



**Steven Winter Associates, Inc.**  
Architects and Engineers  
[www.swinter.com](http://www.swinter.com)

293 Route 18 South, Suite 330  
East Brunswick, NJ 08816

Telephone: (866) 676-1972  
E-mail: [swinter@swinter.com](mailto:swinter@swinter.com)

*June 17, 2010*

**Local Government Energy Program  
Energy Audit Report**

*For*

***Middletown Township  
Former Community Center & Police Garage  
1 King's Highway  
Middletown, NJ 07748***

***Project Number: LGEA41***



## TABLE OF CONTENTS

<b>INTRODUCTION</b> .....	<b>3</b>
<b>EXECUTIVE SUMMARY</b> .....	<b>4</b>
<b>1. HISTORIC ENERGY CONSUMPTION</b> .....	<b>7</b>
1.1 ENERGY USAGE AND COST ANALYSIS.....	7
1.2 UTILITY RATE.....	9
1.3 ENERGY BENCHMARKING .....	9
<b>2. FACILITY AND SYSTEMS DESCRIPTION</b> .....	<b>12</b>
2.1 BUILDING CHARACTERISTICS .....	12
2.2 BUILDING OCCUPANCY PROFILES.....	12
2.3 BUILDING ENVELOPE .....	12
2.3.1 EXTERIOR WALLS .....	12
2.3.2 ROOF.....	12
2.3.3 BASE .....	13
2.3.4 WINDOWS.....	13
2.3.5 EXTERIOR DOORS .....	13
2.3.6 BUILDING AIR TIGHTNESS .....	14
2.4 HVAC SYSTEMS .....	14
2.4.1 HEATING.....	14
2.4.2 COOLING .....	15
2.4.3 VENTILATION.....	16
2.4.4 DOMESTIC HOT WATER.....	16
2.5 ELECTRICAL SYSTEMS .....	16
2.5.1 LIGHTING .....	16
2.5.2 APPLIANCES AND PROCESS .....	17
2.5.3 ELEVATORS.....	17
2.5.4 OTHER ELECTRICAL SYSTEMS.....	17
<b>3. EQUIPMENT LIST</b> .....	<b>18</b>
<b>4. ENERGY CONSERVATION MEASURES</b> .....	<b>19</b>
<b>5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES</b> .....	<b>28</b>
5.1 EXISTING SYSTEMS .....	28
5.2 SOLAR PHOTOVOLTAIC.....	28
5.3 SOLAR THERMAL COLLECTORS.....	28
5.4 COMBINED HEAT AND POWER.....	28
5.5 GEOTHERMAL.....	28
5.6 WIND.....	28
<b>6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES</b> .....	<b>28</b>
6.1 LOAD PROFILES .....	28
6.2 ENERGY PROCUREMENT STRATEGIES .....	31
<b>7. METHOD OF ANALYSIS</b> .....	<b>34</b>
7.1 ASSUMPTIONS AND TOOLS .....	34
7.2 DISCLAIMER.....	34
<b>APPENDIX A: LIGHTING STUDY</b> .....	<b>35</b>
<b>APPENDIX B: THIRD PARTY ENERGY SUPPLIERS (ESCOs)</b> .....	<b>37</b>

## **INTRODUCTION**

On November 23, 2009 and January 8, 2010, Steven Winter Associates, Inc. (SWA) and PMK Group, Inc., a business unit of Birdsall Services Group (BSG-PMK), performed an energy audit and assessment for the Former Community Center building and the Police Garage. These buildings are located at 1 Kings Highway, Middletown, New Jersey 07748, in Monmouth County. The current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

The Former Community Center is a two story building constructed in 1907. The building has a total area of 4,000 square feet. The facility houses an auxiliary police training room, restrooms, a small kitchen, and a professional boxing ring. The building is open as needed and there are no permanent employees in the building.

The Police Garage was built in 1958. The building has a total area of 5,102 square feet. The Police Garage houses a classroom, evidence storage, evidence vault, radio repair, workout room, and garages. The building is open from 8:00 AM to 4:30 PM Monday through Friday and has no full time employees.

Energy data and building information collected in the field were analyzed to determine the baseline energy performance of each building. Using spreadsheet-based calculation methods, SWA/BSG-PMK estimated the energy and cost savings associated with the installation of each of the recommended energy conservation measures. The findings for the building are summarized in this report.

The goal of this energy audit is to provide sufficient information to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the buildings.

Launched in 2008, the LGEA Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit, after applying eligible NJ SmartStart Buildings incentives, exceeds the remaining cost of the audit, then the additional 25% will also be paid by the program. The Board of Public Utilities (BPU) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

## EXECUTIVE SUMMARY

This document contains the energy audit report for the Former Community Center building and Police Garage, located at 1 Kings Highway, Middletown, New Jersey 07748.

Based on the field visits performed by SWA/BSG-PMK staff on November 23, 2009 and January 8, 2010, and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

### Current conditions

In the most recent full year of data collected, October, 2008 through October, 2009, the Former Community Center consumed a total of 12,370 kWh of electricity for a total cost of \$2,549, the Police Garage consumed a total of 40,329 kWh of electricity for a total cost of \$6,718 and together consumed 5,131 therms of natural gas, for a total cost of \$6,872.

With electricity and fossil fuel combined, the building consumed 669 MMBtus of energy at a total cost of \$16,139.

SWA/BSG-PMK has entered energy information about the Facility in the US Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. In order to compare commercial buildings equitably, the *Portfolio Manager* ratings convey the consumption of each type of energy in a single common unit. The EPA uses source energy to represent the total amount of raw fuel required to operate the building. The site energy use intensity for the complex is 77.0 kBtu/sq.ft/year. After energy efficiency improvements are made, future utility bills can be added to the *Portfolio Manager* and the site energy use intensity for a different time period can be compared to the year 2009 baseline to track the changes in energy consumption associated with the energy improvements.

Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). SWA/BSG-PMK encourages the Township of Middletown to continue entering utility data in *Energy Star Portfolio Manager* in order to track whether normalized source energy use over time. The building performance rating could not be determined because this is a mixed-use facility, comprised by non-eligible space types categorized as "Other".

(Refer to Section 1.3 for Energy Star Rating)

### Category I Recommendations: Capital Improvement Measures

- The water heater in the Police Garage is beyond its useful life and in poor condition, and should be replaced. Replacing the existing electric water heater with a new electric water heater will not yield enough savings to produce a lucrative payback.
- The windows at the Former Community Center should be replaced with thermal, double pane windows.

### Category II Recommendations: Operations and Maintenance

- Replace the two window air-conditioners at the former community center with newer, high-efficiency units.
- Seal the exterior openings in the roof at the Police Garage.
- Insulate the under-side of the roof in the radio repair room at the Police garage.
- Seal the open louvers in the Police Garage.
- Replace weather-stripping for door at the Former Community Center

**Category III Recommendations: Energy Conservation Measures - Upgrades with associated energy savings**

At this time, SWA/BSG-PMK highly recommends a total of **4** Energy Conservation Measures (ECMs) for the Former Community Center and Police Garages that are summarized in the following tables. The total investment cost for these ECMs is **\$10,265**. SWA/BSG-PMK estimates a first year savings of **\$1,623** with a simple payback of **6.3 years**. SWA/BSG-PMK estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the buildings by **11,279 lbs of CO<sub>2</sub>**.

There are various incentives that the Township of Middletown could apply for that could also help lower the cost of installing the ECMs. SWA/BSG-PMK recommends that the Township apply for the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project. A new NJ Clean Power program, Direct Install, could also assist to cover up to 80% of the capital investment. In order to qualify, the facility being upgraded must not have had a peak demand that exceeded 200 kW in any of the preceding 12 months; the highest peak demand for the complex in the previous year was 9.4 kW.

The following tables summarize the proposed Energy Conservation Measures (ECM) and their economic relevance:

ROI: Return on Investment (%)

**Assumptions:**

Discount rate: 3.2% per DOE FEMP guidelines  
 Energy price escalation rate: 0% per DOE FEMP guidelines

Electricity rate: \$0.17 \$/kWh (Police Garages)  
 \$0.21 \$/kWh (Former Community Center)  
 Gas rate: \$1.34 \$/therm

Avg. Annual Demand: 0.0024851 (Police Garages) Area of Building (SF) 5,102 (Police Garages)  
 0.0069281 (Former Community Center) 4,000 (Former Community Center)

Table 1 - Highly Recommended 0-5 Year Payback ECMs																			
ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW, Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings, \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO <sub>2</sub> Reduced, lbs/yr
1	Lighting Upgrades (Former Community Center)	Empirical Data	\$4,230	\$630	\$3,600	3,837	2.22	0	3.27	\$0	\$806	15	\$9,481	4.47	1089%	73%	21%	\$6,019	5,256
TOTAL			\$4,230	\$630	\$3,600	3,837	2.22	0	3.27	\$0.00	\$806	-	\$9,481	4.47	-	-	-	\$6,019	5,256

Table 2 - Recommended 5-10 Year Payback ECMs																			
ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW, Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings, \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO <sub>2</sub> Reduced, lbs/yr
2	Outdoor Air Reset Control (Former Community Center)	Similar Projects	\$2,000	\$0	\$2,000	0	0.00	274	6.84	\$0	\$367	10	\$3,096	5.45	548.22%	55%	13%	\$1,128	3,202
3	Convert DHW to Gas (Former Community Center)	Similar Projects	\$2,500	\$50	\$2,450	2,189	1.26	-113	-0.96	\$0	\$308	13	\$3,233	7.96	245.96%	19%	8%	\$825	1,674
TOTAL			\$4,500	\$50	\$4,450	2,189	1.26	160	5.88	\$0.00	\$675	-	\$6,330	6.60	-	-	-	\$1,953	4,876

Table 3 - Recommended Extended-Payback ECMs																			
ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW, Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings, \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO <sub>2</sub> Reduced, lbs/yr
4	Lighting Upgrades (Police Garages)	Empirical Data	\$2,770	\$555	\$2,215	837	0.17	0.00	0.56	\$0	\$142	15	\$1,675	15.56	-163%	-11%	0%	-\$516	1,147
TOTAL			\$2,770	\$555	\$2,215	837	0.17	0	0.56	\$0.00	\$142	-	\$1,675	15.56	-	-	-	-\$516	1,147

