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Local Government Energy Program
Energy Audit Final Report

South River Rescue Squad Building
South River, NJ 08882

Project Number: LGEA48

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INTRODUCTION

As an approved energy consulting firm under the Local Government Energy Audit Program (LGEA), Steven Winter Associates, Inc. (SWA) was selected to perform an energy audit and assessment for the Borough of South River municipal buildings. The audit, conducted on January 5th, 11th and 12th, included a review of the:

- Human Services Building
- Municipal Building
- Public Library
- Criminal Justice Building
- War Memorial Building
- Roads Department Building
- George Street Firehouse
- Rescue Squad Building
- Appleby Avenue Firehouse

The buildings are located in South River, NJ. A separate energy audit report is issued for each of the referenced buildings.

This report addresses the South River Rescue Squad Building located at 6 Thomas St., South River, NJ 08882. 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 South River South River Rescue Squad Building was built 1916 with the latest renovation mainly concentrated around the basement area in 2001. The building consists of 7,400 square feet of conditioned space and houses: storage / supply rooms, a boiler room, two meeting rooms, three van / truck rig bays, bathrooms and a kitchen. Occupancy for the Rescue Squad Building is sporadic, usually 2 to 6 volunteers for approximately 12 hours per day. There is usually one special event held in the large meeting room area every couple of months for volunteer Rescue Squad members.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Borough of South River to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the Rescue Squad Building.

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 that additional 25% will also be paid by the program. The Board of Public Utilities (BPUs) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Rescue Squad Building located at 6 Thomas St., South River, NJ 08882. The Rescue Squad Building is a single-story building with basement comprising of a total floor area of 7,400 square feet. The original structure was built in 1916, with additions and renovations, last upgrade occurring in the basement in 2001.

Based on the field visits performed by the SWA staff on January 5th, 11th and 12th 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.

From November 2008 through October 2009 the Rescue Squad Building consumed 54,866 kWh or $7,133 worth of electricity at an approximate rate of $0.130/kWh and 4,193 therms or $5,012 worth of natural gas at an approximate rate of $1.195/therm. The joint energy consumption for the building, including both electricity and natural gas, was 607 MMBtus of energy that cost a total of $12,145.

SWA has entered energy information about the Rescue Squad Building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. This Public Order and Safety facility is comprised of non-eligible (Other) space type, since national comparisons are yet unavailable for rating. SWA encourages the Borough of South River to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time. EPA is continually working to expand the available space types.

The Site Energy Use Intensity is 79.0 kBtu/ft^2yr compared to the national average of Borough Public Order and Safety building consuming 90.0 kBtu/ft^2yr. Implementing this report's recommendations will reduce use by approximately 10.3 kBtu/ft^2yr, which when implemented would make the building energy consumption much better than the national average.

Based on the assessment of the Rescue Squad Building, SWA has separated the recommendations into three categories (See Section 4 for more details). These are summarized as follows:

Category I Recommendations: Capital Improvement Measures

- Install emergency generator for the Safety of the volunteers during power outages
- Select NEMA Premium motors when replacing motors at the end of their useful operating lives
- Add insulation to under-insulated exterior wall sections - upgrade at the next major renovation

Category II Recommendations: Operations and Maintenance

- Insulate Boiler room and distribution piping
- Maintain / repair garage doors
- Repair / replace rusted / deteriorated steel lintels. SWA also recommends having the structural integrity of the roof evaluated
- Thoroughly and evenly insulate space above the ceiling
- Maintain roofs - SWA recommends regular maintenance to verify water is draining correctly

- Maintain downspouts and cap flashing - repair / install missing downspouts and cap flashing as needed
- Provide weather stripping / air sealing
- Repair / seal wall cracks and penetrations
- Provide water efficient fixtures and controls
- Use Energy Star labeled appliances
- Use smart power electric strips
- Create an energy educational program

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

At this time, SWA highly recommends a total of **3** Energy Conservation Measures (ECMs) for the Rescue Squad Building that is summarized in the following Table 1. The total investment cost for these ECMs without incentives is **$1,389**. SWA estimates a first year savings of **$565** with a simple payback of **2.5 years**. SWA also recommends **3** more ECMs with a total first year savings of **$787** that is summarized in Table 2 and **1** recommended End of Life Cycle ECM with a total first year savings of **$927** that is summarized in Table 3. SWA estimates that implementing these recommended ECMs will reduce the carbon footprint of the Rescue Squad Building by **21,419 lbs of CO_2**, which is equivalent to removing approximately 2 cars from the roads each year or avoiding the need of 52 trees to absorb the annual CO_2 generated.

There are various incentives available in New Jersey to lower the cost of installing the Energy Conservation Measures (ECMs), like NJ SmartStart program and Direct Install through the New Jersey Office of Clean Energy. These incentive programs can help provide technical assistance for the building in the implementation phase of any energy conservation project. The Borough of South River and 6 other nearby boroughs have a long term contract to purchase electricity as a consortium from the South River Electric Utility and do not pay the Societal Benefit Charges (SBCs) that fund NJCEP programs. Therefore, the Borough of South River is not eligible to receive any incentives for energy conservation under the New Jersey Clean Energy Program (NJCEP) at the present time. SWA recommends the Borough of South River initiate a dialogue with the Board of Public Utilities (BPU) to gain access to these and other incentives in the future.

The following three tables summarize the proposed Energy Conservation Measures (ECMs) and their economic relevance. In order to clearly present the overall energy opportunities for the building and ease the decision and choice of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight / potential overlaps between some of the summarized ECMs (i.e. lighting change influence on heating / cooling).

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 cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	install (1) Beverage vending machine energy miser - in kitchen	www.usatech.com and established costs	279	0	279	1,456	0.3	0	0.7	0	189	12	2,271	1.5	714	60	68	1,534	2,607
2.1	install (3) occupancy sensors in van bays and meeting room	RS Means, Lit Search	660	0	660	2,030	0.4	0	0.9	0	264	12	3,167	2.5	380	32	39	1,876	3,635
2.2	replace (9) incandescent meeting room bulbs with CFLs	RS Means, Lit Search	450	0	450	591	0.1	0	0.3	35	112	5	559	4.0	24	5	8	57	1,058
	Totals		**1,389**	**0**	**1,389**	**4,077**	**0.8**	**0**	**1.9**	**35**	**565**	-	**5,997**	**2.5**	**332**	-	**38**	**3,467**	**7,300**

Assumptions: Discount Rate: 3.2% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines
Note: A 0.0 electrical demand reduction / month indicates that it is very low / negligible

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 cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
3	replace one (1) kitchen refrigerator with an 18 cu ft Energy Star model	Energy Star purchasing and procurement site, similar projects	750	0	750	350	0.1	0	0.2	50	96	12	1,146	7.9	53	4	7	183	627
2.3	replace (4) exterior Metal Halide fixtures with pulse start MH type	RS Means, Lit Search	2,600	0	2,600	806	0.2	0	0.4	160	265	15	3,972	9.8	53	4	6	500	1,443
2.4	replace (20) T12 fixtures in van bays and bathrooms with T8 fixtures	RS Means, Lit Search	4,400	0	4,400	2,880	0.6	0	1.3	53	427	15	6,404	10.3	46	3	5	604	5,157
	Totals		**7,750**	**0**	**7,750**	**4,036**	**0.8**	**0**	**1.9**	**263**	**787**	**-**	**11,521**	**9.8**	**49**	**-**	**6**	**1,287**	**7,226**

