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April 7, 2010

Local Government Energy Program
Energy audit report

For

West End Firehouse
Borough of Rutherford
Rutherford, NJ 07070

Project Number: LGEA13

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INTRODUCTION

On May 20th, 2009, Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment of the West End Firehouse building 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 West End Firehouse building was built in 1925 and currently houses a two bay garage as well as, a lounge area and a large meeting area. The West End Firehouse is two stories and consists of a total floor area of 4,288 square feet. The building contains a partial basement and an attic. 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 West End firehouse building located at 350 Union Ave., Rutherford, NJ 07070. The West End Firehouse is two stories tall and has a total area of 7,200 square feet. Based on the field visit performed by Steven Winter Associates (SWA) staff on May 20th, 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 West End Firehouse consumed approximately 36,568 kWh or $6,206 worth of electricity and 223 therms or $474 worth of natural gas. The average aggregated cost of electricity was calculated to be $0.17/kWh and the average aggregated cost of natural gas was calculated to be $2.13/therm. With electricity and gas combined, the building consumed 147 MMBtus of energy at a total cost of $6,680.

SWA benchmarked Rutherford West End 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 West End Firehouse building is 34 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 West End Firehouse building. The total investment cost for these ECMs is **$4,315**. SWA estimates a first year savings of **$223** with a simple payback of **19.4 years**. SWA also estimates that the Rutherford West End Firehouse will be able to reduce their carbon footprint by **2,571 lbs of CO2 annually.**

There are various incentives that the Rutherford West End Firehouse building 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: Estimated Cost ($)	Source	1st year energy and cost savings: Electric Savings – Consumption		Demand		Fuel Savings – Natural Gas		Cost Savings ($)	Simple Payback (SPP)	Life of Measure (LoM)	Lifetime Cost Savings ($)	Return on Invest (ROI)	Annual Carbon Reduction (lbs of CO2)
1	Upgrade lighting	$ 4,315	RS Means	1,436	kWh	0	kW	0	Therms	$ 223	19.4	25	$ 3,791	-0.5%	2,571
	Total Scope of Work	**$ 4,315**	**-**	**-**	**-**	**0.0**	**-**			**$ 223**	**19.4**		**$ 3,791**		**2,571**

Definitions:

SPP: Simple Payback (years)

LoM: Life of Measure (years)

ROI: Return on Investment (%)

Assumptions:

Discount rate =	3.2%	per DOE FEMP guidelines	
Energy price escalation rate =	0%	per DOE FEMP guidelines	
Carbon Dioxide per unit Electriciy =	1.7905	lbs of CO2/kWh	
Carbon Dioxide per unit of Fuel =	11.023	lbs of CO2/unit fuel	