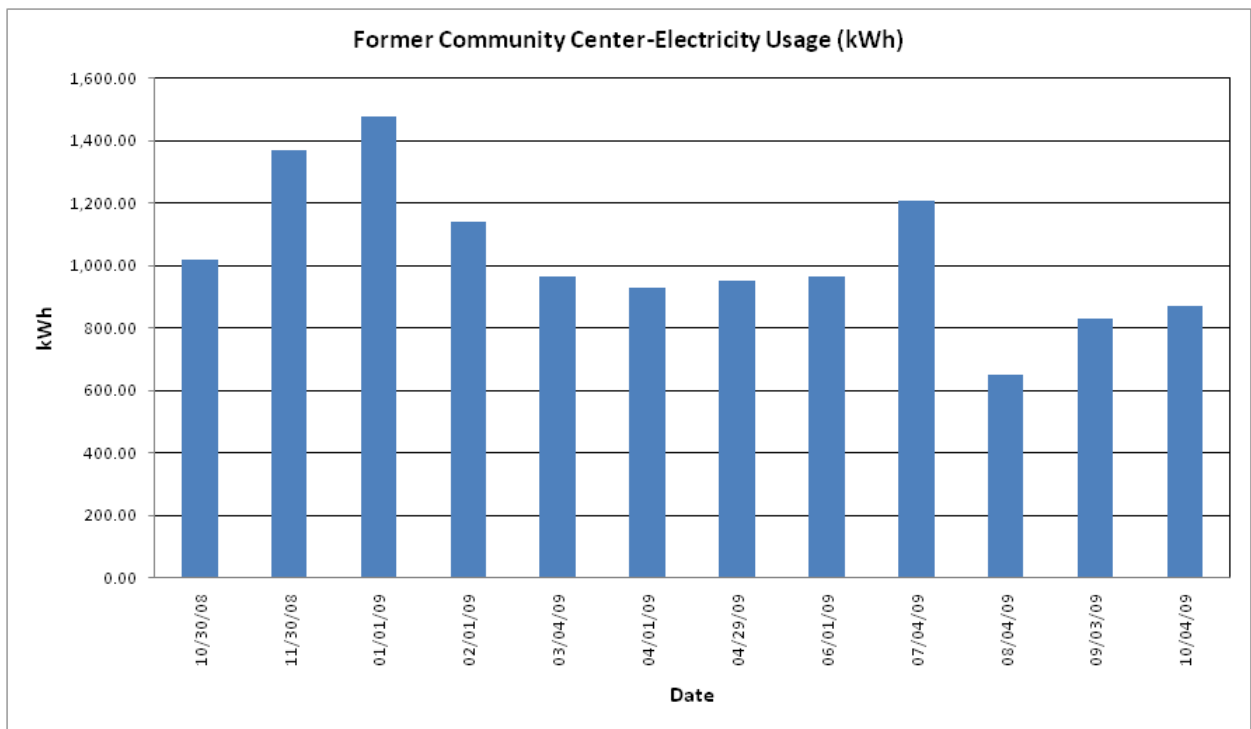
# 1. HISTORIC ENERGY CONSUMPTION

## 1.1 Energy Usage and Cost Analysis

SWA/BSG-PMK analyzed utility bills from November, 2007 through December, 2009 that were received from the utility companies supplying the Former Community Center and Police Garage with electric and natural gas.

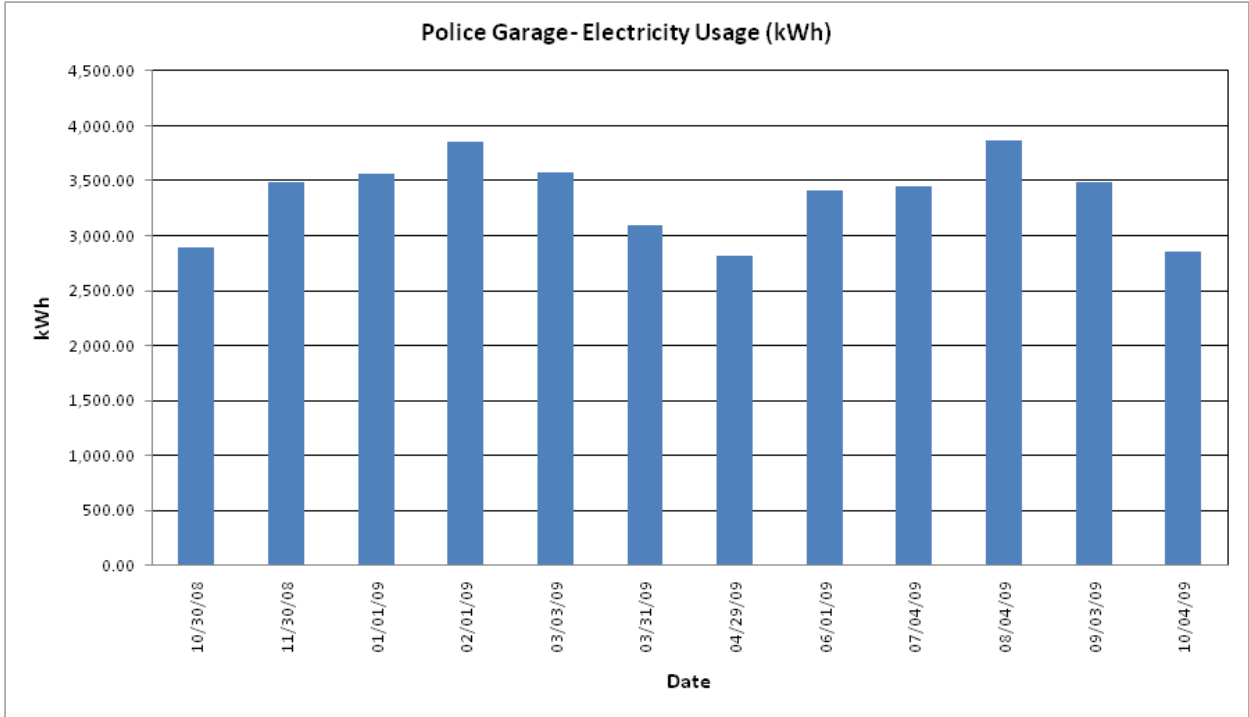
Electricity - The Former Community Center is currently served by one electric meter and receives electricity from Jersey Central Power & Light at **an average rate of \$0.21/kWh** based on 12 months of utility bills from October, 2008 through October, 2009. The building consumed **12,370 kWh or \$2,549 worth of electricity** during that time span.

The following chart shows electricity usage for the building based on utility bills from October, 2008 through October, 2009:



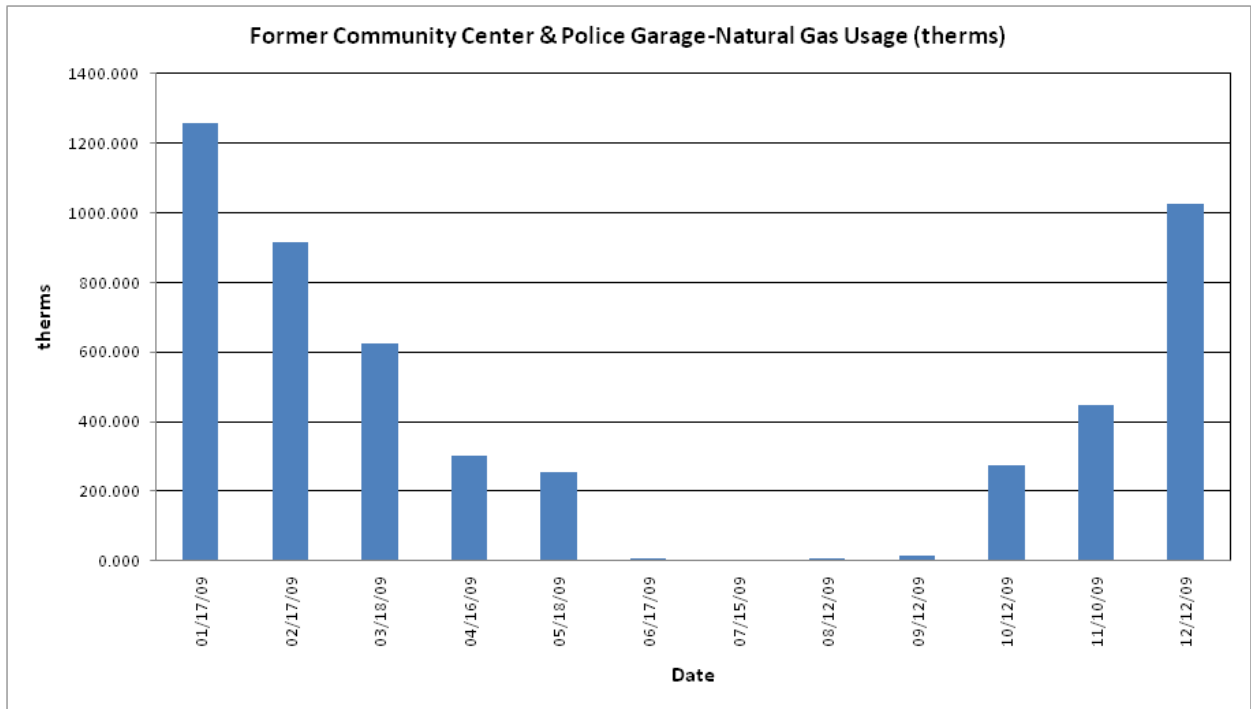
The Police Garage is currently served by one electric meter and receives electricity from Jersey Central Power & Light at **an average rate of \$0.17/kWh** based on 12 months of utility bills from October, 2008 through October, 2009. The building consumed **40,329 kWh or \$6,718 worth of electricity** during that time span.

The following chart shows electricity usage for the building based on utility bills from October, 2008 through October, 2009:



Natural Gas - The Former Community Center and Police Garage are currently served by one natural gas meter and receives gas from New Jersey Natural Gas at **an average rate of \$1.34/therm** based on 12 months of utility bills from January, 2009 through December, 2009. The building consumed **5,131 therms or \$6,872 worth of natural gas** during that time span.

The following chart shows the natural gas consumption for the complex based on natural gas bills for the 12 month period of January, 2009 through December, 2009:



## 1.2 Utility Rate

The Former Community Center currently receives electricity from Jersey Central Power & Light for electricity use (kWh) with a separate (kW) demand charge. The complex currently pays an average rate of approximately \$0.21/kWh based on the 12 months of utility bills of October, 2008 through October, 2009.

The Police Garage currently receives electricity from Jersey Central Power & Light for electricity use (kWh) with a separate (kW) demand charge. The complex currently pays an average rate of approximately \$0.17/kWh based on the 12 months of utility bills of October, 2008 through October, 2009.

The Former Community Center & Police Garage currently receives natural gas supply and transmission from New Jersey Natural Gas at an average aggregated rate of \$1.34/therm based on 12 months of utility bills from January, 2009 through December, 2009.

## 1.3 Energy Benchmarking

The building information and utility data were entered into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. SWA/BSG-PMK recommends that the Township maintain the Portfolio Manager account at the link below. As the account is maintained, SWA/BSG-PMK can share with the Township and TRC and allow future data to be added and tracked using the benchmarking tool.

[http://www.energystar.gov/index.cfm?c=evaluate\\_performance.bus\\_portfoliomanager](http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager)

**Username:** middletowntownship

**Password:** middletown

Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). SWA/BSG-PMK encourages the Township to continue entering utility data in Energy Star Portfolio Manager in order to track whether normalized source energy use over time.

The Site Energy Use Intensity is 74.0 kBtu/ft<sup>2</sup>yr compared to the national average of 77.0 kBtu/ft<sup>2</sup>yr for commercial buildings classified similarly by the Energy Star Portfolio Manager. Implementing this report's recommendations will reduce use by approximately 9.7 kBtu/ft<sup>2</sup>yr, which when implemented would lower the buildings energy consumption.



