LOCAL GOVERNMENT ENERGY AUDIT PROGRAM: ENERGY AUDIT REPORT

PREPARED FOR: **VOORHEES TOWNSHIP - POLICE DEPARTMENT**

1180 WHITE HORSE ROAD
VOORHEES, NJ 08043

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REPORT ISSUANCE: **FINAL, JANUARY 20, 2012**

PROJECT NO: **9C11032**

VOORHEES TOWNSHIP
POLICE DEPARTMENT

1180 WHITE HORSE ROAD
VOORHEES, NJ 08043

FACILITY ENERGY REPORT

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I. EXECUTIVE SUMMARY

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

Voorhees Township Police Department
1180 White Horse Road
Voorhees, NJ 08043

Municipal Contact Person: Jay Sherbine – Planning Board Voorhees Twp.
Facility Contact Person: Joseph Hale – Code Enforcement Officer

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 efficient use of energy.

The annual energy costs at this facility are as follows:

Electricity	$ 46,886
Natural Gas	$ 5,054
Total	$ 51,940

The potential annual energy cost savings for each energy conservation measure (ECM) and renewable energy measure (REM) are shown below in Table 1. Be aware that the ECM's and REM'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 Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST[A]**	**ANNUAL SAVINGS[B]**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
ECM #1	General Lighting & Re-Lamping Interior Fixtures	$2,674	$1,746	1.5	879.4%
ECM #2	General Lighting & Re-Lamping Exterior Fixtures	$1,520	$2,141	0.7	2013.1%
ECM #3	Lighting Occupancy Interior Fixtures	$1,910	$916	2.1	619.4%
ECM #4	High Efficiency Domestic Hot Water	$4,050	$314	12.9	16.3%
ECM #5	Replace 4 Carrier Split Units	$49,590	$10,070	4.9	204.6%
ECM #6	Replace AC-4 Condensing Unit Only	$6,974	$1,137	6.1	144.6%
ECM #7	Premium Efficiency Motor	$738	$216	3.4	339.4%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	**DESCRIPTION**	**NET INSTALLATION COST**	**ANNUAL SAVINGS**	**SIMPLE PAYBACK (Yrs)**	**SIMPLE LIFETIME ROI**
REM #1	28.6 KW PV Array	$240,618	$22,745	10.6	41.8%

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

Table 2
Estimated Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
ECM #1	General Lighting & Re-Lamping Interior Fixtures	2.3	11,411	-
ECM #2	General Lighting & Re-Lamping Exterior Fixtures	1.3	5,871	-
ECM #3	Lighting Occupancy Interior Fixtures	1.5	5,984	-
ECM #4	High Efficiency Domestic Hot Water	-	-	314.0
ECM #5	Replace 4 Carrier Split Units	15.7	31,342	-
ECM #6	Replace AC-4 Condensing Unit Only	1.8	3,539	-
ECM #7	Premium Efficiency Motor	0.1	1,413	-
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	NATURAL GAS (THERMS)
REM #1	28.6 KW PV Array	28.6	42,229	-

Table 3
Energy Savings Improvement Program Table Summary

ENERGY SAVINGS IMPROVEMENT PROGRAM					
ENERGY CONSERVATION MEASURES	**ANNUAL ENERGY SAVINGS ($)**	**PROJECT COST ($)**	**SMART START INCENTIVES**	**CUSTOMER COST**	**SIMPLE PAYBACK**
General Lighting & Re-Lamping Interior Fixtures	$1,746	$2,674	$0	$2,674	1.5
General Lighting & Re-Lamping Exterior Fixtures	$2,141	$1,520	$0	$1,520	0.7
Lighting Occupancy Interior Fixtures	$916	$2,435	$525	$1,910	2.1
High Efficiency Domestic Hot Water	$314	$4,100	$50	$4,050	12.9
Replace 4 Carrier Split Units	$10,070	$53,170	$3,580	$49,590	4.9
Replace AC-4 Condensing Unit Only	$1,137	$7,250	$276	$6,974	6.1
Premium Efficiency Motor	$216	$788	$50	$738	3.4
Design / Construction Extras (15%)	-	*$10,791*	-	*$10,118*	-
Total Project	**$16,541**	**$82,728**	**$4,481**	**$77,574**	**4.7**

Fast Payback - Energy Conservation Measures:

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

- **ECM #1:** General Lighting & Re-Lamping Interior Fixtures (1.5 Yrs)
- **ECM #2:** General Lighting & Re-Lamping Exterior Fixtures (1.4 Yrs)
- **ECM #3:** Lighting Occupancy Controls Interior Fixtures (2.1 Yrs)
- **ECM #7:** Premium Efficiency Motor (3.4 Yrs)

Operational and Maintenance Considerations:

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

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

Renewable Energy Measures:

Renewable Energy Measures (REMs) were also reviewed for implementation at Voorhees Township Police Department. CE used a site survey and aerial photographs to determine the optimal location of a solar array. The array would be placed along the side parking lot of the building, with additional capacity in the front parking area. This area would be canopy based, as there is no suitable location on the roof for a roof mounted system. The recommended 28.6 kW PV system will produce approximately 42,229 kWh of electricity annually and will reduce the building electrical consumption from the grid by 13.76%. A larger array could not be sized due to shading concerns near the building and a lack of available roof space.

Overall Assessment:

Overall, the Voorhees Township Police Department is currently operating with adequately efficient mechanical and lighting equipment. The building is currently still using the equipment that was installed in the original construction in 2001. CE recommends replacing this equipment with higher efficiency equipment based on the ECM calculations provided. Additional upgrades to high efficiency equipment should be considered as equipment reaches the end of its useful service life, such as occupancy based controls and tighter operating schedules. The occupancy based controls would help greatly because the building has various occupancy loads at different points during the day which leads to energy usage in certain areas of the building that are not in use. For example the cell block area during the site survey was not currently in use by the department, however the lighting and mechanical equipment were in operation in this area of the building. It is also estimated based on the site survey that a large percentage of lighting in the building is left on regardless of the occupancy of the area that is being lit. These areas contain potential energy savings through the installation of lighting occupancy controls and the avoidance of unnecessary extended run periods of heating and cooling equipment in minimally occupied areas.

CE highly recommends that the Voorhees Township Police Department take advantage of the funding opportunities summarized at the end of this report. There is a great opportunity to provide alternative funding to the energy projects utilizing NJ Direct Install and the NJ DCA's Energy Savings Improvement Program (Public Law 2009, Chapter 4).

II. INTRODUCTION

The comprehensive energy audit covers the Voorhees Township Police Station. The 10,380 SF one story building is comprised of an entrance area, numerous offices, a currently unused dispatch room, parking facility, holding cells, storage, and a server 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 were utilized for additional background information. The building envelope, lighting systems, HVAC equipment, and controls information gathered from building drawings allow for a more accurate 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 the facility operates:

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

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

III. METHOD OF ANALYSIS

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

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

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

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

ECM Calculation Equations:

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

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

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

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

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

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

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

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

The total 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 Voorhees Township.

The electric usage profile represents the electrical usage for the facility. PSE&G provides electricity to the facility under their General Service Secondary Three-Phase rate structure. The township has contracted Nextera Energy Services New Jersey, a Third Party Supplier (TPS), to provide electric commodity supply (generation) service. 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 natural gas energy usage for the facility. South Jersey Gas provides natural gas to the facility. There is currently no TPS for gas in use at the Police Department. 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.

Table 4
Electricity Billing Data

ELECTRIC USAGE SUMMARY

Utility Provider: PSE&G
Rate: GLP
Meter No: 728004221
Account # 6655970202
Third Party Utility Provider: Nextera Energy Services New Jersey, LLC
TPS Meter / Acct No: -

MONTH OF USE	CONSUMPTION KWH	DEMAND KW	TOTAL BILL
Aug-10	31,520	72.0	$5,450
Sep-10	33,040	69.6	$5,708
Oct-10	27,680	66.4	$4,072
Nov-10	20,960	57.6	$3,077
Dec-10	21,680	50.4	$3,133
Jan-11	22,000	37.6	$3,130
Feb-11	18,960	38.4	$2,882
Mar-11	19,280	40.8	$2,628
Apr-11	21,440	56.0	$2,993
May-11	27,360	60.0	$3,794
Jun-11	30,480	64.0	$4,902
Jul-11	32,560	58.4	$5,119
Totals	**306,960**	**72.0 Max**	**$46,886**

AVERAGE DEMAND **55.9 KW average**
AVERAGE RATE **$0.153** **$/kWh**

Figure 1
Electricity Usage Profile

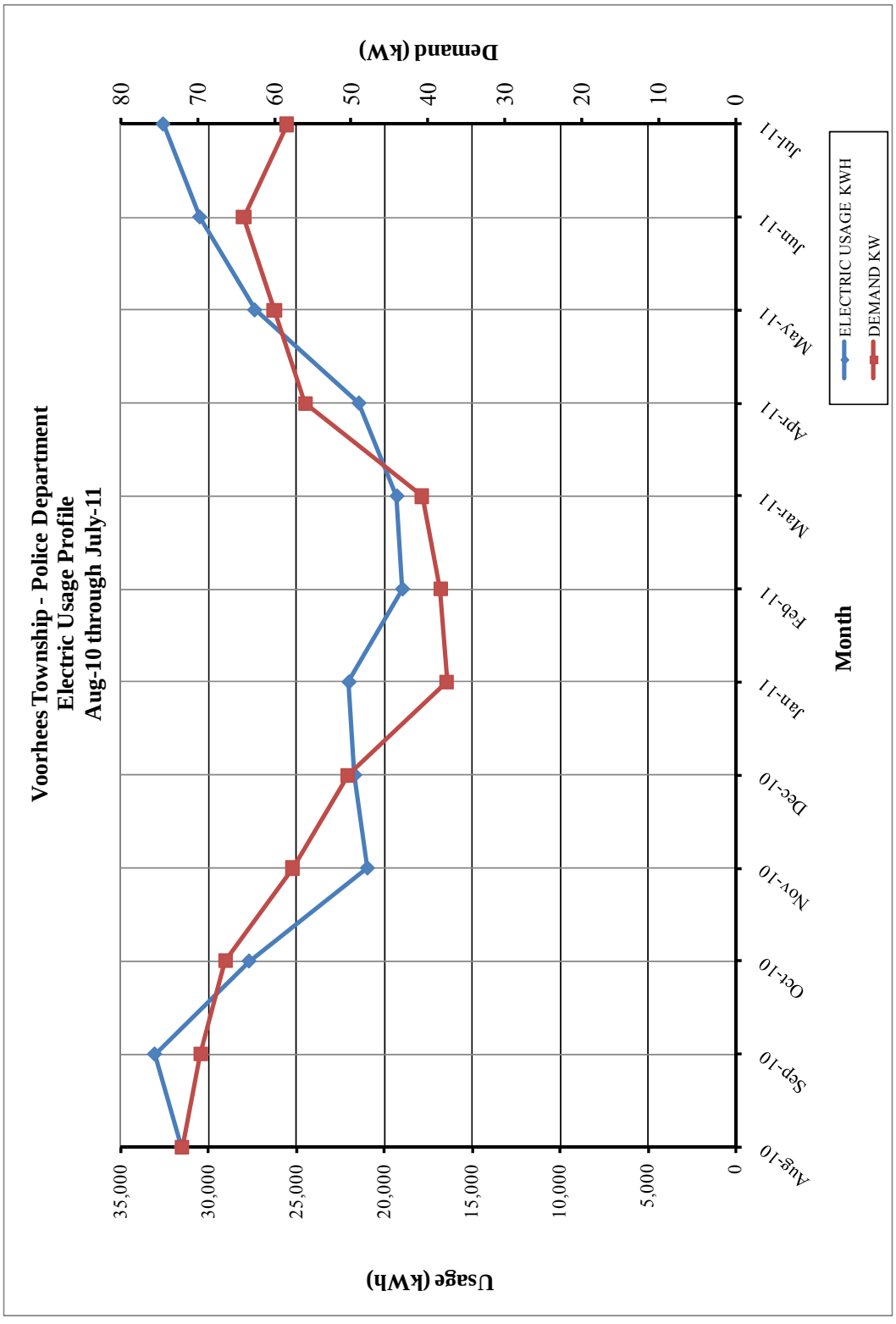
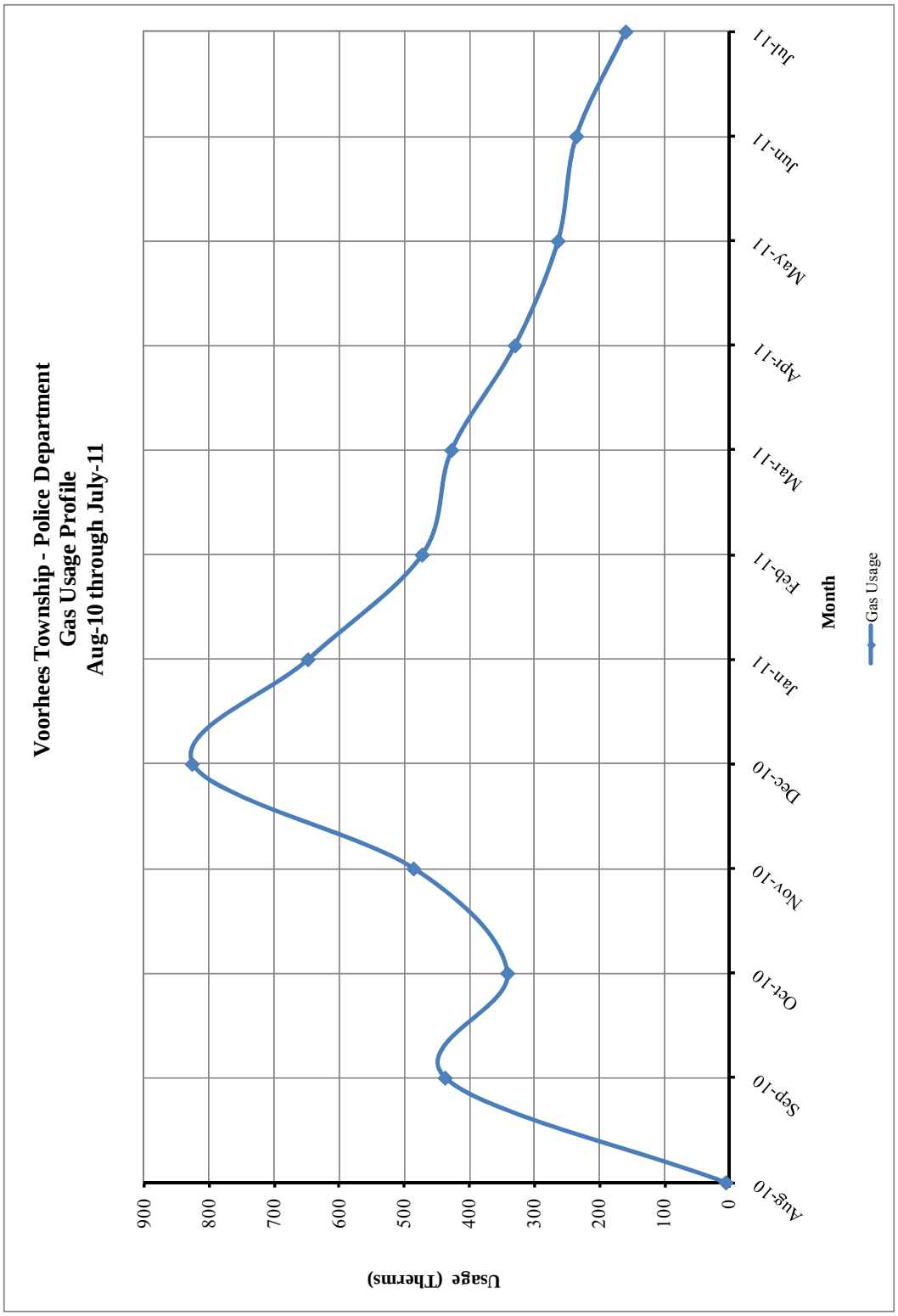