Average Electric Rate =	**0.155**	$/kWh
Average Fuel Rate =	**1.55**	$/Therm

1. HISTORIC ENERGY CONSUMPTION

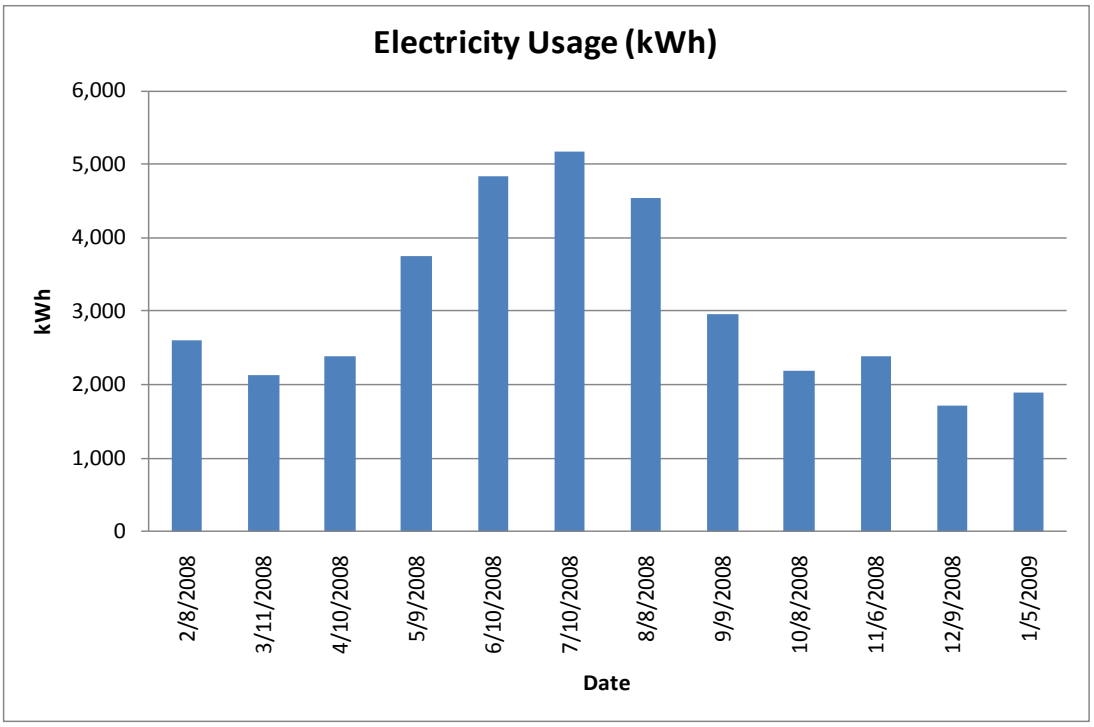
1.1. Energy usage and cost analysis

SWA received and analyzed utility bills from February 2008 through February 2009 that were received from the Borough of Rutherford.

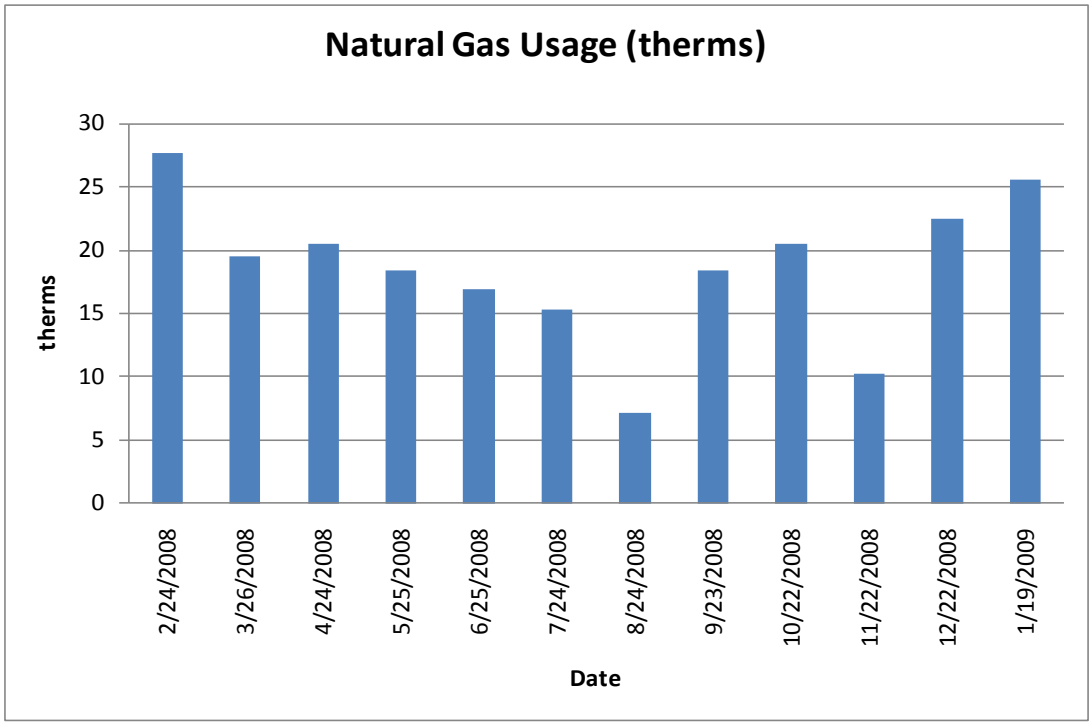
Electricity – The Rutherford West End Firehouse building has one electric meter for incoming electricity supply. The building purchases electricity from PSEG at **an average aggregated rate of $0.17/kWh** based on February 2008 through February 2009 electric bills. The building purchased **approximately 36,568 kWh or $6,206 worth of electricity from February 2008 through February 2009.** Based on the same time period, the building also has **an average monthly demand of 10.0 kW and monthly peak demand of 14.7 kW.**

Natural Gas – The Rutherford West End Firehouse building has one gas meter for incoming natural gas from PSE&G. Between February 2008 and February 2009, the building purchased **approximately 223 therms or $474 worth of natural gas.** The average aggregated cost of natural gas was calculated to be $2.13 per therm.

The following chart shows electricity usage for the West End Firehouse based on utility bills for the February 2008 to February 2009 billing period.