## STATEMENT OF ENERGY PERFORMANCE Former Community Center and Police Garage

Building ID: 2062048  
For 12-month Period Ending: October 31, 2009<sup>1</sup>  
Date SEP becomes ineligible: N/A

Date SEP Generated: February 18, 2010

**Facility**  
Former Community Center and Police  
Garage  
1 King's Hwy  
Middletown, NJ 07748

**Facility Owner**  
Middletown Township  
1 Kings Highway  
Middletown, NJ 07749

**Primary Contact for this Facility**  
Jason Greenspan  
1 King's Highway  
Middletown, NJ 07737

**Year Built:** 1907  
**Gross Floor Area (ft<sup>2</sup>):** 9,102

**Energy Performance Rating<sup>2</sup> (1-100)** N/A

### Site Energy Use Summary<sup>3</sup>

Electricity - Grid Purchase(kBtu)	181,014
Natural Gas (kBtu) <sup>4</sup>	488,521
Total Energy (kBtu)	669,535

### Energy Intensity<sup>5</sup>

Site (kBtu/ft <sup>2</sup> /yr)	74
Source (kBtu/ft <sup>2</sup> /yr)	123

### Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO <sub>2</sub> e/year)	54
---	----

### Electric Distribution Utility

FirstEnergy - Jersey Central Power & Lt Co

### National Average Comparison

National Average Site EUI	77
National Average Source EUI	150
% Difference from National Average Source EUI	-18%
Building Type	Service (Vehicle Repair/Service, Postal Service)

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<sup>6</sup> for Indoor Environmental Conditions:

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

**Certifying Professional**  
N/A

#### Notes:

1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

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

EPA Form 5900-16

## 2. FACILITY AND SYSTEMS DESCRIPTION

### 2.1 Building Characteristics

The Former Community Center is a two story building constructed in 1907. The building has a total floor area of 4,000 square feet. The facility houses an auxiliary police training room, restrooms, a small kitchen, and a professional boxing ring.

The Police Garage was built in 1958. The building has a total area of 5,102 square feet. The Police Garage houses a classroom, evidence storage, evidence vault, radio repair, workout room, and garages.

### 2.2 Building Occupancy Profiles

The Former Community Center is open as needed. There are no permanent employees in the building.

The Police Garage is open from 8:00 AM to 4:30 PM Monday through Friday and has no full time employees.

### 2.3 Building Envelope

#### 2.3.1 Exterior Walls

##### Former Community Center

The exterior walls are constructed from brick veneer over wood framing. The interior is finished with a mixture of original plaster, drywall, and wood paneling. The walls are in fair condition.



##### Police Garage

The exterior walls are constructed from concrete block. The walls are in good condition.



#### 2.3.2 Roof

##### Former Community Center

The roof is constructed from wood rafters and finished with asphalt shingles. The roof is in good condition.

##### Police Garage

The roof is constructed of wood rafters with tongue and groove sheathing finished with asphalt shingles. The roof is in good condition. The radio room and the garage bay have no insulation in the ceiling. The



garage bay also has open louvers and an open gap between the concrete block and the roof.

Category II Repair and Maintenance- Installing insulation to the underside of the roof, and closing up all open gaps between the roof and block will greatly reduce heat loss in the winter months.

### **2.3.3 Base**

#### Former Community Center

There is a basement in the building. The basement floor is wood on grade and in fair condition.

#### Police Garage

The base of the building is poured concrete and is in fair condition.

### **2.3.4 Windows**

#### Former Community Center

There are original single pane wood framed windows on the building. All are in poor condition.

Category I Capital Improvements- The windows at the Former Community Center should be replaced with thermal, double pane windows.



#### Police Garage

There are no windows in the building.

### **2.3.5 Exterior Doors**

#### Former Community Center

The exterior doors are in fair condition. The doors are steel doors. The basement door has no weather stripping at the bottom, allowing leaves to enter the building.

Category II Repair & Maintenance- Add/ replace weather-stripping

#### Police Garage

The exterior doors are all garage and bay doors. The doors are in fair condition. The doors are steel doors with no insulation.

### 2.3.6 Building Air Tightness

#### Former Community Center

There are no visual signs of outside air infiltration. However, all of the windows are single pane allowing for heat loss.

#### Police Garage

Due to the nature of the use of these buildings, the garage and bay doors are constantly being opened or closed. This allows for a large amount of heat to escape in the winter and air conditioning in the summer.

## 2.4 HVAC Systems

### 2.4.1 Heating

#### Former Community Center

The Former Community Center is heated by a Weil-McLain natural gas, hot water boiler, with model number EGH-105-PI. It is rated at 450 MBH and is 80% efficient. The training room is heated by a Dayton unit heater, with model number 3E367E and rated at 45 MBH.

Category III Recommendation – ECM #2: Install hot water outdoor air reset control (OAR). These controllers reduce the maximum boiler water temperature depending on the outside air temperature; for instance, if the outside air temperature is 0°F, the boiler temperature will be 180°F, but if the outside air temperature is 40°F, the boiler temperature will only need to be 130°F.



*Weil-McLain boiler (former community center)*

### Police Garage

The Police Garage is heated by three gas-fired unit heaters:

Manufacturer	Model #	MBH	Area Served
Reznor	UDA75	75	Radio repair
Dayton	3E367E	45	Police garage
Dayton	3E406D	60	Weight room

### **2.4.2 Cooling**

#### Former Community Center

The Former Community Center is cooled by two window air-conditioners:

Manufacturer	Model #	BTU	EER
Sanyo	SA91	9,000	9
GE	AGGS632DA	No specs available	

Category II Recommendation – Operations & Maintenance: Replace the two window air-conditioners at the former community center with newer, high-efficiency units.



*Sanyo window air-conditioner (former community center)*

### Police Garage

There is no cooling at the Police Garage.

### 2.4.3 Ventilation

Natural ventilation is provided to both facilities through doors and windows.

### 2.4.4 Domestic Hot Water

#### Former Community Center

Hot Water at the Former Community Center is heated by a 30 gallon, 4.5 kW AO Smith electric water heater, with model number EES 30 917.

Category III Recommendation – ECM #3: Replace the electric water heater at the former community center with a gas unit.

#### Police Garage

Hot Water at the Police Garage is heated by a 15 gallon, 2 kW Rheem electric water heater, with model number 81VP15S.

Category I Recommendation – Capital Improvement: Replace the Rheem electric water heater at the Police Garage with a more efficient unit, because the existing unit has surpassed its useful life.



*Rheem electric water heater (police garage)*

## 2.5 Electrical systems

### 2.5.1 Lighting

#### Former Community Center

A complete inventory of all interior, exterior, and exit sign light fixtures were examined at the Former Community Center and documented in Appendix A of this report including an estimated total lighting power consumption. Our initial findings indicate that performing a detailed lighting upgrade per the

recommendations in Appendix A will result in an annual savings of \$806 based on the current \$0.21/kWh and the current occupancy schedule. Implementation of this ECM will cost approximately \$4,230. Currently the Board of Public Utilities (BPU) would offer an estimated rebate of \$630.00, yielding a net cost of \$3,600 for this project. With a yearly savings of \$806 the payback on this ECM would be about 4.5 years.

Category III Recommendation for the Former Community Center - ECM #1: Recommend upgrading all T-12 lighting fixtures with magnetic ballasts to T-8 fixtures with electronic ballasts, as well as various other lighting upgrades outlined in Appendix A. It is not recommended to install lighting sensors in certain areas, such as bathrooms, since the paybacks would be extremely high.

### Police Garage

A complete inventory of all interior, exterior, and exit sign light fixtures were examined at the Police Garage and documented in Appendix A of this report including an estimated total lighting power consumption. Our initial findings indicate that performing a detailed lighting upgrade per the recommendations in Appendix A will result in an annual savings of \$142 based on the current \$0.17/kWh and the current occupancy schedule. Implementation of this ECM will cost approximately \$2,770. Currently the Board of Public Utilities (BPU) would offer an estimated rebate of \$555, yielding a net cost of \$2,215 for this project. With a yearly savings of \$142 the payback on this ECM would be about 15.6 years.

Category III Recommendation for the Police Garage - ECM #5: Recommend upgrading all T-12 lighting fixtures with magnetic ballasts to T-8 fixtures with electronic ballasts, as well as various other lighting upgrades outlined in Appendix A. It is not recommended to install lighting sensors in the Police Garage due to the nature of the building use and in most cases the paybacks would be extremely high.

**Refer to Appendix A for further details.**

#### **2.5.2 Appliances and process**

There are no appliances of note at either building.

#### **2.5.3 Elevators**

There are no elevators in these facilities.

#### **2.5.4 Other electrical systems**

There are currently no other significant energy impacting electrical systems installed at either building.

### 3. EQUIPMENT LIST

Building System	Description	Location	Model #	Fuel	Space Served	Estimated Remaining Useful Life %
<b>Former Community Center</b>						
Heating	Gas-fired hot water boiler, 450,000 BTU/Hr, 80% efficient	MER	Weil-McLain #EGH-105-PI	Natural Gas	Entire building	36%
Cooling	Window AC Unit, 9000 BTU/Hr, EER 9.0	Lower Level	Sanyo #SA91	Electric	Lower Level Meeting Room	0%
Domestic Hot Water	Domestic Hot Water Heater, 30 gal, 4500W	MER	A.O. Smith #EES 30 917	Electric	Entire building	50%
Cooling	Window AC Unit, 32,000 BTU	1st Floor (Ring)	GE #AGGS632DA	Electric	1st Floor (Ring)	0%
Heating	Circulation Pump	MER	Bell & Gossett	Electric	Entire building	20%
Heating	Unit heater, 45 MBH	Training room	Dayton M# 3E367E	Natural Gas	Training room	80%
<b>Police Garage</b>						
Domestic Hot Water	Domestic Hot Water Heater, 15 gal, 2000W	Loft	Rheem #81VP15S	Electric	Entire building	20%
Heating	Unit heater, 75 MBH	Radio Repair	Reznor #UDA75	Natural Gas	Radio Repair	20%
Heating	Unit Heater, 45 MBH	Police Garage	Dayton #3E367E	Natural Gas	Police Garage	80%
Heating	Unit Heater, 60 MBH	Weight Room	Dayton #3E406D	Natural Gas	Weight Room	80%

**Note:** The remaining useful life of a system (in %) is the relationship between the system manufactured and/or installed date and the standard life expectancy of similar equipment based on ASHRAE (2003), ASHRAE Handbook: HVAC Applications, Chapter 36.

#### 4. ENERGY CONSERVATION MEASURES

Based on the assessment of the Former Community Center & Police Garage, SWA/BSG-PMK has separated the investment opportunities into three recommended categories:

1. Capital Improvements - Upgrades not directly associated with energy savings
2. Operations and Maintenance - Low Cost / No Cost Measures
3. Energy Conservation Measures - Higher cost upgrades with associated energy savings

##### Category I Recommendations: Capital Improvement Measures

- The water heater in the Police Garage is beyond its useful life and in poor condition, and should be replaced. Replacing the existing electric water heater with a new electric water heater will not yield enough savings to produce a lucrative payback.
- The windows at the Former Community Center should be replaced with thermal, double pane windows.

##### Category II Recommendations: Operations and Maintenance

- Replace the two window air-conditioners at the former community center with newer, high-efficiency units.
- Seal the roof to exterior openings in the Police Garages.
- Insulate the under-side of the roof in the radio garage.
- Seal the open louvers in the Police Garages.