Table 5
Natural Gas Billing Data

NATURAL GAS USAGE SUMMARY		
Utility Provider: South Jersey Gas		
Rate: GSG		
Meter No: 397792		
Point of Delivery ID: 2-01-35-0071-0-0		
Third Party Utility Provider: N/A		
TPS Meter No: N/A		
MONTH OF USE	**CONSUMPTION (THERMS)**	**TOTAL BILL**
Aug-10	6.14	$27.02
Sep-10	437.08	$456.15
Oct-10	341.33	$379.03
Nov-10	485.45	$534.43
Dec-10	825.34	$732.80
Jan-11	647.56	$732.03
Feb-11	472.42	$532.36
Mar-11	427.23	$467.64
Apr-11	329.80	$385.63
May-11	263.67	$318.00
Jun-11	235.43	$288.98
Jul-11	159.70	$200.39
TOTALS	**4,631.15**	**$5,054.47**
AVERAGE RATE:	**$1.09**	**$/THERM**

*The meter reading taken by South Jersey Gas in August 2010 was estimated resulting in a lower than expected use of Therms for the month. The actual reading taken in September is higher than expected due to the lower reading the month prior.

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:

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

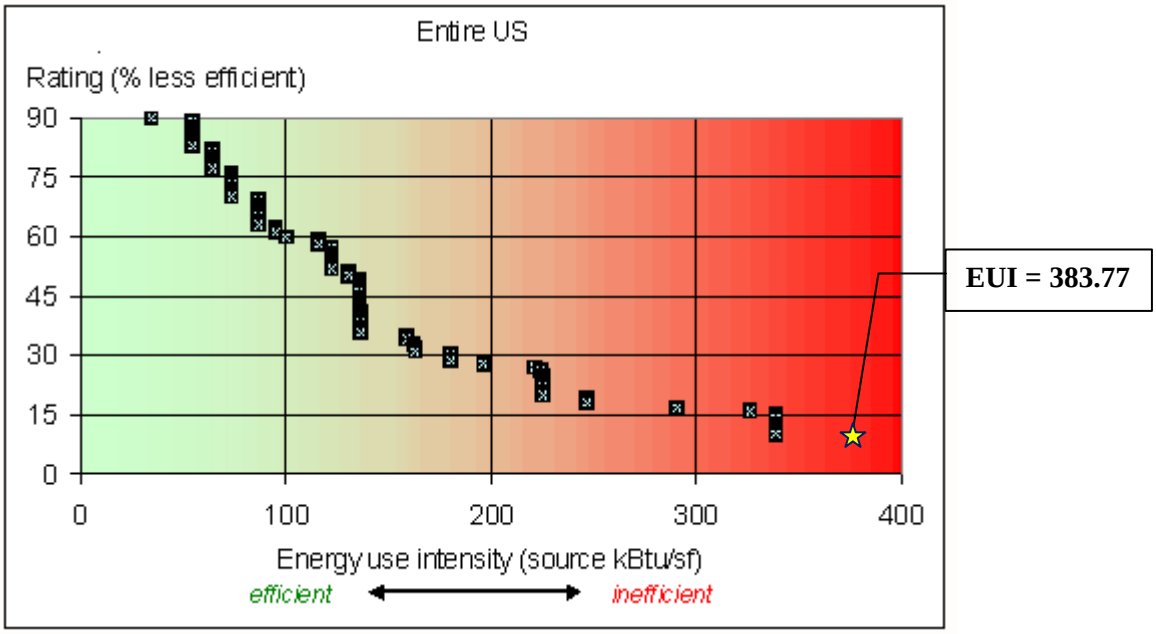
$$\text{Building Source EUI} = \frac{(\text{Electric Usage in kBtu X SS Ratio} + \text{Gas Usage in kBtu X SS Ratio})}{\text{Building Square Footage}}$$

Table 6
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	306,960.0			1,047,961	3.340	3,500,191
NATURAL GAS		4,631.2		463,115	1.047	484,881
TOTAL				1,511,076		3,985,073
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA		10,384	SQUARE FEET			
BUILDING SITE EUI		*145.52*	kBtu/SF/YR			
BUILDING SOURCE EUI		*383.77*	kBtu/SF/YR			

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

Figure 3
Source Energy Use Intensity Distributions: Public Order Buildings



Although the national average chart indicates an inefficient rating, based on Concord Engineering's utility database, the Police Department utility usage is comparable to other 24/7 facilities in South Jersey.

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, CE has created an ENERGY STAR account for the municipality to access and monitoring the facility's yearly energy usage as it compares to facilities of similar type. The login page for the account can be accessed at the following web address; the username and password are also listed below:

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

User Name:	VoorheesTwpPolice
Password:	lgeaceg2011
Security Question:	What city were you born in?
Security Answer:	Voorhees

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 7
ENERGY STAR Performance Rating

ENERGY STAR PERFORMANCE RATING PER FACILITY			
FACILITY	**ENERGY STAR PERFORMANCE RATING**		
DESCRIPTION	**SCORE**	**AVERAGE**	**POTENTIAL CERTIFICATIONS**
Voorhees Township Police Department	11	50	N/A

See the Appendix C - Statement of Energy Performance for comparative facilities
Score: "N/A" represents facility that could not receive a rating. See Energy Star website for details.

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

V. FACILITY DESCRIPTION

The Voorhees Township Police Station is located at 1180 White Horse Road, Voorhees NJ. The building serves the Voorhees Township Police Force, with dispatch employees being relocated to a county-wide facility in another location. The 10,380 SF, one story building, is comprised of an entrance area, offices, a dispatch room, parking facility, holding cells, storage, a rear sally port, ammo room, and a server room. The building was originally constructed in 2001 and has seen no recent additions or significant renovations.

Occupancy Profile

The facility has some form of occupancy 24 hours a day everyday of the year. This occupancy varies with the time of day, peak occupancy occurs during normal business hours (8am to 5pm). During off peak hours there are an estimated six police officers that occupy the building. Based on a site survey it was determined that the majority of corridor space and select rooms have lighting operating 24 hours a day even when those areas are not occupied by building personnel.

Building Envelope

The exterior walls of the facility are split face brick construction. The facility is estimated to have a low rate of infiltration (air leakage through cracks, doors, and windows) due to its reasonably new construction. The facility windows are in good condition and located primarily along the front wall of the building near the entrance. The facility entrance is a round entrance with stone construction. The majority of the roof structure is a standing seam metal pitched roof. The rear parking section of the facility and sallyport in the rear have a flat built up rubber roof structure.

HVAC Systems

Heating for the building is provided through a combination of a hot water boiler plant that supplies heating hot water to various single duct variable air volume boxes with heating coils, cabinet unit heaters, and reheat coils. The system is summarized below.

- *Heating Plant*: Heating hot water for the building is provided by a single A.O. Smith Legend 2000 gas fired boiler. The boiler is located in the mechanical room and has an input capacity of 580 MBH with an output capacity of 520 MBH resulting in a 90% combustion efficiency. The boiler was manufactured in 2000 and is original to the facility. The service life on a boiler of this type and condition is 25 years, as rated by ASHRAE. Building occupants stated the temperature was comfortable in cooler months of the year.

  Hot water is pumped from the boiler to the system via a single In-Line circulator pump as manufactured by Bell & Gossett with a Baldor motor. The pump runs at a constant speed of 1725 RPM with an operating efficiency of 78.5%, this pump does not make use of a NEMA efficient motor. In-Line pumps have a service life of 10 years. The pump has exceeded its useful service life and should be replaced with a NEMA efficient model to reduce energy consumption and avoid a unit failure during heating season.

The Voorhees Township Police Station includes four split system units with zones served by single duct VAV boxes containing heating coils. The air handling units have DX cooling coils and are paired with the remote air-cooled condensing units. The condensing units are 10 years old and installed with original building construction in 2001. The ASHRAE defined service life for split system condensing units is 15 years. A Mitsubishi Mr. Slim was recently installed to provide cooling for the technology and server room. A brief description of the air handling systems is provided below.

Condensing Units

- *AC-1 & AC-2*: Two identical Carrier model 38AKS024 split system condensing units are located at grade along the building perimeter. These units feed back into the mechanical room which contains a separate air handler for each unit. The units have a cooling capacity of 18 Tons each, operating DX R-22 cooling at an efficiency of 9.0 EER.

- *AC-3:* A Carrier model 38AK007 split system condensing unit is located at grade along the building perimeter with the larger two Carrier units. The unit feeds back to a smaller air handling unit located in the mechanical room. The DX R-22 based unit cools with an EER rating of 9.2 and a capacity of 5 Tons.

- *AC-4:* A small condensing unit provides cooling to the dispatch area of the building. AC-4 is Carrier model CKC042 air cooled split system condensing unit with a capacity of 3.5 Tons cooling. The unit operates with an EER efficiency of 9.5, the unit uses DX R-22 refrigerant. The condenser fins, coil, and fan of this unit appear rusted from weather, and in poor condition. A unit operating in this condition will produce less cooling at a lower efficiency than a well maintained unit.

- *Mitsubishi-Mr. Slim*: A Mitsubishi Mr. Slim condensing unit serves the technology and server room of the police department. This room contains the building servers, which require a dedicated cooling system due to the heat generated by the electronics. The technology room is a small space and requires only a 1 Ton cooling capacity unit. The unit has a high efficiency of 12.8 EER and uses R-410A the new standard refrigerant over the older R-22 refrigerant based systems. The unit was installed in the past year and is in like new condition.

HVAC System Controls

Voorhees Township Police Department HVAC systems are controlled through a Honeywell Rapid link controller located in the mechanical room. The system was installed in 2001 with the original building construction. Based on the site survey and contact with the provider the control system was determined to provide limited temperature control and scheduling over the building.

Domestic Hot Water

Domestic hot water for the facility bathrooms and sinks is provided by a single hot water heater. The following is a brief description of the system:

- *Domestic Hot Water*: A State Select domestic hot water heater provides the facility hot water needs for bathrooms and sinks. The heater is located within the mechanical room, behind air handling units AHU-1 and AHU-2. It appeared to be in good condition based on a site survey, is original to the building (2001). The domestic unit has a tank capacity of 40 gallons, and can recover 41 gallons per hour with an efficiency of 80%. A hot water heater has a typical ASHRAE service life of 12 years.