Table 3 - Recommended End of Life Cycle 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 cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
4	replace (1) old boiler with (2) condensing boilers - 92% eff and (2) hi eff pumps	Energy Star purchasing and procurement site, similar projects	16,000	0	16,000	1,097	0.2	447	6.5	250	927	25	23,171	17.3	45	2	3	-208	6,892
	Totals		**16,000**	**0**	**16,000**	**1,097**	**0.2**	**447**	**6.5**	**250**	**927**	**25**	**23,171**	**17.3**	**45**	**2**	**3**	**-208**	**6,892**

1. HISTORIC ENERGY CONSUMPTION

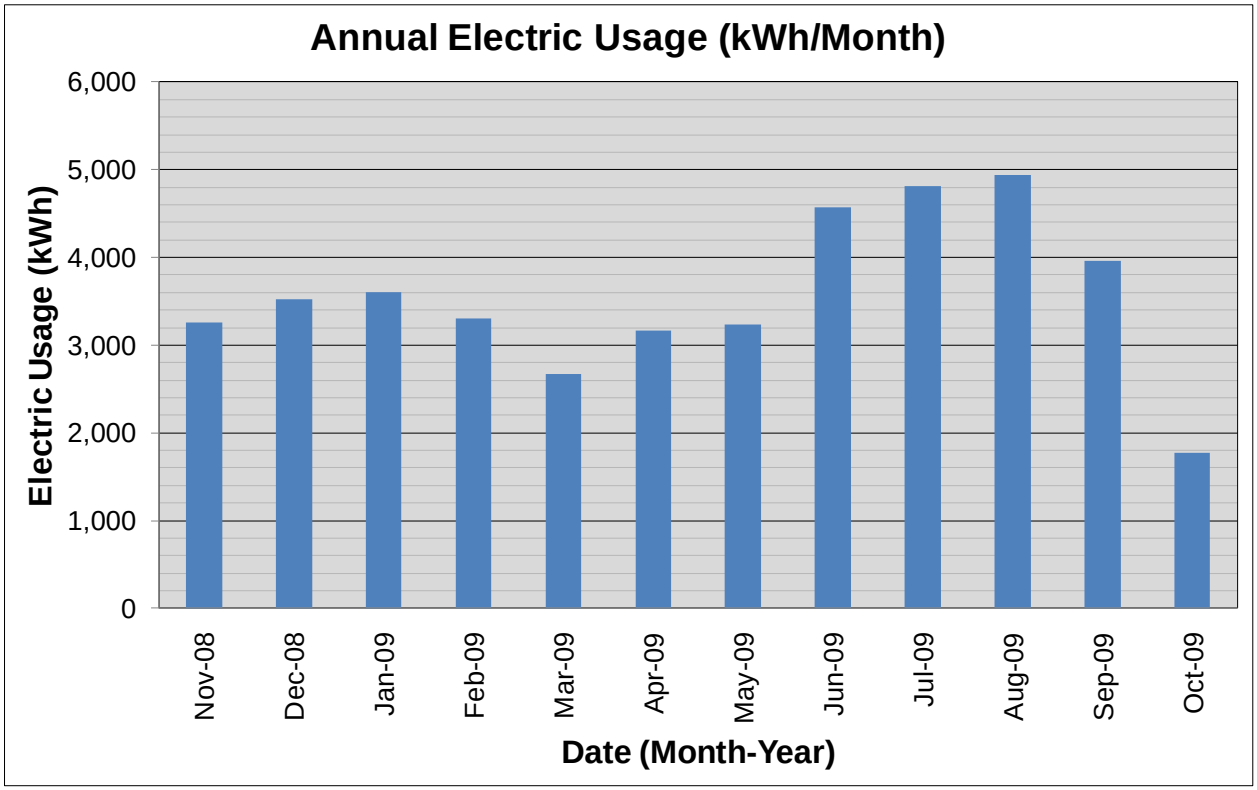
1.1. Energy Usage and Cost Analysis

SWA analyzed utility bills from December 2007 through October 2009 that were received from the utility companies supplying the South River Rescue Squad Building with electric and natural gas.

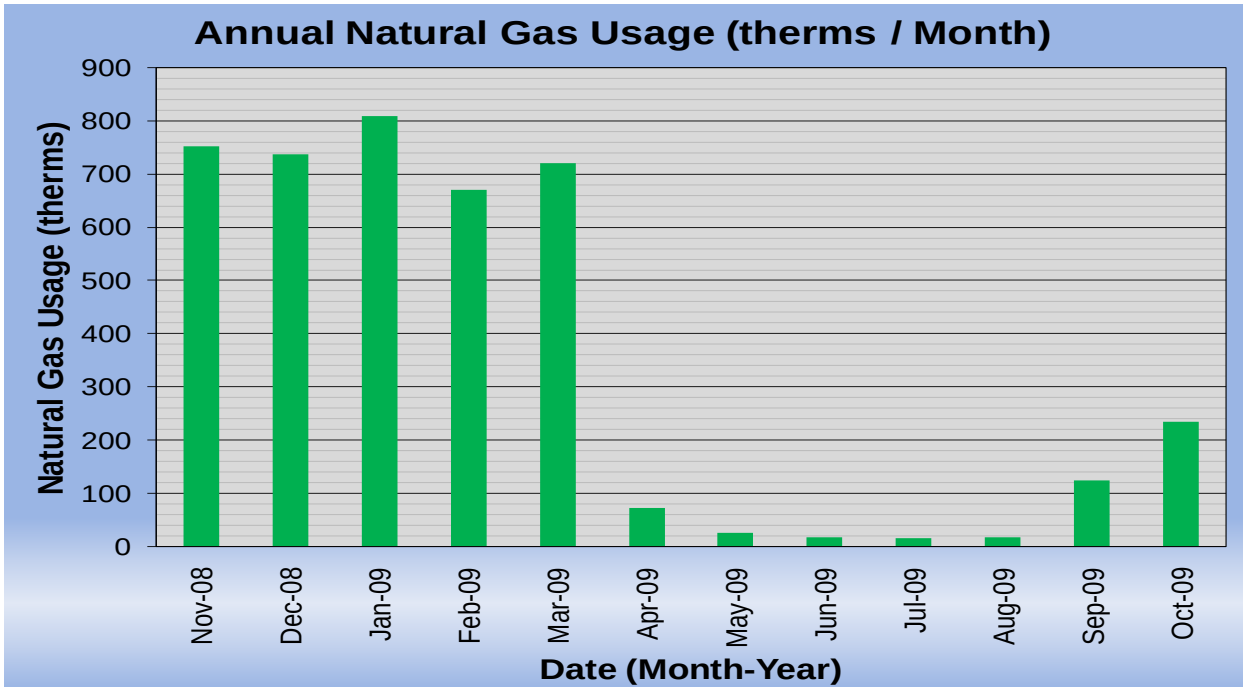
Electricity - The South River Rescue Squad Building is currently served by one electric meter. The Rescue Squad Building currently buys electricity from South River Electric Utility at **an average rate of $0.130/kWh** based on 12 months of utility estimates from November 2008 through October 2009. The Rescue Squad Building purchased **approximately 54,866 kWh or $7,133 worth of electricity** in the previous year. The average monthly demand was not recorded and is unavailable.

Natural gas - The South River Rescue Squad Building is currently served by one meter for natural gas. The South River Rescue Squad Building currently buys natural gas from PSE&G at **an average aggregated rate of $1.195/therm** based on 12 months of utility bills for November 2008 through October 2009. The South River Rescue Squad Building purchased **approximately 4,193 therms or $5,012 worth of natural gas** in the previous year at a very competitive rate.

