



**Steven Winter Associates, Inc.**  
Architects and Engineers

50 Washington Street  
Norwalk, CT 06854  
[www.swinter.com](http://www.swinter.com)

Telephone  
Facsimile  
E-mail:

(203) 857-0200  
(203) 852-0741  
swinter@swinter.com

*April 7, 2010*

**Local Government Energy Program  
Energy audit report**

*For*

***Ames Avenue Firehouse  
Borough of Rutherford  
Rutherford, NJ 07070***

***Project Number: LGEA13***



**TABLE OF CONTENTS**

**INTRODUCTION..... 3**  
**EXECUTIVE SUMMARY ..... 4**  
**SCOPE OF WORK – SUMMARY TABLE ..... 6**  
**1. HISTORIC ENERGY CONSUMPTION..... 7**  
**1.1. ENERGY USAGE AND COST ANALYSIS ..... 7**  
**1.2. UTILITY RATE ..... 8**  
**1.3. ENERGY BENCHMARKING ..... 8**  
**2. FACILITY AND SYSTEMS DESCRIPTION..... 10**  
**2.1. BUILDING CHARACTERISTICS..... 10**  
**2.2. BUILDING OCCUPANCY PROFILES..... 10**  
**2.3. BUILDING ENVELOPE..... 10**  
**2.3.1. EXTERIOR WALLS ..... 10**  
**2.3.2. ROOF..... 10**  
**2.3.3. BASE..... 10**  
**2.3.4. WINDOWS ..... 10**  
**2.3.5. EXTERIOR DOORS ..... 11**  
**2.3.6. BUILDING AIR TIGHTNESS ..... 11**  
**2.4. HVAC SYSTEMS..... 11**  
**2.4.1. HEATING..... 11**  
**2.4.2. COOLING ..... 11**  
**2.4.3. VENTILATION..... 11**  
**2.4.4. DOMESTIC HOT WATER..... 11**  
**2.5. ELECTRICAL SYSTEMS..... 12**  
**2.5.1. LIGHTING ..... 12**  
**2.5.2. APPLIANCES AND PROCESS ..... 12**  
**2.5.3. ELEVATORS ..... 12**  
**2.5.4. OTHER ELECTRICAL SYSTEMS..... 12**  
**3. EQUIPMENT LIST ..... 13**  
**4. ENERGY CONSERVATION MEASURES ..... 13**  
**5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES ..... 16**  
**5.1. EXISTING SYSTEMS ..... 16**  
**5.2. SOLAR PHOTOVOLTAIC..... 16**  
**5.3. SOLAR THERMAL COLLECTORS..... 16**  
**5.4. COMBINED HEAT AND POWER..... 16**  
**5.5. GEOTHERMAL ..... 16**  
**5.6. WIND..... 16**  
**6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES..... 16**  
**6.1. LOAD PROFILES..... 16**  
**6.2. TARIFF ANALYSIS..... 18**  
**6.3. ENERGY PROCUREMENT STRATEGIES ..... 18**  
**7. METHOD OF ANALYSIS ..... 21**  
**7.1. ASSUMPTIONS AND METHODS ..... 21**  
**7.2. DISCLAIMER..... 21**  
**APPENDIX A: LIGHTING STUDY ..... 22**  
**APPENDIX B: THIRD PARTY ENERGY SUPPLIERS (ESCOs)..... 24**

## **INTRODUCTION**

On May 20th, 2009, Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment of the Ames Avenue Firehouse located in Rutherford, NJ. Current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

The Rutherford Ames Avenue Firehouse was built in 1978 and currently houses a two bay garage as well as, a few small offices and a large meeting area. The Ames Avenue firehouse building is two stories and consists of a total floor area of 7,040 square feet. Due to the nature of a volunteer fire department, the building is not operated on a set schedule but is accessible 24 hours per day.

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 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 building.

## EXECUTIVE SUMMARY

This document contains the energy audit report for the Rutherford Ames Avenue Firehouse located at 44 Ames Ave., Rutherford, NJ 07070. The Ames Avenue firehouse is two stories tall and has a total area of 7,040 square feet. Based on the field visit performed by Steven Winter Associates (SWA) staff on May 20<sup>th</sup>, 2009 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.

In the most recent full year of data collected (February 2008 through February 2009), the Ames Avenue firehouse building consumed approximately 54,611 kWh or \$10,391 worth of electricity and 6,994 therms or \$10,957 worth of natural gas. The average aggregated cost of electricity was calculated to be \$0.19/kWh and the average aggregated cost of natural gas was calculated to be \$1.69/therm. With electricity and gas combined, the building consumed 886 MMBtus of energy at a total cost of \$21,348.

SWA benchmarked Rutherford Ames Avenue Firehouse using the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently a benchmark score cannot be generated for Firehouse buildings. The benchmark rating is based on the facility's source energy use, level of business activity, and geographical location. The Portfolio Manager is also capable of generating a site energy use intensity number using 2008 as a baseline year.

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 Rutherford Ames Avenue Firehouse building is 112 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 2008 baseline to track the changes in energy consumption associated with the energy improvements.

SWA recommends some measures that may not be cost-effective but should be included into a capital investment plan or as part of routine maintenance. SWA recommends that occupancy sensors are installed in small rooms such as storage closets and bathrooms. Savings from occupancy sensors cannot be quantified due to the limited use of the building but can help prevent lights from being left on overnight or for extended periods of time. This building has limited domestic hot water usage; however, low flow aerators and shower heads should always be used in order to limit the amount of hot water usage that is used.

SWA recommends a total of 1 Energy Conservation Measures (ECMs) for Rutherford Ames Avenue firehouse. The total investment cost for these ECMs is **\$8,650**. SWA estimates a first year savings of **\$1,178** with a simple payback of **7.3 years**. SWA also estimates that Rutherford Ames Avenue firehouse will be able to reduce their carbon footprint by **11,098 lbs of CO2 annually**.

There are various incentives that Rutherford Ames Avenue firehouse could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the Borough of Rutherford applies 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.

When pursuing incentives through the SmartStart program, SWA encourages building managers to contact the program provider to obtain more detailed information on the program guidelines and request pre-approval for all planned upgrades. At the time of this report, incentives for lighting vary but replacing T12 lighting with T8 lighting would be eligible for an incentive up to \$30 per fixture.