Lighting and Electronics

The computers in use at Voorhees Township Police Station are currently using LCD based monitors exclusively. CE recommends as monitors are replaced that Voorhees Township uses LED (Light Emitting Diode) based backlight monitors. LED monitor's uses less energy and provide a brighter image to the user over traditional LCD monitors. At this time no significant energy savings would be gained by replacing existing units

Refer to the **Investment Grade Lighting Audit Appendix** for a detailed list of the lighting throughout the facility and estimated operating hours per space.

VI. MAJOR EQUIPMENT LIST

The equipment list contains major energy consuming equipment that through implementation of 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.

ECM #1: Lighting Upgrade – General Lighting & Re-Lamping Interior Fixtures

Description:

Majority of the interior lighting throughout the Voorhees Township Police Department building is provided with fluorescent fixtures with older generation, 700 series 32W T8 lamps and electronic ballasts. Although 700 series T8 lamps are considered fairly efficient, further energy savings can be achieved by replacing the existing T8 lamps with new generation, 800 series 28W T8 lamps without compromising light output.

This ECM includes re-lamping of the existing fluorescent fixtures with 800 series, 28W T8 lamps. The new, energy efficient T8 fixtures will provide adequate lighting and will save on electrical costs due to better performance of the lamp.

It is recommended that Voorhees Township Police Department review current occupancy loads of lighting prior to implementation of this ECM. This could be accomplished by setting up data loggers to monitor the light usage in the building over a set time period. Currently the usage was estimated based on typical building occupancy and a site survey. The data logger information would inform Voorhees Township on the exact usage in hours of the building lighting and provide a better estimate on energy savings from this ECM.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the hours of operation, proposed retrofits, costs, savings, and payback periods for each set of fixtures in the each building. Installation costs for this measuring include material cost only as the lamp installation can be completed by township staff.

Rebates and Incentives:

There are currently no Smart Start Incentive's for the replacement of the interior light fixtures.

Replacement and Maintenance Savings:

Maintenance savings is negligible for this ECM and has not been included in the energy savings summary

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,674
Net Installation Cost ($):	$2,674
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$1,746
Total Yearly Savings ($/Yr):	$1,746
Estimated ECM Lifetime (Yr):	15
Simple Payback	1.5
Simple Lifetime ROI	879.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$26,190
Internal Rate of Return (IRR)	65%
Net Present Value (NPV)	$18,169.63

ECM #2: Lighting Upgrade – General Lighting & Re-Lamping Exterior Fixtures

Description:

Exterior lighting throughout the Voorhees Township Police Department building is provided by high intensity discharge surface and recessed fixtures and both incandescent and fluorescent type fixtures. This ECM includes re-lamping or replacement of existing fixtures with new higher efficiency lighting that requires a lower energy use for the same light output. If re-lamping is recommended at a minimum the, the fixture lenses should be replaced as the existing lenses are discolored and brittle after years of being exposed to the elements.

Exterior lighting is controlled via time clock and typically operates from dusk to dawn or less.

Energy Savings Calculations:

The **Investment Grade Lighting Audit Appendix** outlines the hours of operation, proposed retrofits, costs, savings, and payback periods for each set of fixtures in the each building.

Replacement and Maintenance Savings:

Maintenance savings is negligible for this ECM and has not been included in the energy savings summary

Energy Savings Summary:

ECM #2 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$1,520
Net Installation Cost ($):	$1,520
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$2,141
Total Yearly Savings ($/Yr):	$2,141
Estimated ECM Lifetime (Yr):	15
Simple Payback	0.7
Simple Lifetime ROI	2013.1%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$32,119
Internal Rate of Return (IRR)	141%
Net Present Value (NPV)	$24,042.06

ECM #3: Lighting Controls – Occupancy Sensors Interior Fixtures

Description:

A large number of lights are left on in the police department when the rooms are unoccupied and not in use. 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 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 expected to be 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.

The U.S. Department of Energy sponsored a study to analyze energy savings achieved through various types of building system controls. The referenced savings is based on the "Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways," document posted for public use April 2005. The study has found that commercial buildings have the potential to achieve significant energy savings through the use of building controls. The average energy savings are as follows based on the report:

- Occupancy Sensors for Lighting Control 20% - 28% energy savings.

Savings resulting from the implementation of this ECM for energy management controls are estimated to be 20% of the total light energy controlled by occupancy sensors. The majority of savings

This ECM includes installation of ceiling or switch mount sensors for individual offices, classrooms, large bathrooms, and libraries. Sensors shall be manufactured by Sensorswitch, Watt Stopper or an equivalent device. 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 the applicable percent savings for each area that includes lighting controls.

Energy Savings Calculations:

$$\text{EnergySavings} = (\%\,\text{Savings} \times \text{ControlledLight Energy}(\text{kWh/Yr}))$$

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

Rebates and Incentives:

Installation cost per dual-technology sensors (Basis: Sensor switch or equivalent) are as follows:

Dual Technology Occupancy Sensor - Switch Mnt.	$150 per installation
Dual Technology Occupancy Sensor - Remote Mnt.	$300 per installation

Cost includes material and labor.

From the **NJ Smart Start® Program Incentives Appendix**, the installation of a lighting control device warrants the following incentive:

Occupancy Sensor Fixture Mounted (existing facility only) = $20 per sensor
Occupancy Sensor Remote Mounted (existing facility only) = $35 per sensor

Energy Savings Summary:

ECM #3 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$2,435
NJ Smart Start Equipment Incentive ($):	$525
Net Installation Cost ($):	$1,910
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$916
Total Yearly Savings ($/Yr):	$916
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.1
Simple Lifetime ROI	619.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$13,740
Internal Rate of Return (IRR)	48%
Net Present Value (NPV)	$9,025.15

ECM #4: High Efficiency Gas Hot Water Heater

Description:

Hot water for the bathroom facilities and sinks at the Voorhees Township Police Department is provided by a State Select domestic hot water heater located within mechanical room. The unit uses combustion of natural gas to heat a 40 gallon storage tank and is stored in the tank until used by building personnel. The unit was installed in 2001 when the police station was constructed. A high efficiency unit was not installed and the unit operates with an efficiency rating of 80%. A rating of 80% would lose 20% of its potential heating energy during the heating process. These loses are high compared to modern high efficiency units that operate with efficiency ratings above 90%.

The baseline usage of the gas domestic hot water heater is based on the provided utility bill information. The utility information was used to determine the site usage during months when the hot water boiler was not in use. By averaging these months an estimated gas usage by the domestic hot water heat was determined.

This ECM will show the savings and cost effect of replacing the original gas domestic water heater with a new high efficiency gas water heater. Concord Engineering recommends replacing the unit at the end of its service life in two years. The useful service life as defined by ASHRAE for a unit of this type is 12 years. The unit currently does not have enough usage to necessitate an immediate replacement. CE recommends that the unit be replaced with a high efficiency unit of similar specifications to the one used in the basis for this calculation. The basis of the calculation was an A.O. Smith Vertex Power Direct Vent residential hot water heater. Voorhees Township Police Department should retain a professional engineer to finalize the sizing and design of the system upon replacement.

Energy Savings Calculations:

CONDENSING DOM. HOT WATER HEATER CALCULATIONS			
ECM INPUTS	**EXISTING**	**PROPOSED**	**SAVINGS**
ECM INPUTS	Existing Hot Water Heater	High Efficiency Hot Water Heater	-
Building Type	Police Station	Police Station	-
Area Served	Bathrooms & Sinks	Bathrooms & Sinks	-
DHW Heating Fuel Type	Gas	Gas	-
Heating Efficiency	80%	96%	16%
Nat Gas Cost ($/Therm)	$1.09	$1.09	-
ENERGY SAVINGS CALCULATIONS			
ECM RESULTS	**EXISTING**	**PROPOSED**	**SAVINGS**
Nat Gas Consumption (Therms)	1,800	1,512	288
Energy Cost ($)	$1,962	$1,648	$314

Cost, Rebates and Incentives:

The total installed of an A.O. Smith Vertex Power Direct Vent 100 MBH residential hot water heater is **$4,050.**

From the **NJ Smart Start® Program Appendix**, the hot water heater installation falls under the category "Gas Water Heating" and warrants an incentive as follows:

Smart Start ® Incentive: $50 per unit

Energy Savings Summary:

ECM #4 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$4,100
NJ Smart Start Equipment Incentive ($):	$50
Net Installation Cost ($):	$4,050
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$314
Total Yearly Savings ($/Yr):	$314
Estimated ECM Lifetime (Yr):	15
Simple Payback	12.9
Simple Lifetime ROI	16.3%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$4,710
Internal Rate of Return (IRR)	2%
Net Present Value (NPV)	($301.49)

ECM #5: Replacement of 4 Split System Condensing Units

Description:

The Voorhees Township Police Station is air conditioned by split system AC units located at the building exterior on grade. The units were installed during the initial building construction in 2001. Unit's identified as AC-1, AC-2, and AC-3 are located near the rear parking area of the building, unit AC-4 is located on the same side of the building closer to the front sidewalk entrance. AC-4 is in poor condition having rusted on the exterior grill and fan blade. The useful service life of these units is 15 years as defined by ASHRAE when units are maintained in optimal condition. Based on the site inspection the units appear to have been well maintained which will reduce there efficiency and overall lifespan.

The units currently installed are lower efficiency compared to modern units. The units can be replaced with new high efficiency units. New condensing units provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and higher efficiency refrigerants such as R410A.

This ECM includes one-for-one replacement of the older condensing units with new higher efficiency systems. It is recommended to fully evaluate the capacity needed for all new systems prior to moving forward with this ECM. A summary of the unit replacements for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
ECM INPUTS	**SERVICE FOR**	**NUMBER OF UNITS**	**COOLING CAPACITY, BTU/HR**	**TOTAL CAPACITY, TONS**	**REPLACE UNIT WITH**
SS	AC-1	1	216,000	18.0	Trane - RAUJC20
SS	AC-2	1	216,000	18.0	Trane - RAUJC20
SS	AC-3	1	60,000	5.0	Carrier - 24ANA60
SS	AC-4	1	36,000	3.0	Carrier - 24ANA36
Total		**4**	**528,000**	**44.0**	

The manufacturers used as the basis for the calculation are Trane and Carrier. All units are one for one style replacements with a similar capacity to the old units. The unit pricing and install cost were estimated based on current rates quotes and labor rates. The payback may change based on actual unit pricing and install costs if the ECM is implemented.

Energy Savings Calculations:

Cooling Energy Savings:

Seasonal energy consumption of the air conditioners at the cooling mode is calculated with the equation below:

$$\text{Energy Savings, kWh} = \text{Cooling Capacity,} \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}} \right) \times \frac{\text{Operation Hours}}{1000 \frac{\text{W}}{\text{kWh}}}$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Cooling}}$$

$$\text{Cooling Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity} \left(\frac{\$}{\text{kWh}} \right)$$

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**EXISTING UNITS EER**	**SPLIT UNITS EER**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
SS	216,000	2,000	9 EER	12.1 EER	1	12,298	6.1
SS	216,000	2,000	9 EER	12.1 EER	1	12,298	6.1
SS	60,000	2,000	9.2 EER	12.2 EER	1	3,207	1.6
SS	36,000	2,000	8.5 EER	14.6 EER	1	3,539	1.8
Total					4	31,342	15.7

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start® Program appendix, the replacement of split system AC units and unitary systems with high efficiency AC systems falls under the category "Unitary HVAC Split System" and warrants an incentive based on efficiency (EER/SEER). The program incentives are calculated as follows:

$$\text{Smart Start} \circledR \text{ Incentive} = (\text{Cooling Tons} \times \$/\text{Ton Incentive})$$

SPLIT SYSTEM AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	**UNIT EFFICIENCY**	**REBATE $/TON**	**PROPOSED CAPACITY TONS**	**TOTAL REBATE $**
≥20 to 30 tons	10.5 EER	79	0	$0
≥ 11.25 to < 20 tons	11.5 EER	79	36	$2,844
≥ 5.4 to < 11.25 tons	11.5 EER	73	0	$0
5.4 tons or less Unitary AC and Split System	≥14 SEER	$92	8.0	$736
TOTAL			**44**	**$3,580**

Summary of cost, savings and payback for this ECM is below.

COST & SAVINGS SUMMARY								
ECM INPUTS	**UNIT COST**	**INSTALL COST**	**# OF UNITS**	**TOTAL COST**	**REBATES**	**NET COST**	**ENERGY SAVING**	**PAY BACK YEARS**
SS	$11,250	$9,000	1	$20,250	$1,422	$18,828	$1,882	10.0
SS	$11,250	$9,000	1	$20,250	$1,422	$18,828	$1,882	10.0
SS	$5,000	$4,000	1	$9,000	$460	$8,540	$491	17.4
SS	$3,750	$3,750	1	$7,250	$276	$6,974	$541	12.9
Total	$31,250		4	$56,750	$3,580	$53,170	$4,795	11.1

There is no significant maintenance savings due to implementation of this ECM.

