03/2009
KWH COST: **$0.154**

ECM #1: Lighting Upgrade - General

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	CEG Type	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
1	A	Front Office	2	8' 4 lamp T-12, No lens, Magnetic Ballast	3016	444	0.89	2678.208	$412.44	2	8' 4 Lamp T-8, no lens, Electronic Balast Cooper Metalux	236	0.472	1423.552	$219.23	$200.00	$400.00	0.42	1254.656	$193.22	2.07
2	D	Boiler Rooms	1	8' 2 Lamp T-12, No lens, Magnetic Ballast	3016	222	0.22	669.552	$103.11	2	4' - 2-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N	48	0.096	289.536	$44.59	$160.00	$320.00	0.13	380.016	$58.52	5.47
4	D	Kitchen Hall	3	8' 2 Lamp T-12, No lens, Magnetic Ballast	3016	222	0.67	2008.656	$309.33	6	4' - 2-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N	48	0.288	868.608	$133.77	$160.00	$960.00	0.38	1140.048	$175.57	5.47
5	D	Storage	1	8' 2 Lamp T-12, No lens, Magnetic Ballast	3016	222	0.22	669.552	$103.11	2	4' - 2-Lamp 32W T-8 Industrial Strip w/ Elect Ballast; Metalux M/N	48	0.096	289.536	$44.59	$160.00	$320.00	0.13	380.016	$58.52	5.47
7	E	3rd Floor Front Room	9	2' x 4' 2 Lamp T-12, Prism Lens, Magnetic Ballast	3016	80	0.72	2171.52	$334.41	9	2'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N	61	0.549	1655.784	$254.99	$120.00	$1,080.00	0.17	515.736	$79.42	13.60
8	E	3rd Floor Back Room	6	2' x 4' 2 Lamp T-12, Prism Lens, Magnetic Ballast	3016	80	0.48	1447.68	$222.94	6	2'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N	61	0.366	1103.856	$169.99	$120.00	$720.00	0.11	343.824	$52.95	13.60
9	F	Elevator Lobby	4	2' x 2' 2 Lamp, U-tube T-8. No lens, Electronic Ballast	3016	73	0.29	880.672	$135.62		No Replacement		0	0	$0.00		$0.00	0.29	880.672	$135.62	0.00
10	A	2nd Floor	9	8' 4 lamp T-12, No lens, Magnetic Ballast	3016	444	4.00	12051.936	$1,856.00	9	8' 4 Lamp T-8, no lens, Electronic Balast Cooper Metalux	236	2.124	6405.984	$986.52	$200.00	$1,800.00	1.87	5645.952	$869.48	2.07
11	F	2nd Floor	3	2' x 2' 2 Lamp, U-tube T-8. No lens, Electronic Ballast	3016	73	0.22	660.504	$101.72		No Replacement		0	0	$0.00		$0.00	0.22	660.504	$0.00	0.00
12	G	2nd Floor	5	4' x 1' 4 Lamp T-8, Prism Reflection, Electronic Ballast	3016	28	0.14	422.24	$65.02		No Replacement		0	0	$0.00		$0.00	0.14	422.24	$65.02	0.00
13	I	Bathroom	1	2' 2 Lamp T-12	3016	70	0.07	211.12	$32.51	1	2' 2-Lamp T-8, 17W wall Mtd.	34	0.034	102.544	$15.79	$80.00	$80.00	0.04	108.576	$16.72	4.78
14	A	1st Floor	6	8' 4 lamp T-12, No lens, Magnetic Ballast	3016	444	2.66	8034.624	$1,237.33	6	8' 4 Lamp T-8, no lens, Electronic Balast Cooper Metalux	236	1.416	4270.656	$657.68	$200.00	$1,200.00	1.25	3763.968	$579.65	2.07
15	B	1st Floor	96	4' 1 Lamp T-12, No lens, Magnetic Ballast	3016	42	4.03	12160.512	$1,872.72	96	1'X4' 1-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N	30	2.88	8686.08	$1,337.66	$100.00	$9,600.00	1.15	3474.432	$535.06	17.94
		Totals	146				14.61	44066.78	6786.28	139			8.32	25096.14	3864.80		$16,480.00	6.29	18,970.64	$2,819.76	5.84

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

INVESTMENT GRADE LIGHTNG AUDIT

CONCORD ENGINEERING GROUP

CEG Job #: 9C08143
Project: Hoboken Energy Audit
Address: 250 - 254 5th st
Hoboken, NJ 07030
Building SF: 6575

"Hoboken Public Library"