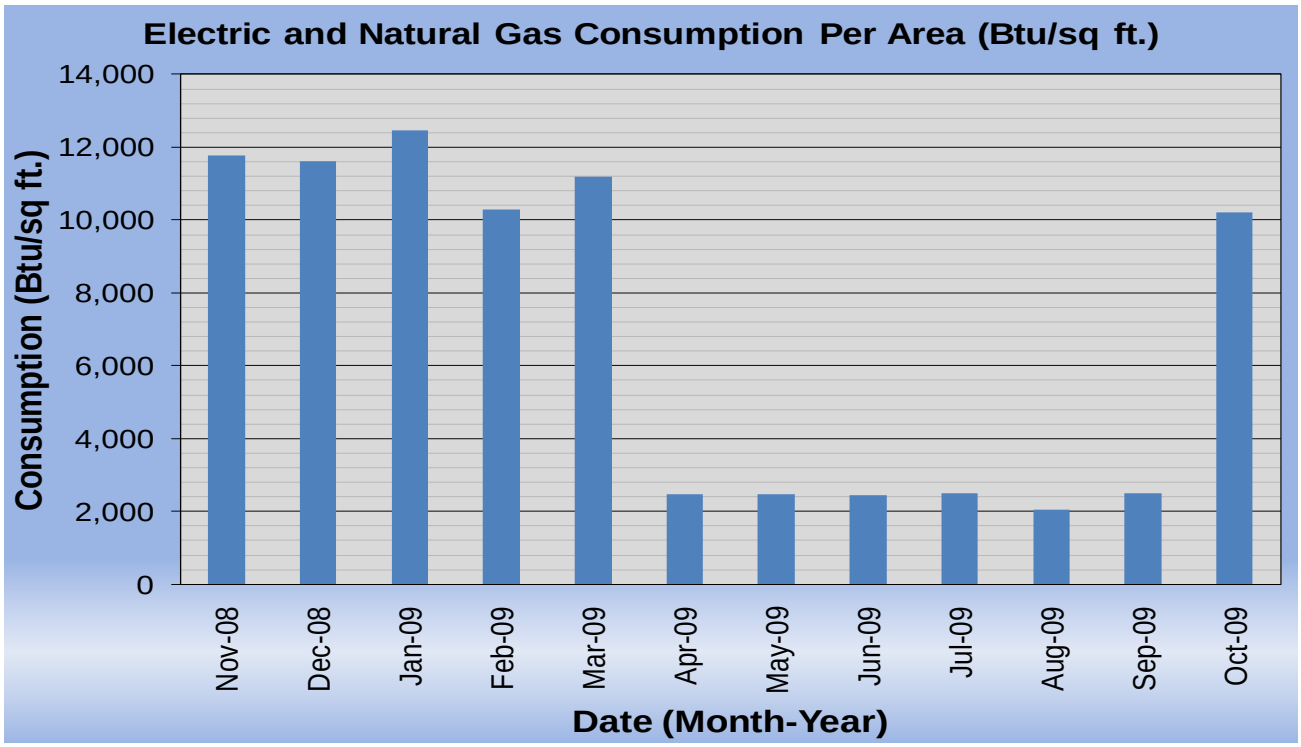
The following chart shows electricity consumption for the Rescue Squad Building based on electric bills for the 12 month period of November 2008 through October 2009.



The following chart shows the natural gas consumption for the Rescue Squad Building based on natural gas bills for the 12 month period of November 2008 through October 2009.

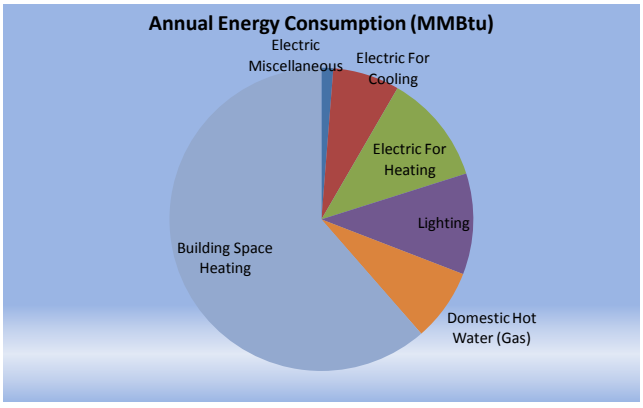


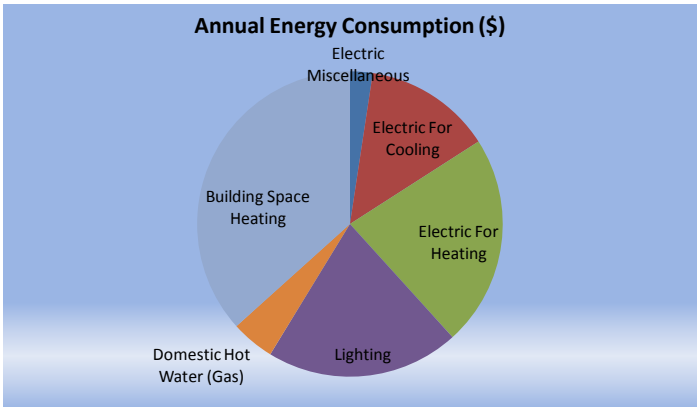
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Rescue Squad Building based on estimates and utility bills for the 12 month period of November 2008 through October 2009.



The following table and chart pies show energy use for the Rescue Squad Building based on utility bills for the 12 month period of November 2008 through October 2009. Note electrical cost at $38/MMBtu of energy is more than 3 times as expensive to use as natural gas at $12/MMBtu.

2009 Annual Energy Consumption / Costs					
	MMBtu	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Electric Miscellaneous	8	1%	$290	2%	38
Electric For Cooling	43	7%	$1,642	14%	38
Electric For Heating	71	12%	$2,716	22%	38
Lighting	65	11%	$2,483	20%	38
Domestic Hot Water (Gas)	47	8%	$559	5%	12
Building Space Heating	373	61%	$4,453	37%	12
Totals	607	100%	$12,145	100%	20
Total Electric Usage	187	31%	$7,133	59%	38
Total Gas Usage	419	69%	$5,012	41%	12
Totals	607	100%	$12,145	100%	20





1.2. Utility Rate

The Rescue Squad Building currently purchases electricity from South River Electric Utility at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Rescue Squad Building currently pays an average rate of approximately $0.130/kWh based on the 12 months estimates of November 2008 through October 2009.

The Rescue Squad Building currently purchases natural gas supply from the PSE&G at a competitive general service market rate for natural gas (therms). PSE&G also acts as the transport company. There is one gas meter that provides natural gas service to the Rescue Squad Building currently. The average aggregated rate (supply and transport) for the meter is

approximately $1.195/therm based on 12 months of utility bills for November 2008 through October 2009.

Some of the minor unusual utility fluctuations that showed up for a couple of months on the utility bills may be due to adjustments between estimated and actual meter readings.

1.3. Energy Benchmarking

SWA has entered energy information about the Rescue Squad Building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. This Public Order and Safety facility is comprised of non-eligible (Other) space type. A Public Order and Safety facility space or "Other" can be used to classify a facility or a portion of a facility where the primary activity does not fall into any of the available space types. Consequently, the Rescue Squad Building is not eligible to receive a national energy performance rating at this time however *Portfolio Manager* provides a preliminary kBtu/sq ft yr comparison.

The Site Energy Use Intensity is 79.0 kBtu/sq ft yr compared to the national average of a Public Order and Safety building consuming 90.0 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 1.9 kBtu/sq ft yr, with an additional 1.9 kBtu/sq ft yr from the recommended ECMs and 6.5 kBtu/sq ft yr from the recommended End of Life Cycle ECMs. These recommendations could account for at least 10.3 kBtu/sq ft yr reduction, which when implemented would make the building energy consumption much better than the national average.

Per the LGEA program requirements, SWA has assisted the Borough of South River to create an *Energy Star Portfolio Manager* account and share the Rescue Squad Building facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager site information with the Borough of South River (user name of "sriverboro" with a password of "sriverboro") and TRC Energy Services (user name of TRC-LGEA).

