ENERGY AUDIT – FINAL REPORT

CHERRY HILL FIRE DEPARTMENT
FIRE DEPARTMENT #2

805 WEST ROUTE 70
CHERRY HILL, NJ 08002
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CEG PROJECT NO. 9C09087

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I. EXECUTIVE SUMMARY

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

Cherry Hill Fire Department
Fire Station #2
805 West Route 70
Cherry Hill, NJ 08002

Municipal Contact Person: Don Dougherty
Facility Contact Person: Thomas Kolbe

This audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program. The energy audit is conducted to promote the mission of the office of Clean Energy, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

The annual energy costs at this facility are as follows:

Electricity	$ 22,495
Natural Gas	$ 18,480
Total	$ 40,975

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

Table 1
Financial Cost Summary - Energy Conservation Measures (ECM's)

ECM NO.	DESCRIPTION	COST[A]	ANNUAL SAVINGS[B]	SIMPLE PAYBACK (YEARS)	SIMPLE LIFETIME ROI
1	Engine Bay Lighting Replacement	$3,060	$2,903	1.1	2,272%
2	Lighting Controls	$1,680	$315	5.3	181%
3	Engine Bay Heater Upgrade	$5,000	$1,627	3.1	323%
4	Engine Bay Garage Door Replacement	$11,340	$652	17.4	43.7%
5	Roof Top Unit Replacement	$5,724	$639	9.0	123%
6	Exhaust Fan Motor Upgrade/Controls	$1,844	$1,034	1.8	741%
7	Kitchen Hood Controls	$750	$366	2.1	632%

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

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

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

ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELEC. DEMAND (KW)	ELEC. CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Engine Bay Lighting Replacement	1.8	15,785	0
2	Lighting Controls	0	1,934	0
3	Engine Bay Heater Upgrade	0	1,215	897
4	Engine Bay Garage Door Replacement	0	0	415
5	Roof Top Unit Replacement	0	1,571	228
6	Exhaust Fan Motor Upgrade/Controls	0	5,777	0
7	Kitchen Hood Controls	0	2,043	0

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

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

REM NO.	DESCRIPTION	COST	ANNUAL SAVINGS	SIMPLE PAYBACK (YEARS)	SIMPLE LIFETIME ROI[A]
1	Solar Photovoltaic System	$107,870	$10,259	10.8	98%

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

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

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

REM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELEC. DEMAND (KW)	ELEC. CONSUMPTION (KWH)	NAT GAS (THERMS)
1	Solar Photovoltaic System	0	18,826	0

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

- **ECM #1:** Engine Bay Lighting Replacement
- **ECM #2:** Lighting Controls
- **ECM #3:** Engine Bay Heater Upgrade
- **ECM #5:** Roof Top Unit Replacement
- **ECM #6:** Exhaust Fan Motor Upgrade/Controls

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

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

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

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

II. INTRODUCTION

The comprehensive energy audit covers the 5,917 square foot Cherry Hill Fire Station #2, which includes the engine bay, day room, officer bunk, firefighter bunkroom, kitchen and exercise room.

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

The Energy Use Index (EUI) is established for the building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft^2/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTU's and dividing by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. A low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance therefore a high potential for energy savings.

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

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

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

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

III. METHOD OF ANALYSIS

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

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

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

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

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

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

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

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

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

The gas usage profile shows the actual natural gas energy usage for the facility. Public Service Electric and Gas (PSE&G) provides natural gas to the facility under the Basic General Supply Service (GSGH) rate structure. The third party commodity provider Woodruff Energy provides the natural gas from the well head to the PSE&G pipeline. The gas utility measures consumption in cubic feet x 100 (CCF), and converts the quantity into Therms of energy. One Therm is equivalent to 100,000 BTUs of energy.

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

Description	Average
Electricity	17.9¢ / kWh
Natural Gas	$1.57 / Therm

Table 5
Electricity Billing Data

Utility Provider: PSE&G, Rate - General Power and Light (GLP) (Meter # 678004634)			
MONTH OF USE	**CONSUMPTION KWH**	**DEMAND**	**TOTAL BILL**
Jan-08	7,320	46.8	$1,102
Feb-08	8,300	27.3	$1,138
Mar-08	7,690	24.9	$1,062
Apr-08	7,800	28.5	$1,078
May-08	8,250	43.8	$1,180
Jun-08	12,750	64.2	$2,464
Jul-08	17,580	61.8	$3,503
Aug-08	15,420	62.4	$3,254
Sep-08	14,910	61.5	$3,208
Oct-08	9,420	54.6	$1,765
Nov-08	8,460	31.2	$1,411
Dec-08	7,620	40.2	$1,330
Totals	**125,520**	**64.2 Max**	**$22,495**
AVERAGE DEMAND		**45.6 KW average**	
AVERAGE RATE		**$0.179 $/kWh**	

Figure 1
Electricity Usage Profile

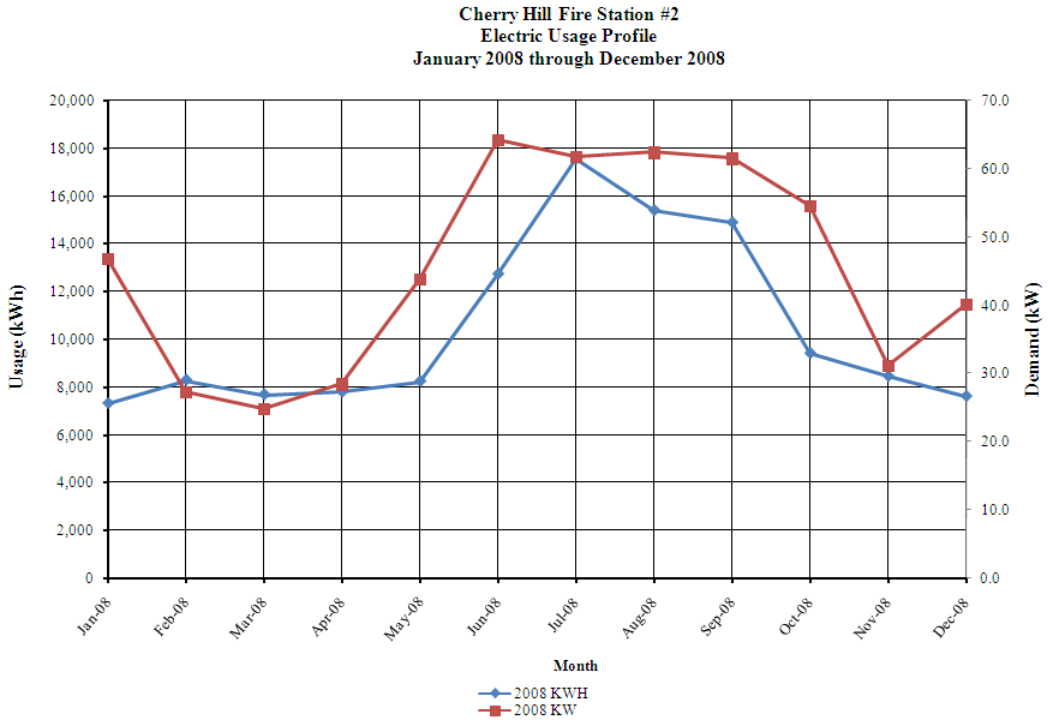
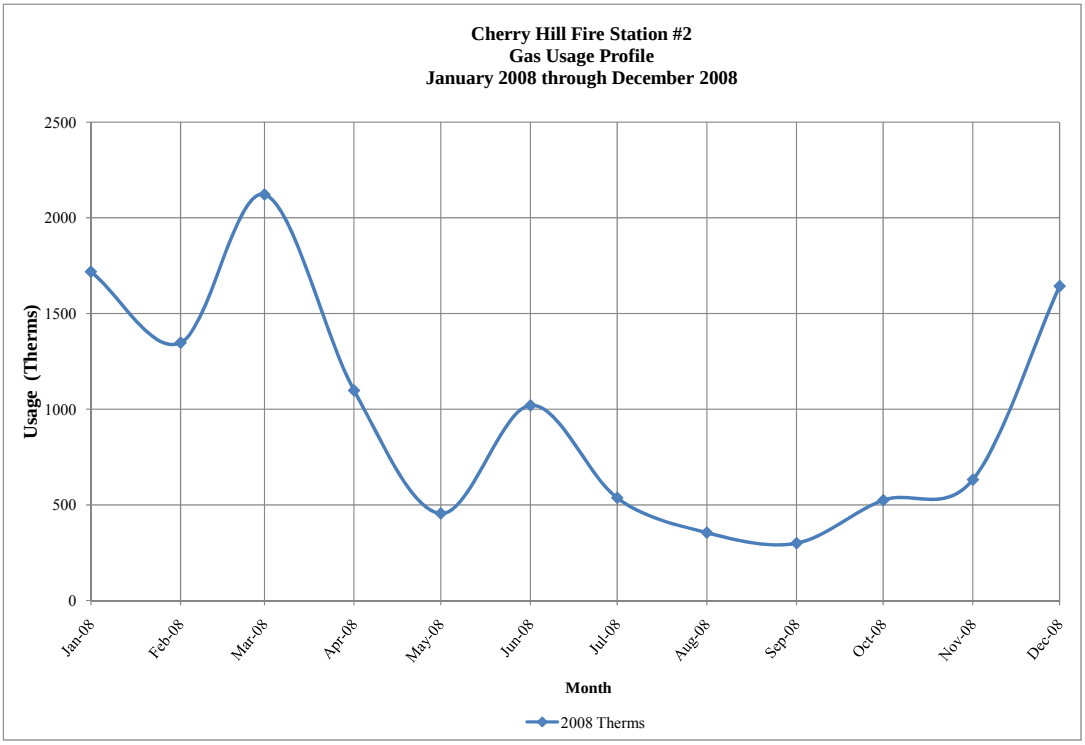