For further information on both custom and prescriptive incentives, please visit:

<http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/equipment-incentives/equi>

The New Jersey Clean Energy website also provides information on an upcoming Direct-Install program that would be applicable to this project. The Direct-Install program is aimed at commercial buildings with an average annual demand of less than 200kW. This program is designed to offset up to 80% of the cost of replacing equipment nearing the end of its useful lifecycle with high efficiency alternatives. This program has not officially been released but can be followed online at:

<http://www.njcleanenergy.com/commercial-industrial/programs/programs>

The following table summarizes the proposed Energy Conservation Measures (ECM) and their economical relevance. It is important to note that each measure is listed as a line item and savings are shown without any interactive effects with other measures. The Total Scope of Work included at the bottom of the table shows savings based on the entire package of Energy Conservation Measures being installed together with interactive effects.

**SCOPE OF WORK – SUMMARY TABLE**

ECM Table without Incentives															
ECM #	ECM description	Installed Cost		1st year energy and cost savings						Simple Payback (SPP)	Life of Measure (LoM)	Lifetime Cost Savings (\$)	Return on Invest (ROI)	Annual Carbon Reduction (lbs of CO2)	
		Estimated Cost (\$)	Source	Electric Savings		Fuel Savings		Cost Savings (\$)							
				Consumption	Demand	Natural Gas									
1	Upgrade existing lighting	\$ 8,650	RS Means	6,198	kWh	0	kW	0	Therms	\$ 1,178	7.3	25	\$ 20,056	5.3%	11,098
<b>Total Scope of Work</b>		<b>\$ 8,650</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>0.0</b>	<b>-</b>			<b>\$ 1,178</b>	<b>7.3</b>		<b>\$ 20,056</b>		<b>11,098</b>
<b>Definitions:</b>			<b>Assumptions:</b>												
SPP: Simple Payback (years)			Discount rate = 3.2%			per DOE FEMP guidelines			Average Electric Rate = 0.19			\$/kWh			
LoM: Life of Measure (years)			Energy price escalation rate = 0%			per DOE FEMP guidelines			Average Fuel Rate = 1.69			\$/Therm			
ROI: Return on Investment (%)			Carbon Dioxide per unit Electricity = 1.7905			lbs of CO2/kWh									
			Carbon Dioxide per unit of Fuel = 11.023			lbs of CO2/unit fuel									

# 1. HISTORIC ENERGY CONSUMPTION

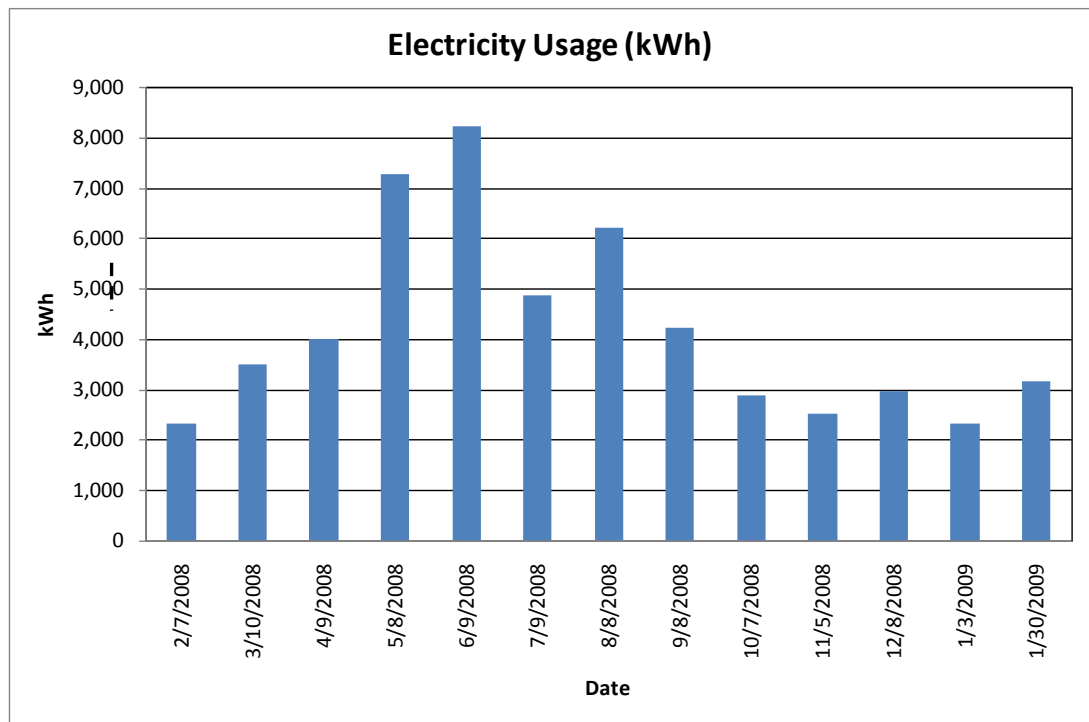
## 1.1. Energy usage and cost analysis

SWA received and analyzed utility bills from February 2007 through February 2009 that were received from the Borough of Rutherford.

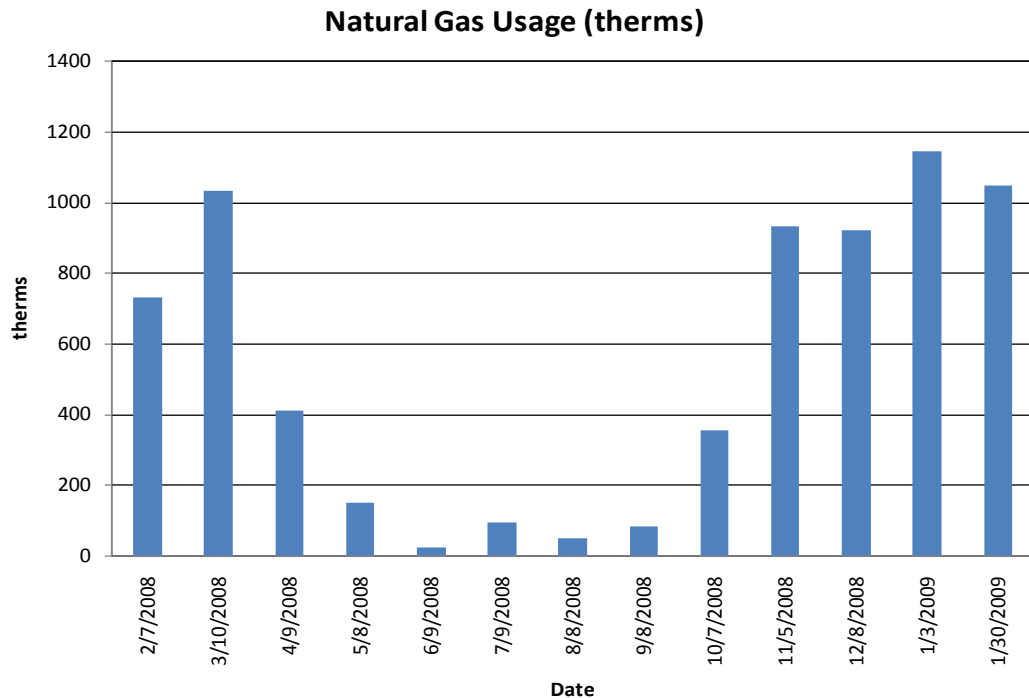
Electricity – The Rutherford Ames Avenue firehouse has one electric meter for incoming electricity supply. The building purchases electricity from PSEG at **an average aggregated rate of \$0.19/kWh** based on February 2008 through February 2009 electric bills. The building purchased **approximately 54,611 kWh or \$10,391 worth of electricity from February 2008 through February 2009**. Based on the same time period, the building also has **an average monthly demand of 18.3 kW and monthly peak demand of 28.9 kW**.