##### Category III Recommendations: Energy Conservation Measures

Summary Table

ECM #	Description
1	Lighting Upgrades (Former Community Center)
2	Outdoor Air Reset Control (Former Community Center)
3	Convert DHW to Gas (Former Community Center)
4	Lighting Upgrades (Police Garage)

**ECM#1: Lighting Upgrades (Former Community Center)**

**Description:**

Lighting at the Former Community Center consists primarily of T-12 fluorescent lamps with magnetic ballasts. The exterior lighting consisted of both H.I.D. and incandescent fixtures. It is recommended that all T-12 fixtures with magnetic ballasts be retrofit with T-8 lamps and electronic ballasts. The exterior incandescent lamps should be replaced with compact fluorescents. Lighting replacement generally yields a very good payback, due to the fact that most lighting usage in commercial buildings is fairly high and the installation is relatively inexpensive.

**Recommended lighting upgrades are detailed in Appendix A.**

**Installation cost:** \$3,600

<b>Summary</b>	<b>Lighting (Only)</b>	<b>Sensors (Only)</b>	<b>Complete Lighting Upgrade</b>
<b>Cost</b>	\$4,230.00	\$0.00	\$4,230.00
<b>Rebate</b>	\$630.00	\$0.00	\$630.00
<b>Net Cost</b>	\$3,600.00	\$0.00	<b>\$3,600.00</b>
<b>Savings (kWh)</b>	3,837	0	<b>3,837</b>
<b>Savings (\$)</b>	\$805.72	\$0.00	<b>\$805.72</b>
<b>Payback</b>	4.5		<b>4.5</b>

**Variables:**

<b>\$0.21</b>	<b>Avg. Electric Rate (\$/kWh)</b>
	<b>Avg. Demand Rate (\$/kW)</b>
<b>1560</b>	<b>Operating Hours/Year</b>
<b>6</b>	<b>Operating Hours/Work Day</b>

**Assumptions:**

<b>25%</b>	<b>Occupancy Sensor Savings (Avg)</b>
<b>40%</b>	<b>Occupancy Sensor Savings(&gt;Avg)</b>

Source of cost estimate: Empirical Data

**Economics (without incentives):**

ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW, Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings \$	Total 1st Yr Savings \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO2 Reduced, lbs/yr
1	Lighting Upgrades (Former Community Center)	Empirical Data	\$4,230	\$630	\$3,600	3,837	2.22	0	3.27	\$0	\$306	15	\$9,481	4.47	1089%	73%	21%	\$6,019	5,256

**Assumptions:**

The electric cost used in this ECM was \$0.21/kWh, which was the Former Community Center’s average rate for the 12-month period ranging from October, 2008 through October, 2009. The replacements for each lighting fixture, the costs to replace or retrofit each one, and the rebates and wattages for each fixture are located in Appendix A.

**Rebates/financial incentives:**

The New Jersey SmartStart offers rebates for upgrading lighting fixtures. The total rebate this ECM qualifies for is \$630.

## ECM#2: Outdoor Air Reset Control (Former Community Center)

### Description:

Heating is provided to the Former Community Center by a gas-fired hot water boiler, located in the mechanical room. This boiler is in good condition, and its operation can be made even more efficient by installing outdoor air reset control. The boiler is designed to provide water to radiators or hot water coils at a constant temperature, of approximately 180°F. This can cause the system to provide too high a temperature to the space it was designed to heat, which wastes energy and increases gas bills. Outdoor air reset controllers reduce the maximum boiler water temperature depending on the outside air temperature; for instance, if the outside air temperature is 0°F, the boiler temperature will be 180°F, but if the outside air temperature is 40°F, the boiler temperature will only need to be 130°F.

### Installation cost:

Estimated installed cost: \$2,000

Source of cost estimate: Similar Projects

### Economics:

ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kWh Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings, \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO2 Reduced, lbs/yr
2	Outdoor Air Reset Control (Former Community Center)	Similar Projects	\$2,000	\$0	\$2,000	0	0.00	274	6.84	\$0	\$367	10	\$3,096	5.45	548%	55%	13%	\$1,128	3,202

### Assumptions:

The cost per therm of natural gas that was used, taken from twelve months of the Former Community Center and Police Garage's energy bills, was \$1.34. Also taken from the energy bills was the annual heating consumption for all heating units in the Former Community Center and Police Garages, 5,131 therms. There are five gas-consuming units in all buildings combined, so the gas consumption must be divided between these units. An accurate way to go about this is to add the heating capacities of all five units, and make the percentage of the total gas consumption that each unit consumed would be proportional to the percentage of the cumulative heating capacities that each unit represents:

Building	Unit	Location	MBH	% of Total MBH	Gas Consumption (therms)
Former Community Center	Boiler	MER	450	66.7%	3,421
	Unit Heater	Training Room	45	6.7%	342
Police Garages	Unit Heater	Radio Repair	75	11.1%	570
	Unit Heater	Police Garage	45	6.7%	342
	Unit Heater	Weight Room	60	8.9%	456

The boiler consumed approximately 3,421 therms of natural gas during this time period.

Outside air reset controllers typically save between 8% and 15% of the annual heating consumption; to be conservative, the lower end of this range, 8%, was be used.

**Rebates/financial incentives:**

No rebates for outside air reset control are available.

### ECM #3: Convert Electric Water Heater to Natural Gas

#### Description:

Domestic hot water is provided by an electric water heater, which has a volume of 30 gallons. A natural gas fired water heater would be much more cost-efficient. The current water heater is located in the same room as a gas-fired boiler, so switching to a gas-fired water heater is economically feasible.

#### Installation cost:

Estimated installed cost: Installation: \$2,450

Source of cost estimate: Similar projects

#### Economics:

ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings, \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO2 Reduced, lbs/yr
3	Convert DHW to Gas (Former Community Center)	Similar Projects	\$2,500	\$50	\$2,450	2,189	1.26	-113	-0.96	\$0	\$308	13	\$3,233	7.96	246%	19%	8%	\$825	1,674

#### Assumptions:

Using the facility's electricity bills from October 15<sup>th</sup>, 2008 through October 20<sup>th</sup>, 2009, it was determined that the cost of electricity is currently \$0.21/kWh. The cost of natural gas, using bills from January 1<sup>st</sup>, 2009 through December 12<sup>th</sup>, 2009, is \$1.34/therm.

To calculate the savings from switching from electricity to gas, a spreadsheet created by Rheem was used. The temperature rise of the heated water was set at 77°F on the spreadsheet, and the energy factor (a unit that specifies the efficiency of water heaters) is specified as 0.94 for new electric units and 0.62 for gas units. Weight of water was set at 8.33 pounds/ft.<sup>3</sup>. Using this data, the BTUs of output heat used for heating the water were calculated by the following equation:

$$BTUs_{\text{output}} = \text{Vol.} \times \text{Wt.}_{\text{water}} \times \Delta \text{Temp.}$$

This value would be the same for the current and proposed units. The actual BTUs purchased by each unit are calculated using this value and the energy factors:

$$BTU_{\text{input}} = \frac{BTU_{\text{output}}}{\text{Energy Factor}}$$

The annual costs for heating the water can now be calculated using this data:

Current

Volume of Water Heated (gal)	Weight of Water (lb/ft <sup>3</sup> )	Temp. Rise (°F)	BTUs Required to Heat Water	Energy Factor	BTUs Purchased to Heat Water	Cost per kWh	Actual Daily Cost to Heat Water	Actual Yearly Cost to Heat Water
30	8.33	77	19,242	0.94	20,471	\$0.21	\$1.26	\$460

Proposed

Volume of Water Heated (gal)	Weight of Water (lb/ft <sup>3</sup> )	Temp. Rise (°F)	BTUs Required to Heat Water	Energy Factor	BTUs Purchased to Heat Water	Cost per Therm	Actual Daily Cost to Heat Water	Actual Yearly Cost to Heat Water
30	8.33	77	19,242	0.62	31,036	\$1.34	\$0.42	\$152

**Rebates/financial incentives:**

This ECM qualifies for a New Jersey SmartStart rebate of \$50.

**ECM#4: Lighting Upgrades (Police Garages)**

**Description:**

Lighting at the Police Garage consists primarily of T-12 fluorescent lamps with magnetic ballasts. It is recommended that all T-12 fixtures with magnetic ballasts be retrofit with T-8 lamps and electronic ballasts. Lighting replacement generally yields a very good payback, due to the fact that most lighting usage in commercial buildings is fairly high and the installation is relatively inexpensive.

**Recommended lighting upgrades are detailed in Appendix A.**

**Installation cost:** \$2,215

Summary	Lighting (Only)	Sensors (Only)	Complete Lighting Upgrade
Cost	\$2,770.00	\$0.00	\$2,770.00
Rebate	\$555.00	\$0.00	\$555.00
Net Cost	\$2,215.00	\$0.00	<b>\$2,215.00</b>
Savings (kWh)	837	0	<b>837</b>
Savings (\$)	\$142.32	\$0.00	<b>\$142.32</b>
Payback	15.6		<b>15.6</b>

**Variables:**

<b>\$0.17</b>	Avg. Electric Rate (\$/kWh)
	Avg. Demand Rate (\$/kW)
<b>1040</b>	Operating Hours/Year
<b>4</b>	Operating Hours/Work Day

**Assumptions:**

<b>25%</b>	Occupancy Sensor Savings (Avg)
<b>40%</b>	Occupancy Sensor Savings(>Avg)

Source of cost estimate: Empirical Data

**Economics (without incentives):**

ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings, \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO2 Reduced, lbs/yr
4	Lighting Upgrades (Police Garages)	Empirical Data	\$2,770	\$555	\$2,215	837	0.17	0	0.56	\$0	\$142	15	\$1,675	15.56	-163%	-11%	0%	-\$516	1,147

**Assumptions:**

The electric cost used in this ECM was \$0.17/kWh, which was the Police Garage’s average rate for the 12-month period ranging from October, 2008 through October, 2009. The replacements for each lighting fixture, the costs to replace or retrofit each one, and the rebates and wattages for each fixture are located in Appendix A.

**Rebates/financial incentives:**

The New Jersey SmartStart offers rebates for upgrading lighting fixtures and installing lighting controls. The total rebate this ECM qualifies for is \$555.

## **5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES**

### **5.1 Existing Systems**

There are currently no existing renewable energy systems.

### **5.2 Solar Photovoltaic**

Photovoltaic (PV) technology would not be cost beneficial to this project since there is such a high cost of installation and small area of viable space available.

### **5.3 Solar Thermal Collectors**

Solar thermal collectors are not cost effective for this project and are not recommended due to the low amount of domestic hot water use throughout the building.

### **5.4 Combined Heat and Power**

CHP is not applicable to this project because of the HVAC system type and limited domestic hot water usage.

### **5.5 Geothermal**

Geothermal is not applicable to this project because it would require modifications to the existing heat distribution system, which would not be cost effective.