Table 6
Natural Gas Billing Data

Utility Provider: PSE&G, Rate - General Service Gas Heating (GSGH), (Meter # 2303806)		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Jan-08	1,718.01	$2,736
Feb-08	1,346.99	$2,145
Mar-08	2,121.20	$3,374
Apr-08	1,097.63	$1,658
May-08	454.91	$693
Jun-08	1,019.43	$1,654
Jul-08	536.29	$1,036
Aug-08	354.73	$678
Sep-08	299.56	$476
Oct-08	524.25	$778
Nov-08	631.42	$884
Dec-08	1,642.77	$2,367
TOTALS	**11747.19**	**$18,479**
AVERAGE RATE:	**$1.57**	**$/THERM**

Figure 2
Natural Gas Usage Profile



B. Energy Use Index (EUI)

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

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

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

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

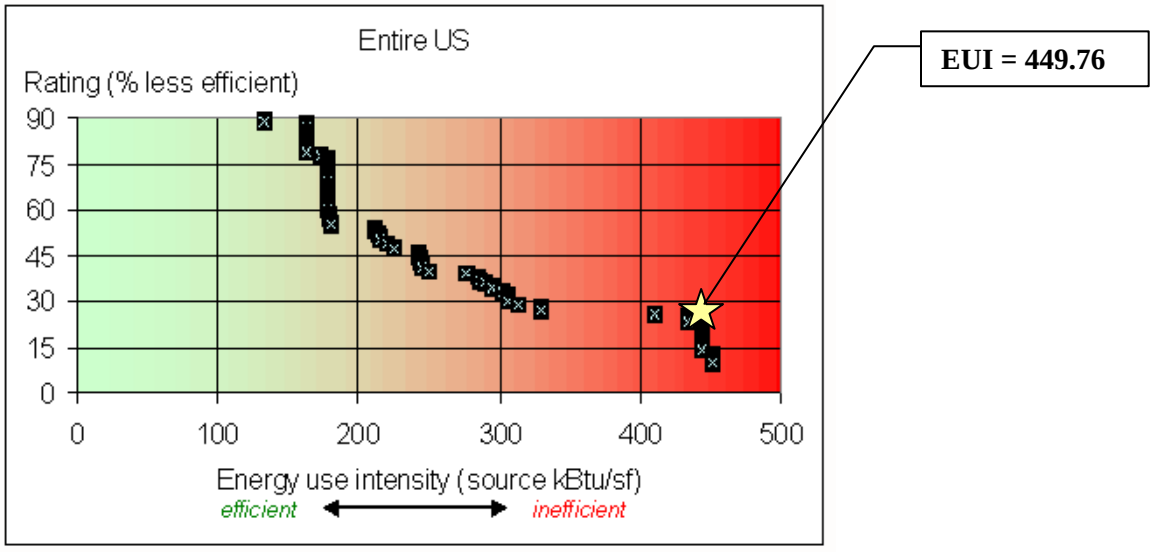
$$Building\ Source\ EUI = \frac{(Electric\ Usage\ in\ kBtu\ X\ SS\ Ratio + Gas\ Usage\ in\ kBtu\ X\ SS\ Ratio)}{Building\ Square\ Footage}$$

Table 7
Cherry Hill Fire Station #2 EUI Calculations

ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu	RATIO	kBtu
ELECTRIC	125,520			428,525	3.340	1,431,274
NATURAL GAS		11,747		1,174,719	1.047	1,229,931
FUEL OIL			0.00	0	1.010	0
PROPANE			0.00	0	1.010	0
TOTAL				1,603,244		2,661,205
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		5,917		SQUARE FEET		
BUILDING SITE EUI		270.96		kBtu/SF/YR		
BUILDING SOURCE EUI		**449.76**		**kBtu/SF/YR**		

Figure 3 below depicts a national EUI grading for the source use of public order and safety buildings.

Figure 3
Source Energy Use Intensity Distributions:
Fire and Police Buildings



The EUI calculated above shows an unusually high kBtu/SF. The utility meter for this facility is shared with the adjacent Erlton Fire Company Building (not included in this report) whose square footage was not provided and not included in the above calculation. The addition of the

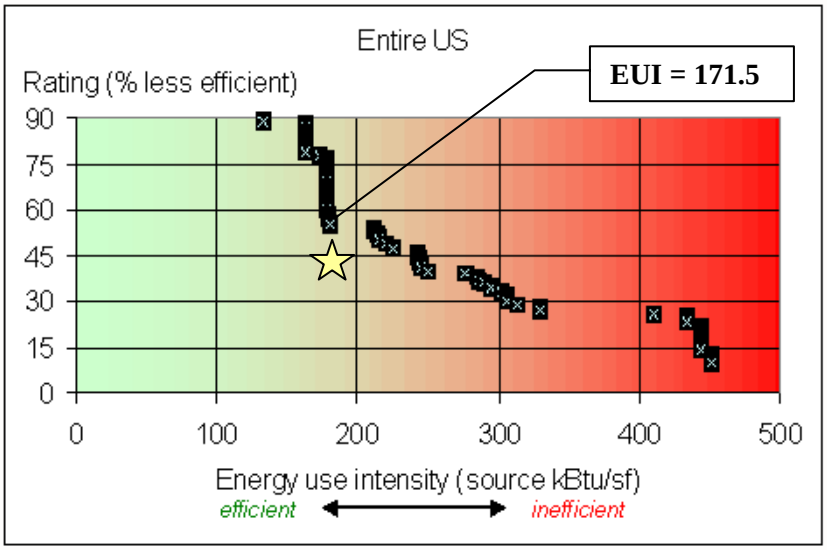
Erlton Fire Company's square footage will lower the Buildings site and source EUI from the high value shown above. Based on architectural drawings of the facility provided by the owner an approximate area of 9,600 SF was calculated for the Erlton Fire Company. Using this square footage will lower the above EUI results. The following calculation (Table 6) represents the revised EUI, incorporating the Cherry Hill Fire Station #2 area as well as the Erlton Fire Company Area:

Table 8
Cherry Hill Fire Station #2 & Erlton Fire Company EUI Calculations

ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu	RATIO	kBtu
ELECTRIC	125,520			428,525	3.340	1,431,274
NATURAL GAS		11,747		1,174,719	1.047	1,229,931
FUEL OIL			0.00	0	1.010	0
PROPANE			0.00	0	1.010	0
TOTAL				1,603,244		2,661,205
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		15,517		SQUARE FEET		
BUILDING SITE EUI		103.32		kBtu/SF/YR		
BUILDING SOURCE EUI		**171.50**		**kBtu/SF/YR**		

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

Figure 4
Source Energy Use Intensity Distributions:
Fire and Police Buildings



C. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows tracking and assessment of energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and emphasis is being placed on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than $10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. It is vital that local government municipalities assess facility energy usage, benchmark energy usage utilizing Portfolio Manager, set priorities and goals to lessen energy usage and move forward with priorities and goals.