Energy Savings Summary:

ECM #5 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$53,170
NJ Smart Start Equipment Incentive ($):	$3,580
Net Installation Cost ($):	$49,590
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$4,795
Total Yearly Savings ($/Yr):	$4,795
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.3
Simple Lifetime ROI	45.0%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$71,929
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	$7,655.44

ECM #6: AC-4 Split System Replacement Only

Description:

The Voorhees Township Police Station dispatch area and front offices is air conditioned by a single split system AC unit located at the building exterior on grade. The unit was installed during the initial building construction in 2001.The unit identified as AC-4 is in poor condition and has rusting on the exterior grill and fan blade. It is estimated the unit is not operating at peak efficiency due to the poor unit condition. The useful service life of this unit is 15 years as defined by ASHRAE, however CE recommends replacing this unit before that time with a unit that is in new condition.

The unit currently installed is a lower efficiency compared to a modern unit. The unit can be replaced with a new high efficiency unit. New condensing units provide higher full load and part load efficiencies due to advances in inverter motor technologies, heat exchangers and higher efficiency refrigerants such as R410A.

This ECM includes one-for-one replacement of the older condensing unit with a new higher efficiency system. It is recommended to fully evaluate the capacity needed for all new systems prior to moving forward with this ECM. A summary of the unit replacements for this ECM can be found in the table below:

IMPLEMENTATION SUMMARY					
ECM INPUTS	**SERVICE FOR**	**NUMBER OF UNITS**	**COOLING CAPACITY, BTU/HR**	**TOTAL CAPACITY, TONS**	**REPLACE UNIT WITH**
SS	AC-4	1	36,000	3.0	Carrier - 24ANA36
Total		**1**	**36,000**	**3.0**	

The manufacturers used as the basis for the calculation are Carrier. All units are one for one style replacements with a similar capacity to the old units. The unit pricing and install cost were estimated based on current rates quotes and labor rates. The payback may change based on actual unit pricing and install costs if the ECM is implemented.

Energy Savings Calculations:

Cooling Energy Savings:

Seasonal energy consumption of the air conditioners at the cooling mode is calculated with the equation below:

$$\text{Energy Savings, kWh} = \text{Cooling Capacity,} \frac{\text{BTU}}{\text{Hr}} \times \left(\frac{1}{\text{SEER}_{\text{Old}}} - \frac{1}{\text{SEER}_{\text{New}}} \right) \times \frac{\text{Operation Hours}}{1000 \frac{\text{W}}{\text{kWh}}}$$

$$\text{Demand Savings, kW} = \frac{\text{Energy Savings (kWh)}}{\text{Hours of Cooling}}$$

$$\text{Cooling Cost Savings} = \text{Energy Savings, kWh} \times \text{Cost of Electricity} \left(\frac{\$}{\text{kWh}} \right)$$

ENERGY SAVINGS CALCULATIONS							
ECM INPUTS	**COOLING CAPACITY, BTU/Hr**	**ANNUAL COOLING HOURS**	**EXISTING UNITS EER**	**SPLIT UNITS EER**	**# OF UNITS**	**ENERGY SAVINGS kWh**	**DEMAND SAVINGS kW**
SS	36,000	2,000	8.5 EER	14.6 EER	1	3,539	1.8
Total					1	3,539	1.8

Project Cost, Incentives and Maintenance Savings

From the NJ Smart Start® Program appendix, the replacement of split system AC units and unitary systems with high efficiency AC systems falls under the category "Unitary HVAC Split System" and warrants an incentive based on efficiency (EER/SEER). The program incentives are calculated as follows:

$$\text{SmartStart® Incentive} = (\text{Cooling Tons} \times \$/\text{Ton Incentive})$$

SPLIT SYSTEM AC UNITS REBATE SUMMARY				
UNIT DESCRIPTION	**UNIT EFFICIENCY**	**REBATE $/TON**	**PROPOSED CAPACITY TONS**	**TOTAL REBATE $**
≥20 to 30 tons	10.5 EER	79	0	$0
≥ 11.25 to < 20 tons	11.5 EER	79	0	$0
≥ 5.4 to < 11.25 tons	11.5 EER	73	0	$0
5.4 tons or less Unitary AC and Split System	≥14 SEER	$92	3.0	$276
TOTAL			**3**	**$276**

Summary of cost, savings and payback for this ECM is below.

COST & SAVINGS SUMMARY							
ECM INPUTS	**INSTALLED COST**	**# OF UNITS**	**TOTAL COST**	**REBATES**	**NET COST**	**ENERGY SAVING**	**PAY BACK YEARS**
SS	$7,250	1	$7,250	$276	$6,974	$541	12.9
Total	$7,250	1	$7,250	$276	$6,974	$541	12.9

There is no significant maintenance savings due to implementation of this ECM.

Energy Savings Summary:

ECM #6 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$7,250
NJ Smart Start Equipment Incentive ($):	$276
Net Installation Cost ($):	$6,974
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$541
Total Yearly Savings ($/Yr):	$541
Estimated ECM Lifetime (Yr):	15
Simple Payback	12.9
Simple Lifetime ROI	16.5%
Simple Lifetime Maintenance Savings	0
Simple Lifetime Savings	$8,122
Internal Rate of Return (IRR)	2%
Net Present Value (NPV)	($509.85)

ECM #7: Install NEMA Premium® Efficiency Motor

Description:

The improved efficiency of the NEMA Premium® efficient motors is primarily due to better designs with use of better materials to reduce losses. Surprisingly, the electricity used to power a motor represents 95% of its total lifetime operating cost. Due to the fact that many motors operate continuously 24 hours a day, even small increases in efficiency can yield substantial energy and dollar savings.

The in-line electric motor driving the heating hot water circulation pump located in the mechanical room is a candidate for replacement. The current motor operates with an efficiency of 78.5%. ASHRAE defines an in-line motor's expected service life as 10 years. The motor currently installed is from the initial building construction and has therefore passed its service life. This motor only operates during the usage of the hot water boiler when heating in the building is required.

This energy conservation measure replaces the existing low efficiency electric motor with a NEMA Premium® efficiency motor. NEMA Premium® is the most efficient motor designation in the marketplace today. The proposed motor used for the basis of the calculation will represent an increased efficiency of 10% over the current motor.

An additional motor is located in the mechanical room domestic hot water system. This motor lacked the required runtime during the year to propose any changes to the motor.

The run time hours of each motor were based on the buildings occupancy as well as standard weather information for the local area. This was used to determine the number of heating hours per year that the motor would run. The energy savings and payback are subject to change based on the heating needs of the building during a given year. An implementation summary of the motor is provided below.

IMPLEMENTATION SUMMARY					
EQMT ID	**FUNCTION**	**MOTOR HP**	**HOURS OF OPERATION**	**EXISTING EFFICIENCY**	**NEMA PREMIUM EFFICIENCY**
Circulation Pump Motor	Heating Hot Water Circulation Pump	1.5	2,920	78.5%	88.5%

Energy Savings Calculations:

$$\text{Electric usage, kWh} = \frac{\text{HP} \times \text{LF} \times 0.746 \times \text{Hours of Operation}}{\text{Motor Efficiency}}$$

where, HP = Motor Nameplate Horsepower Rating

LF = Load Factor Motor Efficiency = Motor Nameplate Efficiency

$$\text{Electric Usage Savings, kWh} = \text{Electric Usage}_{\text{Existing}} - \text{Electric Usage}_{\text{Proposed}}$$

$$\text{Electric cost savings} = \text{Electric Usage Savings} \times \text{Electric Rate} \left(\frac{\$}{\text{kWh}}\right)$$

The calculations were carried out and the results are tabulated in the table below:

PREMIUM EFFICIENCY MOTOR CALCULATIONS							
EQMT ID	MOTOR HP	LOAD FACTOR	EXISTING EFFICIENCY	NEMA PREMIUM EFFICIENCY	POWER SAVINGS kW	ENERGY SAVINGS kWH	COST SAVINGS
Circulation Pump Motor	1.5	75%	78.5%	88.5%	0.12	1,413	$216
TOTAL					**0.1**	**1,413**	**$216**

Equipment Cost and Incentives

Below is a summary of SmartStart Building® incentives for premium efficiency motors:

INCENTIVES	
HORSE POWER	NJ SMART START INCENTIVE
1	$50
1.5	$50
2	$60
3	$60
5	$60
7.5	$90
10	$100
15	$115
20	$125
25	$130
30	$150
40	$180

The following table outlines the summary of motor replacement costs and incentives:

MOTOR REPLACEMENT SUMMARY						
EQMT ID	MOTOR POWER HP	INSTALLED COST	SMART START INCENTIVE	NET COST	TOTAL SAVINGS	SIMPLE PAYBACK
Circulation Pump Motor	1.5	$788	$50	$738	$216	3.4
TOTAL		**$788**	**$50**	**$738**	**$216**	**3.4**

Energy Savings Summary:

ECM #7 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$788
NJ Smart Start Equipment Incentive ($):	$50
Net Installation Cost ($):	$738
Maintenance Savings ($/Yr):	$0
Energy Savings ($/Yr):	$216
Total Yearly Savings ($/Yr):	$216
Estimated ECM Lifetime (Yr):	15
Simple Payback	3.4
Simple Lifetime ROI	339.4%
Simple Lifetime Maintenance Savings	$0
Simple Lifetime Savings	$3,243
Internal Rate of Return (IRR)	29%
Net Present Value (NPV)	$1,842.78

REM #1: Rooftop Solar Array

Description:

The Voorhees Township Police Department has approximately 6,400 square-feet of available roof space that can accommodate a 28.6 kilowatt solar array, assuming the existing roof structure is capable of supporting an array.

The array will produce approximately 42,229 kilowatt-hours annually that will reduce the overall electric usage of the facility 13.76%.

Energy Savings Calculations:

See **LGEA Solar Financials Appendix F** for detailed financial summary and proposed solar layout areas.

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost ($):	$240,618
NJ Smart Start Equipment Incentive ($):	$0
Net Installation Cost ($):	$240,618
Maintenance Savings ($/Yr):	$16,284
Energy Savings ($/Yr):	$6,461
Total Yearly Savings ($/Yr):	$22,745
Estimated ECM Lifetime (Yr):	15
Simple Payback	10.6
Simple Lifetime ROI	41.8%
Simple Lifetime Maintenance Savings	$244,260
Simple Lifetime Savings	$341,175
Internal Rate of Return (IRR)	5%
Net Present Value (NPV)	$30,910.33

VII. 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. CE has assessed the feasibility of installing renewable energy measures (REM) for the township utilizing renewable technologies and concluded that there is potential for solar energy generation.

Solar Generation

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which are mounted on compatible 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). Parking lots can also be utilized for the installation of a solar array. A truss system can be installed that is high enough to park vehicles under the array and no parking lot area is lost.

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.

CE has reviewed the Voorhees Township Police Department for the purposes of determining the potential for roof mounted, ground mounted, and parking canopy photovoltaic system. It was determined that a total area of 6,400 S.F. can be utilized for a parking canopy system. This system would be divided into three rows, covering specific areas of parking space at the building. Additional parking space was not used to building and tree shading which would reduce the output of the install PV panels.

A depiction of the area utilized is shown in **Appendix F – Renewable / Distributed Energy Measures Calculations**. Using this square footage it was determined that a system size of 28.6 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 42,229 kWh annually, reducing the overall utility bill by approximately 13.76% percent. A detailed financial analysis can be found in **Appendix F – Renewable / Distributed Energy Measures Calculations**. This analysis illustrates the payback of the system over a 15 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

The proposed photovoltaic array layout is designed based on the specifications for the Sharp NU-235U panel. This panel has a "DC" rated full load output of 235 watts, and has a total panel conversion efficiency of 14.4%. Although panels rated at higher wattages are available through Sharp and other various manufacturers, in general most manufacturers who produce commercially available solar panels produce a similar panel in the 200 to 250 watt range. This provides more manufacturer options to the public entity if they wish to pursue the proposed solar recommendation without losing significant system capacity.