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of South River - Rescue Squad

Building ID: 2023868
For 12-month Period Ending: October 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: January 27, 2010

Facility
Borough of South River - Rescue Squad
6 Thomas Street
South River, NY 08882

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1916
Gross Floor Area (ft²): 7,400

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	149,946
Natural Gas (kBtu)[4]	431,768
Total Energy (kBtu)	581,714

Energy Intensity[5]

Site (kBtu/ft²/yr)	79
Source (kBtu/ft²/yr)	129

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	46

Electric Distribution Utility
Borough of South River

National Average Comparison

National Average Site EUI	90
National Average Source EUI	189
% Difference from National Average Source EUI	-32%
Building Type	Public Order and Safety

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

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

Certifying Professional
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 submitting 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 single-story with basement South River Rescue Squad Building was originally built in 1916 with the latest renovation mainly concentrated around the basement area in 2001. The building consists of 7,400 square feet of conditioned space. In the basement there are storage / janitor closets, a medical supply room, a boiler room and a meeting / members' room. The first floor houses a two van rig bay and another separate one van / truck bay, a large meeting / dispatch room, storage / janitor closets, bathrooms and a kitchen.


Front Façade; Partial Right Side Façade (typ.); Partial Left Side Façade (typ)

2.2. Building Occupancy Profiles

Occupancy for the Rescue Squad Building is sporadic, usually 2 and up to 6 volunteers for approximately 12 hours per day. There is usually one special event held in the large meeting room area every couple of months for volunteer Rescue Squad members.

2.3. Building Envelope

Due to favorable weather conditions (min. 20 deg F delta-T in/ outside & no / low wind) some exterior envelope infrared (IR) images were taken during the field audit. Thermal imaging / infrared (IR) technology helps to identify energy compromising problem areas in a non-invasive way.

General Note: All findings and recommendations on the exterior envelope (base, walls, roofs, doors and windows) are based on the energy auditors' experience and expertise, on construction document reviews (if available) and on detailed visual and thermal analysis, as far as accessibility and weather conditions allowed at the time of the field audit.

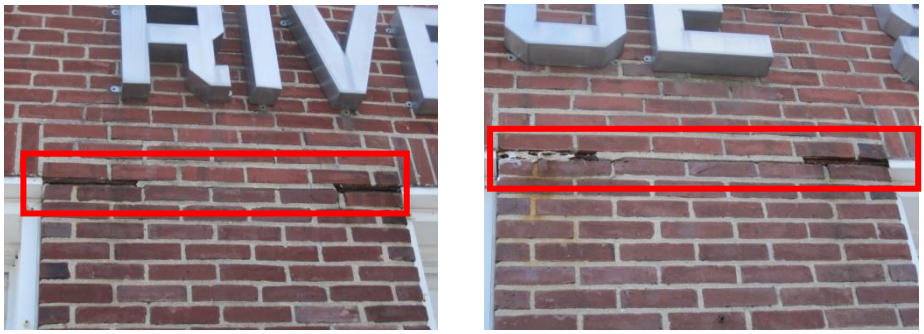
2.3.1. Exterior Walls

The exterior wall envelope is mostly constructed of brick veneer over 3-1/2" framing with 2-1/2 inches of fiberglass batt cavity insulation. The interior is mostly painted gypsum wallboard with some exposed CMU (Concrete Masonry Unit).

Note: Wall insulation levels could not be verified in the field or on construction plans and are based upon similar wall types and time of construction.

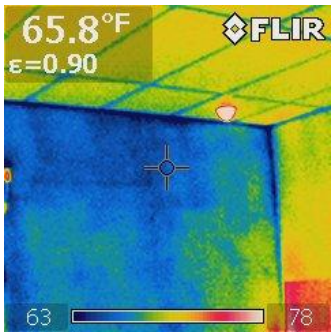
During the field audit exterior and interior wall surfaces were inspected. They were found / reported to be in overall acceptable / age appropriate condition with only a few signs of potential uncontrolled moisture, air-leakage and / or other energy-compromising issues located mostly at the front of the building.

The following specific exterior wall problem spots and areas were identified:



Rusted / deteriorated steel lintels over the overhead type doors were found.

The following IR image further visualizes some of the exterior wall issues mentioned above:



Missing / ineffective wall insulation.

In light of the exterior wall conditions mentioned above SWA has the following recommendations, which are further outlined and categorized in the *Executive Summary*:

1. Add insulation into ineffectively or under-insulated exterior wall sections. SWA suggests applying 2" XPS rigid foam boards to the interior and cover with gypsum wallboard or other preferred interior finish. Undertake this upgrade with the next major renovation.

2. Rusted / deteriorated steel lintels need to be repaired or replaced before water / moisture can penetrate further into the wall cavity.

2.3.2. Roof

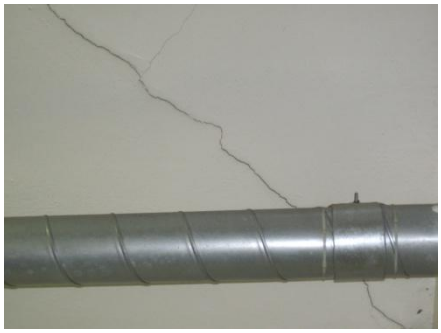
The building's roof is predominantly a flat and parapet type over steel decking with a built-up asphalt finish and reflective coating. It was replaced approximately 15 years ago. Very little detectable / assumed attic / ceiling and 2-1/2 inches of foam board roof insulation were recorded.

Note: Roof insulation levels could not be verified in the field or on construction plans and are based upon similar wall types at time of construction.

During the field audit roofs, related flashing, gutters and downspouts were inspected. They were found / reported to be in overall acceptable condition with only a few signs of uncontrolled moisture, air-leakage and / or other energy-compromising issues.

The following specific roof problem spots and areas were identified:

Delaminating / deteriorated roof membrane / patches.



Cracked gypsum wallboard visible in the interior.

Deteriorating roof decking discovered.

In light of the roof conditions mentioned above SWA has the following recommendations, which are further outlined and categorized in the *Executive Summary*:

1. Maintain / inspect all roof surfaces on a regular basis and repair / any deteriorated seams.

2. SWA recommends having the structural integrity of the roof evaluated, due to signs of deteriorating structural members and potential structural cracks found in the ceiling.

2.3.3. Base

The building's base is composed of a below-grade basement with a slab floor with a perimeter foundation and no detectable slab edge / perimeter insulation.

Slab / perimeter insulation levels could not be verified in the field or on construction plans and are based upon similar wall types and time of construction.

The building's base and its perimeter were inspected. Judging from signs of uncontrolled moisture or water presence and other energy compromising issues, overall the base was found / reported to be in acceptable condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

In light of the base conditions mentioned above, SWA has no recommendations at this time.

2.3.4. Windows

The building contains basically one type of window.

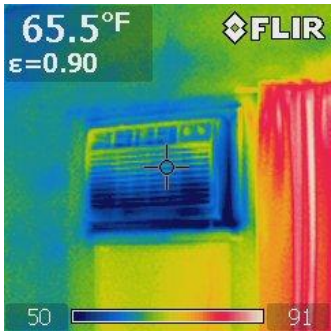
1. Double-hung type windows with a wood frame, clear double glazing and no interior or exterior shading devices. They and were replaced approximately 20 years ago.

Windows, shading devices, sills, related flashing and caulking were inspected from the exterior and interior as far as accessibility allowed. Based on signs of moisture, air-leakage and other energy compromising issues, overall the windows were found and / or reported to be in acceptable / age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and / or other energy-compromising issues.