In accordance with the Local Government Energy Audit Program, CEG has created an ENERGY STAR account for the municipality to access and monitoring the facility's yearly energy usage as it compares to facilities of similar type. The following is the user name and password for this account:

User Name: cherryhillfd
Password: lgeaceg2009

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

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

Table 9
ENERGY STAR Performance Rating

FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Fire Station #2	N/A	N/A

See the **Statement of Energy Performance Appendix** for the detailed energy summary. An Energy Performance Rating for this facility is not applicable. A fire house falls under Energy Stars other category. At the present time there is not enough data available in the program to develop an average rating for this building type. Although the rating is not available the program is still useful for tracking building Site/Source EUI.

V. FACILITY DESCRIPTION

The 5,917 SF Fire Station is a one story facility comprised of an engine bay, day room, officer bunk, firefighter bunkroom, kitchen and exercise room. The Cherry Hill Fire Station # 2 is located on West Route 70 in the Township of Cherry Hill. The building was originally constructed in 1927 and underwent a major expansion project in 1972. The portion that is currently being used by the Cherry Hill Fire Department operates 24 hours a day as the Ladder Company for the West Side of the Township and was completely renovated in November of 2006. The portion of the building that is not part of the Fire and Rescue Service for the Township is identified as the Erlton Fire Company which has the address 807 West Route 70. This portion of the building is utilized for occasional meetings and banquets and was not included in the energy audit.

The building portion that is currently being used for the Fire Department is comprised of four (4) Engine Bays, Day Room, Officer Bunkroom, 2 FF Bunkroom's, Kitchen and Exercise Room. The facility also has a small laundry area and Shower room with a dual gender restroom facility. A portion of the Engine Room was renovated to be utilized for living space in the November 2006 renovation. During the November renovation, a new roof was also installed. The Engine Room garage doors are six (6) section, light weight aluminum framed with single pane glass in five (5) sections of the 12'x 14' door.

HVAC Systems

RTU-1 services the Firefighter bunkrooms, Exercise room and Firefighter work area. The thermostat for this unit is located in the hallway outside the bunkroom. RTU-1 appears to be significantly older than the other rooftop equipment. The unit is in good working order and appears to be properly maintained. Air filters were clean and the belts were aligned and properly tensioned at the time of the survey. The unit was modified to meet minimum outdoor air requirements with the addition of an intake air hood.

RTU-2 services the Entrance vestibule, Station officer office/bunkroom and the Dayroom. The thermostat for this unit is located in the Dayroom. The officer office/bunkroom was noticed to significantly colder than the dayroom. The unit appears to have been part of the November 2006 renovation and is good working order and also is well maintained. Air filters were clean and the belt was properly aligned and tensioned at the time of the survey. It was also noticed that the economizer was functioning properly, return air dampers were approximately 95% open and the outside air intake dampers were 5% open.

RTU-3 services the kitchen/dining areas, laundry area and shower/restroom areas. The thermostat for this area is in the dining area. It does appear that this thermostat is partially affected by the kitchen appliances, mainly the cooking range. The unit also appears to have been part of the November 2006 renovation and is good working order and also is well maintained. Air filters were clean and the belt was properly aligned and tensioned at the time of the survey. It was also noticed that the economizer was functioning properly, return air dampers were approximately 90% open and the outside air intake dampers were 10% open.

The Engine Room area is serviced by hot water fan coil units which are supplied from the existing boiler. It was determined by discussions with staff that the Engine Room fan coil units do not adequately heat the area in the winter months. It was also determined that only one unit out of four is currently operating.

Controls

Temperature Control for the Rooftops is provided by (3) separate programmable digital thermostats. Temperature readings within the space were recorded at the thermostat locations and were found to be accurate with +/- 1° of zone temperature. It was also noted that all thermostats were programmed with different set points. Thermostats were able to be overridden and at the time of the survey. It appears that the ability to override the temperature controls is an ongoing issue with staffing. This was causing the space to be extremely uneven in temperature. The thermostat that controlled the kitchen/dining areas was in an area that was being affected by use of the kitchen area to prepare meals. Thermostats located in other areas while not in an ideal locations were better located to fit the needs of the space.

Exhaust System

There are two main exhaust fans located within the facility; the Engine Room has a general exhaust fan that appears to run continuously. Through discussion with the staff at the facility, personnel like to leave this fan on continuously in order to maintain consistent air circulation throughout the Engine Room. There is a motor starter located in the day room that operates this fan. It should be noted that the Engine Room does not have a typical diesel exhaust system but does use industrial air scrubbers in the place of the exhaust system. The Engine Room exhaust fan appears to have been installed during the 1972 expansion. It was noted that this unit did not have an identification tag on it but the motor information was taken.

The kitchen area is also serviced by a roof mounted exhaust fan. Through discussions with staffing this fan also appears to run continuously. There is a wall mounted switch in the kitchen area that controls the hood exhaust fan. Excessive conditioned air was noticed to be exhausting from the space at the time of the survey. This fan was installed during the latest renovation, November 2006. Both fans are maintained and are in good working order. Belts at the time of the survey were properly tensioned and aligned.

Additional exhaust fans service areas such as the exercise room, small restroom area and main restroom and shower area. No data was collected on these fans due to there fractional HP motors with the exception of the main shower area fan. This fan is a wall mounted fan which also runs continuously due to the fact that it is tied into the light switch for the room in which it serves. It was determined that this switch is left in the on position which intern leaves the fan on. After discussion with staff it was determined that in the winter months this room is extremely cool due to the inabiltiy to overcome the amount of exhausted air with conditioned air from the rooftop unit. This appeared to be a major complaint from the staffing within the facility.

The Engine Room as mentioned does not have the typical diesel exhaust system installed. It is currently serviced by (4) Industrial Air Scrubbers.

Lighting

All areas of the facility, except for the engine bay, currently utilize either T8 or compact fluorescent technology for lighting. The engine bay still utilizes 8' industrial T12 fixtures. Refer to the **Investment Grade Lighting Audit Appendix** contained within this report for details of the various lighting systems utilized in the facility.

VI. MAJOR EQUIPMENT LIST

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

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

VII. ENERGY CONSERVATION MEASURES

ECM #1: Engine Bay Lighting Replacement

Description:

The lighting in the Engine Bay consists of 8-foot T12 industrial fixtures that contain magnetic ballasts.

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

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

Energy Savings Calculations:

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

NJ Smart Start® Program Incentives are calculated as follows:

From the Smart Start Incentive appendix, the replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: T-5 or T-8 (1-2 lamp) = $10 per fixture; T-5 or T-8 (3-4 lamp) = $20 per fixture.

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

$$\text{Smart Start®}\ Incentive = (34 \times\ \$\,10) + (0 \times\ \$\,20) = \underline{\$340}$$

Replacement and Maintenance Savings are calculated as follows:

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

$$Savings = (\,34 \times 33\%\ reduction \times \$\ 2.00) + (11 \times \$5.00) = \underline{\$78}$$

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$3,400
NJ Smart Start Equipment Incentive ($):	($340)
Net Installation Cost ($):	$3,060
Annual Maintenance Savings ($ / yr):	*$78*
Annual Energy Savings ($ / yr):	*$2,825*
Annual Net Savings ($ / yr):	*$2,903*
Simple Payback (yrs):	*1.1*
Simple Lifetime Return On Investment (%):	*2,272%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Maintenance Savings ($):	*$1,950*
Simple Lifetime Energy Savings ($):	*$70,625*

ECM #2: Lighting Controls

Description:

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

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

ASHRAE Standard 90.1-2004, Appendix G is a reference standard for modeling building efficiency. The standard estimates that lighting controls provide a 10% reduction in lighting power usage for daytime occupancies in buildings over 5,000 SF, and 15% reduction in buildings under 5,000 SF. This ECM includes dual technology occupancy sensors in the each private office, bunk room, restrooms, dining room, etc.

The ECM includes replacement of standard wall switches with occupancy sensor-type wall switches for individual rooms and ceiling mount sensors for large office areas or restroom. Sensors shall be manufactured by Sensorswitch, Watt Stopper or equivalent.

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

Light Energy = 17,573 kWh/Yr. occupancy controlled lighting.