The following chart shows the natural gas usage for the West End Firehouse based on utility bills for the 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 West End 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 West End Firehouse building uses PSEG electric account #05 21 214 355 06 and PSEG natural gas account #05 21 214 355 06 at the service address of 356 Union Ave, Rutherford, NJ. Electricity for the building was billed at an average rate of **$0.17/kWh.** Natural Gas for the building was billed at an average rate of **$2.13/therm.**

1.3. Energy benchmarking

The Rutherford West End Firehouse Building information and utility data were entered into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, a performance score cannot be generated for firehouse buildings. 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 West End 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

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Rutherford - 356 Union

Building ID: 1800724
For 12-month Period Ending: January 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: October 14, 2009

Facility
Borough of Rutherford - 356 Union
356 Union Avenue
Rutherford, NJ 07070

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 2009
Gross Floor Area (ft^2): 4,288

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	126,209
Natural Gas (kBtu)[4]	21,396
Total Energy (kBtu)	147,605

Energy Intensity[5]	
Site ($kBtu/ft^2/yr$)	34
Source ($kBtu/ft^2/yr$)	104

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	20

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	-34%
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.

Certifying Professional
N/A

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

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

Rutherford West End Firehouse was originally built in 1925 and has undergone several interior renovations since. The building is three stories with a total floor area of 4,288 square feet.

2.2. Building occupancy profiles

During the site visit, there was only 1 employees observed in the building at once. The West End 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 West End 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 West End Firehouse roof is sloped and formed by wooden trusses. The roof surface consists of gray asphalt shingly. The roof surface appeared to be in good condition. The attic contains R-19 insulation batts located above the top floor ceiling. These insulation batts have been moved around since they were first laid above the ceiling. SWA recommends maintaining this insulation so that it forms an even insulation layer in the attic. If insulation is moved around as a result of accessing the attic, the batts should be properly set back in 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. 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 with no low-e coating. The windows appeared to be in good condition and did not allow for excessive air or moisture penetration around the frame however. The windows currently do not need to be upgraded. If windows are ever replaced as part of a capital improvement plan, the Borough of Rutherford should be sure to include windows that contain a high insulation value as well as a low-e coating.

2.3.5. Exterior doors

The main entrance for the building is located on the side of the building facing the parking area and consists of an insulated, steel door. The front of the building consists of two large garage doors. The back entrance consists of an insulated, steel door. All of the doors appeared to have weather-stripping that was intact. 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 West End Firehouse building was relatively tight with the exception of some small penetrations inside of the building. Windows and Entranceways such as the side entrance door and front garage doors of the West End Firehouse building should be maintained so that a tight seal is always formed to keep conditioned are from leaking outside of the building.

2.4. HVAC systems

2.4.1. Heating

The Rutherford West End Firehouse building contains one Weil McLain 80 Series hot water boiler with an output of 278 MBH. This boiler appeared in good cosmetic condition. The boiler had a nameplate efficiency of 80%. The boiler serves hot water baseboards throughout the building.

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 are showing signs of cosmetic aging but are fully functional for the limited amount of use that they endure. These units will most likely operate usefully for another 4-5 years. When the lifetime of these units expire, the Borough of Rutherford should consider adding infrared units in the West End Firehouse garage to reduce heating costs. Replacement equipment should always be evaluated with energy efficiency in mind.

2.4.2. Cooling

The Rutherford West End Firehouse building uses two split system air-conditioning units to provide cooling and control humidity within the building. One unit primarily serves the second floor, while the other unit primarily serves the third floor. Each of these units has a condenser behind the building that corresponds to evaporator units inside the building. The unit conditions the air using R22 refrigerant. The units appeared to be in good, working conditions and would not be cost-effective to upgrade at this point in time.

2.4.3. Ventilation

The West End 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 Rheem Guardian, atmospheric, gas-fired domestic hot water heater with an input capacity of 36 kBtuh and a total storage of 40 gallons. SWA estimates that there is approximately 67% 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 West End 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 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 West End Firehouse building.

2.5.4. Other electrical systems

There are no other electrical systems in this building.

3. EQUIPMENT LIST

Building System	Description	Make/ Model	Fuel	Space served	Estimated Remaining useful life %
Heating	Weil McLain 80 Series 1 boiler, 278 MBH output, natural gas, atmospheric, some nameplate information missing	Weil Mclain 80 Series 1 boiler, Model #380	Natural Gas	All areas	30%
Cooling	Rheem Classic condensor, 11/2002, 10 SEER, R22	Rheem Classic, Model #RAKA-060JAZ	Electric	All areas	72%
Cooling	Corsaire condensor, 5/99, R-22	Corsaire, Model #FADC-024JAS	Electric	All areas	60%
Cooling	Rheem Split AC unit, 11/2002, corresponds to above condensor	Rheem, Model #RBHC-17511NHD	Electric	All areas	72%
Domestic Hot Water	Rheem Guardian System, Fury gas water heater, 11/2004, 40 gallons, 36,000 Btuh input, Energy star 254 therms/year	Rheem Guardian System, Fury gas water heater, Model #22V40-36FL	Natural Gas	All areas	67%
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 West End 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 West End 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