The following specific window problem spots and areas were identified:

Air-leakage at sleeved window / wall air-conditioning units

The following IR image further visualizes the window issue mentioned above:



Air-leakage around sleeved air-conditioning wall units.

In light of the window conditions mentioned above, SWA has the following recommendation, which is further outlined and categorized in the *Executive Summary*:

1. Openings around window air conditioning units need airtight gaskets / sealants for optimal all year performance. Insulated hoods should be installed during winter months if removing the units is not an option.

2.3.5. Exterior Doors

The building contains basically one type of exterior door.

1. Metal type exterior doors. They are located throughout the building and were replaced approximately 20 years ago.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected. Based on signs of moisture, air-leakage and other energy compromising issues, overall the doors were found / reported to be in acceptable condition with some signs of uncontrolled moisture, air-leakage and / or other energy-compromising issues.

The following specific door problem spots and areas were identified:

Missing / worn weather stripping at swing and overhead type doors

In light of the door conditions mentioned above SWA has the following recommendation, which is further outlined and categorized in the *Executive Summary*:

1. Install / replace / maintain weather stripping around all exterior doors.

2.3.6. Building Air Tightness

Overall, the field auditors found the building to be reasonably air-tight with only a few areas of suggested improvements, as described in more detail in the previous sections.

In addition to all the above mentioned findings SWA recommends air sealing, caulking and / or insulating around all structural members, recessed lighting fixtures, electrical boxes that are part of or penetrate the exterior envelope and where air-leakage can occur.

The air tightness of buildings helps maximize all other implemented energy measures and investments and minimizes potentially costly long term maintenance / repair / replacement expenses.

2.4. HVAC Systems

The Rescue Squad Building heating is provided by a hot water boiler (located in the basement) and gas fired heaters in one of the rig bays or van / truck garage spaces. Cooling

for the basement is provided by a split system and for the first floor meeting room by through the wall AC units.

2.4.1. Heating

The building is heated via hot water circulated by two (2) pumps to various terminal units throughout the first floor. The heating hot water is produced by one (1) fire-tube style hot water boiler located in the boiler room on the basement level. The Utica natural gas fired boiler was installed in 1980 and has surpassed its expected service life of 25 years per 2007 ASHRAE HVAC Applications Handbook. The boiler burner is rated for 300 MBtu/hr input and 240 MBtu/hr output for an estimated efficiency of 80%.

The hot water boiler is installed without an automated or gravity vent. When the boiler is not firing, the vent damper would close to reduce air flow through the boiler, thus retaining heat in the system.

It is assumed that the circulating pumps are the original pumps installed in the system. The pump motors are fractional horsepower and beyond their expected service life of 20 years and should be replaced. SWA recommends that the pumps are replaced with new pumps with premium efficiency motors.

In addition to the hydronic heating system, the second van / truck rig bay garage is heated via 2 ceiling hung Sterling gas heating / electric fan, each capable of 75 MBtu/hr input, 81% efficient. This equipment was installed in 2000 and has approximately 30% left of its expected service life of 15 years.

There weren't many complaints about the ability of the heating system to provide adequate comfort to the building occupants. SWA recommends that the existing boiler be replaced with two fully condensing hot water boilers with pulse combustion burners. The boiler size should be specified to more closely match the actual heating load of the building. The boiler should be managed by one (1) controller that controls the firing rate to ensure maximum efficiency at all times.

It should be noted that condensing boilers require a stainless steel flue or chimney liner that must be accounted for when calculating the replacement cost of the system.

30-year old hot water Utica boiler; ceiling hung gas fired Sterling van / truck bay heaters

2.4.2. Cooling

The Rescue Squad Building cooling of the ground floor meeting room is provided by a Gibson and a Samsung through the wall air conditioning units. These are relatively new units, 2007-2008. They could be better sealed in the walls to prevent expensive conditioned air from escaping to the outside. When they are replaced, it should be with high efficiency Energy Star rated units.

The basement and the servers located there, generating constant heat, are cooled by a split system with the condenser on the roof. A Honeywell exchanger is used to recover cooling from the exhaust air. This system is operated at all times with the rooftop condenser on during the summer months. The system has approximately 40% left of its expected service life of 15 years.

2.4.3. Ventilation

The various spaces of the building are ventilated by infiltration air, the air conditioning units that serve the large meeting room as described in the “Cooling” section above and the basement air handling unit (AHU). The exhaust from the vans is captured via rapid disengaging hoses and ducted to a rooftop exhaust fan operated only when vans / trucks are warmed up to leave.

Rooftop van / truck exhaust fan

2.4.4. Domestic Hot Water

The domestic hot water (DHW) for the Rescue Squad Building is provided by a GE natural gas fired heater with 50 gal storage and 36,000 Btu/hr heating capability. The heater was replaced in 2008. SWA recommends that next time it is replaced with a high efficiency gas fired, Energy Star, condensing type unit.

2.5. Electrical Systems

2.5.1. Lighting

Interior Lighting - The Rescue Squad Building currently consists of T8 fluorescent fixtures with electronic ballasts, T12 fluorescent fixtures with magnetic ballasts and screw-in incandescent fixtures. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA recommends replacing the following inefficient fixtures with more energy efficient types: Incandescent bulbs should be replaced with screw-in CFLs and 4ft T12 lamps should be replaced with 4ft T8 lamps. Compact fluorescents produce the same lumen output with less wattage than incandescent bulbs and last up to 5 times longer. SWA recommends installing 3 occupancy sensors in areas that are occupied only part of the day and payback on savings are justified, such as the truck bays and basement lounge area. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advance micro-phonic lighting sensors include sound detection as a mean to control lighting operation. See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

Exit Lights - Exit signs were found to be efficient LED type.

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of Metal Halide lamp fixtures. Exterior lighting is controlled by timers. SWA recommends replacing the Metal Halide lamps with pulse start Metal Halide lamps. Pulse-start metal halide (MH) lamps offer the advantages of standard (probe-start) MH lamps, but minimize the disadvantages. They produce higher light output both initially and over time, operate

more efficiently, produce whiter light, and turn on and re-strike faster. Due to these characteristics, energy savings can be realized via one-to-one substitution of lower-wattage systems, or by taking advantage of higher light output and reducing the number of fixtures required in the space. SWA is not recommending at this time any upgrades to the exterior timers however they should be checked periodically for proper (seasonal) settings and functionality.

2.5.2. Appliances and Process

Appliances, such as refrigerators, 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 315 kWh / yr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Building management should select Energy Star label appliances and equipment when replacing: 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. Also, energy vending miser devices are now available for conserving energy usage by Beverage and Snacks vending machines. When equipped with the vending miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines.

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions (DVDs, stereos, computers, and kitchen appliances which now have internal memories or clocks which always require a trickle of power) in meeting areas use approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all appliances (i.e. fridges, coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off. The building's computers are generally NOT programmed for the power save mode, to shut down after a period of time that they have not been used.

2.5.3. Elevators

The Rescue Squad Building is a single-story building with basement and without an elevator.

2.5.4. Others Electrical Systems

Besides a few very small transformers, there are not currently any other significant energy impacting electrical systems installed at the Rescue Squad Building.