Energy Savings Calculations:

$$Energy\ Savings = 10\% \times Occuapancy\ Sensored\ Light\ Energy\ (kWh/Yr)$$

$$Energy\ Savings = 10\% \times 17{,}573\ (kWh) = 1{,}757\ (kWh)$$

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

$$Savings. = 1{,}757\ (kWh) \times 0.179\left(\frac{\$}{kWh}\right) = \$315$$

Installation cost per dual-technology sensor (Basis: Sensorswitch or equivalent) is $160/unit including material and labor. Installation Cost = $160 x 12 motion sensors = $1,920

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

$$\text{Smart Start®}\ Incentive = (\#\ of\ \ wall\ mount\ devices \times\ \$\ 20) = (12 \times \$20) = \$240$$

It is pertinent to note that electric demand savings were unable to be estimated. Also, maintenance savings could not be adequately calculated because information was not available to baseline the savings.

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY*	
Installation Cost ($):	$1,920
NJ Smart Start Equipment Incentive ($):	($240)
Net Installation Cost ($):	*$1,680*
Annual Maintenance Savings ($ / yr):	*$0*
Annual Energy Savings ($ / yr):	*$315*
Annual Net Savings ($ / yr):	*$315*
Simple Payback (yrs):	*5.3*
Simple Lifetime Return On Investment (%):	*181%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Maintenance Savings ($):	*$0*
Simple Lifetime Energy Savings ($):	*$4,725*

ECM #3: Engine Bay Heater Upgrade

Description:

The Engine Bays are heated by four (4) unit heaters equipped with hot water coils. The remote thermostat that controls this heating unit is set at 60ºF. These units do not provide adequate heating because of losses through the garage door when open. This style of heating unit only heats the air, not the surrounding walls and floors. In addition, these units are beyond their expected 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.

Our team recommends replacing the existing unit heaters with a low intensity infrared (IR) tube heating system. When compared to convective heating systems, IR heaters provide more efficient heating in large areas and warehouses for two reasons: they only heat people and objects (not air); they can be conveniently located and directed to provide heat to only a smaller section occupied by workers. Radiant heating turns the building and the objects inside into a thermal mass. This thermal mass will maintain its temperature for a long period of time as compared to the air, and will not be as affected by infiltration (the opening of the garage doors) as the air.

This ECM recommends the replacement of all unit heaters that have met or exceeded their expected service life with Sterling Infrared Heaters or equivalent.

Energy Savings Calculations:

Garage Heat Loss Calculations:

Based on the size of the existing heating unit and the use of engineering calculations, the heat loss for the Engine Bay has been calculated to be approximately 115,000 Btu/h (40 Btu/h per SF, 2,830 SF). The Base Building Heat Loss calculation is based on maintaining a 60 º F delta in temperature between indoor and outdoor ambient, respectively.

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

$$\text{Heat Loss}_{WA} = (\text{Base Building Heat Loss} \times \text{Revised } \Delta T\ (70\ ^\circ F)) / \text{Standard } \Delta T\ (60\ ^\circ F)$$
$$= (115{,}000\ \text{Btu/h} \times 70\ ^\circ F) / (60\ ^\circ F)$$
$$= 134{,}167\ \text{Btu/h}$$

Estimated Fan Energy Savings:

Each of the four (4) unit heaters contain a small supply fan (approx. 1/6 HP) that runs each time the space calls for heating. Assuming that this motor is 80% efficient and the total run hours is 2,600 hours per year, this equates to an electrical savings of:

Fan Energy Savings = {0.746 kW/HP x Motor HP x Load Factor (0.75) x Hours of Operation x Cost of Electricity ($0.179)] ÷ Motor Efficiency

Total Fan energy Savings =1215 kWh = $217

Natural Gas Energy Savings:

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

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

Where:

H_L = Building Heat Loss, BTU/Hr. (Warm Air = 134,167 Btu/h, Infrared = 115,000 Btu/h)

HDD = number of Heating Degree Days as Specified Base Temperature
(Warm Air $HDD_{70^\circ F}$ = 6,597; Infrared $HDD_{60^\circ F}$ = 4,113 Mount Holly Airport, NJ)

Hrs = Hours per Day

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

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

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

Estimated Energy Consumption – Gas Fired Air Handling Unit:

$$EnergyUsed = \frac{(134{,}167 Btu/h) \times (6{,}597^\circ F) \times 12h}{70^\circ F \times 75\% \times 100{,}000 Btu/Therm}$$

Energy Used = 2,023 Therms/Year

Estimated Energy Consumption – Infrared Heaters:

$$EnergyUsed = \frac{(115{,}000Btu/h)\times(4{,}113°F)\times 12h}{60°F\times 84\%\times 100{,}000Btu/Therm}$$

Energy Used = 1,126 Therms/Year

Energy Savings = 2,023 – 1,126 = 897 Therms per year

Cost Savings = 897 Therms/yr x $1.57/Therm = $1,410 per year

Total Energy Savings = Fan Energy Savings + Natural Gas Savings
= $217 + $1,410 = $6,565 per year

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

The total implementation cost including material and labor is estimated at approximately $5,000. It is pertinent to note, the labor cost includes installation of the infra-red heaters and required modifications of the existing natural gas piping.

Incentives for this ECM are not currently available and maintenance savings could not be adequately calculated because information was not available to baseline the savings.

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY*	
Installation Cost ($):	$5,000
NJ Smart Start Equipment Incentive ($):	($0)
Net Installation Cost ($):	*$5,000*
Annual Maintenance Savings ($ / yr):	*$0*
Annual Energy Savings ($ / yr):	*$1,627*
Annual Net Savings ($ / yr):	*$1,627*
Simple Payback (yrs):	*3.1*
Simple Lifetime Return On Investment (%):	*323%*
Estimated ECM Lifetime (yr):	*13*
Simple Lifetime Maintenance Savings ($):	*$0*
Simple Lifetime Energy Savings ($):	*$21,151*

ECM #4: Engine Bay Garage Door Replacement

Description:

The four (4) 14'x12' garage doors currently have single-pane glass in 5 out of 6 panels with aluminum frames. This style of door allows excess heat loss and gain resulting in cooler interior surfaces during the heating season and warmer interior surfaces during the cooling season. In addition, these doors are a source of cold air infiltration into the facility during the winter months. Based on CEG research, high-performance garage doors can provide many benefits including:

- Improved comfort by reducing radiant heat exchange
- Improved indoor air quality by reducing air leakage that can bring dirt, dust, and other impurities into the building
- Lower utility bills since these garage doors are better insulated and more air-tight
- Fewer condensation problems since these garage doors stay warmer in the heating season resulting in a drier surface

This energy conservation measure would replace four (4) existing garage doors with high performance expanded polyurethane insulated garage doors as manufactured by, Clopay (model 3720) or equivalent.

Energy Savings Calculations:

General Data:

For Cherry Hill, NJ; Camden County the following is the Degree Days for January through December 2008:

Heating Degree Days (65°F Base) = 5,270 HDD recorded at the Mount Holly Airport

Total garage door area to be retrofitted = (4) 14'H x 12'L Windows; approximately 672 SF

Energy Calculation:

Existing Single Pane Garage Doors; R_{exist} = 1.5 (hr – ft^2 - °F)/Btu

New Polyurethane Insulated Garage Doors Thermal Value; Rnew = 17.2 (hr – ft^2 - °F)/Btu

$$Annual\ Energy\ Savings = 24 \times System\ Efficiency \times Garage\ Door\ Area \times \left(\frac{1}{R_{Existing}} - \frac{1}{R_{New}}\right) \times HDD$$

$$Annual\ Energy\ Savings = 24 \times 80\% \times 672\ SF \times \left(\frac{1}{1.5} - \frac{1}{17.2}\right) \times 5{,}270 = 41{,}380\ kBtu\ /\ yr$$

Conversion to Natural Gas = (41,380 kBtu * 1000 Btu per kBtu) / 100,000 Btu per Therm = 415 Therms of Natural Gas

Annual Energy Cost Savings = 415 Therms of Nat. Gas x $1.57/Therm = $652

Incentives for this ECM are not currently available and maintenance savings could not be adequately calculated because information was not available to baseline the savings.

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY*	
Installation Cost ($):	$11,340
NJ Smart Start Equipment Incentive ($):	($0)
Net Installation Cost ($):	$11,340
Annual Maintenance Savings ($ / yr):	*$0*
Annual Energy Savings ($ / yr):	*$652*
Annual Net Savings ($ / yr):	*$652*
Simple Payback (yrs):	*17.4*
Simple Lifetime Return On Investment (%):	*43.7%*
Estimated ECM Lifetime (yr):	*25*
Simple Lifetime Maintenance Savings ($):	*$0*
Simple Lifetime Energy Savings ($):	*$16,300*

ECM #5: Roof Top Unit Replacement

Description:

One (1) of the three (3) roof-top units serving the fire station is approaching its expected service life of fifteen (15) years as outlined in Chapter 36 of the 2007 ASHRAE Applications Handbook. This unit appears to be 1995 vintage, and is an excellent candidate for replacement. Due to escalating operating and maintenance costs, this unit should be replaced. The unit contains a heating and cooling section and savings can be yielded from year round operation.