Natural Gas – The Rutherford Ames Avenue firehouse has one gas meter for incoming natural gas from PSE&G. Between February 2008 and February 2009, the building purchased **approximately 6,994 therms or \$10,957 worth of natural gas**. The average aggregated cost of natural gas was calculated to be \$1.69 per therm.

The following chart shows electricity usage for the Ames Avenue firehouse based on utility bills for the 2008- 2009 billing period.



The following chart shows the natural gas usage for the Ames Avenue firehouse based on utility bills for the year February 2008 to February 2009.



In the above chart, the natural gas usage follows a heating trend as expected. During the summer it is clear that the natural gas usage is very minimal which reflects that heat is not being used and the DHW load is minimal.

### 1.2. Utility rate

Rutherford Ames Avenue firehouse currently buys electricity and gas from PSEG at the GSGH MD general service rate. The GSGH MD general service rate is a typical rate where customers pay for natural gas based on usage and electricity based on usage with the addition of an electrical charge demand. Rutherford Ames Avenue uses PSEG account #04 21 143 340 15 at the service address of 44 Ames Ave, Rutherford, NJ. Electricity for the building was billed at an average rate of **\$0.19/kWh**. Natural Gas for the building was billed at an average rate of **\$1.69/therm**.

### 1.3. Energy benchmarking

The Rutherford Ames Avenue Firehouse information and utility data were entered into the U.S. Environmental Protection Agency’s (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. A performance score currently cannot be generated for firehouses. SWA recommends that the Borough of Rutherford maintain the Portfolio Manager account at the link below. As the account is maintained, SWA can share the Rutherford Ames Avenue firehouse building 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)



## STATEMENT OF ENERGY PERFORMANCE Rutherford - Ames Ave Firehouse

Building ID: 1921517  
For 12-month Period Ending: January 31, 2009<sup>1</sup>  
Date SEP becomes ineligible: N/A

Date SEP Generated: October 27, 2009

<b>Facility</b> Rutherford - Ames Ave Firehouse 44 Ames Avenue Rutherford, NJ 07070	<b>Facility Owner</b> N/A	<b>Primary Contact for this Facility</b> N/A
----------------------------------------------------------------------------------------------	------------------------------	-------------------------------------------------

Year Built: 1978  
Gross Floor Area (ft<sup>2</sup>): 7,040

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

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

Electricity - Grid Purchase(kBtu)	178,292
Natural Gas (kBtu) <sup>4</sup>	610,560
Total Energy (kBtu)	788,852

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

Site (kBtu/ft <sup>2</sup> /yr)	1.12
Source (kBtu/ft <sup>2</sup> /yr)	1.75

#### Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO <sub>2</sub> e/year)	60
-----------------------------------------------------	----

#### Electric Distribution Utility

PSE&G - Public Service Elec & Gas Co

#### National Average Comparison

National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	12%
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<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:

- 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.
- 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.
- Values represent energy consumption, annualized to a 12 month period.
- 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.
- Values represent energy intensity, annualized to a 12 month period.
- 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**

Rutherford Ames Avenue firehouse was built in 1978. The building is two stories and consists of a two bay garage, small offices and a large meeting area. The building also contains a sub-grade basement that contains the boiler and other mechanical equipment. The firehouse has a total floor area of 7,040 square feet.

### **2.2. Building occupancy profiles**

During the site visit, there was only 1 employee observed in the building at once. The Ames Avenue firehouse building is operated as emergency calls are received or for events such as meetings and community events. The building is not operated on a set schedule. For the purpose of the audit, the building was assumed to operate for 4 hours, 7 days per week.

### **2.3. Building envelope**

#### **2.3.1. Exterior walls**

The exterior walls of the Ames Avenue firehouse building consist of a 4" face brick. The walls are furred out with 2"x4" wood framing spaced 16" on center on the interior side. The building currently has R-19 batt insulation installed in each stud bay. The building contains a small basement area where the boiler and domestic hot water heater are located. This area is built with 8" CMU blocks below grade. If any portion of the building is renovated or improved as part of a capital improvement plan, SWA recommends increased insulation is added to any walls during construction.

#### **2.3.2. Roof**

The Ames Avenue firehouse roof has a slight slope and the surface consists of black rolled roofing. The roof surface appeared to be in good condition. The attic contains R-19 insulation batts located above the top floor ceiling. The attic insulation was observed to sufficient as a thermal barrier. If insulation is moved around as a result of accessing the attic, the batts should be properly set back into place. If any portion of the building is renovated or improved as part of a capital improvement plan, SWA recommends increasing the insulation in the roof cavity with blown cellulose insulation.

#### **2.3.3. Base**

The building's base is 4" concrete slab-below-grade. The basement contains storage as well as the boiler and mechanical equipment. There were no reported problems with water penetration or moisture.

#### **2.3.4. Windows**

All of the windows in the building are wooden framed double-hung windows. These windows contain double-pane glass. The windows appeared to be in good condition and did not allow for excessive air or moisture penetration around the frame however. At this time, replacing the windows would not be cost-effective based on energy savings alone; however, newer windows will decrease maintenance costs and increase tenants comforts as well.