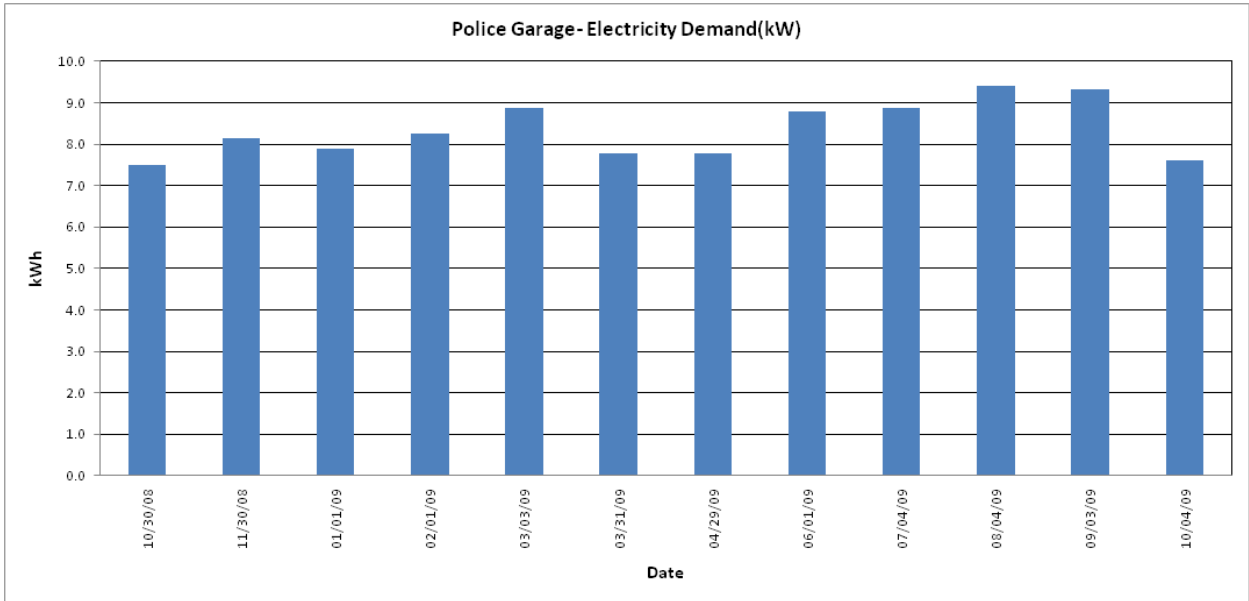
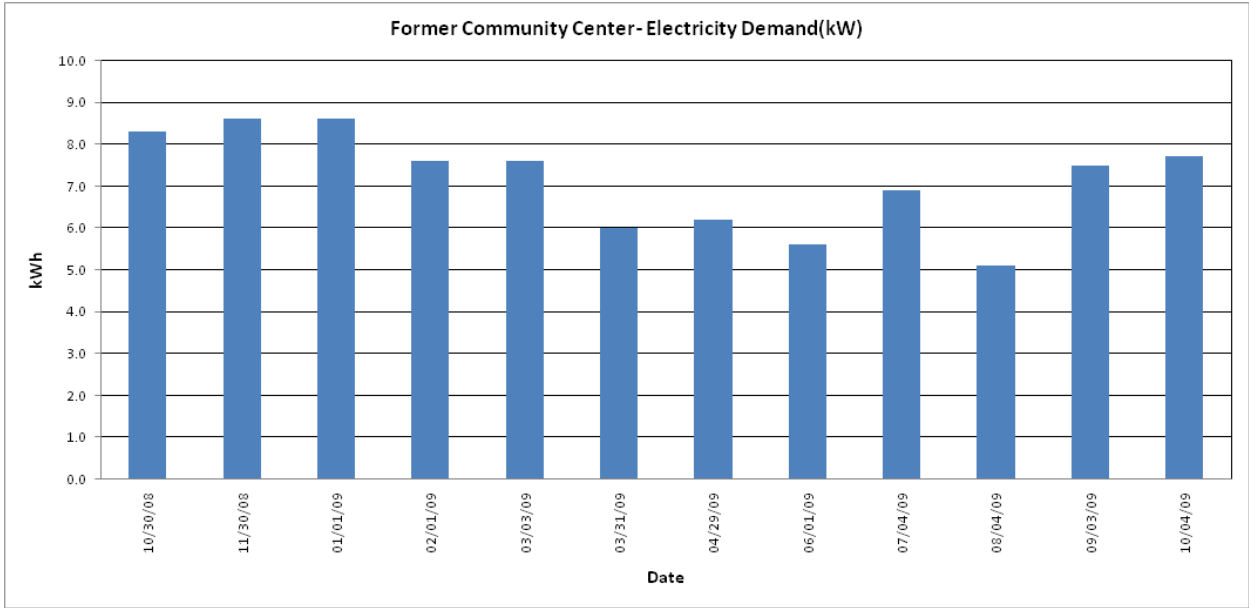
### **5.6 Wind**

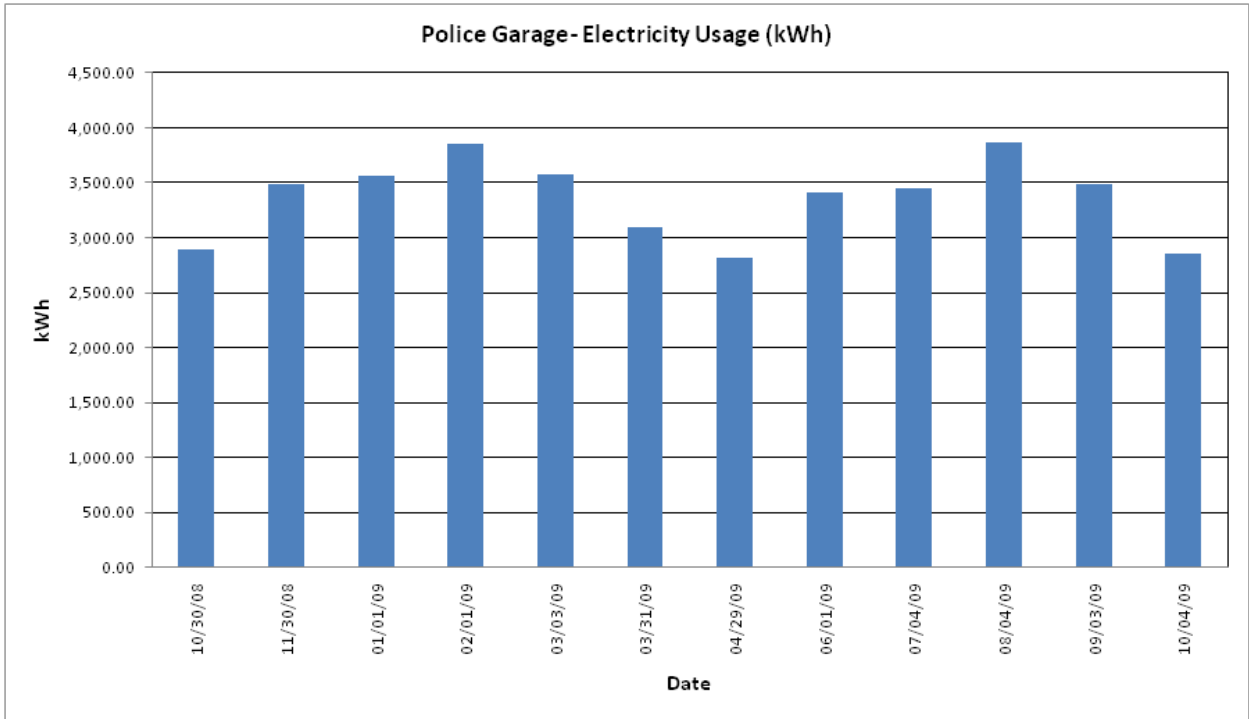
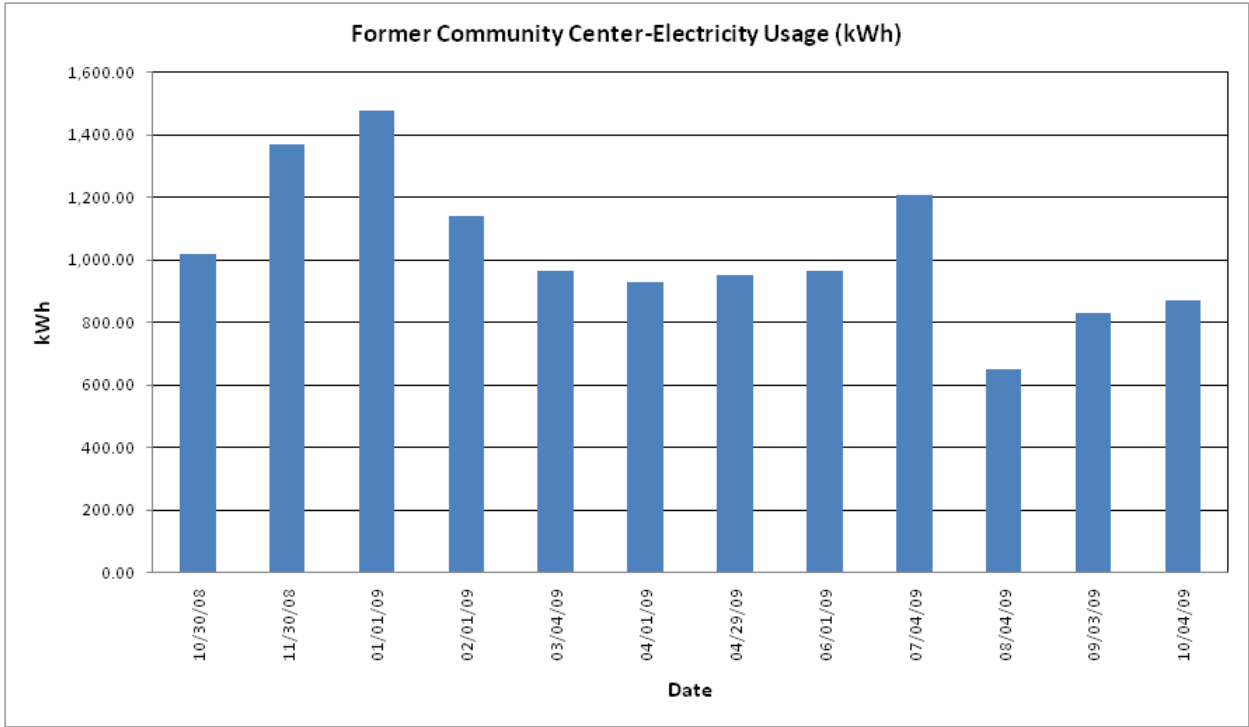
Wind power production is not appropriate for this location because required land is not available for the wind turbine. Also, the available wind energy resource is very low.