This measure would replace this one (1) unit with a new energy efficient unit. The York Affinity series (DNX036N) or equivalent was utilized as a basis of design. Sizing indicated within the calculation of this ECM is based on a one for one replacement of the existing equipment. Owner should have a Professional Engineer verify heating and cooling loads prior to moving forward with this ECM.

Energy Savings Calculations:

The energy savings were calculated using the following equations and the rates found in Section I.V.

$$Cooling\ \ Energy\ \ Savings = \frac{[CoolingTon\ s \times 12{,}000\ Btu\ /\ ton]}{[1000\ W\ /\ kW]} \times \left(\frac{1}{SEER_{OLD}} - \frac{1}{SEER_{NEW}} \right) \times Avg.LoadFactor\ \times Hrs.ofCooling$$

$$Cooling\ \ Energy\ \ Savings = \frac{[3 \times 12{,}000\ Btu\ /\ ton]}{[1000\ W\ /\ kW]} \times \left(\frac{1}{11.0} - \frac{1}{16.5} \right) \times 80\% \times 1{,}800 = 1{,}571\ kwh \times \$0.179\ /\ kWh = \underline{\$281}$$

$$Heating\ Energy\ Savings = Fuel\ Consumption \times \frac{(New\ Furnace\ Efficiency - Old\ Furnace\ Efficiency)}{Old\ Furnace\ Efficiency}$$

$$Heating\ Energy\ Savings = 3{,}645\ therms \times \frac{(80\% - 75\%)}{75\%} = 228\ therms \times \$1.57\ /\ therm = \underline{\$358}$$

Installation and material cost for the roof-top unit is estimated at $6,000. It is pertinent to note that this estimate includes the demolition of the existing units and curb modifications (if required).

NJ Smart Start® Program Incentives are calculated as follows:

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

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

Maintenance savings could not be adequately calculated because information was not available to baseline the savings.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$6,000
NJ Smart Start Equipment Incentive ($):	($276)
Net Installation Cost ($):	$5,724
Annual Maintenance Savings ($ / yr):	*$0*
Annual Energy Savings ($ / yr):	*$639*
Annual Net Savings ($ / yr):	*$639*
Simple Payback (yrs):	*9.0*
Simple Lifetime Return On Investment (%):	*123%*
Estimated ECM Lifetime (yr):	*20*
Simple Lifetime Maintenance Savings ($):	*$0*
Simple Lifetime Energy Savings ($):	*$12,780*

ECM #6: Exhaust Fan Motor Replacement/Controls

Description:

Standard efficiency electric motors equal to or greater than one horsepower ranged from 78 to 81% efficient. Standard motors can easily be replaced by NEMA premium efficient motors, which require less electric to operate. This is due to better design and use of improved materials to reduce electrical losses. Many motors operate 40-80 hours per week, due to this long run period even small increases in efficiency can yield substantial energy savings.

This ECM will replace the standard exhaust fan motor serving the engine bay, with a new NEMA Premium® Efficient Motor by US Motors or equivalent. It is currently understood that the exhaust fan in the engine bay runs 24/7. This is an unnecessary run time for this application. In addition to the motor replacement CEG believes the new fan motor should be installed with a temperature and carbon monoxide control. This set up will minimize the run time of the fan and elevate the problem of excessive on time. The temperature sensor will only activate the fan when the space temperature is above 85°F. The carbon monoxide detector will be set up to maintain an acceptable PPM of Carbon Monoxide in the space. This sensor will have the ability to activate the fan at any time regardless of space temperature. Heating and cooling savings will also be realized through this installation, but for simplicity have not been included in this calculation.

Energy Savings Calculations:

The following is a list of current exhaust fan characteristics:

- Existing Motor Efficiency = 78.5%
- Annual Hours of Operations = 8,760 (Approximately)
- 1 HP = 0.746 Watt
- Cost of electricity = $0.179 / kWh

The following is a list of NEMA Premium Motor characteristics:

- New NEMA Premium Motor Efficiency = 85.5%
- Annual Hours of Operations = 2,920(Approximately eight (8) hours per day, it is important to note that this number is only an estimate. Actual runtime may be less than demonstrated in this ECM)
- 1 HP = 0.746 Watt
- Cost of electricity = $0.179 / kWh

$$Motor\ Operating\ Cost = \frac{0.746\ kW/HP \times Motor\ HP \times Hours\ of\ Operation}{Motor\ Efficiency}$$

$$Existing Motor Operating Cost = \frac{0.746 kW/HP \times 1 HP \times 8{,}760 Hours}{78.5\%} = 8{,}325 kWh \times \$0.179/kWh = \$1{,}490$$

$$New Motor/Controls Operating Cost = \frac{0.746 kW/HP \times 1 HP \times 2{,}920 Hours}{85.5\%} = 2{,}548 kWh \times \$0.179/kWh = \$456$$

Total Savings = Existing – New = $1,490 - $456 = $1,034

Smart Start Building® incentive of $50 for a 1 HP motor

Maintenance savings could not be adequately calculated because information was not available to baseline the savings.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,894
NJ Smart Start Equipment Incentive ($):	($50)
Net Installation Cost ($):	$1,844
Annual Maintenance Savings ($ / yr):	*$0*
Annual Energy Savings ($ / yr):	*$1,034*
Annual Net Savings ($ / yr):	*$1,034*
Simple Payback (yrs):	*1.8*
Simple Lifetime Return On Investment (%):	*741%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Maintenance Savings ($):	*$0*
Simple Lifetime Energy Savings ($):	*$15,510*

ECM #7: Kitchen Hood Controls

Description:

Standard kitchen hood controls consist of switches and relays that interlock the kitchen grease hood exhaust fan(s) with the 100% outside air unit that provides make-up air for the system. Normal operation of a kitchen hood system should limit fan operation to only the times the kitchen range is in use. During the site inspection, it was noted that the kitchen hood exhaust fan runs 24/7. The system in place at the facility does not utilize a 100% outdoor air unit to provide make-up air to the kitchen. Instead the fan causes the net pressure of the kitchen to go negative, which will draw conditioned air from the facility and outside infiltration into the kitchen through gaps around windows and doors. The current operation of the system, as witnessed is not necessary and is costing the facility owners many dollars in utility costs for natural gas and electric. Based on the above, there is great potential energy savings thought better controls of the hood exhaust fan. Exhaust fans consume large amounts of electricity when operating and if controlled properly, the energy consumption can be greatly reduced.

This energy conservation measure would install a Kitchen Hood Control System that consists of the following: a UL listed temperature sensor, fan controller with motor starter and interlock with ansul system (if applicable). During normal operation, the temperature sensor mounted in the kitchen hood will energize the grease exhaust fan. Once the temperature within the hood drops below the set point the grease exhaust fan will de-energize. A local switch will be provided to allow supervisory on/off control. Energy savings are realized through efficient on/off control of the kitchen hood.

Energy Savings Calculations:

The following is a list of current exhaust fan characteristics:

- Existing Motor Efficiency = 80%
- Annual Hours of Operations = 8,760 (Approximately)
- 1/3 HP Motor
- Cost of electricity = $0.179 / kWh

The following is a list of NEMA Premium Motor characteristics:

- Existing Motor Efficiency = 80%, Premium Efficient Motors not available in this size.
- Annual Hours of Operations = 2,190(Approximately eight (6) hours per day, it is important to note that this number is only an estimate. Actual runtime may be less than demonstrated in this ECM)
- 1/3 HP Motor
- Cost of electricity = $0.179 / kWh

$$Motor\ Operating\ Cost = \frac{0.746\ kW\ /\ HP \times Motor\ HP \times Hours\ of\ Operation}{Motor\ Efficiency}$$

$$Existing Motor Operating Cost = \frac{0.746 kW / HP \times 1/3\ HP \times 8{,}760\ Hours}{80\%} = 2{,}723 kWh \times \$0.179 / kWh = \$488$$

$$New Motor/Controls Operating Cost = \frac{0.746 kW / HP \times 1/3\ HP \times 2{,}190\ Hours}{80\%} = 680 kWh \times \$0.179 / kWh = \$122$$

Total Savings = Existing – New = $488 - $122 = $366

Installed cost of the kitchen hood control system is $750.