### **2.3.5. Exterior doors**

The main entrance for the building is located on the front side of the building facing the road and consists of an insulated, steel door. The front of the building also contains two large garage doors. The back entrance consists of an insulated, steel door. All of the doors appeared to have deteriorating weather-stripping. Weather-stripping should be checked at least once a year and replaced as soon as signs of deterioration show.

### **2.3.6. Building air tightness**

The Ames Avenue firehouse was relatively tight with the exception of the exterior doors and some small penetrations inside of the building. Windows and Entranceways such as the front door, garage doors and back door should be maintained so that a tight seal is always formed to keep conditioned air from leaking outside of the building.

## **2.4. HVAC systems**

### **2.4.1. Heating**

The Rutherford Ames Avenue firehouse contains one natural gas-fired Hydrotherm hot waters boiler with an output capacity of 303,000 Btuh. This boiler supplies hot water for baseboard heating throughout the office and meeting areas and also provides hot water to ceiling mounted convective heating units in the garage bays.

The garage bays are heated using ceiling-mounted gas-fired heaters. These heaters are the “propeller” type heaters that consist of a fan that blows over the heating element. These units appeared to be in good working and cosmetic condition. Replacement equipment should always be evaluated with energy efficiency in mind.

### **2.4.2. Cooling**

The Rutherford Ames Avenue firehouse uses two split system air-conditioning units to provide cooling and control humidity within the building. The condensers are located side by side behind the building. Each cooling unit uses R-22 refrigerant. The units appear to be in good working condition and would not be cost-effective to upgrade at this point in time.

### **2.4.3. Ventilation**

The Ames Avenue firehouse building relies on exhaust fans to help induce fresh air into the building. When firefighters are present within the building and the outside temperature is warm, the garage doors are opened to provide natural ventilation.

### **2.4.4. Domestic Hot Water**

The building contains one gas-fired domestic hot water with an input of 45,000 Btuh and a total storage of 38 gallons. SWA estimates that there is approximately 60% of useful life left in the equipment.

It is not cost-effective to replace the existing water heating equipment with higher efficiency equipment. However, higher efficiency water heating equipment will save energy and should be strongly considered upon replacement of the equipment. Energy saving appliances bearing the

ENERGY STAR label should be selected to ensure efficiency performance. Incentives may be available to offset any added costs for the installed equipment.

More efficient water-consuming fixtures and appliances save both energy and money through reduced energy consumption for water heating, as well decreased water and sewer bills. SWA recommends that the aerators in all sinks are retrofitted with low-flow aerators that constrict the volume of water allowed to flow out of the faucets during the time it takes to wash hands, wash dishes, etc. Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce hot water consumption. In addition, routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy.

## **2.5. Electrical systems**

### **2.5.1. Lighting**

*Interior Lighting* – The Ames Avenue firehouse building consists of mostly outdated lighting. In the larger areas, the lighting consists of T12 fluorescent fixtures that contain magnetic ballasts. Smaller rooms such as bathrooms, storage and closets consist of incandescent light bulbs. All of the exit signs in the building except for one have already been upgraded to LED exit signs. Please see attached lighting schedule in Appendix A.

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

Appliances, such as refrigerators, copiers and computers that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. For example, Energy Star refrigerators use as little as 315kwh/hr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Look for the Energy Star label when replacing appliances and equipment, including: window air conditioners, refrigerators, printers, computers, copy machines, etc. More information can be found in the “Products” section of the Energy Star website at: <http://www.energystar.gov>

### **2.5.3. Elevators**

There are no elevators at the Ames Avenue firehouse building.

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

There are currently no other electrical systems in the building.

### 3. EQUIPMENT LIST

Building System	Description	Physical Location	Make/ Model	Fuel	Space served	Estimated Remaining useful life %
Heating	Hydrotherm hot water boiler, natural gas, output capacity 303,000 Btuh, Serial number was missing from nameplate	Basement boiler room	Hydrotherm, Model #0R385A	Natural Gas	All areas	10%
Heating	Three (3) ceiling-mounted hot water heaters, nameplates could not be accessed	Garage bays	Reznor	Natural Gas	All areas	65%
Cooling	Dunham-Bush condenser unit, split AC system, 1/3 HP compressor motor, R-22	Behind firehouse (larger of two units)	Dunham-Bush, Unit #RCU-010-T, Serial #770901916	Electricity	All areas	30%
Cooling	Luxaire condenser unit, split AC system, 1/4 HP compressor motor, R-22	Behind firehouse (smaller of two units)	Luxaire, Model #HABA-T0365G, Serial #W0A5480249	Electricity	All areas	30%
Pumps	Two (2) Hot Water Pumps, Bell & Gossett, 1/4 HP, nameplate could not be read	Basement boiler room	Bell & Gossett, NA	Electricity	All areas	20%
Domestic Hot Water	A.O Smith ProMax gas-fired water heater, 38 gallon capacity, 40,000 btuh input, 39.32 gal/hr recover, Energy Star label states 250 therms/year, serial number not available	Basement boiler room	A.O Smith ProMax, Model #GCU 40 100	Natural Gas	All areas	60%
Lighting	See details appendix A	-	-	-	-	-

**Note:** The remaining useful life of a system (in %) is an estimate based on the system date of built and existing conditions derived from visual inspection.

### 4. ENERGY CONSERVATION MEASURES

Based on the assessment of this building, SWA has separated the investment opportunities into two categories of recommendations:

**General Recommendations: Operations and Maintenance**

- Occupancy sensors – Small rooms such as storage closets and bathrooms could benefit from occupancy sensors. Due to the limited use of the Ames Avenue Firehouse building, energy savings from the use occupancy sensors cannot be quantified. Occupancy sensors can help prevent lights from being left on unintentionally for extended periods of time. For a building with sporadic use such as the Ames Avenue Firehouse building, savings will most likely not be seen when the building is occupied.
- Weather Stripping/Air Sealing - SWA observed that exterior door weather-stripping was beginning to deteriorate. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the window frame. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.
- Water Efficient Fixtures & Controls - Adding controlled on/off timers on all lavatory faucets is a cost-effect way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consuming fixtures and appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water and sewer bills.