DATE: 07/03/2009
KWH COST: $0.154

ECM #3: Lighting Upgrade - Multi-Purpose Room

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	CEG Type	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
1	K	Boiler Room	3	100 W Incandescent	3016	100	0.30	904.8	$139.34	3	Eiko-30w mini sprial	23	0.069	208.104	$32.05	$6.00	$18.00	0.23	696.696	$107.29	0.17
2	H	Library	24	40 W Incandescent	3016	40	0.96	2895.36	$445.89	24	Eiko-13w mini sprial	13	0.312	940.992	$144.91	$3.99	$95.76	0.65	1954.368	$300.97	0.32
3	J	1st Floor	24	60 W Incandescent	3016	60	1.44	4343.04	$668.83	24	Eiko-15w mini sprial	15	0.36	1085.76	$167.21	$3.99	$95.76	1.08	3257.28	$501.62	0.19
		Totals	51				2.70	8143.20	1254.05	51			0.74	2234.86	344.17		$209.52	1.96	5,908.34	$909.88	0.23

NOTES: 1. Simple Payback noted in this spreadsheet does not include Maintenance Savings and NJ Smart Start Incentives.

Project Name: LGEA Solar PV Project - Hoboken Public Library
Location: Hoboken, NJ
Description: Photovoltaic System 95% Financing - 20 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 20 year
Total Construction Cost	$140,760
Annual kWh Production	24,407
Annual Energy Cost Reduction	$3,759
Annual SREC Revenue	$8,542
First Cost Premium	**$140,760**
Simple Payback:	**11.44** Years

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	95%
Financing Term (mths):	240	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.154**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	7.00%	SREC Value ($/kWh)	$0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$7,038	0	0	0	$0	0	0	(7,038)	0
1	$0	24,407	$3,759	$0	$8,542	$9,260	$3,181	($140)	($7,178)
2	$0	24,285	$3,871	$0	$8,500	$9,030	$3,411	($70)	($7,248)
3	$0	24,163	$3,988	$0	$8,457	$8,783	$3,658	$4	($7,244)
4	$0	24,043	$4,107	$0	$8,415	$8,519	$3,922	$81	($7,163)
5	$0	23,922	$4,230	$246	$8,373	$8,235	$4,206	($84)	($7,247)
6	$0	23,803	$4,357	$245	$8,331	$7,931	$4,510	$2	($7,244)
7	$0	23,684	$4,488	$244	$8,289	$7,605	$4,836	$92	($7,152)
8	$0	23,565	$4,623	$243	$8,248	$7,256	$5,185	$187	($6,965)
9	$0	23,448	$4,761	$242	$8,207	$6,881	$5,560	$286	($6,679)
10	$0	23,330	$4,904	$240	$8,166	$6,479	$5,962	$389	($6,291)
11	$0	23,214	$5,051	$239	$8,125	$6,048	$6,393	$496	($5,795)
12	$0	23,098	$5,203	$238	$8,084	$5,586	$6,855	$608	($5,187)
13	$0	22,982	$5,359	$237	$8,044	$5,090	$7,351	$725	($4,462)
14	$0	22,867	$5,520	$236	$8,004	$4,559	$7,882	$847	($3,615)
15	$0	22,753	$5,685	$234	$7,964	$3,989	$8,452	$974	($2,641)
16	$0	22,639	$5,856	$233	$7,924	$3,378	$9,063	$1,105	($1,536)
17	$0	22,526	$6,032	$232	$7,884	$2,723	$9,718	$1,243	($293)
18	$0	22,413	$6,213	$231	$7,845	$2,020	$10,421	$1,385	$1,092
19	$0	22,301	$6,399	$230	$7,805	$1,267	$11,174	$1,534	$2,626
20	$0	22,190	$6,591	$229	$7,766	$459	$11,982	$1,688	$4,314
21	$0	22,079	$6,789	$227	$7,728	$389	$11,015	$2,885	$7,198
22	$0	21,968	$6,992	$226	$7,689	$266	$9,064	$5,124	$12,322
23	$0	21,859	$7,202	$225	$7,650	$0	$0	$14,627	$26,950
24	$0	21,749	$7,418	$224	$7,612	$0	$0	$14,806	$41,756
25	$0	21,640	$7,641	$223	$7,574	$0	$0	$14,992	$56,748
	Totals:	465,633	$100,997	$3,798	$162,972	$115,097	$133,722	$153,801	$59,067
				Net Present Value (NPV)				**$6,524**	
				Internal Rate of Return (IRR)				**10.7%**	

Project Name: LGEA Solar PV Project - Hoboken Public Library
Location: Hoboken, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