Incentives for this ECM are not currently available and maintenance savings could not be adequately calculated because information was not available to baseline the savings.

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Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$750
NJ Smart Start Equipment Incentive ($):	($0)
Net Installation Cost ($):	$750
Annual Maintenance Savings ($ / yr):	*$0*
Annual Energy Savings ($ / yr):	*$366*
Annual Net Savings ($ / yr):	*$366*
Simple Payback (yrs):	*2.1*
Simple Lifetime Return On Investment (%):	*632%*
Estimated ECM Lifetime (yr):	*15*
Simple Lifetime Maintenance Savings ($):	*$0*
Simple Lifetime Energy Savings ($):	*$5,490*

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 Cherry Hill, NJ and concluded that there is potential for solar energy generation.

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

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 985 S.F. can be utilized for a PV system. A depiction of the area utilized is shown in **Renewable / Distributed Energy Measures Calculation Appendix**. Using this square footage it was determined that a system size of 15.41 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 18,826 KWh annually, reducing the overall utility bill by approximately 15.0% percent. A detailed financial analysis can be found in the **Renewable / Distributed Energy Measures Calculation Appendix**. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

The solar panel system analysis is based on Sun Power SPR-230 panels. The panel efficiency is 18% with an inverter efficiency of 95%. This region allows for a typical range of sunlight between 4.5 and 4.9 hours per day. The calculations are based on an average 4.68 hours per day. The operating hours are calculated based on 351 days per year accounting for two weeks per year of service down time. The calculations are also based on a solar PV system which utilizes the New Jersey guidelines for net metering. Net metering allows excess energy generated at production peaks to flow onto the grid. The excess energy is metered and subtracted from the facility's total energy usage on an annual basis. Due to this allowance the system design excludes the use of inefficient battery storage.

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with

95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront via one of the methods noted in the Installation Funding Options section below. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

PAYMENT TYPE	SIMPLE PAYBACK	NET PRESENT VALUE	INTERNAL RATE OF RETURN
Self-Finance	10.83 Years	$11,977	16.8%
Direct Purchase	10.83 Years	$166,432	8.5%

*The solar energy measure is shown for reference in the executive summary REM table

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

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

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

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

Electricity:

The Electric Usage Profile demonstrates a typical electric usage profile, with increased summer profile and a lower yet steady winter usage profile. The summer usage profile (May-October) is a standard load associated with air conditioner (cooling load). Cooling is supplied by (3) three, Roof Top Units (RTU). The winter usage load profile remains steady through the balance of the year. This steady usage is due in part to the fact that this is a 24 hour ladder company. The steadier (base-load) electric profile will allow for lower energy costs when procuring from a Third Party Supplier.

Natural Gas:

The Natural Gas Usage Profile demonstrates a fairly normal heating load (November –March). This increased load usage is consistent with heating profiles. Heating is mostly sourced through the Roof Top Units (RTU's). The RTU's are supplied by natural gas. The domestic hot-water is also sourced through natural gas. The domestic hot water load will carry some usage throughout the balance of the year as this is a 24 hour operation. CEG observed a peak in natural gas usage in the month of March. There is a 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.

Tariff Analysis:

Electricity:

This 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 from a Third Party Supplier (this facility has used Woodruff Energy as a natural gas 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.

CEG has observed that Woodruff Energy has supplied natural gas on a Third Party Basis. Because the energy market has seen the lowest natural gas prices in about 10 years, Cherry Hill could see an improvement in natural gas of up to 30%.
Imbalances occur when Third Party Suppliers are used to supply natural gas, full-delivery is not made, and when a new supplier is contracted or the customer returns to the utility. It is important when utilizing a Third Party Supplier, that an experienced regional supplier is used. Otherwise, imbalances can occur, jeopardizing economics and scheduling.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities. 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 $.1542/kWh (kWh is the common unit of electric measure). The average "price to compare" per decatherm (the portion of the invoice that can be competitively shopped), for natural gas is $ 11.29 dth (dth, is the common unit of measure). Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. Cherry Hill 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 2008) and current electric rates, Cherry Hill could see an improvement in its electrical costs of up to 30%. (Note: Savings were calculated using 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 the natural gas costs. Based on the current market, Cherry Hill could improve its natural gas costs by up to 30% annually. Cherry Hill is

currently using Woodruff Energy as a Third Party Supplier. The average price per dth from the Woodruff invoices reveals a cost of $11.29 / dth. Current market prices are closer to $8.00 / dth. CEG recommends further advisement on these prices. The City should also consider procuring energy (natural gas) through alternative supply sources. CEG recommends the use of 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. The Fire Department 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 Cherry Hill 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 facility owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

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

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

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

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

XI. ADDITIONAL RECOMMENDATIONS

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

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

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

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

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

DETAILED COST BREAKDOWN PER ECM

CONCORD ENGINEERING GROUP

Cherry Hill Fire Station #2

ECM 1 Engine Bay Lighting Replacement

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Replacement	LS	$3,400	$0	$0	$3,400
Total Cost			$0	$0	$3,400
Utility Incentive - NJ Smart Start (1-2 lamp fixture $10, 3-4 lamp fixture $20)					($340)
Total Cost Less Incentive					$3,060

ECM 2 Lighting Controls

	Qty	Unit Cost $	Material $	Labor $	Total $
Lighting Controls	12	$160	$105	$55	$1,920
Total Cost			$105	$55	$1,920
Utility Incentive - NJ Smart Start ($20 per control)					($240)
Total Cost Less Incentive					$1,680

ECM 3 Engine Bay Heater Upgrade

	Qty	Unit Cost $	Material $	Labor $	Total $
Infrared Heaters	LS	$5,000	$3,000	$2,000	$5,000
Total Cost			$3,000	$2,000	$5,000
Utility Incentive - N/A					$0
Total Cost Less Incentive					$5,000

ECM 4 Engine Bay Garage Door Replacement

	Qty	Unit Cost $	Material $	Labor $	Total $
New Garage Doors	4	$2,835	$1,890	$945	$11,340
Total Cost			$1,890	$945	$11,340
Utility Incentive - N/A					$0
Total Cost Less Incentive					$11,340

ECM 5 Roof Top Unit Replacement

	Qty	Unit Cost $	Material $	Labor $	Total $
3 Ton High Efficiency Packaged Roof Top Unit	1	$6,000	$4,000	$2,000	$6,000
Total Cost			$4,000	$2,000	$6,000
Utility Incentive - N/A					($276)
Total Cost Less Incentive					$5,724

ECM 6 Exhaust Fan Motor Replacement/Controls

	Qty	Unit Cost $	Material $	Labor $	Total $
NEMA Premium Efficiency Motor	1	$614	414	200	$614
Carbon Monoxide Control	1	$1,000	500	500	$1,000
Temperature Control	1	$280	$130	$150	$280
Total Cost			$1,044	$850	$1,894
Smart Start® Incentive ($50/1 HP Motor)					($50)
Total Cost Less Incentive					$1,844

ECM 7 Kitchen Hood Controls

	Qty	Unit Cost $	Material $	Labor $	Total $
Captive Air Energy Management System	1	$750	$500	$250	$750
Total Cost			$500	$250	$750
Utility Incentive - N/A					$0
Total Cost Less Incentive					$750

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
Cherry Hill Fire Station #2

Building ID: 1853384
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: September 30, 2009

Facility
Cherry Hill Fire Station #2
805 West Route 70
Cherry Hill, NJ 08002

Facility Owner
Cherry Hill Fire Department
301 Burnt Mill Road
Cherry Hill, NJ 08003

Primary Contact for this Facility
Don Dougherty
301 Burnt Mill Road
Cherry Hill, NJ 08003

Year Built: 1970
Gross Floor Area (ft²): 5,917

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	428,274
Natural Gas (kBtu)[4]	1,174,719
Total Energy (kBtu)	1,602,993

Energy Intensity[5]

Site (kBtu/ft²/yr)	271
Source (kBtu/ft²/yr)	450

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	128

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	186%
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 South 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.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, PE facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