**Specified Recommendations: Energy Conservation Measures**

**Summary table**

<b>ECM#</b>	<b>Description</b>
<b>1</b>	<b>Upgrade existing lighting; See Appendix A for entire lighting retrofit schedule</b>

## ECM#1: *Lighting Upgrade*

**Description:**

The Rutherford Ames Avenue Firehouse building consists of outdated and inefficient lighting. The building contains 41 fixtures that contain T12 fluorescent lamps with magnetic ballasts. Upgrading to fixtures with T8 lamps with electronic ballasts can save up to 30% electricity savings per fixture, while providing the same quality of light. The building also contains 30 incandescent bulbs that should be upgraded to CFLs. CFL bulbs provide the same or better quality of light using a smaller amount of energy. The Borough of Rutherford should also consider adding occupancy sensors to smaller rooms such as storage closets and bathrooms. See Appendix A for complete existing and proposed lighting schedules.

**Installation cost:**

Estimated installed cost: \$8,650  
 Source of cost estimate: *RS Means*

**Economics:**

1st year energy and cost savings						Simple Payback (SPP)	Life of Meas. (LoM)	Lifetime Cost Savings	Return on Invest (ROI)	
Electricity Savings			Fuel Savings		Cost Savings					
Consumption	Demand		Natural Gas							
6,198	kWh	0	kW	0	Therms	\$1,178	7.35	25	\$20,056	5.27%

**Assumptions:** SWA calculated the savings for this measure using measurements taken the day of the field visit, and billing analysis.

**Rebates/financial incentives:**

*NJ Clean Energy – Prescriptive Lighting Incentive, Incentive based on installing T5 or T8 lamps with electronic ballasts in existing facilities (\$10-\$30 per fixture, depending on quantity of lamps). Maximum incentive amount is \$1,230.*

**Options for funding ECM:**

*This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.*  
<http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings>

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

### **5.1. Existing systems**

*There are currently no existing renewable energy systems.*

### **5.2. Solar Photovoltaic**

*Solar photovoltaic panels would not be cost effective for this project based on the available roof area and low electric baseload.*

### **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.*

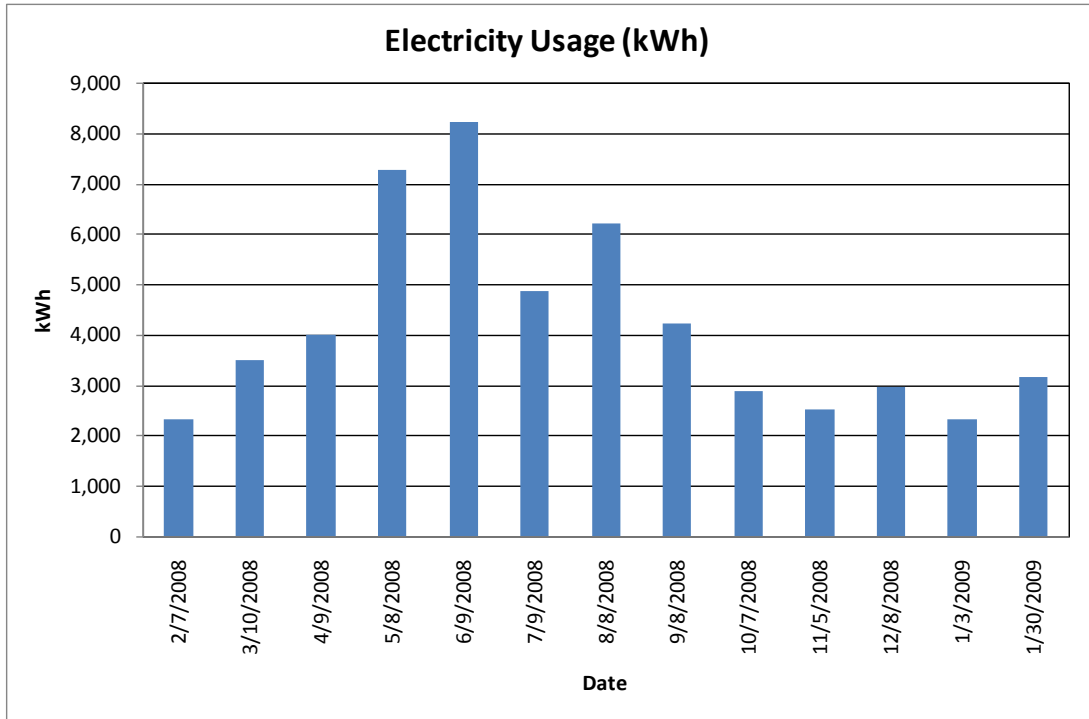
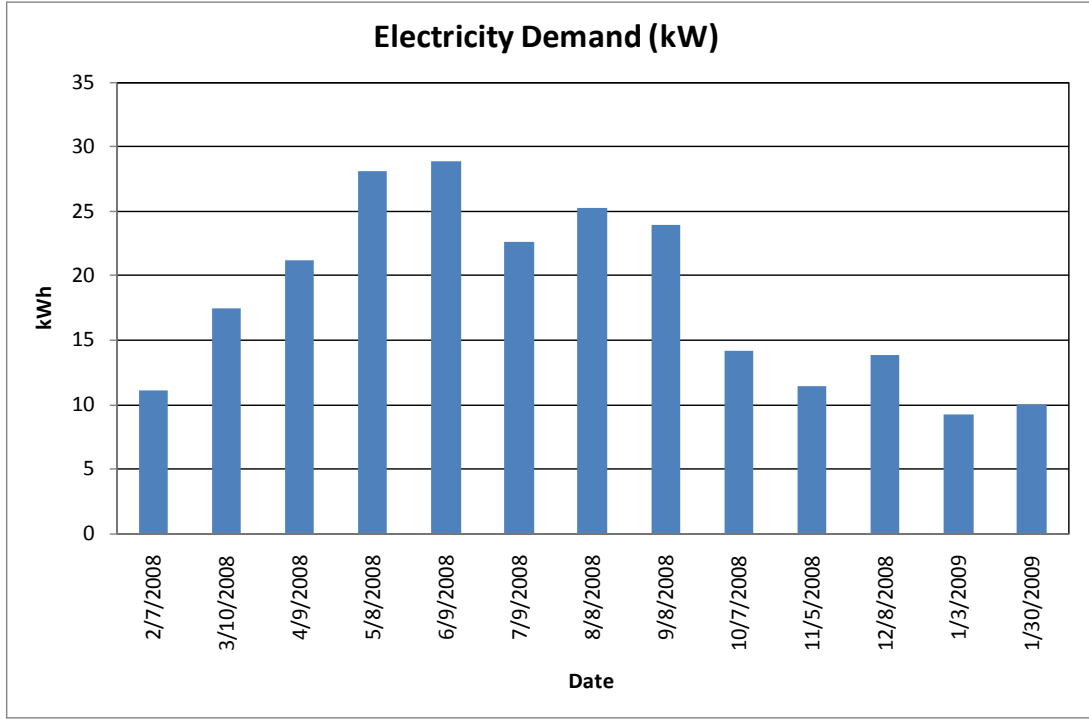
### **5.6. Wind**