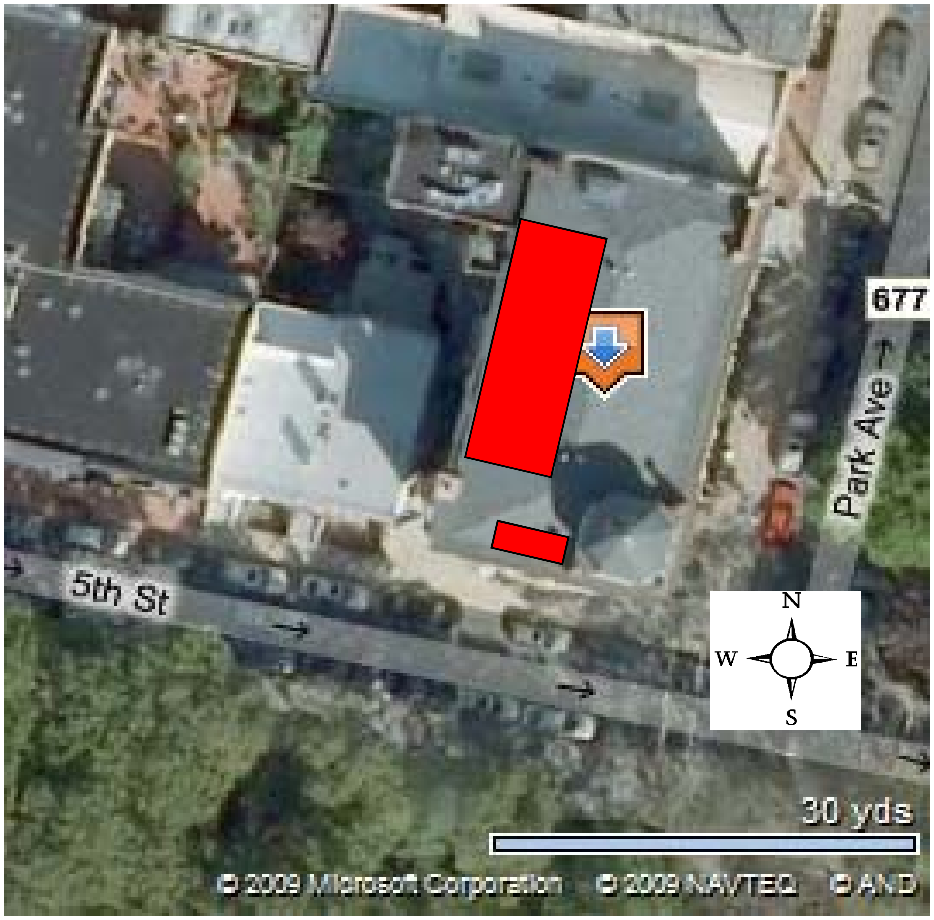
	Photovoltaic System - Direct Purchase
Total Construction Cost	$140,760
Annual kWh Production	24,407
Annual Energy Cost Reduction	$3,759
Annual SREC Revenue	$8,542
First Cost Premium	**$140,760**
Simple Payback:	**11.44** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.154**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$140,760	0	0	0	$0	(140,760)	0
1	$0	24,407	$3,759	$0	$8,542	$12,301	($128,459)
2	$0	24,285	$3,871	$0	$8,500	$12,371	($116,088)
3	$0	24,163	$3,988	$0	$8,457	$12,445	($103,643)
4	$0	24,043	$4,107	$0	$8,415	$12,522	($91,121)
5	$0	23,922	$4,230	$246	$8,373	$12,357	($78,764)
6	$0	23,803	$4,357	$245	$8,331	$12,443	($66,321)
7	$0	23,684	$4,488	$244	$8,289	$12,533	($53,787)
8	$0	23,565	$4,623	$243	$8,248	$12,628	($41,160)
9	$0	23,448	$4,761	$242	$8,207	$12,727	($28,433)
10	$0	23,330	$4,904	$240	$8,166	$12,830	($15,603)
11	$0	23,214	$5,051	$239	$8,125	$12,937	($2,666)
12	$0	23,098	$5,203	$238	$8,084	$13,049	$10,383
13	$0	22,982	$5,359	$237	$8,044	$13,166	$23,549
14	$0	22,867	$5,520	$236	$8,004	$13,288	$36,836
15	$0	22,753	$5,685	$234	$7,964	$13,414	$50,251
16	$0	22,639	$5,856	$233	$7,924	$13,546	$63,797
17	$0	22,526	$6,032	$232	$7,884	$13,684	$77,481
18	$0	22,413	$6,213	$231	$7,845	$13,826	$91,307
19	$0	22,301	$6,399	$230	$7,805	$13,975	$105,282
20	$0	22,190	$6,591	$229	$7,766	$14,129	$119,410
21	$1	22,079	$6,789	$227	$7,728	$14,289	$133,699
22	$2	21,968	$6,992	$226	$7,689	$14,455	$148,154
23	$3	21,859	$7,202	$225	$7,650	$14,627	$162,781
24	$4	21,749	$7,418	$224	$7,612	$14,806	$177,588
25	$5	21,640	$7,641	$223	$7,574	$14,992	$192,580
	Totals:	465,633	$100,997	$3,798	$162,972	$333,340	$260,170
				Net Present Value (NPV)		**$192,605**	
				Internal Rate of Return (IRR)		**7.8%**	

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
Police Station	990	Sunpower SPR230	68	14.7	1,000	15.64	24,407	2,244	15.64



Notes:

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