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

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

Direct purchase involves the township paying for 100% of the total project cost upfront via one of the methods noted in the Installation Funding Options section below. Calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following is the payback period:

Table 8
Financial Summary – Photovoltaic System

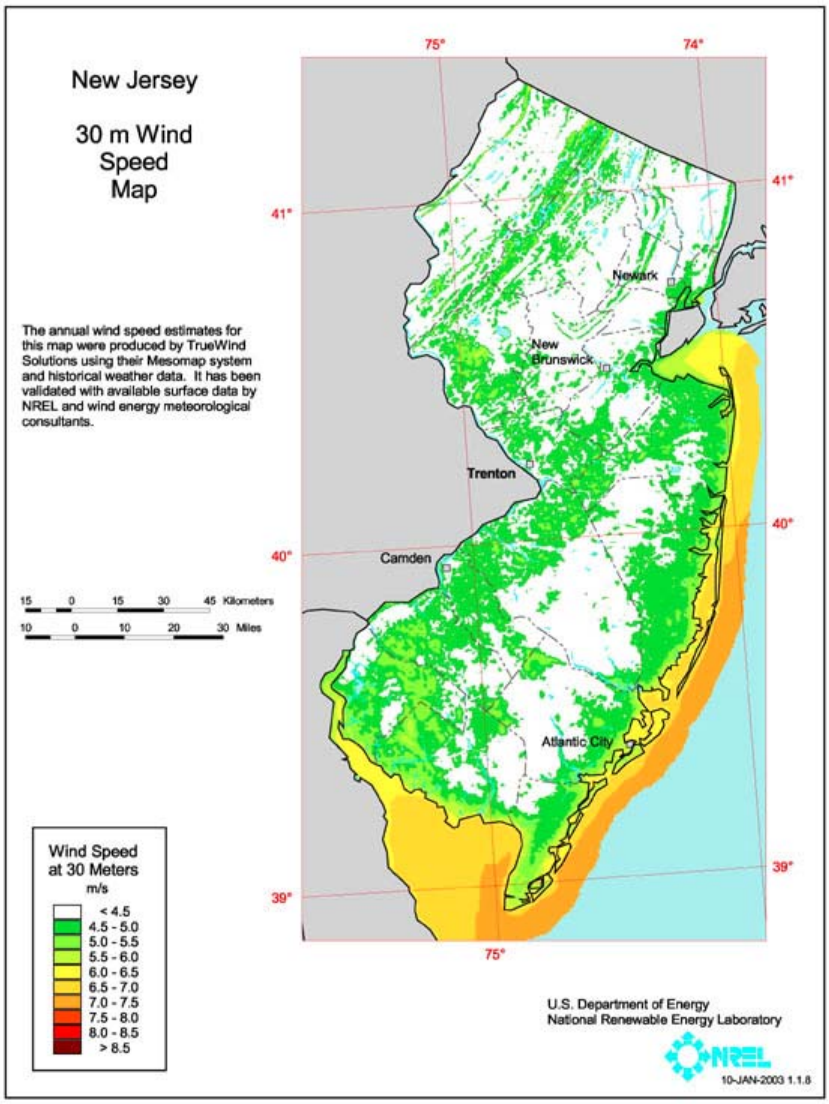
FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM		
PAYMENT TYPE	**SIMPLE PAYBACK, Yrs.**	**NET PRESENT VALUE**
Finance 100% - 15 yr	10.60	$30,910

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

Wind Generation

In addition to the Solar Analysis, CE 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 for certain applications of wind turbines.

Based on CE's review of the applicability of wind energy for the facility, it was determined that the average wind speed was too low to provide constant power. This speed would be well below the recommended wind speed as suggested by the peak power curve for a standard wind turbine. It would result in a simple payback period of unreasonable length. Therefore, wind energy is not a viable option to implement and is currently not economically feasible. Referring to the figure below the Voorhees Township Police Department can be located within a zone that produces approximately less than 6 m/s of wind speed annually on average. A wind speed annual average above 6 m/s is required to have a feasible payback period on the purchase and installation of wind turbines.



Wind generation through small roof mounted wind turbines was also analyzed for the Voorhees Township Police Station. The turbines used for the basis of analysis were Honeywell model WT6500 small roof mounted turbines. They measure only 6 feet in diameter with an installed weight of 241lbs. The relative size and dimensions make them candidates for a structure such as the police department building. These units can operate with wind speeds as low as 0.2 m/s and have a safety shutoff at 17.0 m/s to prevent damage during severe weather conditions.

The small blade diameter is beneficial for space considerations as, but it lowers the overall power generated. The wind velocity has the most influence in power generated, a small increase in wind velocity will greatly increase power generated. For the purpose of this estimation a wind velocity of 6 m/s was used with a swept area of 2.6 m^2 for the turbine and 8760 operating hours per year. The approximate yield is 756 kWh per year which is too low to justify the install and equipment cost of this unit. This would provide an estimated savings of $115.66 per year for the building, creating an unreasonable simple payback period.

Other small turbine units provide similar results to the mentioned Honeywell unit. These units are typically mounted for demonstration or educational purposes, not to provide a significant energy savings. At this time Concord Engineering does not recommend the installation of a small roof mounted horizontal axis turbine unit or a larger ground mounted unit at the Voorhees Township Police Department.

VIII. 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 electricity usage profile demonstrates a traditional profile with peaks occurring in the warmer months with the use of air conditioning. The facility peak for the study period occurred in August 2010 at 31, 520 kWh and 72 kW demand. This is most likely due to the use of air-conditioning equipment in addition to the steady lighting and miscellaneous electric loads throughout the facility.

Natural Gas:

The Natural Gas Usage Profile demonstrates a very typical natural gas (heat load) profile for the facility. The average monthly winter (Nov-Mar) consumption is 571 therms and the average monthly summer (Apr-Oct) consumption is 252 therms. It is pertinent to note that the August 2010 bill was averaged and the September 2010 bill was an actual meter read. Hence, the apparent large consumption and resulting cost in September 2010.

This load profile will yield less favorable natural gas fixed pricing when shopping for alternative suppliers. This is because the higher winter month consumption will yield higher pricing which will not be offset by the summer month consumption. Nymex commodity pricing is generally higher in the winter months of November – March and lower in the summer months of April – October. Obtaining a flat load profile, (usage is similar each month), will yield optimum natural gas pricing when shopping for alternative suppliers. Moving forward, the Township should review Third Party Supplier (TPS) natural gas commodity contracts that offer a product structure to include either 1) a fixed basis rate with a market based Nymex/commodity rate or 2) a fixed basis rate with fixed Nymex/commodity winter rate (Nov – March) and market based Nymex/commodity rate for the summer months (April – October) for 100% of the facility's metered natural gas requirements are both recommended due to current market pricing.

Tariff Analysis:

Electricity:

The facility receives electrical service through PSE&G's rate tariff, General Light and Power (GLP). Additionally, the facility is contracted with a Third Party Supplier (TPS), NextEra Energy Services of New Jersey, LLC to provide electric commodity service. For electric supply (generation) service, the client has a choice to either use PSE&G's default service rate BGS-FP or contract with a Third Party Supplier (TPS) to supply electric as they are currently doing.

Each year since 2002, the four New Jersey Electric Distribution Companies (EDCs) - Public Service Gas & Electric Company (PSE&G), Atlantic City Electric Company (ACE), Jersey Central Power & Light Company (JCP&L), and Rockland Electric Company (RECO) - have procured several billion dollars of electric supply to serve their Basic Generation Service (BGS) customers through a statewide auction process held in February. BGS refers to the service of customers who are not served by a third party supplier or competitive retailer. This service is sometimes known as Standard Offer Service, Default Service, or Provider of Last Resort Service.

The Auction Process has consisted of two auctions that are held concurrently, one for larger customers on an hourly price plan (BGS-CIEP) and one for smaller commercial and residential customers on a fixed-price plan (BGS-FP). This facility's rate structure is based on the fixed-price plan (BGS-FP).

The facility's current BGS-FP average price to compare for GS-Secondary rate is $0.1087/kWh (based on last bill received; August 2011).

The utility, PSE&G will continue to be responsible for maintaining the existing network of wires, pipes and poles that make up the delivery system, which will serve all consumers, regardless of whom they choose to purchase their electricity from. PSE&G's Delivery Service rate includes the following charges: Customer Charge, Supplemental Customer Charge, Distribution Charge (kW Demand), kWh Charge, Non-utility Generation Charge, TEFA, SBC, SCC, Standby Fee and RGGI.

Natural Gas:

This facility currently receives natural gas distribution and commodity service through South Jersey Gas (SJG) on the General Service Gas (GSG) rate schedule and has not contracted a Third Party Supplier (TPS) to provide natural gas commodity service.

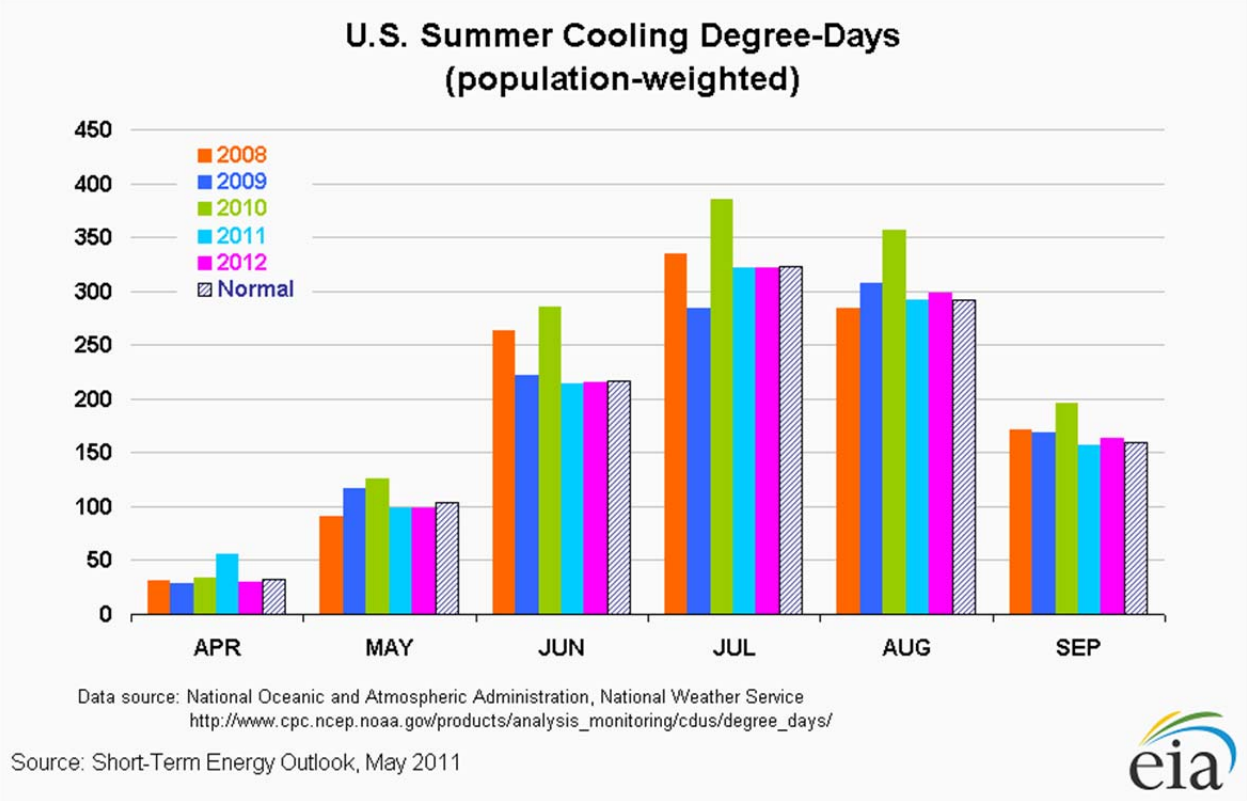
South Jersey Gas provides basic gas supply service (BGSS) to customers who choose not to shop from a Third Party Supplier (TPS) for natural gas commodity. The option is essential to protect the reliability of service to consumers as well as protecting consumers if a third party supplier defaults or fails to provide commodity service. Please refer to the link below for a recap of natural gas BGSS charges from South Jersey Gas for rate schedule GSG.
http://www.southjerseygas.com/108/tariff/bgssrates.pdf

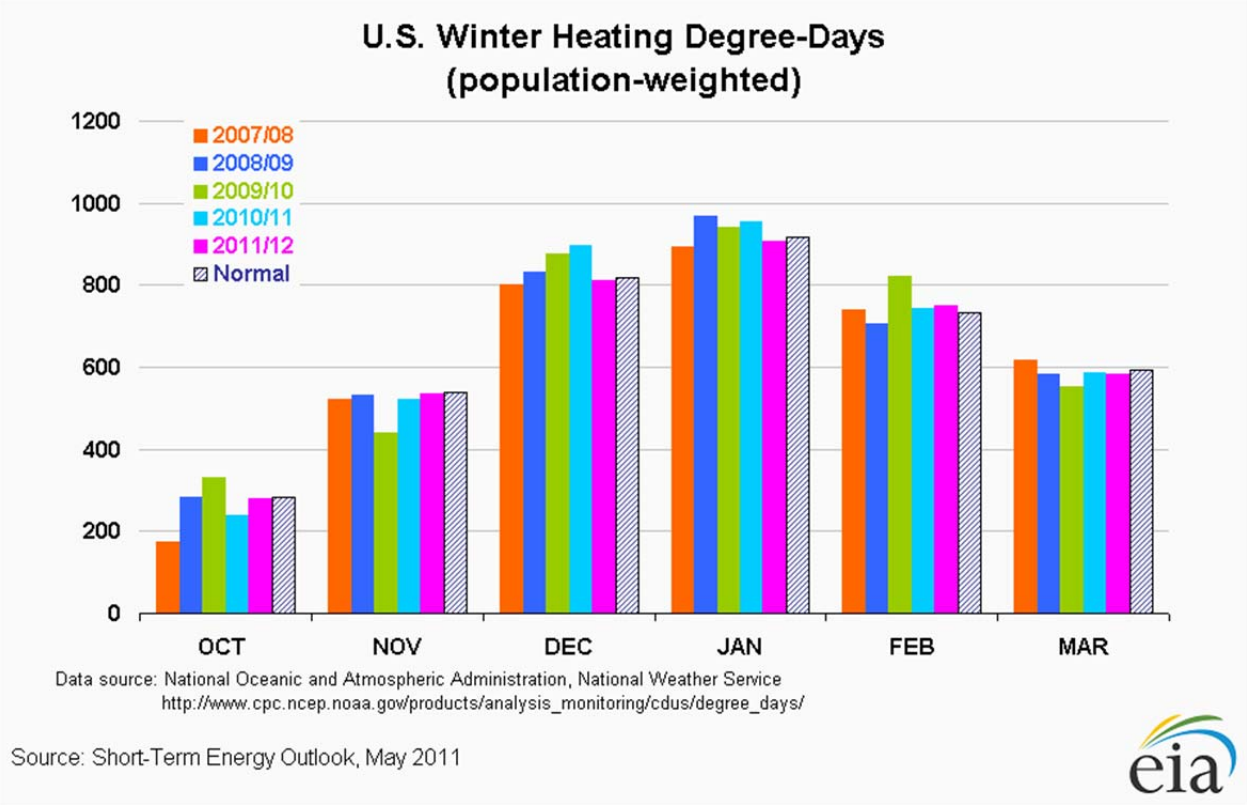
The utility, South Jersey Gas is responsible for maintaining the existing network of wires, pipes and poles that make up the delivery system, which will serve all consumers, regardless of whom they choose to purchase their electricity or natural gas from. South Jersey Gas's delivery service rate includes the following charges: Customer Service Charge, Distribution Charge, & Societal Benefits Charge (SBC).