ECM#	Description
1	**Upgrade existing lighting; See Appendix A for entire lighting retrofit schedule**

ECM#1: *Lighting Upgrade*

Description:

The Rutherford West End Firehouse building consists of outdated and inefficient lighting. The building contains 20 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 21 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: $4,315
Source of cost estimate: RS *Means*

Economics:

1st year energy and cost savings							Simple Payback (SPP)	Life of Meas. (LoM)	Lifetime Cost Savings	on Invest (ROI)
Electricity Savings				Fuel Savings		Cost Savings				
Consumption		Demand		Natural Gas						
1,436	kWh	0	kW	0	Therms	$223	19.39	25	$3,791	-0.49%

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 $600.

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.

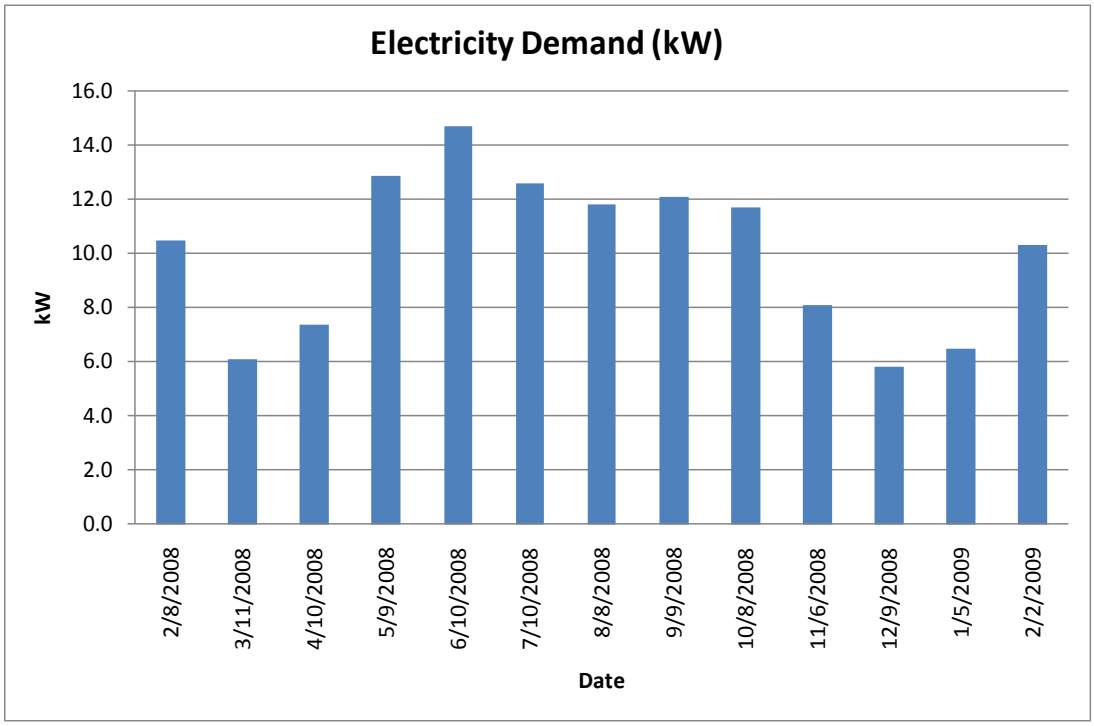
5.6. Wind

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 10.0 kW and the maximum peak demand was 14.7 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.