3. EQUIPMENT LIST

Inventory

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	one old hot water boiler, 300 MBH input, 240 MBH output - 80% est. htg. eff. with 2 circulating pumps for 2 zones	basement furnace room	Utica boiler, B&G pump Series 100 L50 (bldg outside truck bays), Taco pump 1/25 HP - 007-F4 (front truck bay); Serial #: GS 17788	Natural Gas	bldg	1980	0%
Heating	(2) hot water hydronic unit heaters	first truck bay, ceiling mounted	Modine HS 63S01, 1/12 HP motor; Serial #s: 39010905-5711 and 39010905-5700	Electric - fan	first truck bays	2007	80%
Heating	(2) gas heaters, 75 MBH input, 60.75 MBH output - 81% est. htg. eff. with a 75 Watt fan	second truck bay, ceiling mounted	Sterling SVF-75S; Serial #: A965002200	Natural Gas / Electric - fan	second truck bay	2000	30%
Cooling	AHU (HCFC-22)	medical supply rm	Fan Cool Unit 13XF, International Comfort Products Corp NFCX24000C2; Serial #: L0140 78728	Electric - fan	basement	2001	40%
Cooling	1 wall AC unit, 17,900-17,400 Btu/hr - 9.7 EER eff.	main flr meeting rm	Gibson, tag plate hidden inside the enclosure	Electric	main flr meeting rm	2007	80%
Cooling	1 wall AC unit, 17,900-17,400 Btu/hr - est. energy eff. is 2.8 Btu/W	main flr meeting rm	Samsung AW 1803M (R22); Serial #: PAGW C00 319	Electric	main flr meeting rm	2008	90%
Cooling	rooftop condenser (R22)	rooftop	Air Conditioner TCA424AKA4; Serial #: L013968788	Electric	basement	2001	40%
Ventilation	truck exhaust fan, 7.5 HP, 3450 RPM motor - 83% eff	rooftop	fan - driven by Baldor motor Cat # L3709T, Spec 37C01W579	Electric	truck bays - via exhaust hoses	2000	30%
Ventilation	1 fresh air to exhaust air exchanger, sensible recovery efficiency: 57% (+32 F), 61% (-31 F)	medical supply rm	Honeywell Fresh Air Ventilation System HR150B1005; Serial #: 0146N9332	N/A	basement	2001	40%
Domestic Hot Water	1 hot water heater, 36,000 BTUH, 40 gal - energy factor est. at 0.6	basement furnace room	GE - GE40S06AVG00; Serial #: GELN0306AD00071	Natural Gas	Rescue Squad Bldg	2008	80%
Air Compressor	1 air compressor unit with surge tank	second truck bay	Westward, Dayton motor 8YJ20B, 3,450 RPM, 15 amp / 120 Volts	Electric	Rescue Squad Bldg	2000	30%
Lighting	See details - Appendix A	See details - Appendix A	See details - Appendix A	Electric	Rescue Squad Bldg	2002	50%

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 the South River Rescue Squad Building, SWA 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 Improvements

- SWA recommends that the Rescue Squad install a building emergency generator that would support the Safety of the volunteers during power outages.

- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives.

- Add insulation into ineffectively or under-insulated exterior wall sections. SWA suggests applying 2" XPS rigid foam boards to the interior and cover with gypsum wallboard or other preferred interior finish. Undertake this upgrade with the next major renovation.

Category II Recommendations: Operations and Maintenance

- Boiler room and distribution piping insulation - Insulate un-insulated hot water piping to efficiently deliver heat where required and provide personnel protection.

- Maintain / repair garage doors so that they fully close and are sealed all around.

- Repair / replace rusted / deteriorated steel lintels before water / moisture can penetrate further into the wall cavity. SWA also recommends having the structural integrity of the roof evaluated, due to signs of deteriorating structural members and potential structural cracks found in the ceiling.

- Thoroughly and evenly insulate space above the ceiling and plug all ceiling penetration.

- Maintain roofs - SWA recommends regular maintenance to verify water is draining correctly. Maintain / inspect all roof surfaces on a regular basis and repair / any deteriorated seams.

- Maintain downspouts and cap flashing - Repair / install missing downspouts and cap flashing as needed to prevent water / moisture infiltration and insulation damage.

- Provide weather stripping / air sealing - SWA observed that exterior door weather-stripping in places 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 frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam. Openings around window air conditioning units need airtight gaskets / sealants for optimal all year performance. Insulated hoods should be installed during winter months if removing the units is not an option.

- Repair / seal wall cracks and penetrations - SWA recommends as part of the maintenance program to install proper flashing, seal wall cracks and penetrations wherever necessary in order to keep insulation dry and effective.

- Provide water efficient fixtures and controls - Adding controlled on / off timers on all lavatory faucets is a cost-effective 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-consumption fixtures / appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water / sewer bills.

- Use Energy Star labeled appliances - such as Energy Star refrigerators that should replace older energy inefficient equipment.

- Use smart power electric strips - in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time.

- Create an energy educational program - that teaches how to minimize their energy use. The US Department of Energy offers free information for hosting energy efficiency educational programs and plans, for more information please visit: http://www1.eere.energy.gov/education/ .

Category III Recommendations: Energy Conservation Measures - Summary Table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	install Beverage vending machine energy miser
2.1 & 2.2	install occupancy sensors and replace incandescent lamps with CFLs
	Description of Recommended 5-10 Year Payback ECMs
2.3 & 2.4	replace Metal Halide with pulse start Metal Halide fixtures and T12 with T8 fixtures
3	replace old refrigerator with Energy Star type model
	Description of Recommended End of Life Cycle ECMs
4	replace boiler with two condensing boilers
	Description of Renewable ECMs
5	install a 5 kW solar PV rooftop system

ECM#1: *Install Vending Miser*

Description:

The Rescue Squad building has one Beverage vending machine located in the kitchen / break room. At the time of the audit there was a callout to the vendor to repair the machine. Energy vending miser devices are now available for conserving energy with these vending machines and coolers. There isn't a need to purchase new machines to reduce operating costs and greenhouse gas emissions. When equipped with the vending miser devices, refrigerated beverage vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines. Vending miser devices incorporate innovative energy-saving technology into small plug-and-play devices that installs in minutes, either on the wall or on the vending machine. Vending miser devices use a Passive Infrared Sensor (PIR) to: Power down the machine when the surrounding area is vacant; Monitor the room's temperature; Automatically repower the cooling system at one- to three-hour intervals, independent of sales; Ensure the product stays cold.

Snacks vending miser devices can be used on Snacks vending machines to achieve maximum energy savings that result in reduced operating costs and decreased greenhouse gas emissions with existing machines. Snacks vending miser devices also use a Passive Infrared Sensor (PIR) to determine if there is anyone within 25 feet of the machine. It waits for 15 minutes of vacancy, then powers down the machine. If a customer approaches the machine while powered down, the snacks vending miser will sense the presence and immediately power up.

Installation cost:

Estimated installed cost: $279 (includes $100 of labor)
Source of cost estimate: www.usatech.com *and established costs*

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 cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	install (1) Beverage vending machine energy miser - in kitchen	www.usatech.com and established costs	279	0	279	1,456	0.3	0	0.7	0	189	12	2,271	1.5	714	60	68	1,534	2,607

Assumptions: SWA assumes energy savings based modeling calculator found at www.usatech.com or http://www.usatech.com/energy_management/energy_calculator.php

Rebates/financial incentives:

This measure does not qualify for a rebate or other financial incentive at this time.

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.

http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#2: *Building Lighting Upgrades*

Description:

On the days of the site visits, SWA completed a lighting inventory of the Rescue Squad Building (see Appendix A). The interior lighting in the Rescue Squad Building consists of T8 fluorescent fixtures with electronic ballasts, T12 fluorescent fixtures with magnetic ballasts and screw-in incandescent fixtures. SWA recommends replacing the following inefficient fixtures with more energy efficient types: Incandescent bulbs should be replaced with screw-in CFLs and 4ft T12 lamps should be replaced with 4ft T8 lamps. SWA recommends installing 3 occupancy sensors in areas that are occupied only part of the day and payback on savings are justified, such as the truck bays and basement lounge area. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advance micro-phonic lighting sensors include sound detection as a mean to control lighting operation. See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption. The exterior lighting surveyed during the building audit was found to be a mix of Metal Halide lamp fixtures. SWA recommends replacing the Metal Halide lamps with pulse start Metal Halide lamps. Pulse-start metal halide (MH) lamps offer the advantages of standard (probe-start) MH lamps, but minimize the disadvantages. They produce higher light output both initially and over time, operate more efficiently, produce whiter light, and turn on and re-strike faster. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Borough of South River may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor, to obtain savings.