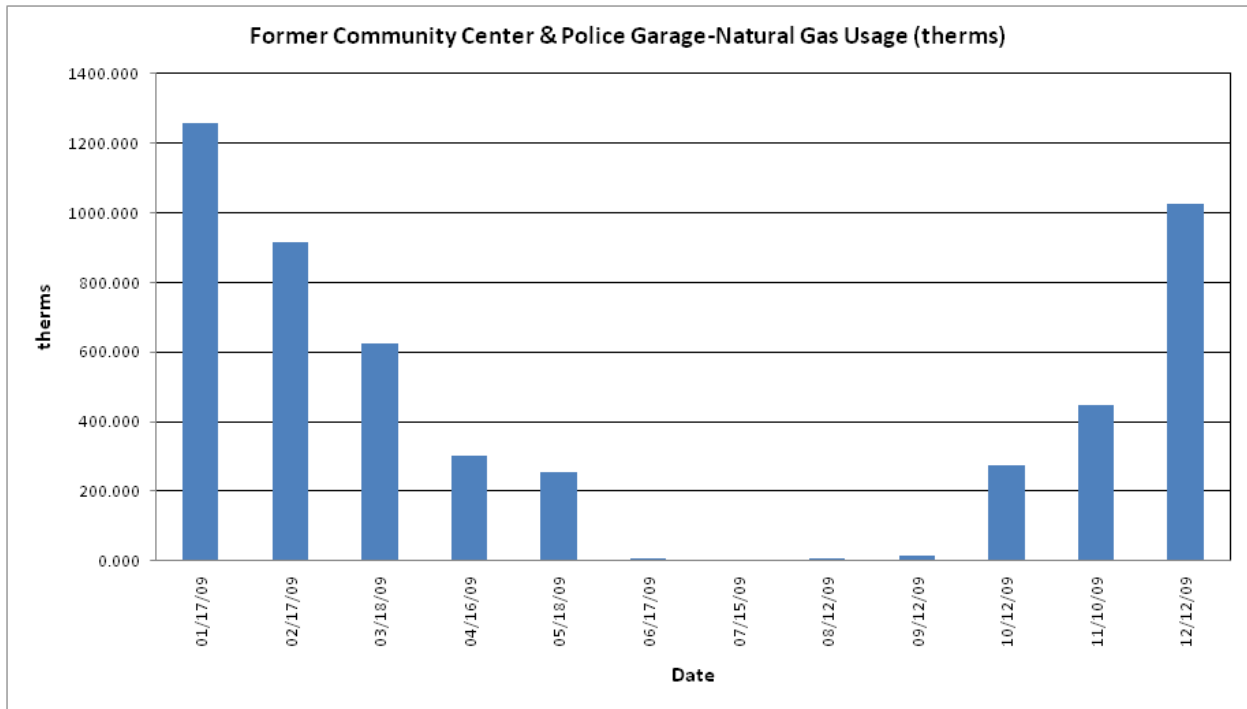
## **6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES**

### **6.1 Load profiles**

The average electrical peak demand for the Former Community Center during previous year was 7.1 kW and the maximum peak demand was 8.6 kW. The average electrical peak demand for the Police Garage during previous year was 8.4 kW and the maximum peak demand was 9.4 kW. The electric and gas load profiles for this project are presented in the following charts. The first two charts show the electric demand (in kW) for the previous 12 months and the other three charts show electric (in kWh) and gas usage (in therms), respectively.





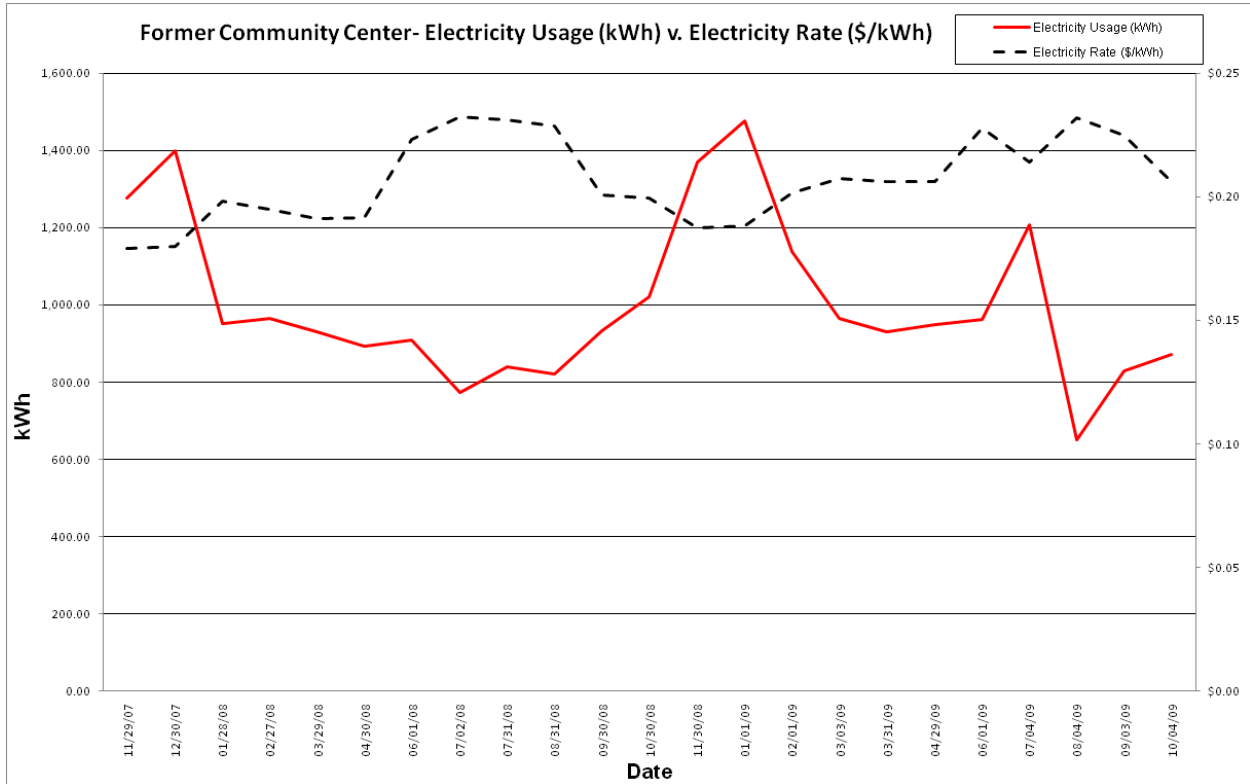


## 6.2 Energy Procurement strategies

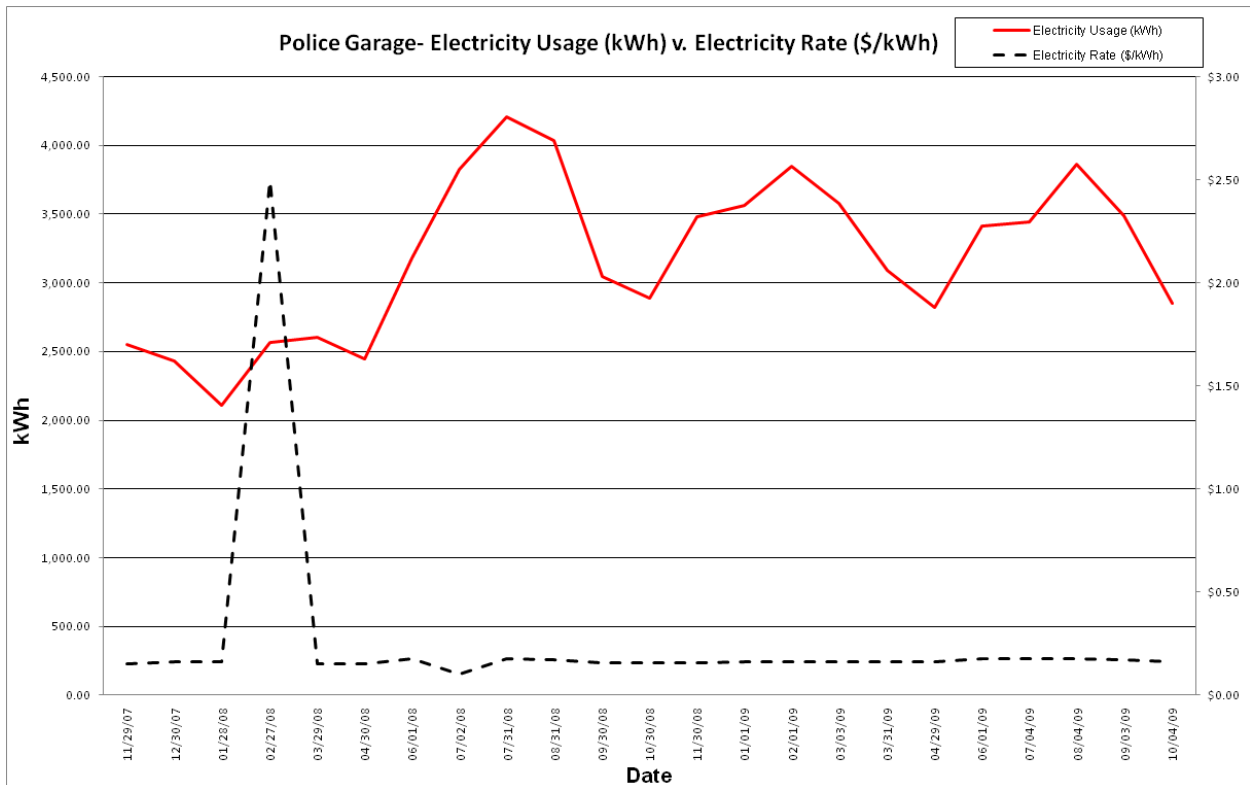
Billing analysis shows price fluctuations of over 20% over the course of the year for the building’s electrical and natural gas accounts. This may be reflective of the utility tariffs under which the building owner secures its’ energy supply. These tariffs often include seasonally adjusted demand charges, or seasonally adjusted usage charges which reflect the markets for the underlying energy commodity. For example a utility often has tariffs which charge more for electricity in the summer when demand for capacity is high and, the marginal producer of electricity is a higher cost generator who otherwise would not be running in the winter, or shoulder seasons.

Buildings which have a large variation in monthly billing rates can often reduce the costs associated with energy procurement by selecting a third party energy supplier who can provide them with fixed pricing over the course of a contract term as well as attain purchasing economies which may not be available on a utilities default tariff (basic generation service in the case of electric and basic gas service in the case of natural gas).

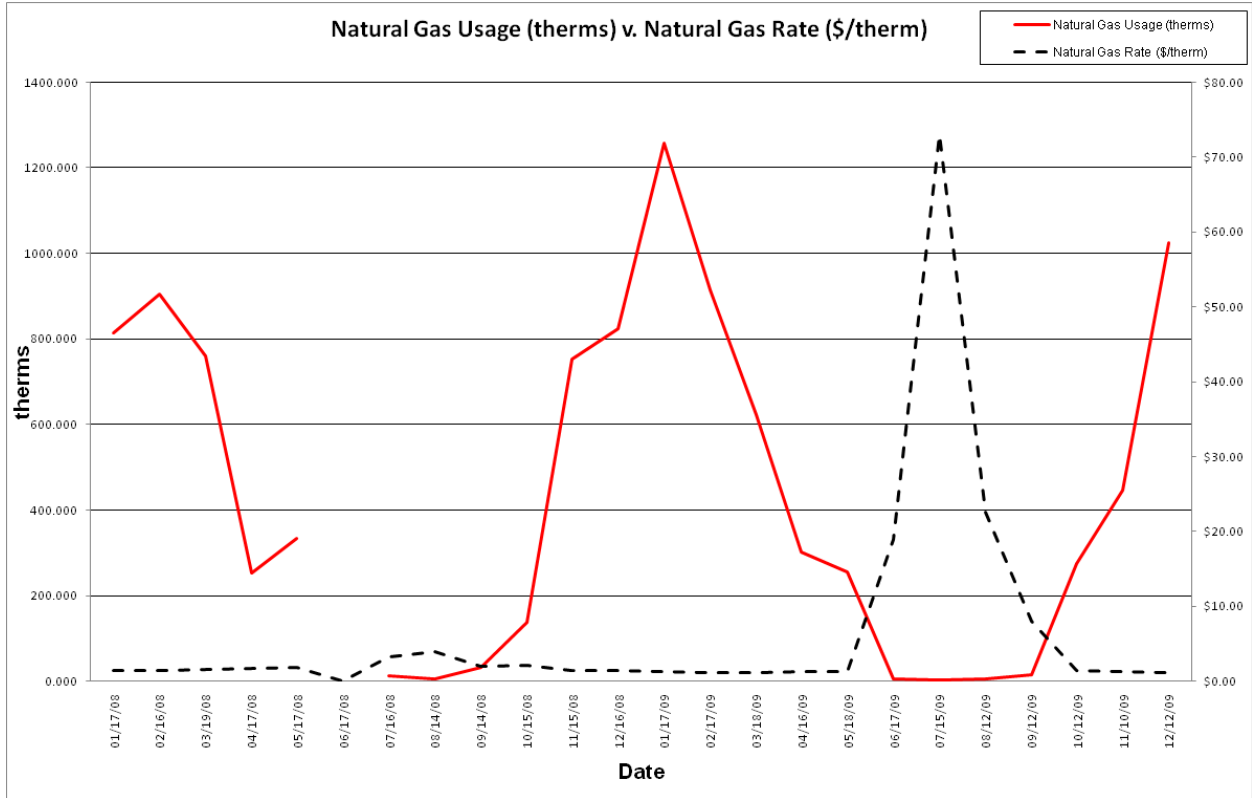
Currently, New Jersey commercial buildings of similar type pay \$0.15/kWh for electricity and \$1.55/therm for natural gas. The electricity rate for the Former Community Center building is \$0.21/kWh, which means there is a potential cost savings of \$694 per year. The electricity rate for the Police Garage building is \$0.17/kWh, which means there is a potential cost savings of \$669 per year. The gas rate for these buildings is \$1.34/therm which is better than the average gas cost. A small cost savings potential for electricity exists, however this involves contacting third party suppliers and negotiating utility rates. SWA recommends that Middletown contact the NJ Energy Choice Program for further information on companies that can act as third party (non-utility) energy suppliers. Purchasing energy from a third party supplier can reduce price fluctuations and can ultimately reduce the annual cost of energy for the facility. Appendix B contains a complete list of third party energy suppliers.