Electricity Demand (kW)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
kW
2/8/2008
3/11/2008
4/10/2008
5/9/2008
6/10/2008
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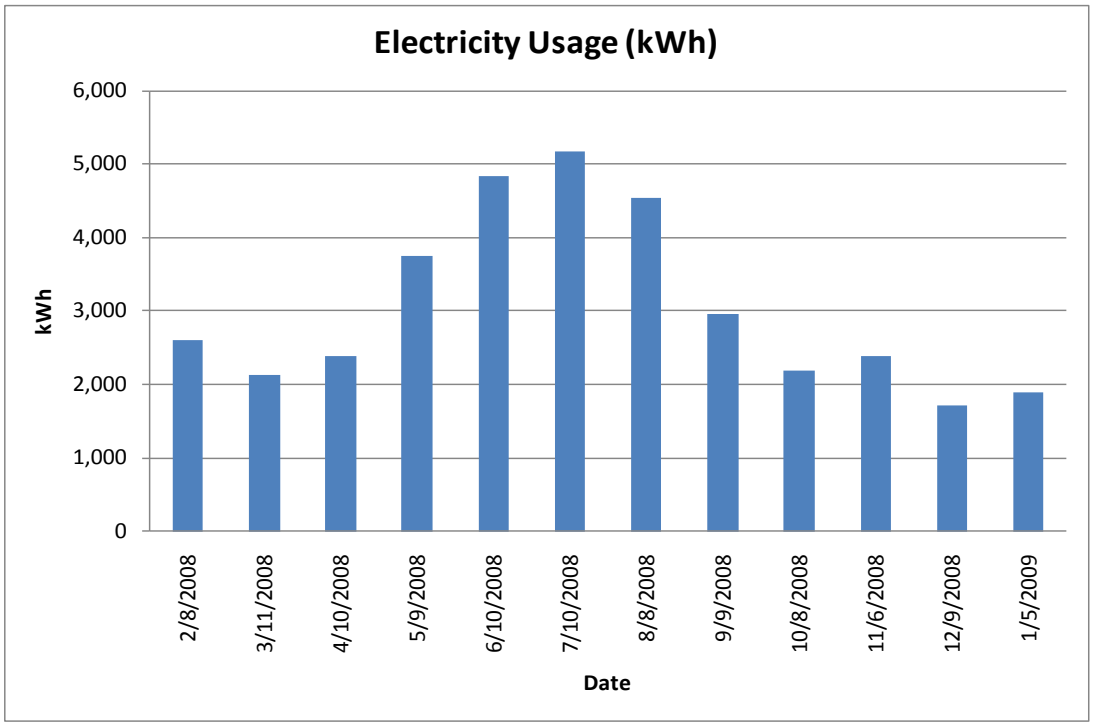
10/8/2008
11/6/2008
12/9/2008
1/5/2009
2/2/2009
Date