Installation cost:

Estimated installed cost: $8,110 (includes $5,504 of labor)
Source of cost estimate: RS *Means; Published and established costs*

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 cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2.1	install (3) occupancy sensors in van bays and meeting room	RS Means, Lit Search	660	0	660	2,030	0.4	0	0.9	0	264	12	3,167	2.5	380	32	39	1,876	3,635
2.2	replace (9) incandescent meeting room bulbs with CFLs	RS Means, Lit Search	450	0	450	591	0.1	0	0.3	35	112	5	559	4.0	24	5	8	57	1,058
2.3	replace (4) exterior Metal Halide fixtures with pulse start MH type	RS Means, Lit Search	2,600	0	2,600	806	0.2	0	0.4	160	265	15	3,972	9.8	53	4	6	500	1,443
2.4	replace (20) T12 fixtures in van bays and bathrooms with T8 fixtures	RS Means, Lit Search	4,400	0	4,400	2,880	0.6	0	1.3	53	427	15	6,404	10.3	46	3	5	604	5,157
	Totals		**8,110**	**0**	**8,110**	**6,307**	**1.3**	**0**	**2.9**	**248**	**1,067**	**-**	**14,101**	**7.6**	**74**	**-**	**9**	**3,037**	**11,293**

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 4.5 hr/yr to replace aging burnt out lamps vs. newly installed.

Rebates / Financial Incentives:

NJ Clean Energy - There aren't any incentives at this time offered by the state of NJ for this energy conservation measure.

Options for Funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.

http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#3: *Replace Old Refrigerator with an Energy Star Model*

Description:

On the day of the site visit, SWA observed that there was an old refrigerator in the kitchen area which was not Energy Star rated (using approximately 773 kWh/yr). Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. SWA recommends the replacement of the existing refrigerator with 18.2 cu. ft. top freezer refrigerator ENERGY STAR®, Mfr. model #6897, 407 kWh / yr, or equivalent. Besides saving energy, the replacement will also keep the kitchen and other areas cooler. When compared to the average electrical consumption of older equipment, Energy Star equipment results in 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.

Installation cost:

Estimated installed cost: $750 (includes $70 of labor)
Source of cost estimate: *Manufacturer and Store established costs*

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 cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
3a	replace (1) old kitchen refrigerator with an 18 cu ft model in kind	Energy Star purchasing and procurement site, similar projects	700	0	700	50	0.0	0	0.0	50	57	12	678	12.4	-3	0	0	-140	90
3b	incremental difference to replace (1) old kitchen refrigerator with an 18 cu ft Energy Star model	Energy Star purchasing and procurement site, similar projects	50	0	50	300	0.1	0	0.1	0	39	12	468	1.3	836	70	78	323	537
3 (a+b)	replace one (1) kitchen refrigerator with an 18 cu ft Energy Star model	Energy Star purchasing and procurement site, similar projects	**750**	**0**	**750**	**350**	**0.1**	**0**	**0.2**	**50**	**96**	**12**	**1,146**	**7.9**	**53**	**4**	**7**	**183**	**627**

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

Rebates/financial incentives: *NJ Clean Energy - There aren't any incentives at this time offered by the state of NJ for this energy conservation measure.*

Options for Funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.
http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#4: *Replace Boiler with Condensing Boilers*

Description:

The existing boiler is beyond its expected service life and should be replaced to avoid catastrophic failure. An upgrade to Energy Star condensing boilers of 92% Annual Fuel Utilization Efficiency (AFUE) rating cannot be justified by energy savings alone. However, replacement is strongly recommended along with upgrades to other portions of the heating system. Those upgrades should include circulating pumps with high efficiency NEMA Premium motors, automated flue gas vent valve(s) and electronic ignition.

The new high efficiency condensing boilers should have a guaranteed minimum thermal efficiency of 88% at the worst case boiler operating conditions, such as mid-fire or high-fire conditions with a return water temperature in the range of 140-160 degrees Fahrenheit, and efficiencies of up to 95% achievable with lower return water temperatures. The boiler should be Low NOx certified with a 5:1 turndown burner, PVC direct venting and direct exhaust, hydronic safety controls and interface systems. The boiler shall have compact design for easy retrofit installation, with sectional aluminum block, ASME relief valve, stainless steel burner as a minimum. The air blower should be variable speed combustion with easily removable access panels.

Installation cost:

Estimated installed cost: $16,000 (includes $7,100 of labor)
Source of cost estimate: Manufacturer's data and 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 cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
4a	replace (1) old 80% eff boiler - 300 MBH input with a model in kind - 82% eff and (2) pumps	Energy Star purchasing and procurement site, similar projects	13,000	0	13,000	75	0.0	75	1.0	250	349	25	8,719	37.3	-33	-1	-3	-6,841	956
4b	incremental difference to replace (1) old with (2) condensing boilers - 92% eff and (2) hi eff pumps	Energy Star purchasing and procurement site, similar projects	3,000	0	3,000	1,022	0.2	373	5.5	0	578	25	14,451	5.2	382	15	19	6,633	5,937
4 (a+b)	replace (1) old boiler with (2) condensing boilers - 92% eff and (2) hi eff pumps	Energy Star purchasing and procurement site, similar projects	**16,000**	**0**	**16,000**	**1,097**	**0.2**	**447**	**6.5**	**250**	**927**	**25**	**23,171**	**17.3**	**45**	**2**	**3**	**-208**	**6,892**

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis.

Rebates/financial incentives: *NJ Clean Energy - There aren't any incentives at this time offered by the state of NJ for this energy conservation measure.*

Options for Funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.
http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#5: *Install a 5 kW PV System*

Description:

Currently the South River Rescue Squad building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels, can be mounted on the building roofs, and can offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. The Borough of South River may want to review installing a 5 kW PV system to offset electrical demand and reduce the annual net electric consumption for the Rescue Squad building. The Rescue Squad building is not eligible for a 30% federal tax credit. The Rescue Squad building may want to consider applying for a grant and / or engage a PV generator / leaser who would install the PV system and then sell the power at a reduced rate. Typically, a major utility provides the ability to buy SREC's at $600/MWh or best market offer. However, this option is not available from the local utility. See below for more information.

Considering the available square footage of the Rescue Squad building roof at this time, it would be possible to install a 50 kW PV system. However, considering the facts that:

- the solar PV system should be limited in size to below the minimum electrical demand since the utility will not buy back excess power generated by the system
- the solar PV system installation cost should be limited to allow for available grant money to considerably shorten the payback period

SWA has considered the system size stated above. Should the Rescue Squad decide to increase the air conditioned spaces, the minimum demand would increase over the historical data cited in this analysis, and therefore further study into expanding the proposed system would be recommended.

There are many possible locations for a 5 kW PV installation on the building roofs. A commercial crystalline 230 watt panel has 17.5 square feet of surface area (13.1 watts per square foot). A 5 kW system needs approximately 22 panels which would take up 380 square feet. The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the community.