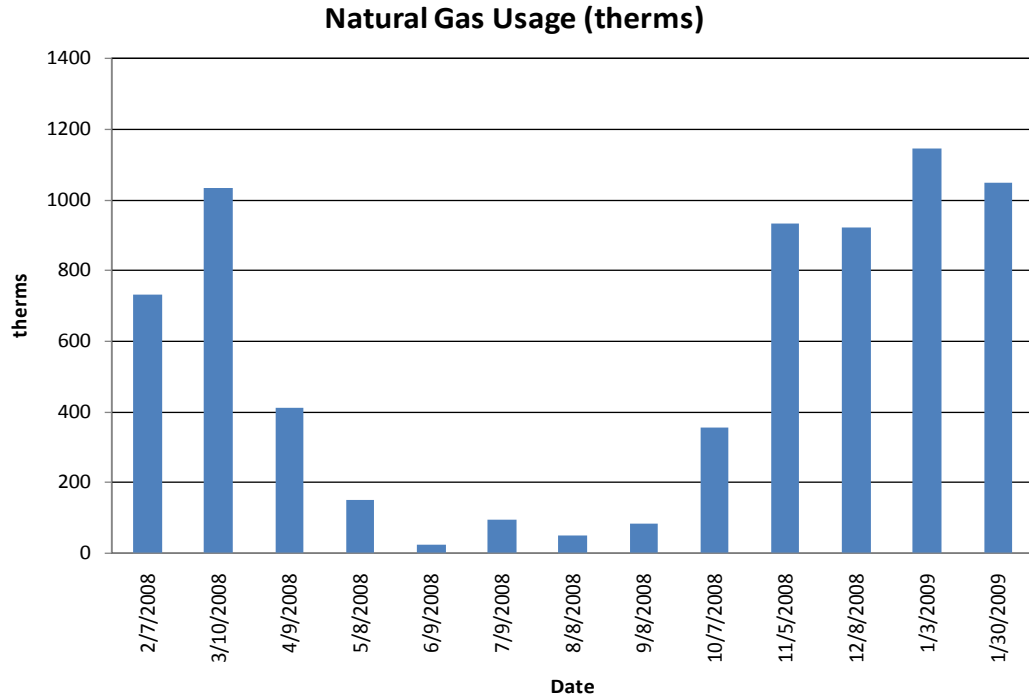
*Wind power production is not appropriate for this location because required land is not available for the wind turbine. Also, the available wind energy resource is very low.*

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

### **6.1. Load profiles**

The average electrical peak demand for the previous year was 18.3 kW and the maximum peak demand was 28.9 kW. The electric and gas load profiles for this project are presented in the following charts. The first chart shows electric demand (in kW) for the previous 12 months and the other two charts show electric and gas usage (in kWh), respectively.