*Electricity prices generally reflect electricity usage*



*Electricity prices generally reflect electricity usage*



*Natural gas prices and usage levels fluctuate over the course of the year*

## 7. METHOD OF ANALYSIS

### 7.1 Assumptions and tools

Energy modeling tool: established / standard industry assumptions, E-Quest  
Cost estimates: RS Means 2009 (Facilities Maintenance & Repair Cost Data)  
RS Means 2009 (Building Construction Cost Data)  
RS Means 2009 (Mechanical Cost Data)  
Published and established specialized equipment material and labor costs.  
Cost estimates also based on utility bill analysis and prior experience with similar projects

### 7.2 Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

***THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, BSG-PMK AND SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.***

# LIGHTING ANALYSIS

## Middletown Township Former Community Center 1 Kings Highway



Upgrade Code	Upgrade Description	Existing		Proposed		Lighting		
		Fixture	Watts	Fixture	Watts	Total # of Upgrades	Cost per Upgrade (\$)	SmartStart Rebate per Upgrade
1	(4) 4' 34W T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	4L4' EE/STD	160	4L4' T8/ELEC	110	22	\$90.00	\$15.00
2	(2) 34W T12 U-Tube Lamps, Magnetic Ballast / Retrofit with T8 U-Tube Lamps, Electronic Ballast	2L22" STD/STD	94	2L22"	62	1	\$60.00	\$15.00
3	(1) 4' 34W T12 Lamp, Magnetic Ballast / Retrofit with T8 Lamp, Electronic Ballast	1L4' EE/STD	50	1L4' T8/ELEC	31	1	\$50.00	\$15.00
4	75 W Incandescent / Replace with 26W Compact Fluorescent	75W INCANDESCENT	75	26W CF/SI	28	2	\$10.00	\$0.00
5	67 W Incandescent / Replace with 26W Compact Fluorescent	67W INCANDESCENT	67	26W CF/SI	28	10	\$10.00	\$0.00
6	1LF20T12	(1) F20T12/HPFMA G	32	(1) FO17T8/ELEC	18	1	\$50.00	\$0.00
7	(2) 8' T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	2L8' EE/STD	138	2L8' T8/ELEC	118	7	\$80.00	\$15.00
8	(2) 6' T12 Lamps, Magnetic Ballast / Replace with new fixture, (2) 4' T8 Lamps, Magnetic Ballasts	2L6' T12/STD/STD	158	2L4' T8/ELEC	61	6	\$150.00	\$25.00
9	300W Incandescent Fixture / Replace with...	300W INCANDESCENT	300	70W MH/BALLAST	95	1	\$200.00	\$0.00
10	(1) Circular T12 Fluorescent / Replace with new fixture (1) 28W T8 Lamp, Magnetic Ballast	1L6" (DIA) EE/ELEC	26	1L4' T8/ELEC	31	2	\$125.00	\$0.00
11	2F20T12	(2) F20T12/HPFMA G	56	(2) FO17T8/ELEC	34	1	\$0.00	\$0.00
12	(2) 4' 34W T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	2L4' EE/STD	80	2L4' T8/ELEC	61	1	\$60.00	\$15.00
13	150W Metal Halide / No Upgrade	150W HPS/BALLAST	190	No Upgrade	1	0	\$0.00	\$0.00
14	LED Exit Sign / No Upgrade	LED	2	No Upgrade	2	2	\$0.00	\$0.00

### Summary

	Lighting (Only)	Sensors (Only)	Complete Lighting Upgrade
Cost	\$4,230.00	\$0.00	\$4,230.00
Rebate	\$630.00	\$0.00	\$630.00
Net Cost	\$3,600.00	\$0.00	\$3,600.00
Savings (kWh)	3,837	0	3,837
Savings (\$)	\$805.72	\$0.00	\$805.72
Payback	4.5		4.5

### Variables:

\$0.21	Avg. Electric Rate (\$/kWh)
	Avg. Demand Rate (\$/kW)
1560	Operating Hours/Year
6	Operating Hours/Work Day

### Assumptions:

25%	Occupancy Sensor Savings (Avg)
40%	Occupancy Sensor Savings(>Avg)

### Notes:

Seq. #	Upgrade Code	Room/Area	Hrs/Work Day	Hrs/Year	Existing				Proposed				Lighting				Occupancy Sensors (ONLY)				SmartStart Rebate		Lighting & Occupancy Sensors				
					Fixture	Qty.	Watts	Foot Candles	Fixture	Qty.	Watts	kW Reduction	Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	Type	Qty.	Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	Lighting	Sensors	Energy Savings, kWh	Post-Rebate Cost (\$)	Savings (\$)
<b>Totals:</b>					7112		4505	2.607	3837	\$4,230.00	\$805.72	5.2			0	\$0.00	\$0.00	\$630.00	\$0.00	3837	\$3,600.00	\$805.72	4.5				
1	1	Main Room	1	260	4L4' EE/STD	5	800		4L4' T8/ELEC	5	550	0.25	65	\$450.00	\$13.65	33.0			0	\$0.00	\$0.00	\$75.00	\$0.00	65	\$375.00	\$13.65	27.5
2	1	Lounge	6	1560	4L4' EE/STD	6	960		4L4' T8/ELEC	6	660	0.3	468	\$540.00	\$98.28	5.5			0	\$0.00	\$0.00	\$90.00	\$0.00	468	\$450.00	\$98.28	4.6
3	2	Hallway	6	1560	2L22" STD/STD	1	94		2L22"	1	62	0.032	50	\$60.00	\$10.48	5.7			0	\$0.00	\$0.00	\$15.00	\$0.00	50	\$45.00	\$10.48	4.3
4	3	Kitchen	6	1560	1L4' EE/STD	1	50		1L4' T8/ELEC	1	31	0.019	30	\$50.00	\$6.22	8.0			0	\$0.00	\$0.00	\$15.00	\$0.00	30	\$35.00	\$6.22	5.6
5	4	Room	6	1560	75W INCANDESCENT	1	75		26W CF/SI	1	28	0.047	73	\$10.00	\$15.40	0.6			0	\$0.00	\$0.00	\$0.00	\$0.00	73	\$10.00	\$15.40	0.6
6	5	Locker Room	6	1560	67W INCANDESCENT	1	67		26W CF/SI	1	28	0.039	61	\$10.00	\$12.78	0.8			0	\$0.00	\$0.00	\$0.00	\$0.00	61	\$10.00	\$12.78	0.8
7	14	Exit	6	1560	LED	2	4		No Upgrade	2	4	0	0	\$0.00	\$0.00				0	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	
8	6	Trophy Case	24	8760	(1) F20T12/HPFMA G	1	32		(1) FO17T8/ELEC	1	18	0.014	123	\$50.00	\$25.75	1.9			0	\$0.00	\$0.00	\$0.00	\$0.00	123	\$50.00	\$25.75	1.9
9	1	Hall	6	1560	4L4' EE/STD	2	320		4L4' T8/ELEC	2	220	0.1	156	\$180.00	\$32.76	5.5			0	\$0.00	\$0.00	\$30.00	\$0.00	156	\$150.00	\$32.76	4.6
10	1	Community Relations	6	1560	4L4' EE/STD	5	800		4L4' T8/ELEC	5	550	0.25	390	\$450.00	\$81.90	5.5			0	\$0.00	\$0.00	\$75.00	\$0.00	390	\$375.00	\$81.90	4.6
11	5	Stairwell	6	1560	67W INCANDESCENT	1	67		26W CF/SI	1	28	0.039	61	\$10.00	\$12.78	0.8			0	\$0.00	\$0.00	\$0.00	\$0.00	61	\$10.00	\$12.78	0.8
12		UPSTAIRS	<0.5																0	\$0.00	\$0.00	\$0.00	\$0.00				
13	7	Gym	6	1560	2L8' EE/STD	7	966		2L8' T8/ELEC	7	826	0.14	218	\$560.00	\$45.86	12.2			0	\$0.00	\$0.00	\$105.00	\$0.00	218	\$455.00	\$45.86	9.9
14	8	Gym	6	1560	2L6' T12/STD/STD	6	948		2L4' T8/ELEC	6	366	0.582	908	\$900.00	\$190.66	4.7			0	\$0.00	\$0.00	\$150.00	\$0.00	908	\$750.00	\$190.66	3.9
15	1	Office	6	1560	4L4' EE/STD	2	320		4L4' T8/ELEC	2	220	0.1	156	\$180.00	\$32.76	5.5			0	\$0.00	\$0.00	\$30.00	\$0.00	156	\$150.00	\$32.76	4.6
16	5	Closet	6	1560	67W INCANDESCENT	1	67		26W CF/SI	1	28	0.039	61	\$10.00	\$12.78	0.8			0	\$0.00	\$0.00	\$0.00	\$0.00	61	\$10.00	\$12.78	0.8
17	5	Old Stairwell	0.5	130	67W INCANDESCENT	1	67		26W CF/SI	1	28	0.039	5	\$10.00	\$1.06	9.4			0	\$0.00	\$0.00	\$0.00	\$0.00	5	\$10.00	\$1.06	9.4
18	9	Vestibule	6	1560	300W INCANDESCENT	1	300		70W MH/BALLAST	1	95	0.205	320	\$200.00	\$67.16	3.0			0	\$0.00	\$0.00	\$0.00	\$0.00	320	\$200.00	\$67.16	3.0
19	5	Closet	6	1560	67W INCANDESCENT	1	67		26W CF/SI	1	28	0.039	61	\$10.00	\$12.78	0.8			0	\$0.00	\$0.00	\$0.00	\$0.00	61	\$10.00	\$12.78	0.8
20	10	Men's Bathroom	0.5	130	1L6" (DIA) EE/EL	1	26		1L4' T8/ELEC	1	31	-0.005	-1	\$125.00	-\$0.14	-915.8			0	\$0.00	\$0.00	\$0.00	\$0.00	-1	\$125.00	-\$0.14	-915.8
21	5	Men's Bathroom	6	1560	67W INCANDESCENT	2	134		26W CF/SI	2	56	0.078	122	\$20.00	\$25.55	0.8			0	\$0.00	\$0.00	\$0.00	\$0.00	122	\$20.00	\$25.55	0.8
22	11	Women's Bathroom	6	1560	(2) F20T12/HPFMA G	1	56		(2) FO17T8/ELEC	1	34	0.022	34	\$0.00	\$7.21	0.0			0	\$0.00	\$0.00	\$0.00	\$0.00	34	\$0.00	\$7.21	0.0
23	10	Women's Bathroom	6	1560	1L6" (DIA) EE/EL	1	26		1L4' T8/ELEC	1	31	-0.005	-8	\$125.00	-\$1.64	-76.3			0	\$0.00	\$0.00	\$0.00	\$0.00	-8	\$125.00	-\$1.64	-76.3
24	1	Kitchen	6	1560	4L4' EE/STD	2	320		4L4' T8/ELEC	2	220	0.1	156	\$180.00	\$32.76	5.5			0	\$0.00	\$0.00	\$30.00	\$0.00	156	\$150.00	\$32.76	4.6
25	12	Room	6	1560	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	30	\$60.00	\$6.22	9.6			0	\$0.00	\$0.00	\$15.00	\$0.00	30	\$45.00	\$6.22	7.2
26	13	Outside	7	1820	150W HPS/BALLAST	3	190		No Upgrade	3	190	0	0	\$0.00	\$0.00				0	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	
27	5	Outside	7	1820	67W INCANDESCENT	3	201		26W CF/SI	3	84	0.117	213	\$30.00	\$44.72	0.7			0	\$0.00	\$0.00	\$0.00	\$0.00	213	\$30.00	\$44.72	0.7
28	4	Outside	7	1820	75W INCANDESCENT	1	75		26W CF/SI	1	28	0.047	86	\$10.00	\$17.96	0.6			0	\$0.00	\$0.00	\$0.00	\$0.00	86	\$10.00	\$17.96	0.6