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	Cherry Hill Fire Station #2	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	805 West Route 70, Cherry Hill, NJ 08002	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		☐
Station #2 (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	5,917 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	2 (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	15 (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 Meter (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2008	12/31/2008	7,620.00
11/01/2008	11/30/2008	8,460.00
10/01/2008	10/31/2008	9,420.00
09/01/2008	09/30/2008	14,910.00
08/01/2008	08/31/2008	15,420.00
07/01/2008	07/31/2008	17,580.00
06/01/2008	06/30/2008	12,750.00
05/01/2008	05/31/2008	8,250.00
04/01/2008	04/30/2008	7,800.00
03/01/2008	03/31/2008	7,690.00
02/01/2008	02/29/2008	8,300.00
01/01/2008	01/31/2008	7,320.00
Electric Meter Consumption (kWh (thousand Watt-hours))		**125,520.00**
Electric Meter Consumption (kBtu (thousand Btu))		**428,274.24**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**428,274.24**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

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

Start Date	End Date	Energy Use (therms)
12/01/2008	12/31/2008	1,642.77
11/01/2008	11/30/2008	631.42
10/01/2008	10/31/2008	524.25
09/01/2008	09/30/2008	299.56
08/01/2008	08/31/2008	354.73
07/01/2008	07/31/2008	536.29
06/01/2008	06/30/2008	1,019.43
05/01/2008	05/31/2008	454.91
04/01/2008	04/30/2008	1,097.63
03/01/2008	03/31/2008	2,121.20

02/01/2008	02/29/2008	1,346.99
01/01/2008	01/31/2008	1,718.01
Gas Meter Consumption (therms)		**11,747.19**
Gas Meter Consumption (kBtu (thousand Btu))		**1,174,719.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**1,174,719.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

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

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

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Cherry Hill Fire Station #2
805 West Route 70
Cherry Hill, NJ 08002

Facility Owner
Cherry Hill Fire Department
301 Burnt Mill Road
Cherry Hill, NJ 08003

Primary Contact for this Facility
Don Dougherty
301 Burnt Mill Road
Cherry Hill, NJ 08003

General Information

Cherry Hill Fire Station #2	
Gross Floor Area Excluding Parking: (ft^2)	5,917
Year Built	1970
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Station #2	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft^2)	5,917
Number of PCs[o]	2
Weekly operating hours[o]	168
Workers on Main Shift[o]	15

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2008)	**Baseline** (Ending Date 12/31/2008)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft^2)	271	271	0	N/A	78
Source (kBtu/ft^2)	450	450	0	N/A	157
Energy Cost					
$/year	$ 40,974.00	$ 40,974.00	N/A	N/A	$ 11,797.17
$/$ft^2$/year	$ 6.92	$ 6.92	N/A	N/A	$ 1.99
Greenhouse Gas Emissions					
$MtCO_2e$/year	128	128	0	N/A	37
$kgCO_2e/ft^2$/year	22	22	0	N/A	6

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.

MAJOR EQUIPMENT LIST

Concord Engineering Group

Cherry Hill Fire Station #2

Roof Top Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Cooling Coil	Cooling Eff. (SEER)	Cooling Capacity	Heating Type	Input (MBh)	Output (MBh)	Heating Eff. (%)	Fuel	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Roof	Bunkrms, Exercise Rm, Firefighter work area	York	1	DAYA - T036N098A	NFEM073844	DX R-22	11.0	3 Tons	Gas HX	90	72	80%	Nat. Gas	208-230	3	60	14	15	1
Roof	Vestibule, Office, Bunkrm, Dayrm	York	1	D2EG036N07925EBD	N0A5439913	DX R-22	12.0	3 Tons	Gas HX	100	80	80%	Nat. Gas	208-230	3	60	3	15	12
Roof	Kitchen, Dinning, Laundry, Shower	York	1	D2EG036N07925EBD	N0A5439916	DX R-22	12.0	3 Tons	Gas HX	100	80	80%	Nat. Gas	208-230	3	60	3	15	12

Exhaust Fans

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Frame Size	NEMA Motor Efficiency	CFM	RPM / HP	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Roof	Engine Room	Baldor - Motor	1	-	-	56T	78.50%	-	1750 / 1	230/460	3	60	20	25	5
Roof	Kitchen	Penn Ventilator	1	NCA14HPFA	-	-	80.00%	1875	1300 / 1/3	115	1	60	3	25	22

Fan Coil Units

Location	Area Served	Manufacturer	Qty	Model #	Serial #	Heating Coil	Capacity (Btu/h)	Fan HP	Fan RPM	Volts	Phase	Hz	Approx. Age	ASHRAE Service Life	Remaining Life
Engine Bay Ceiling	Engine Bay	Nesbitt		345S $ 343S	-	Hot Water	≈ 75,000	-	-	115	1	60	39	20	-19

INVESTMENT GRADE LIGHTING AUDIT

CONCORD ENERGY SERVICES

CEG Job #: 9C09087
Project: Cherry Hill FD
Address: 805 Rt. 70
City: Cherry Hill
Building SF: 5,917

"Cherry Hill Fire Station #2"

DATE: 10/7/2009
KWH COST: $0.179

EXISTING LIGHTING										PROPOSED LIGHTING								SAVINGS			
Line No.	Light PC's	Fixture Location	No. eFixts	Fixture eType	Yearly Usage	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. rFixts	Retro-Unit rDescription	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost (INSTALLED)	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Payback
1		Entry Vestibule	2	6" High Hat 32W Triple Tube CFL	8760	36	0.07	630.72	$112.90	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	630.72	$112.90	0.00
2		Day Room	10	6" High Hat 32W Triple Tube CFL	8760	36	0.36	3153.6	$564.49	10	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.36	3153.6	$564.49	0.00
3	1	Day Room Office	3	6" High Hat 32W Triple Tube CFL	8760	36	0.11	946.08	$169.35	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.11	946.08	$169.35	0.00
4	1	Station Office	6	2'X2' Troffer 3-Lamp T-8 Recessed Parabolic Lens 17W	8760	47	0.28	2470.32	$442.19	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.28	2470.32	$442.19	0.00
5		Officer Bunk	2	6" High Hat 32W Triple Tube CFL	8760	36	0.07	630.72	$112.90	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	630.72	$112.90	0.00
6		Bunk #1	2	6" High Hat 32W Triple Tube CFL	8760	36	0.07	630.72	$112.90	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	630.72	$112.90	0.00
7		Bunk #2	2	6" High Hat 32W Triple Tube CFL	8760	36	0.07	630.72	$112.90	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.07	630.72	$112.90	0.00
8		Bunk #3	3	6" High Hat 32W Triple Tube CFL	8760	36	0.11	946.08	$169.35	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.11	946.08	$169.35	0.00
9		Bunkroom Hallway	1	6" High Hat 32W Triple Tube CFL	8760	36	0.04	315.36	$56.45	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.04	315.36	$56.45	0.00
10		Gym	6	2'X2' Troffer 2-Lamp T-5 Recessed Prismatic Lens 24W	8760	34	0.20	1787.04	$319.88	6	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.20	1787.04	$319.88	0.00
11		Laundry	4	2'X2' Troffer 3-Lamp T-8 Recessed Parabolic Lens 17W	8760	47	0.19	1646.88	$294.79	4	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.19	1646.88	$294.79	0.00
12			2	1'X4' 2-Lamp T-8 Ceiling Mounted Prismatic Lens 32W	8760	58	0.12	1016.16	$181.89	2	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.12	1016.16	$181.89	0.00
13		Main Lavatory	3	2'X2' Troffer 2-Lamp T-8 Recessed Parabolic Lens 17W	8760	34	0.10	893.52	$159.94	3	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.10	893.52	$159.94	0.00
14			1	6" High Hat 32W Triple Tube CFL	8760	36	0.04	315.36	$56.45	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.04	315.36	$56.45	0.00
15		Small Lavatory	1	2'X2' Troffer 2-Lamp T-8 Recessed Parabolic Lens 17W	8760	34	0.03	297.84	$53.31	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.03	297.84	$53.31	0.00
16		Lavatory Hallway	1	2'X2' Troffer 2-Lamp T-8 Recessed Parabolic Lens 17W	8760	34	0.03	297.84	$53.31	1	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.03	297.84	$53.31	0.00
17		Dining Area	8	6" High Hat 32W Triple Tube CFL	8760	36	0.29	2522.88	$451.60	8	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.29	2522.88	$451.60	0.00
18		Kitchen	5	2'X2' Troffer 2-Lamp T-8 Recessed Parabolic Lens 17W	8760	34	0.17	1489.2	$266.57	5	No Change Required	0	0.00	0	$0.00	$0.00	$0.00	0.17	1489.2	$266.57	0.00
19		Engine Bay	17	1'X8' 2-Lamp T-12 Industrial 96W	8760	222	3.77	33060.2	$5,917.78	34	1'X4' 2-Lamp 32W T-8 Prism Lens/Elect Ballast; Metalux M/N GC	58	1.97	17274.7	$3,092.17	$100.00	$3,400.00	1.80	15785.5	$2,825.61	1.20
20		Laundry Closet	1	60W Incandescent	8760	60	0.06	525.6	$94.08	1	13W CFL Lamp	13	0.01	113.88	$20.38	$7.00	$7.00	0.05	411.72	$73.70	0.09
21		Supply Closet	1	60W Incandescent	8760	60	0.06	525.6	$94.08	1	13W CFL Lamp	13	0.01	113.88	$20.38	$7.00	$7.00	0.05	411.72	$73.70	0.09
		Totals	81				6.25	54732.5	$9,797.11	98			2.00	17502.5	$3,132.94		$3,414.00	4.25	37230	$6,664.17	0.51