Electricity Usage (kWh)
6,000
5,000
4,000
3,000
2,000
1,000
0
kWh
2/8/2008
3/11/2008
4/10/2008
5/9/2008
6/10/2008
7/10/2008
8/8/2008
9/9/2008
10/8/2008
11/6/2008
12/9/2008
1/5/2009
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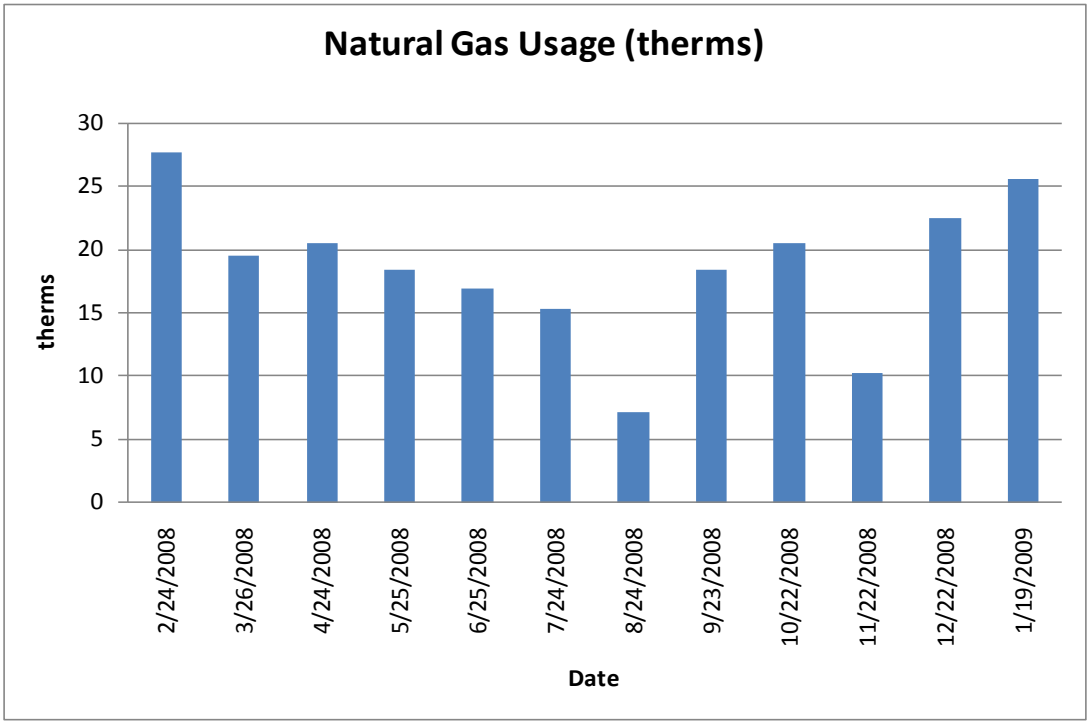
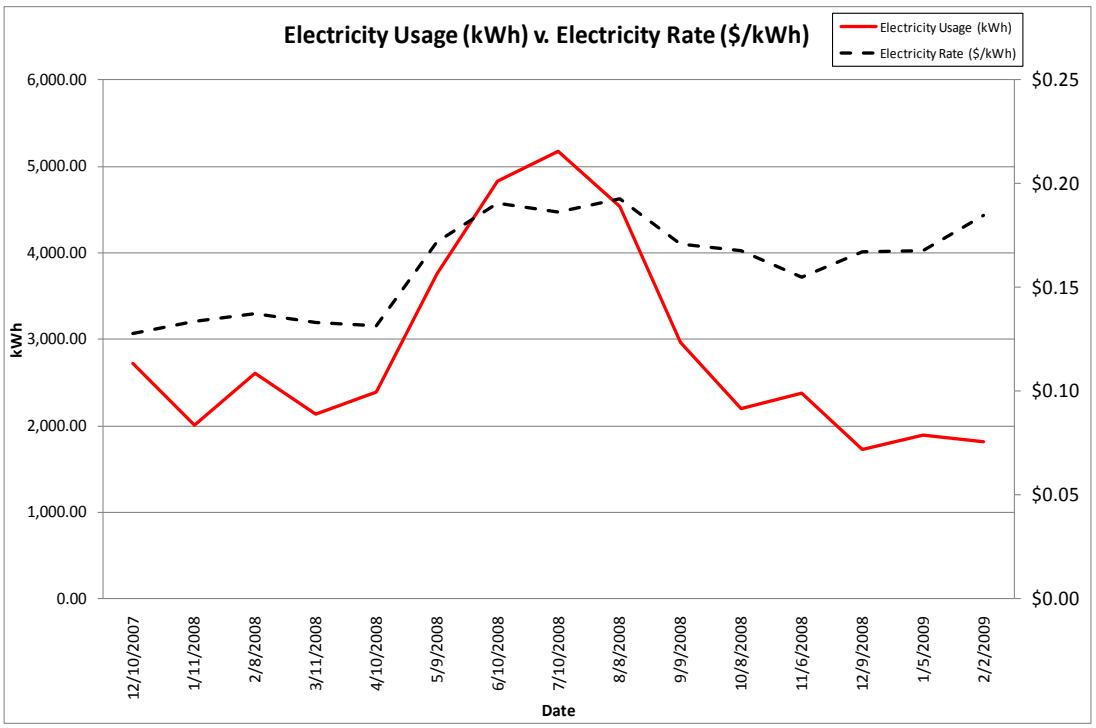


6.2. Tariff analysis

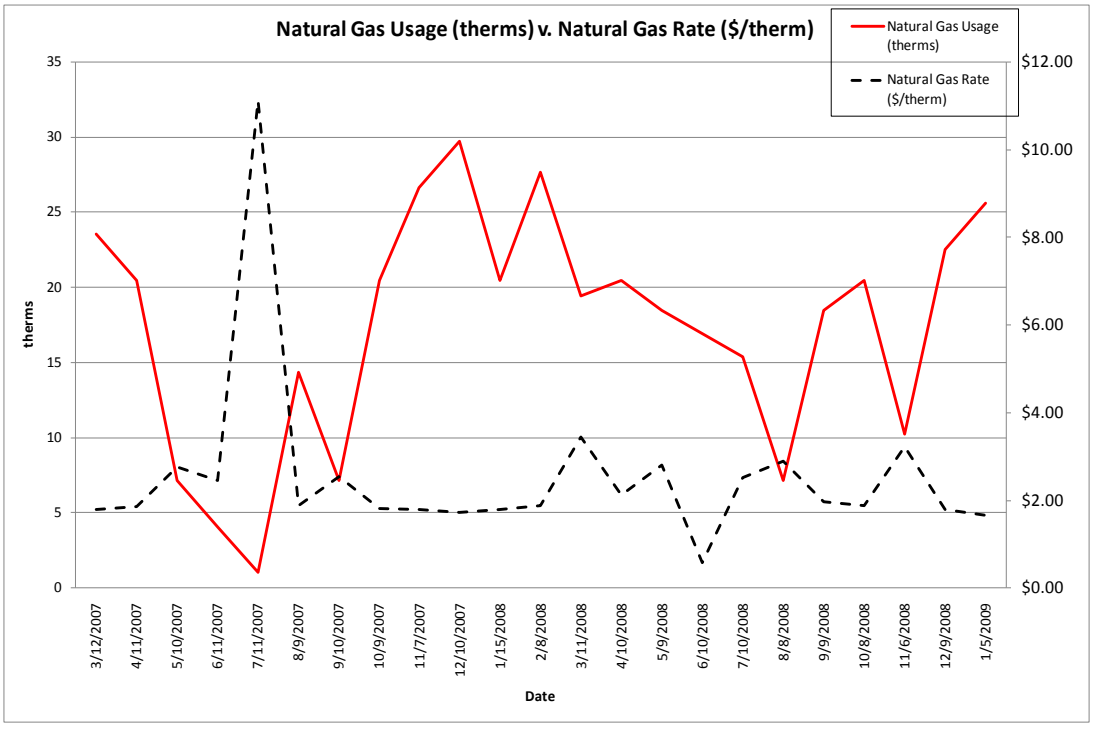
The Rutherford West End Firehouse currently buys electricity from PSEG at the GSGH MD general service rate, which charges customers based on the market rate of electricity usage as well as monthly peak demand. Gas is purchased from PSEG at the GSGH MD general service rate which charges customers based on the market rate of natural gas usage. General Service rates are appropriate for this building due to its size and limited use.