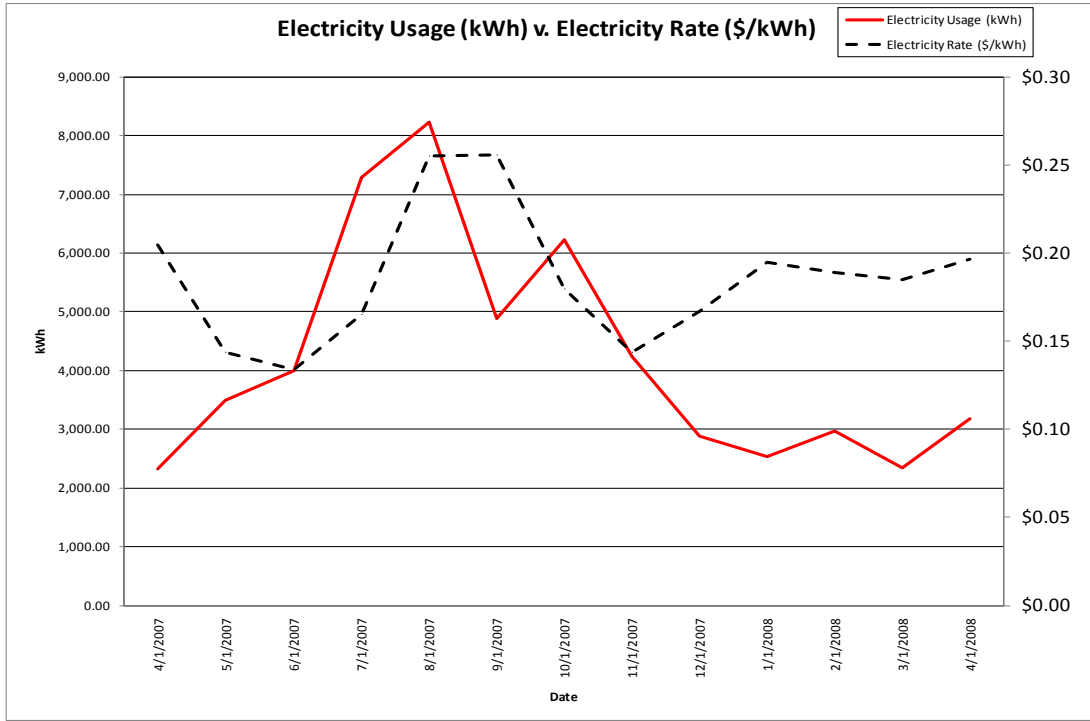


## 6.2. Tariff analysis

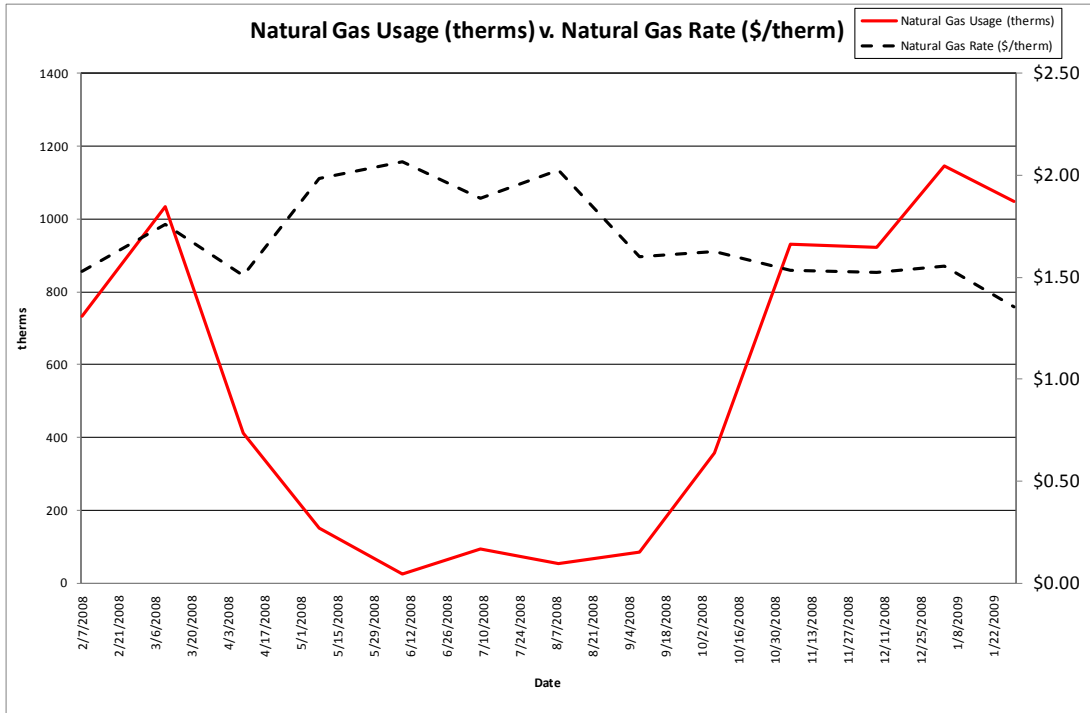
The Rutherford Ames Avenue firehouse currently buys electricity from PSEG at the general service rate, which charges customers based on the market rate of electricity usage as well as monthly peak demand. Gas is purchased from PSEG at the BGSS service rate which charges customers based on the market rate of natural gas usage. General Service rates are appropriate for this building due to its size.

## 6.3. Energy Procurement strategies

Billing analysis shows price fluctuations of over 20% over the course of the year for the building electrical and natural gas accounts. Customers that have a large variation in monthly billing rates can often reduce the costs associated with energy procurement by selecting a third party energy supplier. Contact the NJ Energy Choice Program for further information on Energy Services Companies (ESCOs) that can act as third party energy suppliers. Purchasing electricity from an ESCO can reduce electric rate fluctuation and ultimately reduce the annual cost of energy for the school. Appendix B contains a complete list of third party energy suppliers.



*Electricity prices reflect electricity usage*



*Natural gas prices fluctuate as expected with usage*

The building would not be eligible for enrollment in a Demand Response Program because the minimum electric demand each month does not greatly exceed 50 kW, which is the typical threshold for considering this option.

## 7. METHOD OF ANALYSIS

### 7.1. Assumptions and methods

Energy modeling method: Spreadsheet-based calculation methods  
Cost estimates: RS Means 2009 (Facilities Maintenance & Repair Cost Data)  
RS Means 2009 (Building Construction Cost Data)  
RS Means 2009 (Mechanical Cost Data)  
Note: 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, 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.***

## Appendix A: Lighting study

Existing Lighting Conditions																
#	Building	Level/Floor	Measured Lighting Level in Footcandles	Location in Building	Fixture Type	Ballast Type	No. of Fixtures	No. of Lamps	Type of Lamp	Watts /Lamp	Hrs/Day	Energy Use (Watt hours/day)	Annual Energy Use (kWh/year)	Controls	Daylighting possible?	Total Power (W)
1	Ames Ave. Firehouse	Main	18	Fire Garage	4' linear T12	magnetic	2	1	fluorescent	40	6	480	175	Switch	No	80
2	Ames Ave. Firehouse	Main	18	Fire Garage	LED Exit Signs	-	1	1	LED	5	24	120	44	None	No	5
3	Ames Ave. Firehouse	Main	8	Back Storage	60W Inc.	-	2	1	incandescent	60	4	480	175	Switch	No	120
4	Ames Ave. Firehouse	Main	4	Bathroom	60W Inc.	-	2	1	incandescent	60	4	480	175	Switch	No	120
5	Ames Ave. Firehouse	Main	14	Bath - Storage	60W Inc.	-	1	1	incandescent	60	4	240	88	Switch	No	60
6	Ames Ave. Firehouse	Main	5	Boiler Room	4' linear T12	magnetic	2	2	fluorescent	40	6	960	350	Switch	No	160
7	Ames Ave. Firehouse	Main	20	Stairwell - Storage	60W Inc.	-	1	1	incandescent	60	6	360	131	Switch	No	60
8	Ames Ave. Firehouse	Main	20	Stairs	4' linear T12	magnetic	2	4	fluorescent	40	6	1920	701	Switch	No	320
9	Ames Ave. Firehouse	Main	20	Stairs	4' linear T12	magnetic	1	2	fluorescent	40	6	480	175	Switch	No	80
10	Ames Ave. Firehouse	Main	20	Stairs	LED Exit Signs	-	1	1	LED	5	24	120	44	None	No	5
11	Ames Ave. Firehouse	Main	42	Storage (off Main Area)	4' linear T12	magnetic	1	4	fluorescent	40	6	960	350	None	No	160
12	Ames Ave. Firehouse	Main	77	Office	4' linear T12	magnetic	2	4	fluorescent	40	6	1920	701	Switch	No	320
13	Ames Ave. Firehouse	Second	3	Conference/Lounge Area	60W Inc.	-	6	1	incandescent	60	6	2160	788	Switch	No	360
14	Ames Ave. Firehouse	Second	3	Conference/Lounge Area	40W Inc. candles	-	3	4	incandescent	40	6	2880	1051	Switch	No	480
15	Ames Ave. Firehouse	Second	3	Conference/Lounge Area	LED Exit Signs	-	2	1	LED	5	24	240	88	None	No	10
16	Ames Ave. Firehouse	Second	3	Track Lighting	50W Halogen	-	6	1	Halogen	50	6	1800	657	Switch	No	300
17	Ames Ave. Firehouse	Second	36	Open/Main Area	4' linear T12	magnetic	24	4	fluorescent	40	6	23040	8410	Switch	No	3840
18	Ames Ave. Firehouse	Second	36	Open/Main Area	2' U-shaped T12	magnetic	2	2	fluorescent	40	6	960	350	None	No	160
19	Ames Ave. Firehouse	Second	38	Men's Room	4' linear T12	magnetic	1	4	fluorescent	40	6	960	350	Switch	No	160
20	Ames Ave. Firehouse	Second	38	Women's Room	4' linear T12	magnetic	1	4	fluorescent	40	6	960	350	Switch	No	160
21	Ames Ave. Firehouse	Second	38	Storage	4' linear T12	magnetic	1	4	fluorescent	40	4	640	234	Switch	No	160
22	Ames Ave. Firehouse	Second	102	Kitchen	2' U-shaped T12	magnetic	4	2	fluorescent	40	6	1920	701	Switch	No	320
23	Ames Ave. Firehouse	Second	36	Open/Main Area	LED Exit Signs	-	2	1	LED	5	24	240	88	None	No	10
24	Ames Ave. Firehouse	Second	17	Front Stairs	4' linear T12	magnetic	1	2	fluorescent	40	8	640	234	Switch	No	80