Lighting Controls applicable. Refer to ECM #2

Project Name: LGEA Solar PV Project - Fire Station 32
Location: Cherry Hill, NJ
Description: Photovoltaic System 95% Financing - 20 year

Simple Payback Analysis

	Photovoltaic System 95% Financing - 20 year
Total Construction Cost	$107,870
Annual kWh Production	18,826
Annual Energy Cost Reduction	$3,370
Annual SREC Revenue	$6,589
First Cost Premium	**$107,870**
Simple Payback:	**10.83** Years

Life Cycle Cost Analysis

Analysis Period (years): 25
Financing Term (mths): 240
Average Energy Cost ($/kWh) **$0.179**
Financing Rate: 7.00%
Financing %: 95%
Maintenance Escalation Rate: 3.0%
Energy Cost Escalation Rate: 3.0%
SREC Value ($/kWh) $0.350

Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	$5,394	0	0	0	$0	0	0	(5,394)	0
1	$0	18,826	$3,370	$0	$6,589	$7,096	$2,438	$425	($4,969)
2	$0	18,732	$3,471	$0	$6,556	$6,920	$2,614	$493	($4,475)
3	$0	18,638	$3,575	$0	$6,523	$6,731	$2,803	$564	($3,911)
4	$0	18,545	$3,682	$0	$6,491	$6,528	$3,006	$639	($3,272)
5	$0	18,452	$3,793	$190	$6,458	$6,311	$3,223	$527	($2,745)
6	$0	18,360	$3,907	$189	$6,426	$6,078	$3,456	$609	($2,135)
7	$0	18,268	$4,024	$188	$6,394	$5,828	$3,706	$696	($1,440)
8	$0	18,177	$4,144	$187	$6,362	$5,560	$3,974	$785	($655)
9	$0	18,086	$4,269	$186	$6,330	$5,273	$4,261	$879	$224
10	$0	17,996	$4,397	$185	$6,298	$4,965	$4,569	$976	$1,200
11	$0	17,906	$4,529	$184	$6,267	$4,635	$4,899	$1,077	$2,277
12	$0	17,816	$4,665	$184	$6,236	$4,281	$5,253	$1,183	$3,460
13	$0	17,727	$4,805	$183	$6,204	$3,901	$5,633	$1,292	$4,753
14	$0	17,638	$4,949	$182	$6,173	$3,494	$6,040	$1,407	$6,159
15	$0	17,550	$5,097	$181	$6,143	$3,057	$6,477	$1,525	$7,684
16	$0	17,462	$5,250	$180	$6,112	$2,589	$6,945	$1,648	$9,332
17	$0	17,375	$5,408	$179	$6,081	$2,087	$7,447	$1,776	$11,108
18	$0	17,288	$5,570	$178	$6,051	$1,548	$7,986	$1,909	$13,017
19	$0	17,202	$5,737	$177	$6,021	$971	$8,563	$2,046	$15,063
20	$0	17,116	$5,909	$176	$5,991	$352	$9,182	$2,189	$17,253
21	$0	17,030	$6,086	$175	$5,961	$298	$8,441	$3,132	$20,385
22	$0	16,945	$6,269	$175	$5,931	$204	$6,946	$4,875	$25,259
23	$0	16,860	$6,457	$174	$5,901	$0	$0	$12,184	$37,444
24	$0	16,776	$6,651	$173	$5,872	$0	$0	$12,350	$49,793
25	$0	16,692	$6,850	$172	$5,842	$0	$0	$12,521	$62,314
	Totals:	359,161	$90,549	$2,930	$125,706	$88,203	$102,476	$117,864	$263,124
					Net Present Value (NPV)			**$11,977**	
					Internal Rate of Return (IRR)			**16.8%**	

Project Name: LGEA Solar PV Project - Fire Station 32
Location: Cherry Hill, NJ
Description: Photovoltaic System - Direct Purchase

Simple Payback Analysis

	Photovoltaic System - Direct Purchase
Total Construction Cost	$107,870
Annual kWh Production	18,826
Annual Energy Cost Reduction	$3,370
Annual SREC Revenue	$6,589
First Cost Premium	**$107,870**
Simple Payback:	**10.83** **Years**

Life Cycle Cost Analysis

Analysis Period (years):	25	Financing %:	0%
Financing Term (mths):	0	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.179**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	0.00%	SREC Value ($/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	$107,870	0	0	0	$0	(107,870)	0
1	$0	18,826	$3,370	$0	$6,589	$9,959	($97,911)
2	$0	18,732	$3,471	$0	$6,556	$10,027	($87,884)
3	$0	18,638	$3,575	$0	$6,523	$10,098	($77,785)
4	$0	18,545	$3,682	$0	$6,491	$10,173	($67,612)
5	$0	18,452	$3,793	$190	$6,458	$10,061	($57,551)
6	$0	18,360	$3,907	$189	$6,426	$10,143	($47,408)
7	$0	18,268	$4,024	$188	$6,394	$10,230	($37,178)
8	$0	18,177	$4,144	$187	$6,362	$10,319	($26,859)
9	$0	18,086	$4,269	$186	$6,330	$10,413	($16,447)
10	$0	17,996	$4,397	$185	$6,298	$10,510	($5,937)
11	$0	17,906	$4,529	$184	$6,267	$10,611	$4,675
12	$0	17,816	$4,665	$184	$6,236	$10,717	$15,392
13	$0	17,727	$4,805	$183	$6,204	$10,826	$26,218
14	$0	17,638	$4,949	$182	$6,173	$10,940	$37,159
15	$0	17,550	$5,097	$181	$6,143	$11,059	$48,218
16	$0	17,462	$5,250	$180	$6,112	$11,182	$59,400
17	$0	17,375	$5,408	$179	$6,081	$11,310	$70,710
18	$0	17,288	$5,570	$178	$6,051	$11,443	$82,152
19	$0	17,202	$5,737	$177	$6,021	$11,580	$93,733
20	$0	17,116	$5,909	$176	$5,991	$11,723	$105,456
21	$1	17,030	$6,086	$175	$5,961	$11,871	$117,327
22	$2	16,945	$6,269	$175	$5,931	$12,025	$129,353
23	$3	16,860	$6,457	$174	$5,901	$12,184	$141,537
24	$4	16,776	$6,651	$173	$5,872	$12,350	$153,887
25	$5	16,692	$6,850	$172	$5,842	$12,521	$166,407
	Totals:	359,161	$90,549	$2,930	$125,706	$274,277	$213,326
				Net Present Value (NPV)		**$166,432**	
				Internal Rate of Return (IRR)		**8.5%**	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Fire Station #2	1089	Sunpower SPR230	67	14.7	985	15.41	18,826	2,211	15.64

.= Proposed PV Layout

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

AC Energy & Cost Savings

Cautions for Interpreting the Results

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	15.4 kW
DC to AC Derate Factor:	0.810
AC Rating:	12.5 kW
Array Type:	Fixed Tilt
Array Tilt:	10.0°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	17.9 ¢/kWh

Results			
Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	2.58	1001	179.18
2	3.33	1182	211.58
3	4.31	1651	295.53
4	5.20	1880	336.52
5	5.85	2148	384.49
6	6.14	2090	374.11
7	6.06	2112	378.05
8	5.54	1941	347.44
9	4.85	1669	298.75
10	3.76	1362	243.80
11	2.65	955	170.94
12	2.23	836	149.64
Year	4.38	18826	3369.85

Output Hourly Performance Data * Output Results as Text

About the Hourly Performance Data — Saving Text from a Browser

Run PVWATTS v.1 for another US location or an International location
Run PVWATTS v.2 (US only)

Please send questions and comments regarding PVWATTS to Webmaster

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