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 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	Location in Building	Measured Lighting Level in Footcandles	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	West End Firehouse	Main	Main Garage	31	4' linear T8	electronic	24	2	Fluorescent	32	4	6144	2243	Switch	No	1536
2	West End Firehouse	Main	Main Garage	31	LED Exit Sign	-	1	1	LED	5	24	120	44	None	No	5
3	West End Firehouse	Basement	Boiler room	10	60W Inc.	-	1	1	Incandescent	60	2	120	44	Switch	No	60
4	West End Firehouse	Basement	Tunnel	5	60W Inc.	-	1	1	Incandescent	60	2	120	44	Switch	No	60
5	West End Firehouse	Main	Stairwell	10	60W Inc.	-	1	1	Incandescent	60	4	240	88	Switch	No	60
6	West End Firehouse	Main	Bath	90	4' linear T12	magnetic	2	4	Fluorescent	40	4	1280	467	Switch	No	320
7	West End Firehouse	Main	Hall	20	10W CFL	-	1	2	CFL	10	4	80	29	Switch	No	20
8	West End Firehouse	Main	Hall	20	LED Exit Sign	-	1	1	LED	5	24	120	44	None	No	5
9	West End Firehouse	Main	Stairwell	22	40W Inc. Candles	-	1	2	Incandescent	40	4	320	117	Switch	No	80
10	West End Firehouse	Second	Ladies room	34	2' U-shaped T12	magnetic	1	2	Fluorescent	40	4	320	117	Switch	No	80
11	West End Firehouse	Second	Men's Room	34	2' U-shaped T12	magnetic	1	2	Fluorescent	40	4	320	117	Switch	No	80
12	West End Firehouse	Second	Main Hallway	34	2' U-shaped T12	magnetic	2	2	Fluorescent	40	4	640	234	Switch	No	160
13	West End Firehouse	Second	Lounge	29	2' U-shaped T12	magnetic	6	2	Fluorescent	40	4	1920	701	Switch	No	480
14	West End Firehouse	Second	Storage	30	75W Flood	-	1	1	Incandescent	75	2	150	55	Switch	No	75
15	West End Firehouse	Second	Lounge/Bar	29	40W Inc.	-	6	1	Incandescent	40	4	960	350	Switch	No	240
16	West End Firehouse	Second	Main Room/Larger Area	62	4' linear T12	magnetic	7	4	Fluorescent	40	4	4480	1635	Switch	No	1120
17	West End Firehouse	Second	Main Room/Larger Area	62	2' U-shaped T12	magnetic	1	2	Fluorescent	40	4	320	117	Switch	No	80
18	West End Firehouse	Second	Main Room/Larger Area	62	40W Inc.	-	8	1	Incandescent	40	4	1280	467	Switch	No	320
19	West End Firehouse	Second	Main Room/Larger Area	62	LED Exit Sign	-	2	1	LED	5	24	240	88	None	No	10
20	West End Firehouse	Attic	Stairs	7	60W Inc.	-	1	1	Incandescent	60	4	240	88	Switch	No	60