# LIGHTING ANALYSIS

Middletown Township  
Police Garage  
1 Kings Highway



Upgrade Code	Upgrade Description	Existing		Proposed		Lighting		
		Fixture	Watts	Fixture	Watts	Total # of Upgrades	Cost per Upgrade (\$)	SmartStart Rebate per Upgrade
1	(4) 4' 34W T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	4L4' EE/STD	160	4L4' T8/ELEC	110	12	\$90.00	\$15.00
2	(2) 4' 34W T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	2L4' EE/STD	80	2L4' T8/ELEC	61	12	\$60.00	\$15.00
3	(1) 8' T12 Lamp, Magnetic Ballast / Retrofit with T8 Lamp, Electronic Ballast	1L8' EE/STD	83	1L8' T8/ELEC	67	6	\$80.00	\$15.00
4	(2) 8' T12 Lamp, Magnetic Ballast / Retrofit with T8 Lamp, Electronic Ballast	2L8' EE/STD	138	2L8' T8/ELEC	118	7	\$70.00	\$15.00
5	(1) 8' T8 Lamp, Electronic Ballast / No Upgrade	1L8' T8/ELEC	67	No Upgrade	67	0	\$0.00	\$0.00
6						0	\$0.00	\$0.00
7						0	\$0.00	\$0.00
8						0	\$0.00	\$0.00
9						0	\$0.00	\$0.00
10						0	\$0.00	\$0.00
11						0	\$0.00	\$0.00
12						0	\$0.00	\$0.00

## Summary

	Lighting (Only)	Sensors (Only)	Complete Lighting Upgrade
Cost	\$2,770.00	\$0.00	\$2,770.00
Rebate	\$555.00	\$0.00	\$555.00
Net Cost	\$2,215.00	\$0.00	\$2,215.00
Savings (kWh)	837	0	837
Savings (\$)	\$142.32	\$0.00	\$142.32
Payback	15.6		15.6

## Variables:

\$0.17	Avg. Electric Rate (\$/kWh)
	Avg. Demand Rate (\$/kW)
1040	Operating Hours/Year
4	Operating Hours/Work Day

## Assumptions:

25%	Occupancy Sensor Savings (Avg)
40%	Occupancy Sensor Savings(>Avg)

## Notes:

Seq. #	Upgrade Code	Room/Area	Hrs/Work Day	Hrs/Year	Existing				Proposed				kW Reduction	Lighting				Occupancy Sensors (ONLY)				Lighting & Occupancy Sensors					
					Fixture	Qty.	Watts	Foot Candles	Fixture	Qty.	Watts	Energy Savings, kWh		Cost (\$)	Savings (\$)	Payback (yrs)	Controls Type	Qty.	Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	SmartStart Rebate Lighting	Sensors	Energy Savings, kWh	Post-Rebate Cost (\$)	Savings (\$)
<b>Totals:</b>					4344		3280	1.064	837	\$2,770.00	\$142.32	19.5	0	\$0.00	\$0.00	\$555.00	\$0.00	837	\$2,215.00	\$142.32	15.6						
1	1	Aux Room	4	1040	4L4' EE/STD	4	640		4L4' T8/ELEC	4	440	0.2	208	\$360.00	\$35.36	10.2			0	\$0.00	\$0.00	\$60.00	\$0.00	208	\$300.00	\$35.36	8.5
2	2	Storage Room	4	1040	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	20	\$60.00	\$3.36	17.9			0	\$0.00	\$0.00	\$15.00	\$0.00	20	\$45.00	\$3.36	13.4
3	2	Storage Room	4	1040	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	20	\$60.00	\$3.36	17.9			0	\$0.00	\$0.00	\$15.00	\$0.00	20	\$45.00	\$3.36	13.4
4	1	Gym	4	1040	4L4' EE/STD	2	320		4L4' T8/ELEC	2	220	0.1	104	\$180.00	\$17.68	10.2			0	\$0.00	\$0.00	\$30.00	\$0.00	104	\$150.00	\$17.68	8.5
5	1	Gym	4	1040	4L4' EE/STD	2	320		4L4' T8/ELEC	2	220	0.1	104	\$180.00	\$17.68	10.2			0	\$0.00	\$0.00	\$30.00	\$0.00	104	\$150.00	\$17.68	8.5
6	1	Evidence Vault	0.5	130	4L4' EE/STD	4	640		4L4' T8/ELEC	4	440	0.2	26	\$360.00	\$4.42	81.4			0	\$0.00	\$0.00	\$60.00	\$0.00	26	\$300.00	\$4.42	67.9
7	3	Evidence Storage	0.5	130	1L8' EE/STD	4	332		1L8' T8/ELEC	4	268	0.064	8	\$320.00	\$1.41	226.2			0	\$0.00	\$0.00	\$60.00	\$0.00	8	\$260.00	\$1.41	183.8
8	3	Evidence Storage	0.5	130	1L8' EE/STD	2	166		1L8' T8/ELEC	2	134	0.032	4	\$160.00	\$0.71	226.2			0	\$0.00	\$0.00	\$30.00	\$0.00	4	\$130.00	\$0.71	183.8
9	2	Radio Repair	4	1040	2L4' EE/STD	7	560		2L4' T8/ELEC	7	427	0.133	138	\$420.00	\$23.51	17.9			0	\$0.00	\$0.00	\$105.00	\$0.00	138	\$315.00	\$23.51	13.4
10	4	Garage Bay	4	1040	2L8' EE/STD	7	966		2L8' T8/ELEC	7	826	0.14	146	\$490.00	\$24.75	19.8			0	\$0.00	\$0.00	\$105.00	\$0.00	146	\$385.00	\$24.75	15.6
11	2	Garage bay	4	1040	2L4' EE/STD	3	240		2L4' T8/ELEC	3	183	0.057	59	\$180.00	\$10.08	17.9			0	\$0.00	\$0.00	\$45.00	\$0.00	59	\$135.00	\$10.08	13.4

## Appendix B: Third Party Energy Suppliers (ESCOs)

### Appendix B: Third Party Energy Suppliers (ESCOs)

Supplier	Telephone & Web Site
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009 Attn: Brian Vayda	877-977-2636  <a href="mailto:bvayda@americanpowernet.com">bvayda@americanpowernet.com</a> <a href="http://www.americanpowernet.com">www.americanpowernet.com</a>
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457  <a href="http://www.commerceenergy.com">www.commerceenergy.com</a>
ConEdison Solutions Cherry Tree Corporate Center 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955  <a href="http://www.conedsolutions.com">www.conedsolutions.com</a>
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827  <a href="http://www.newenergy.com">www.newenergy.com</a>
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	212-538-3124  <a href="http://www.creditsuisse.com">www.creditsuisse.com</a>
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722  <a href="http://www.directenergy.com">www.directenergy.com</a>
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07962	(800) 977-0500 Supply chain website <a href="http://www.firstenergycorp.com/supplierregistration">www.firstenergycorp.com/supplierregistration</a> <a href="http://www.fes.com">www.fes.com</a>
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	1-877-569-2841  <a href="http://www.glacialenergy.com">www.glacialenergy.com</a>
Hess Corporation 1 Hess Plaza Woodbridge, NJ 070956	(800) 437-7872 Tom Miller <a href="http://www.hess.com">www.hess.com</a>
Integrus Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	1-877-763-9977 Dole Janssen: 920-617-6029 Charles Kuntz: 614-844-4324 <a href="http://www.integrusenergy.com">www.integrusenergy.com</a>

Supplier	Telephone & Web Site
<b>Liberty Power Delaware, LLC</b> Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866)769-3799 <a href="http://www.libertypowercorp.com">www.libertypowercorp.com</a>
<b>Liberty Power Holdings, LLC</b> Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 <a href="http://www.libertypowercorp.com">www.libertypowercorp.com</a>
<b>Palmco Power NJ, LLC</b> One Greentree Centre 10000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	(877) 726-5862 <a href="http://www.PalmcoEnergy.com">www.PalmcoEnergy.com</a>
<b>Pepco Energy Services, Inc.</b> 112 Main Street Lebanon, NJ 08833	(800) ENERGY-9 (363-7499) <a href="http://www.pepco-services.com">www.pepco-services.com</a>
<b>PPL Energy Plan, LLC</b> 811 Church Road Cherry Hill, NJ 08002	800-281-2000 <a href="http://www.pplenergyplus.com">www.pplenergyplus.com</a>
<b>Sempra Energy Solutions</b> The Mac-Cali Building 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 732-596-6400-Tony Buck <a href="http://www.semprasolutions.com">www.semprasolutions.com</a>
<b>South Jersey Energy Company</b> One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 Gary Bean <a href="mailto:gbean@sjindustries.com">gbean@sjindustries.com</a> <a href="http://www.southjerseyenergy.com">www.southjerseyenergy.com</a>

M:\Cranford\Jobs\Steven Winter Associates\602492093896 - Middletown\Reports\Pub Library-Bayshore\093896-8E-EE-Draft-BayshoreLib.docx