Electric and Natural Gas Commodities Market Overview:

Current electricity and natural gas market pricing has remained relatively stable over the last year. Commodity pricing in 2008 marked historical highs in both natural gas and electricity commodity. Commodity pricing commencing spring of 2009 continuing through 2011, has decreased dramatically over 2008 historic highs and continues to be favorable for locking in long term (2-5 year) contracts with 3rd Party Supplier's for both natural gas and electricity supply requirements.

It is important to note that both natural gas and electric commodity market prices are moved by supply and demand, political conditions, market technicals and trader sentiment. This market is continuously changing. Energy commodity pricing is also correlated to weather forecasts. Because weather forecasts are dependable only in the short-term, prolonged temperature extremes can really cause extreme price swings.



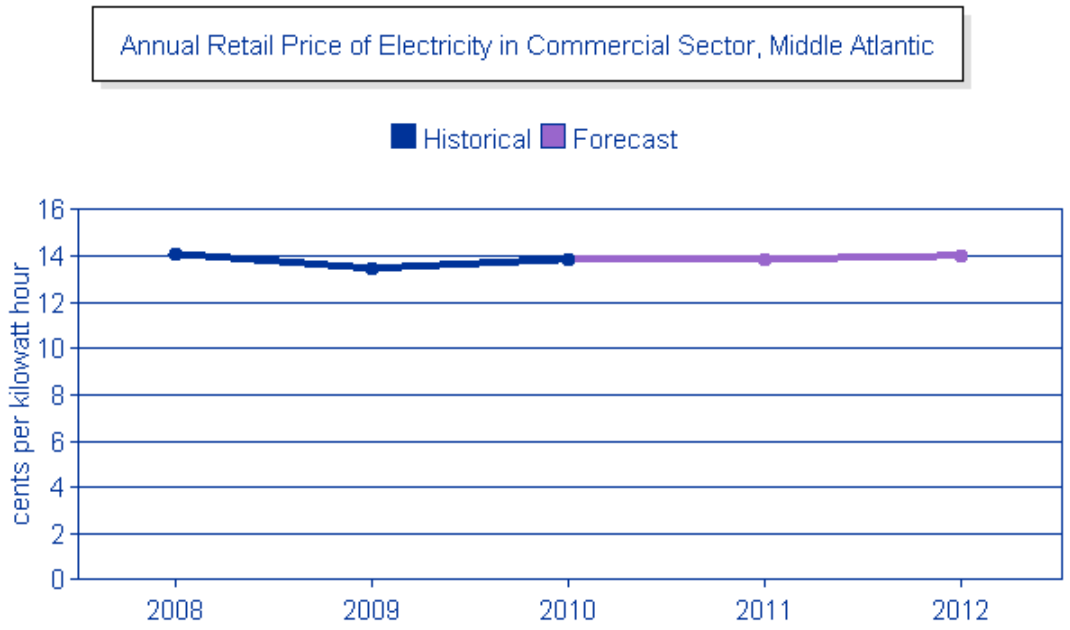


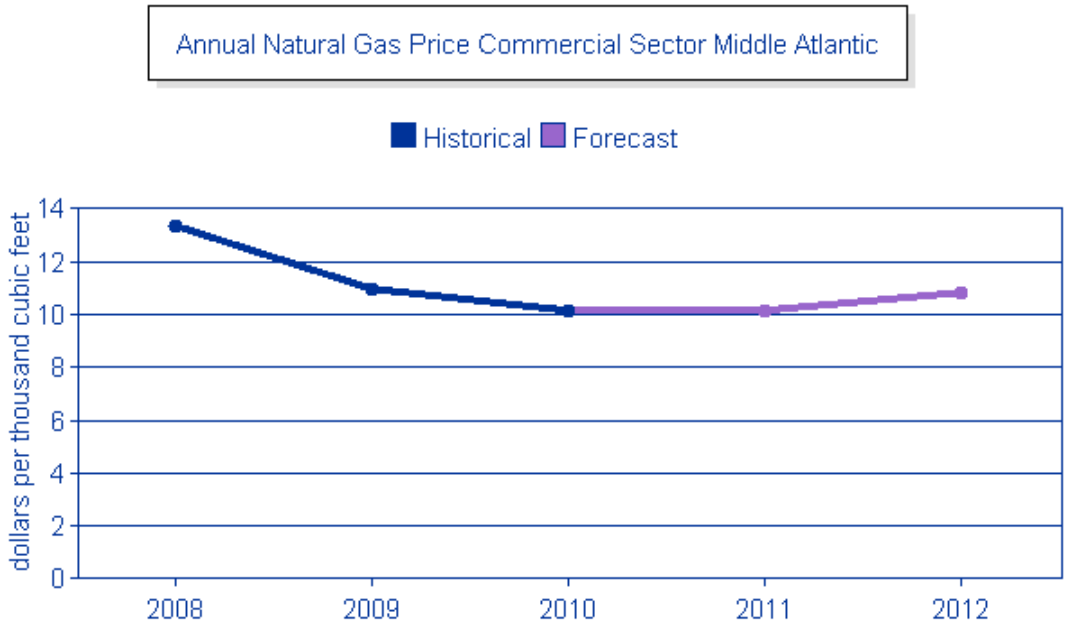
Short Term Energy Outlook - US Energy Information Administration (5/10/2011):

U.S. Natural Gas Prices. *The Henry Hub spot price averaged $4.25 per MMBtu in April, 28 cents higher than the March average and 25 cents higher than forecast in last month's Outlook. EIA expects that the Henry Hub price will average $4.24 per MMBtu in 2011, a decline of 15 cents from the 2010 average. EIA expects that the forecast decline in production from current levels will contribute to a tightening domestic market next year with the Henry Hub price averaging $4.65 per MMBtu in 2012.*

Uncertainty over future natural gas prices is lower this year compared with last year at this time. Natural gas futures for July 2011 delivery (for the 5-day period ending May 5) averaged $4.65 per MMBtu, and the average implied volatility was 34 percent. The lower and upper bounds for the 95-percent confidence interval for July 2011 contracts are $3.61 per MMBtu and $5.98 per MMBtu. At this time last year, the natural gas July 2010 futures contract averaged $4.11 per MMBtu and implied volatility averaged 46 percent. The corresponding lower and upper limits of the 95-percent confidence interval were $2.95 per MMBtu and $5.70 per MMBtu.

U.S. Electricity Retail Prices. *EIA expects U.S. residential electricity prices to rise by 2.3 percent in 2011 to an average of 11.84 cents per kilowatt-hour. The forecast of flat coal and natural gas prices to the electric power sector this year should contribute to very little change in retail electricity prices during 2012.*





Pricing in the chart above includes both utility distribution and energy commodity charges.

Recommendations:

1. CE recommends a continued approach utilizing 3rd party commodity supply procurement strategies for electric. Additionally, CE recommends Voorhees Township review utilizing 3rd party commodity supply for the natural gas account. However, Voorhees Township should move towards aggregating the usage of all facilities for electricity and natural gas supply service, allowing the Township to continue to achieve a reduction in commodity supply costs. Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive and contract terms longer than 12 months are desirable. Contracts due to expire in the near term would continue to yield favorable pricing. It is important to aggregate usage where available and take advantage of these current market prices quickly, before energy increases.

2. After review of the available utility information and current commodity pricing outlook, Concord Engineering recommends that Voorhees Township explore the utilization and advisement of a 3rd party unbiased Energy Consulting Firm experienced in the procurement of commodities, New Jersey procurement laws, aggregation of facilities and energy supply risk and commodity management. This firm should be able to provide full service advisement over the term of the contract, provide market watch opportunities and identify any additional opportunities that may further reduce costs. Many of these opportunities may include: energy rates; utility bill auditing; energy data analytics; and efficiency improvements. This will be helpful in looking to expand an aggregated approach inclusive of facilities that were not included in this audit for electricity and natural gas commodity purchasing.

   It is important that a rational, defensible strategy for purchasing commodity in volatile markets is incorporated. Examples include:

   - Budgets that reflect sound market intelligence
   - An understanding of utility and market historical prices and trends
   - Awareness of seasonal opportunities (e.g. shoulder months)
   - Negotiation of fair contractual terms
   - An aggressive, market based price

3. CE recommends that Voorhees Township consider utilizing a third party utility billing-auditing service to further analyze historical utility invoices such as water, sewer, natural gas and electric for incorrect billings and rate tariff optimization services. This service can be based on a shared savings model with no cost to the Township. The service could provide refunds on potential incorrect billings that may have been passed through by the utilities and or supplier and paid by the Township.

The recommendations and projected savings presented by Concord Engineering are based on current information provided by Voorhees Township for its facility's utility usage. Any projected savings presented with these recommendations are estimates only based on that information. It is recommended that further analysis and review of more recent utility data and actual Third Party Suppler invoices be performed prior to performing any of the presented recommendations.

IX. INSTALLATION FUNDING OPTIONS

CE 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.

iv. *Pay For Performance* – The New Jersey Smart Start Pay for Performance program includes incentives based on savings resulted from implemented ECMs. The program is available for all buildings that were audited as part of the NJ Clean Energy's Local Government Energy Audit Program. The facility's participation in the program is assisted by an approved program partner. An "Energy Reduction Plan" is created with the facility and approved partner to shown at least 15% reduction in the building's current energy use. Multiple energy conservation measures implemented together are applicable toward the total savings of at least 15%. No more than 50% of the total energy savings can result from lighting upgrades / changes.

Total incentive is capped at 50% of the project cost. The program savings is broken down into three benchmarks; Energy Reduction Plan, Project Implementation, and Measurement and Verification. Each step provides additional incentives as the energy reduction project continues. The benchmark incentives are as follows:

1. Energy Reduction Plan – Upon completion of an energy reduction plan by an approved program partner, the incentive will grant $0.10 per square foot between $5,000 and $50,000, and not to exceed 50% of the facility's annual energy expense. (Benchmark #1 is not provided in addition to the local government energy audit program incentive.)

2. Project Implementation – Upon installation of the recommended measures along with the "Substantial Completion Construction Report," the incentive will grant savings per KWH or Therm based on the program's rates. Minimum saving must be 15%. (Example $0.11 / kWh for 15% savings, $0.12/ kWh for 17% savings, … and $1.10 / Therm for 15% savings, $1.20 / Therm for 17% saving, …) Increased incentives result from projected savings above 15%.

3. Measurement and Verification – Upon verification 12 months after implementation of all recommended measures, that actual savings have been achieved, based on a completed verification report, the incentive will grant additional savings per kWh or Therm based on the program's rates. Minimum savings must be 15%. (Example $0.07 / kWh for 15% savings, $0.08/ kWh for 17% savings, … and $0.70 / Therm for 15% savings, $0.80 / Therm for 17% saving, …) Increased incentives result from verified savings above 15%.

v. *Energy Efficiency and Conservation Block Grants* – The EECGB rebate provides supplemental funding up to $20,000 for counties and local government entities to implement energy conservation measures. The EECGB funding is provided through the American Recovery and Reinvestment Act (ARRA). The local government must be among the eligible local government entities listed on the NJ Clean Energy website as follows - http://njcleanenergy.com/commercial-industrial/programs/eecbg-eligible-entities. This program is limited to municipalities and counties that have not already received grants directly through the US department of Energy.

1. The entity must utilize additional funding through one or more of the NJ Clean Energy programs such as Smart Start, Direct Install, and Pay for Performance.

2. The EECBG funding in combination with other NJ Clean Energy programs may not exceed the total cost of the energy conservation measures being implemented.

3. Envelope measures are applicable only if recommended by the LGEA energy audit and if the energy audit was completed within the past 12 months.

4. New construction and previously installed measures are not eligible for the EECBG rebate.

5. Energy conservation measures eligible for the EECBG must fall within the list of approved energy conservation measures. The complete list of eligible measures and other program requirements are included in the "EECBG Complete Application Package." The application package is available on the NJ Clean Energy website - http://njcleanenergy.com/commercial-industrial/programs/energy-efficiency-and-conservation-block-grants.