Proposed Lighting Conditions															
#	Building	Level/Floor	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	West End Firehouse	Main	Main Garage	4' linear T8	electronic	24	2	Fluorescent	32	4	6144	2243	Switch	No	1536
2	West End Firehouse	Main	Main Garage	LED Exit Sign	-	1	1	LED	5	24	120	44	None	No	5
3	**West End Firehouse**	**Basement**	**Boiler room**	**17W CFL**	**-**	**1**	**1**	**CFL**	**17**	**2**	**34**	**12**	**Switch**	**No**	**17**
4	**West End Firehouse**	**Basement**	**Tunnel**	**17W CFL**	**-**	**1**	**1**	**CFL**	**17**	**2**	**34**	**12**	**Switch**	**No**	**17**
5	**West End Firehouse**	**Main**	**Stairwell**	**17W CFL**	**-**	**1**	**1**	**CFL**	**17**	**4**	**68**	**25**	**Switch**	**No**	**17**
6	**West End Firehouse**	**Main**	**Bath**	**4' linear T8**	**electronic**	**2**	**4**	**Fluorescent**	**32**	**4**	**1024**	**374**	**Switch**	**No**	**256**
7	West End Firehouse	Main	Hall	10W CFL	-	1	2	CFL	10	4	80	29	Switch	No	20
8	West End Firehouse	Main	Hall	LED Exit Sign	-	1	1	LED	5	24	120	44	None	No	5
9	**West End Firehouse**	**Main**	**Stairwell**	**17W CFL**	**-**	**1**	**2**	**CFL**	**17**	**4**	**136**	**50**	**Switch**	**No**	**34**
10	**West End Firehouse**	**Second**	**Ladies room**	**2' U-shaped T8**	**electronic**	**1**	**2**	**Fluorescent**	**32**	**4**	**256**	**93**	**Switch**	**No**	**64**
11	**West End Firehouse**	**Second**	**Men's Room**	**2' U-shaped T8**	**electronic**	**1**	**2**	**Fluorescent**	**32**	**4**	**256**	**93**	**Switch**	**No**	**64**
12	**West End Firehouse**	**Second**	**Main Hallway**	**2' U-shaped T8**	**electronic**	**2**	**2**	**Fluorescent**	**32**	**4**	**512**	**187**	**Switch**	**No**	**128**
13	**West End Firehouse**	**Second**	**Lounge**	**2' U-shaped T8**	**electronic**	**6**	**2**	**Fluorescent**	**32**	**4**	**1536**	**561**	**Switch**	**No**	**384**
14	**West End Firehouse**	**Second**	**Storage**	**30W CFL refl.**	**-**	**1**	**1**	**CFL**	**30**	**2**	**60**	**22**	**Switch**	**No**	**30**
15	**West End Firehouse**	**Second**	**Lounge/Bar**	**17W CFL**	**-**	**6**	**1**	**CFL**	**17**	**4**	**408**	**149**	**Switch**	**No**	**102**
16	**West End Firehouse**	**Second**	**Main Room/Larger Area**	**4' linear T8**	**electronic**	**7**	**4**	**Fluorescent**	**32**	**4**	**3584**	**1308**	**Switch**	**No**	**896**
17	**West End Firehouse**	**Second**	**Main Room/Larger Area**	**2' U-shaped T8**	**electronic**	**1**	**2**	**Fluorescent**	**32**	**4**	**256**	**93**	**Switch**	**No**	**64**
18	**West End Firehouse**	**Second**	**Main Room/Larger Area**	**17W CFL**	**-**	**8**	**1**	**CFL**	**17**	**4**	**544**	**199**	**Switch**	**No**	**136**
19	West End Firehouse	Second	Main Room/Larger Area	LED Exit Sign	-	2	1	LED	5	24	240	88	None	No	10
20	**West End Firehouse**	**Attic**	**Stairs**	**17W CFL**	**-**	**1**	**1**	**CFL**	**17**	**4**	**68**	**25**	**Switch**	**No**	**17**

Existing Lighting Energy Use (kWh/year)	7,086
Proposed Lighting Energy Use (kWh/year)	5,650
Existing Lighting Energy Cost ($/year)	$1,205
Proposed Lighting Energy Cost ($/year)	$961
Estimated Savings (kWh/year)	1,436
Estimated Savings ($/year)	$244
Existing lighting power density (W/sqft)	1.13
Proposed lighting power density (W/sqft)	0.89

Appendix B: Third Party Energy Suppliers (ESCOs)

Third Party Electric Suppliers for PSEG Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Dominion Retail, Inc. 395 Highway 170, Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Hudson Energy Services, LLC 545 Route 17 South Ridgewood, NJ 07450	(877) 483-7669 www.hudsonenergyservices.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002	(877) 797-8786 www.systrumenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	(800) 646-6457 www.stuyfuel.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com