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

Third Party Electric Suppliers for PSEG Service Territory	Telephone & Web Site
<b>Hess Corporation</b> 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 <a href="http://www.hess.com">www.hess.com</a>
<b>American Powernet Management, LP</b> 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 <a href="http://www.americanpowernet.com">www.americanpowernet.com</a>
<b>BOC Energy Services, Inc.</b> 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 <a href="http://www.boc.com">www.boc.com</a>
<b>Commerce Energy, Inc.</b> 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 <a href="http://www.commerceenergy.com">www.commerceenergy.com</a>
<b>ConEdison Solutions</b> 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 <a href="http://www.conedsolutions.com">www.conedsolutions.com</a>
<b>Constellation NewEnergy, Inc.</b> 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 <a href="http://www.newenergy.com">www.newenergy.com</a>
<b>Credit Suisse, (USA) Inc.</b> 700 College Road East Princeton, NJ 08450	(212) 538-3124 <a href="http://www.creditsuisse.com">www.creditsuisse.com</a>
<b>Direct Energy Services, LLC</b> 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 <a href="http://www.directenergy.com">www.directenergy.com</a>
<b>FirstEnergy Solutions</b> 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 <a href="http://www.fes.com">www.fes.com</a>
<b>Glacial Energy of New Jersey, Inc.</b> 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 <a href="http://www.glacialenergy.com">www.glacialenergy.com</a>
<b>Metro Energy Group, LLC</b> 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 <a href="http://www.metroenergy.com">www.metroenergy.com</a>
<b>Integrus Energy Services, Inc.</b> 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 <a href="http://www.integrusenergy.com">www.integrusenergy.com</a>
<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	(800) 363-7499 <a href="http://www.libertypowercorp.com">www.libertypowercorp.com</a>
<b>Pepco Energy Services, Inc.</b> 112 Main St. Lebanon, NJ 08833	(800) 363-7499 <a href="http://www.pepco-services.com">www.pepco-services.com</a>
<b>PPL EnergyPlus, 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> 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 <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 <a href="http://www.southjerseyenergy.com">www.southjerseyenergy.com</a>
<b>Sprague Energy Corp.</b> 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 <a href="http://www.spragueenergy.com">www.spragueenergy.com</a>
<b>Strategic Energy, LLC</b> 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 <a href="http://www.sel.com">www.sel.com</a>
<b>Suez Energy Resources NA, Inc.</b> 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 <a href="http://www.suezenergyresources.com">www.suezenergyresources.com</a>
<b>UGI Energy Services, Inc.</b> 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 <a href="http://www.ugienergyservices.com">www.ugienergyservices.com</a>

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
<b>Cooperative Industries</b> 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 <a href="http://www.cooperativenet.com">www.cooperativenet.com</a>
<b>Direct Energy Services, LLC</b> 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 <a href="http://www.directenergy.com">www.directenergy.com</a>
<b>Dominion Retail, Inc.</b> 395 Highway 170, Suite 125 Lakewood, NJ 08701	(866) 275-4240 <a href="http://www.retail.dom.com">www.retail.dom.com</a>
<b>Gateway Energy Services Corp.</b> 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 <a href="http://www.gesc.com">www.gesc.com</a>
<b>UGI Energy Services, Inc.</b> 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 <a href="http://www.ugienergyservices.com">www.ugienergyservices.com</a>
<b>Great Eastern Energy</b> 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 <a href="http://www.greateastern.com">www.greateastern.com</a>
<b>Hess Corporation</b> 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 <a href="http://www.hess.com">www.hess.com</a>
<b>Hudson Energy Services, LLC</b> 545 Route 17 South Ridgewood, NJ 07450	(877) 483-7669 <a href="http://www.hudsonenergyservices.com">www.hudsonenergyservices.com</a>
<b>Intelligent Energy</b> 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 <a href="http://www.intelligentenergy.org">www.intelligentenergy.org</a>
<b>Keil &amp; Sons</b> 1 Bergen Blvd. Fairview, NJ 07002	(877) 797-8786 <a href="http://www.systrumenergy.com">www.systrumenergy.com</a>
<b>Metro Energy Group, LLC</b> 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 <a href="http://www.metroenergy.com">www.metroenergy.com</a>
<b>MxEnergy, Inc.</b> 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 <a href="http://www.mxenergy.com">www.mxenergy.com</a>
<b>NATGASCO (Mitchell Supreme)</b> 532 Freeman Street Orange, NJ 07050	(800) 840-4427 <a href="http://www.natgasco.com">www.natgasco.com</a>
<b>Pepco Energy Services, Inc.</b> 112 Main Street Lebanon, NJ 08833	(800) 363-7499 <a href="http://www.pepco-services.com">www.pepco-services.com</a>
<b>PPL EnergyPlus, 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> 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 <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 <a href="http://www.southjerseyenergy.com">www.southjerseyenergy.com</a>
<b>Sprague Energy Corp.</b> 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 <a href="http://www.spragueenergy.com">www.spragueenergy.com</a>
<b>Stuyvesant Energy LLC</b> 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	(800) 646-6457 <a href="http://www.stuyfuel.com">www.stuyfuel.com</a>
<b>Woodruff Energy</b> 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 <a href="http://www.woodruffenergy.com">www.woodruffenergy.com</a>