CE 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. Based on Concord Engineering's review it does not appear that the pay for performance program would be an applicable funding mechanism to offset the costs of the recommended measures. However, Concord Engineering highly recommends the other methods be utilized to their maximum potential and benefit.

X. ADDITIONAL RECOMMENDATIONS

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

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

B. Maintain all weather stripping on windows and doors.

C. Clean all light fixtures to maximize light output.

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

XI. ENERGY AUDIT ASSUMPTIONS

The assumptions utilized in this energy audit include but are not limited to following:

A. Cost Estimates noted within this report are based on industry accepted costing data such as RS Means™ Cost Data, contractor pricing and engineering estimates. All cost estimates for this level of auditing are +/- 20%. Prevailing wage rates for the specified region has been utilized to calculate installation costs. The cost estimates indicated within this audit should be utilized by the owner for prioritizing further project development post the energy audit. Project development would include investment grade auditing and detailed engineering.
B. Energy savings noted within this audit are calculated utilizing industry standard procedures and accepted engineering assumptions. For this level of auditing, energy savings are not guaranteed.
C. Information gathering for each facility is strongly based on interviews with operations personnel. Information dependent on verbal feedback is used for calculation assumptions including but not limited to the following:
    a. operating hours
    b. equipment type
    c. control strategies
    d. scheduling
D. Information contained within the major equipment list is based on the existing owner documentation where available (drawings, O&M manuals, etc.). If existing owner documentation is not available, catalog information is utilized to populate the required information.
E. Equipment incentives and energy credits are based on current pricing and status of rebate programs. Rebate availability is dependent on the individual program funding and applicability.
F. Equipment (HVAC, Plumbing, Electrical, & Lighting) noted within an ECM recommendation is strictly noted as a **basis for calculation** of energy savings. The owner should use this equipment information as a benchmark when pursuing further investment grade project development and detailed engineering for specific energy conservation measures.

Utility bill annual averages are utilized for calculation of all energy costs unless otherwise noted. Accuracy of the utility energy usage and costs are based on the information provided. Utility information including usage and costs is estimated where incomplete data is provided.

APPENDIX A

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING

Voorhees Township - Police Department

ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN (IRR)	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^{N} \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^{N} \frac{C_n}{(1+DR)^n}$
		($)	($)	($)	($)	($/Yr)	($/Yr)	($/Yr)	(Yr)	($)	($)	(%)	(Yr)	($)	($)
ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM #1	General Lighting & Re-Lamping Interior Fixtures	$2,674	$0	$0	$2,674	$1,746	$0	$1,746	15	$26,190	$0	879.4%	1.5	65.26%	$18,169.63
ECM #2	General Lighting & Re-Lamping Exterior Fixtures	$1,520	$0	$0	$1,520	$2,141	$0	$2,141	15	$32,119	$0	2013.1%	0.7	140.87%	$24,042.06
ECM #3	Lighting Occupancy Interior Fixtures	$2,435	$0	$525	$1,910	$916	$0	$916	15	$13,740	$0	619.4%	2.1	47.82%	$9,025.15
ECM #4	High Efficiency Domestic Hot Water	$2,050	$2,050	$50	$4,050	$314	$0	$314	15	$4,710	$0	16.3%	12.9	1.95%	($301.49)
ECM #5	Replace 4 Carrier Split Units	$53,170	$0	$3,580	$49,590	$4,795	$0	$4,795	15	$71,929	$0	45.0%	10.3	5.05%	$7,655.44
ECM #6	Replace AC-4 Condensing Unit Only	$7,250	$0	$276	$6,974	$541	$0	$541	15	$8,122	$0	16.5%	12.9	1.97%	($509.85)
ECM #7	Premium Efficiency Motor	$788	$0	$50	$738	$216	$0	$216	15	$3,243	$0	339.4%	3.4	28.62%	$1,842.78
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	28.6 KW PV Array	$240,618	$0	$0	$240,618	$6,461	$16,284	$22,745	15	$341,175	$244,260	41.8%	10.6	4.72%	$30,910.33

Notes: 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
2) The variable DR in the NPV equation stands for Discount Rate
3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

APPENDIX B

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SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of February, 2010:

Electric Chillers

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

Energy Efficiency must comply with ASHRAE 90.1-2004

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
Occupancy Controlled Thermostat (Hospitality & Institutional Facility)	$75 per thermostat

Energy Efficiency must comply with ASHRAE 90.1-2004

Ground Source Heat Pumps

Closed Loop & Open Loop	$450 per ton, EER ≥ 16 $600 per ton, EER ≥ 18 $750 per ton, EER ≥ 20

Energy Efficiency must comply with ASHRAE 90.1-2004

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, AFUE ≥ 92%

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
Gas Fired Tankless Water Heaters	$300 per unit

Prescriptive Lighting

Retro fit of T12 to T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$10 per fixture (1-4 lamps)
Replacement of T12 with new T-5 or T-8 Lamps w/Electronic Ballast in Existing Facilities	$25 per fixture (1-2 lamps) $30 per fixture (3-4 lamps)
Replacement of incandescent with screw-in PAR 38 or PAR 30 (CFL) bulb	$7 per bulb
T-8 reduced Wattage (28w/25w 4', 1-4 lamps) Lamp & ballast replacement	$10 per fixture
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
HID ≥ 100w Retrofit with induction lamp, power coupler and generator (must be 30% less watts/fixture than HID system)	$50 per fixture
HID ≥ 100w Replacement with new HID ≥ 100w	$70 per fixture
LED Refrigerator/Freezer case lighting replacement of fluorescent in medium and low temperature display case	$42 per 5 foot $65 per 6 foot

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
Daylight Dimming - office	$50 per fixture controlled

Premium Motors

Three-Phase Motors	$45 - $700 per motor
Fractional HP Motors Electronic Communicated Motors (replacing shaded pole motors in refrigerator/freezer cases)	$40 per electronic communicated motor

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
Custom Measures	$0.16 KWh and $1.60/Therm of 1st year savings, or a buy down to a 1 year payback on estimated savings. Minimum required savings of 75,000 KWh or 1,500 Therms and a IRR of at least 10%.
Multi Measures Bonus	15%

APPENDIX C

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Voorhees Township Police Department

Building ID: 2861404
For 12-month Period Ending: July 31, 2011[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: October 06, 2011

Facility
Voorhees Township Police Department
1180 White Horse Road
Voorhees, NJ 08043

Facility Owner
Concord Engineering
520 South Burnt Mill Road
Voorhees, NJ 08043

Primary Contact for this Facility
Jay Sherbine
1180 White Horse Road
Voorhees, NJ 08043

Year Built: 2001
Gross Floor Area (ft²): 10,384

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	1,047,348
Natural Gas (kBtu)[4]	463,115
Total Energy (kBtu)	1,510,463

Energy Intensity[5]

Site (kBtu/ft²/yr)	145
Source (kBtu/ft²/yr)	384

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	173

Electric Distribution Utility
Public Service Electric & Gas Co

National Average Comparison

National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	144%
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
Mike Fischette
520 South Burnt Mill Road
Voorhees, NJ 08043

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Values represent energy intensity, annualized to a 12-month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) or a Registered Architect (RA) 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 or RA 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	Voorhees Township Police Department	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	1180 White Horse Road, Voorhees, NJ 08043	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Police Station (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	10,384 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	24(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	168Hours(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	24(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: Public Service Electric & Gas Co

Fuel Type: Electricity

Meter: Electric (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
07/01/2011	07/31/2011	32,560.00
06/01/2011	06/30/2011	30,480.00
05/01/2011	05/31/2011	27,360.00
04/01/2011	04/30/2011	21,440.00
03/01/2011	03/31/2011	19,280.00
02/01/2011	02/28/2011	18,960.00
01/01/2011	01/31/2011	22,000.00
12/01/2010	12/31/2010	21,680.00
11/01/2010	11/30/2010	20,960.00
10/01/2010	10/31/2010	27,680.00
09/01/2010	09/30/2010	33,040.00
08/01/2010	08/31/2010	31,520.00
Electric Consumption (kWh (thousand Watt-hours))		**306,960.00**
Electric Consumption (kBtu (thousand Btu))		**1,047,347.52**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**1,047,347.52**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

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

Start Date	End Date	Energy Use (therms)
07/01/2011	07/31/2011	159.70
06/01/2011	06/30/2011	235.43
05/01/2011	05/31/2011	263.67
04/01/2011	04/30/2011	329.80
03/01/2011	03/31/2011	427.23
02/01/2011	02/28/2011	472.42
01/01/2011	01/31/2011	647.56
12/01/2010	12/31/2010	825.34
11/01/2010	11/30/2010	485.45
10/01/2010	10/31/2010	341.33

09/01/2010	09/30/2010	437.08
08/01/2010	08/31/2010	6.14
Gas Consumption (therms)		**4,631.15**
Gas Consumption (kBtu (thousand Btu))		**463,115.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**463,115.00**
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 PE or RA 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
Voorhees Township Police Department
1180 White Horse Road
Voorhees, NJ 08043

Facility Owner
Concord Engineering
520 South Burnt Mill Road
Voorhees, NJ 08043

Primary Contact for this Facility
Jay Sherbine
1180 White Horse Road
Voorhees, NJ 08043

General Information

Voorhees Township Police Department	
Gross Floor Area Excluding Parking: (ft^2)	10,384
Year Built	2001
For 12-month Evaluation Period Ending Date:	July 31, 2011

Facility Space Use Summary

Police Station	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft^2)	10,384
Number of PCs[o]	24
Weekly operating hours[o]	168
Workers on Main Shift[o]	24

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 07/31/2011)	**Baseline** (Ending Date 07/31/2011)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft2)	145	145	0	N/A	78
Source (kBtu/ft2)	384	384	0	N/A	157
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/ft2/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	173	173	0	N/A	93
$kgCO_2e/ft^2$/year	17	17	0	N/A	9

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.

APPENDIX D

MAJOR EQUIPMENT LIST

Concord Engineering

Voorhees Township Police Department

AHU

Unit Type	AHU	AHU	AHU
Qty	1	1	1
Location	Mechanical Room	Mechanical Room	Mechanical Room
Area Served	AC-1	AC-2	AC-3
Manufacturer	Carrier	Carrier	Carrier
Model #	39LD12KA-BF-BDN-A9	39LD10KA-BH-BEJ-A9	39LD03KA-BF-BJJ-A9
Serial #	1101F69974	1101F69975	1101F69976
CFM	5700	4750	1450
Supply Fan Motor	5.0	5.0	1.0
Supply Fan RPM	1,372	1,308	1,659
Approx Age	10	10	10
ASHRAE Service Life	20	20	20
Remaining Life	10	10	10
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

AHU

Unit Type	AHU		
Qty	1		
Location	Dispatch		
Area Served	AC-4		
Manufacturer	Carrier		
Model #	FB4A080		
Serial #	-		
CFM	1000		
Supply Fan Motor	1/4		
Supply Fan RPM	1,073		
Approx Age	10		
ASHRAE Service Life	20		
Remaining Life	10		
Comments	Dispatch Area - Not occupied currently		

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Voorhees Township Police Department

Boilers

Tag	Boiler		
Unit Type	Gas Fired Boiler		
Qty	1		
Location	Mechanical Room		
Area Served	Heating Hot Water		
Manufacturer	A.O. Smith Legend 2000		
Model #	210561-000		
Serial #	M0069901		
Input Capacity (MBH)	580		
Rated Output Capacity (MBH)	520		
Approx. Efficiency %	90.0%		
Fuel	Natural Gas		
Approx Age	11		
ASHRAE Service Life	25		
Remaining Life	14		
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Voorhees Township Police Department

Condensing Units

Unit Type	AC-1	AC-2	AC-3
Qty	1	1	1
Location	Exterior at Grade	Exterior at Grade	Exterior at Grade
Area Served	Offices, Storage, Corridors	Offices, Storage, Corridors	Offices, Storage, Corridors
Manufacturer	Carrier	Carrier	Carrier
Model #	38AKS024	38AKS024	38AK007
Serial #	0701F63407	0701F63406	0601G00079
Cooling Type	R-22	R-22	R-22
Cooling Capacity (Tons)	18.0	18.0	5.0
Cooling Efficiency (SEER/EER)	9.0	9.0	9.2
Approx Age	10	10	10
ASHRAE Service Life	15	15	15
Remaining Life	5	5	5
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

Condensing Units

Unit Type	AC-4	SCU-1	
Qty	1	1	
Location	Exterior at Grade	Exterior at Grade	
Area Served	Offices, Storage, Corridors	Tech Room	
Manufacturer	Carrier	Mitsubishi - Mr.Slim	
Model #	38CKC042300	MU-A12WA-1	
Serial #	1101E14187	0001936T	
Cooling Type	R-22	R410A	
Cooling Capacity (Tons)	3.0	1.0	
Cooling Efficiency (SEER/EER)	8.5	12.8	
Approx Age	10	1	
ASHRAE Service Life	15	15	
Remaining Life	5	14	
Comments	Exterior grill and fan of unit is rusted		

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Voorhees Township Police Department

Domestic Water Heaters

Tag	DHW		
Unit Type	Gas Fired Domestic Hot Water		
Qty	1		
Location	Mechanical Room		
Area Served	Restrooms and Sinks		
Manufacturer	State Select		
Model #	PR640NBRT		
Serial #	J00123414		
Size (Gallons)	40		
Input Capacity (MBH/KW)	40 MBH		
Recovery (Gal/Hr)	41		
Efficiency %	80.0%		
Fuel	Natural Gas		
Approx Age	10		
ASHRAE Service Life	12		
Remaining Life	2		
Comments			

Note:

"N/A" = Not Applicable.

"-" = Info Not Available

MAJOR EQUIPMENT LIST

Concord Engineering

Voorhees Township Police Department

Pumps

Tag	DHW Booster	Circulation Pump	
Unit Type	Base Mounted	In-Line Pump	
Qty	1	1	
Location	Mechanical Room	Mechanical Room	
Area Served	DHW Booster Pump	Heating Hot Water	
Manufacturer	Alyan Pump	Baldor	
Model #	VSPP-RC00-3	JMM3554T	
Serial #	32523	35M19M206	
Horse Power	3	1.5	
Flow	-	-	
Motor Info	Baldor	Baldor	
Electrical Power	230/460	200-230/460	
RPM	3,450	1,725	
Motor Efficiency %	80.0%	78.5%	
Approx Age	10	10	
ASHRAE Service Life	10	10	
Remaining Life	0	0	
Comments			

Note:
"N/A" = Not Applicable.
"-" = Info Not Available

APPENDIX E

Investment Grade Lighting Audit

CE Job #: 9C11013

Project: Voorhees Township Police Department Building **Police Department Building** **KWH COST: $0.153**

Bldg. Sq. Ft. 10,384

ECM #1: Lighting Upgrade - General & Re-Lamping All Light Fixtures

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CE Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost INSTALLED	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
221.33	Entrance Lobby	3650	2	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Pendant Mnt., Direct/ Indirect	58	0.12	423.4	$64.78	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	365	$55.85	$14.00	$28.00	0.02	58.4	$8.94	3.13
563	Entrance Lobby	3650	6	2	Recessed Down Light, 26w Tri CFL Lamp	52	0.31	1,138.8	$174.24	6	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
222.21	Records Bureau Entrance	3650	2	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	452.6	$69.25	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	365	$55.85	$14.00	$28.00	0.02	87.6	$13.40	2.09
222.21	Finger Printing	3650	1	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	226.3	$34.62	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	182.5	$27.92	$14.00	$14.00	0.01	43.8	$6.70	2.09
613	Exterior	4368	15	1	Industrial Fixture, 150w A Lamp	150	2.25	9,828.0	$1,503.68	15	1	(1) 46w CFL Lamp	46	0.69	3013.92	$461.13	$20.00	$300.00	1.56	6814.08	$1,042.55	0.29
750	Exterior	4368	2	1	250w HPS Wallpack	295	0.59	2,577.1	$394.30	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
705	Exterior	4368	4	1	70w MH, Recessed Down Light	92	0.37	1,607.4	$245.94	4	1	Bypass ballast. Install socket adapter and 26w CFL Flood Lamp	26	0.10	454.272	$69.50	$30.00	$120.00	0.26	1153.152	$176.43	0.68
761	Exterior	4368	2	1	400w HPS Wallpack	465	0.93	4,062.2	$621.52	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
560	Exterior	4368	2	1	Recessed Down Light, 26w Bi CFL Lamp	52	0.10	454.3	$69.50	2	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
760	Exterior - Rear Parking	4368	4	1	250w HPS Canopy Light	295	1.18	5,154.2	$788.60	4	1	80 Watt Induction Canopy Light	80	0.32	1397.76	$213.86	$250.00	$1,000.00	0.86	3756.48	$574.74	1.74
221.21	Mechanical Room	1460	4	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.25	362.1	$55.40	4	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.20	292	$44.68	$14.00	$56.00	0.05	70.08	$10.72	5.22
222.21	Dispatch	3650	14	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.87	3,168.2	$484.73	14	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.70	2555	$390.92	$14.00	$196.00	0.17	613.2	$93.82	2.09
222.21	Admin	3650	2	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	452.6	$69.25	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	365	$55.85	$14.00	$28.00	0.02	87.6	$13.40	2.09
222.21	Chief Office	3650	6	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.37	1,357.8	$207.74	6	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.30	1095	$167.54	$14.00	$84.00	0.07	262.8	$40.21	2.09
222.21	Chief Storage	730	2	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	90.5	$13.85	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	73	$11.17	$14.00	$28.00	0.02	17.52	$2.68	10.45
222.21	Traffic	3650	4	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.25	905.2	$138.50	4	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.20	730	$111.69	$14.00	$56.00	0.05	175.2	$26.81	2.09
222.21	Operations	3650	6	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.37	1,357.8	$207.74	6	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.30	1095	$167.54	$14.00	$84.00	0.07	262.8	$40.21	2.09

Investment Grade Lighting Audit

ECM #1: Lighting Upgrade - General & Re-Lamping All Light Fixtures

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CE Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost INSTALLED	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
222.21	Services	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Patrol	3650	4	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.25	905.2	$138.50	4	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.20	730	$111.69	$14.00	$56.00	0.05	175.2	$26.81	2.09
222.21	Investigation	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Patrol Sergeant	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Ready Room	3650	10	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.62	2,263.0	$346.24	10	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.50	1825	$279.23	$14.00	$140.00	0.12	438	$67.01	2.09
221.21	Evidence #1	3650	2	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	452.6	$69.25	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	365	$55.85	$14.00	$28.00	0.02	87.6	$13.40	2.09
221.21	Evidence #2	3650	2	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	452.6	$69.25	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	365	$55.85	$14.00	$28.00	0.02	87.6	$13.40	2.09
222.21	Kitchen	3650	2	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	452.6	$69.25	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	365	$55.85	$14.00	$28.00	0.02	87.6	$13.40	2.09
222.21	Men	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Women	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Ammo	3650	2	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	452.6	$69.25	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	365	$55.85	$14.00	$28.00	0.02	87.6	$13.40	2.09
222.21	Interview	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Processing	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
221.23	Sally Port	3650	9	2	1x4, 2 Lamp, 32w T8, Elect. Ballast, Recessed Mnt., Direct/ Indirect	58	0.52	1,905.3	$291.51	9	0	No Change	0	0.00	0	$0.00	$0.00	$0.00	0.00	0	$0.00	0.00
221.21	Cell Blocks	8760	8	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.50	4,345.0	$664.78	8	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.40	3504	$536.11	$14.00	$112.00	0.10	840.96	$128.67	0.87
221.21	Tech Room	3650	3	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
221.21	Office	3650	3	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Storage	3650	1	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	226.3	$34.62	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	182.5	$27.92	$14.00	$14.00	0.01	43.8	$6.70	2.09
222.21	Services	3650	1	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	226.3	$34.62	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	182.5	$27.92	$14.00	$14.00	0.01	43.8	$6.70	2.09

Investment Grade Lighting Audit

ECM #1: Lighting Upgrade - General & Re-Lamping All Light Fixtures

EXISTING LIGHTING										PROPOSED LIGHTING									SAVINGS			
CE Type	Fixture Location	Yearly Usage	No. Fixts	No. Lamps	Fixture Type	Fixt Watts	Total kW	kWh/Yr Fixtures	Yearly $ Cost	No. Fixts	No. Lamps	Retro-Unit Description	Watts Used	Total kW	kWh/Yr Fixtures	Yearly $ Cost	Unit Cost INSTALLED	Total Cost	kW Savings	kWh/Yr Savings	Yearly $ Savings	Yearly Simple Payback
222.21	Prevention	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Detective	3650	2	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	452.6	$69.25	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	365	$55.85	$14.00	$28.00	0.02	87.6	$13.40	2.09
222.21	Restroom	3650	1	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	226.3	$34.62	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	182.5	$27.92	$14.00	$14.00	0.01	43.8	$6.70	2.09
222.21	Detective 1	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Highway - Locked	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Inventory - Locked	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Detective's Office	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Detective's Office	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Interview	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Tech Room	3650	2	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.12	452.6	$69.25	2	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.10	365	$55.85	$14.00	$28.00	0.02	87.6	$13.40	2.09
222.21	Investigation	3650	3	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.19	678.9	$103.87	3	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.15	547.5	$83.77	$14.00	$42.00	0.04	131.4	$20.10	2.09
222.21	Storage	3650	1	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	226.3	$34.62	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	182.5	$27.92	$14.00	$14.00	0.01	43.8	$6.70	2.09
222.21	Records	3650	11	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.68	2,489.3	$380.86	11	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.55	2007.5	$307.15	$14.00	$154.00	0.13	481.8	$73.72	2.09
222.21	Copy Room	3650	1	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	226.3	$34.62	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	182.5	$27.92	$14.00	$14.00	0.01	43.8	$6.70	2.09
222.21	Dispatch Ready Room	3650	1	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	226.3	$34.62	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	182.5	$27.92	$14.00	$14.00	0.01	43.8	$6.70	2.09
222.21	Office	3650	1	2	2x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Recessed Mnt., Prismatic Lens	62	0.06	226.3	$34.62	1	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	0.05	182.5	$27.92	$14.00	$14.00	0.01	43.8	$6.70	2.09
221.31	All Hallway Lights	8760	45	2	1x4, 2 Lamp, 32w 700 Series T8, Elect. Ballast, Pendant Mnt., Prismatic Lens	62	2.79	24,440.4	$3,739.38	45	2	Relamp - Sylvania Lamp FO28/841/SS/ECO	50	2.25	19710	$3,015.63	$14.00	$630.00	0.54	4730.4	$723.75	0.87
	Totals		235	98				85,808	$13,129	235	93			10.7	52535.0	8037.8		$4,094	$5	$23,135	$3,540	1.16

APPENDIX F

Location Description	Area (Sq FT)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW_{DC}	Total Annual kWh	Total KW_{AC}	Panel Weight (41.9 lbs)	W/SQFT
Voorhees Township Police Department	6,400	SHARP NU-U235F2	150	17.5	2,631	35.25	42,229	28.6	6,285	13.40

.= Proposed PV Layout

Notes:

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

PVWatts Program Data Output - Flat Roof

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	35.2 kW
DC to AC Derate Factor:	0.810
AC Rating:	28.6 kW
Array Type:	Fixed Tilt
Array Tilt:	7.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	15.3 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	2.46	2168	331.70
2	3.22	2604	398.41
3	4.23	3703	566.56
4	5.15	4261	651.93
5	5.83	4900	749.70
6	6.14	4785	732.11
7	6.05	4824	738.07
8	5.50	4409	674.58
9	4.76	3753	574.21
10	3.65	3017	461.60
11	2.55	2076	317.63
12	2.13	1801	275.55
Year	4.31	42299	6471.75

Project Name: **Voorhees Township Police Department - 9C11032**
Location: **Voorhees Township Police Department**
Description: **Photovoltaic System 100% Financing - 15 year**

Simple Payback Analysis

	Photovoltaic System 100% Financing - 15 year
Total Construction Cost	$240,618
Annual kWh Production	42,229
Annual Energy Cost Reduction	$6,461
Average Annual SREC Revenue	$16,284

Simple Payback: **10.58** Years

Life Cycle Cost Analysis

Analysis Period (years):	15	Financing %:	100%
Discount Rate:	3%	Maintenance Escalation Rate:	3.0%
Average Energy Cost ($/kWh)	**$0.153**	Energy Cost Escalation Rate:	3.0%
Financing Rate:	6.00%	Average SREC Value ($/kWh)	$0.386

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	$0	0	0	0	$0	0	0	0	0
1	$0	42,229	$6,461	$0	$23,226	$14,159	$10,206	$5,321	$5,321
2	$0	42,018	$6,655	$0	$23,110	$13,530	$10,836	$5,399	$10,720
3	$0	41,808	$6,855	$0	$20,904	$12,862	$11,504	$3,393	$14,113
4	$0	41,599	$7,060	$0	$18,719	$12,152	$12,214	$1,414	$15,527
5	$0	41,391	$7,272	$426	$18,626	$11,399	$12,967	$1,106	$16,633
6	$0	41,184	$7,490	$424	$18,533	$10,599	$13,767	$1,233	$17,866
7	$0	40,978	$7,715	$422	$16,391	$9,750	$14,616	($682)	$17,184
8	$0	40,773	$7,946	$420	$16,309	$8,848	$15,517	($530)	$16,654
9	$0	40,569	$8,185	$418	$14,199	$7,891	$16,474	($2,400)	$14,254
10	$0	40,366	$8,430	$416	$14,128	$6,875	$17,490	($2,223)	$12,031
11	$0	40,164	$8,683	$414	$12,049	$5,797	$18,569	($4,047)	$7,984
12	$0	39,964	$8,944	$412	$11,989	$4,651	$19,714	($3,845)	$4,139
13	$0	39,764	$9,212	$410	$9,941	$3,435	$20,930	($5,622)	($1,483)
14	$0	39,565	$9,488	$408	$9,891	$2,144	$22,221	($5,394)	($6,877)
15	$0	39,367	$9,773	$405	$7,873	$774	$23,592	($7,125)	($14,002)
	Totals:	611,738	$120,168	$4,574	$235,889	$124,867	$240,618	($14,002)	$130,062

Net Present Value (NPV) **($5,124)**