Installation cost:

Estimated installed cost: $37,500 (includes $15,000 of labor)
Source of cost estimate: Similar Projects

Economics (without NJ EECBG Grant):

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 cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
5	Install a 5 kW Solar Photovoltaic system	Similar Projects	37,500	0	37,500	5,902	5.0	0	2.7	0	767	25	19,182	48.9	0	0	-5	-23,675	10,568

Assumptions: SWA estimated the cost and savings of the system based on past PV projects. SWA projected physical dimensions based on a typical Polycrystalline Solar Panel (230 Watts, model #ND-U230C1). PV systems are sized based on Watts and physical dimensions for an array will differ with the efficiency of a given solar panel (W/sq ft).

Rebates/financial incentives:

NJ Clean Energy rebates are not available since the South River Utility is part of an energy consortium that does not pay the Societal Benefits Charge that funds these rebates.

NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1,000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. An estimated SREC value of $3,000 could be realized with a traditional solar PV system setup. However, since net metering is not available from the local utility, savings in the form of SRECs were NOT incorporated into the above analysis.

Options for funding ECM:

This project may benefit from applying for a grant from the State of New Jersey Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.
http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There aren't currently any existing renewable energy systems.

5.2. Wind

Description:

A Wind system is not applicable for this building because the area does not have winds of sufficient velocity to justify installing a wind turbine system.

5.3. Solar Photovoltaic

Description:

A Solar PV System is not applicable because of insufficient financial incentives and a simple payback greater than 40 years. See ECM#5.

5.4. Solar Thermal Collectors

Description:

Solar thermal collectors are not cost effective for this building and would not be recommended due to the insufficient and not constant use of domestic hot water throughout the building to justify the expenditure.

5.5. Combined Heat and Power

Description:

CHP is not applicable for this building because of several existing split system cooling and insufficient domestic hot water use.

5.6. Geothermal

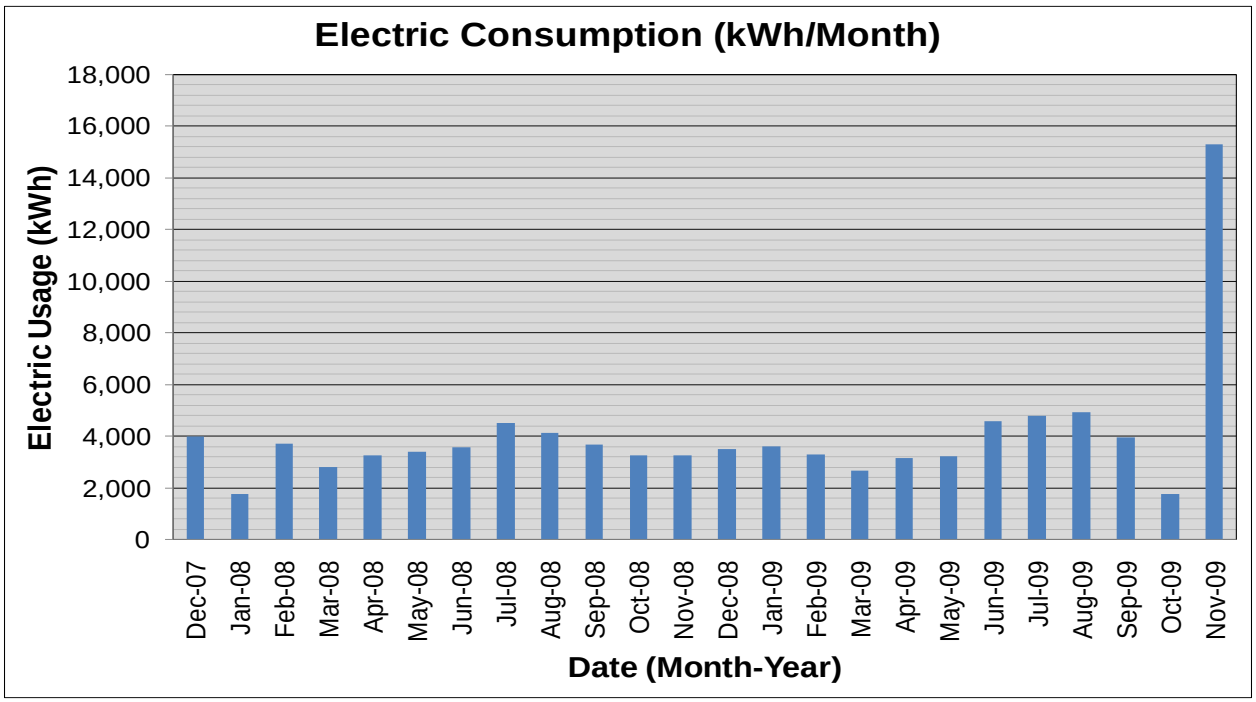
Description:

Geothermal is not applicable for this building because it would not be cost effective, since it would require replacement of the existing HVAC system, of which major components still have as a whole a number of useful operating years.

6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

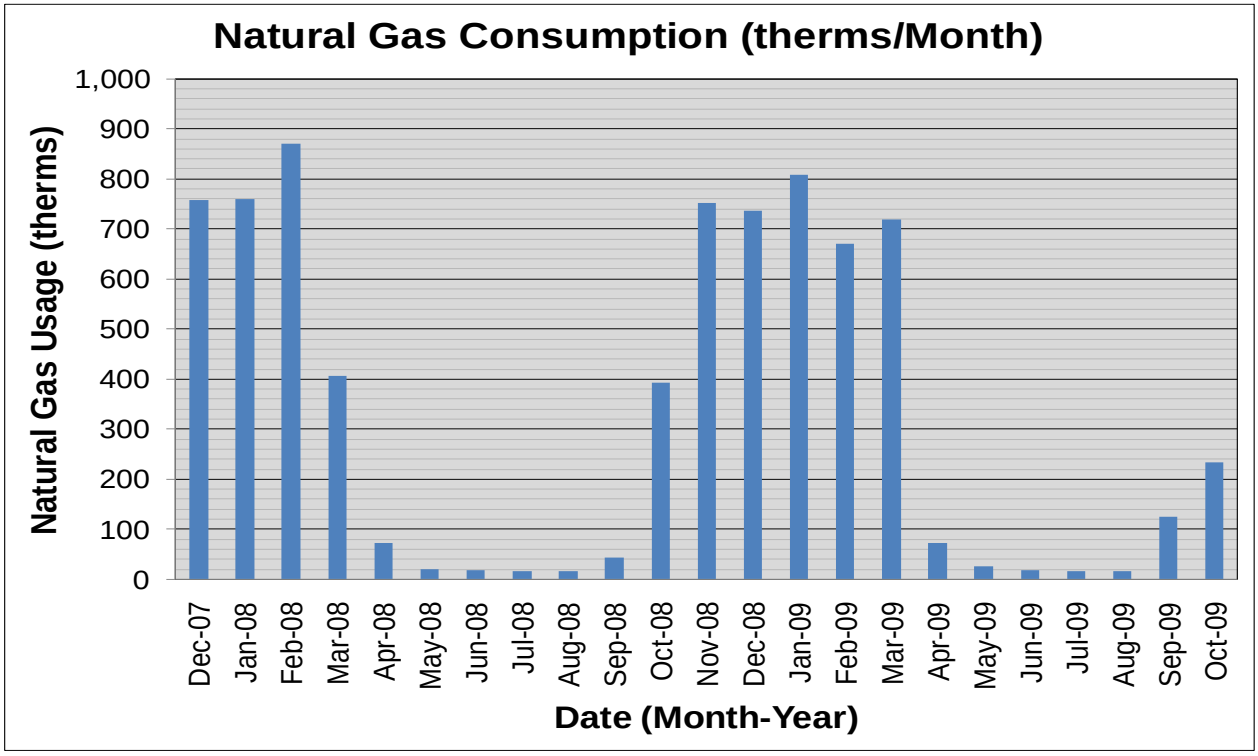
6.1. Load Profiles

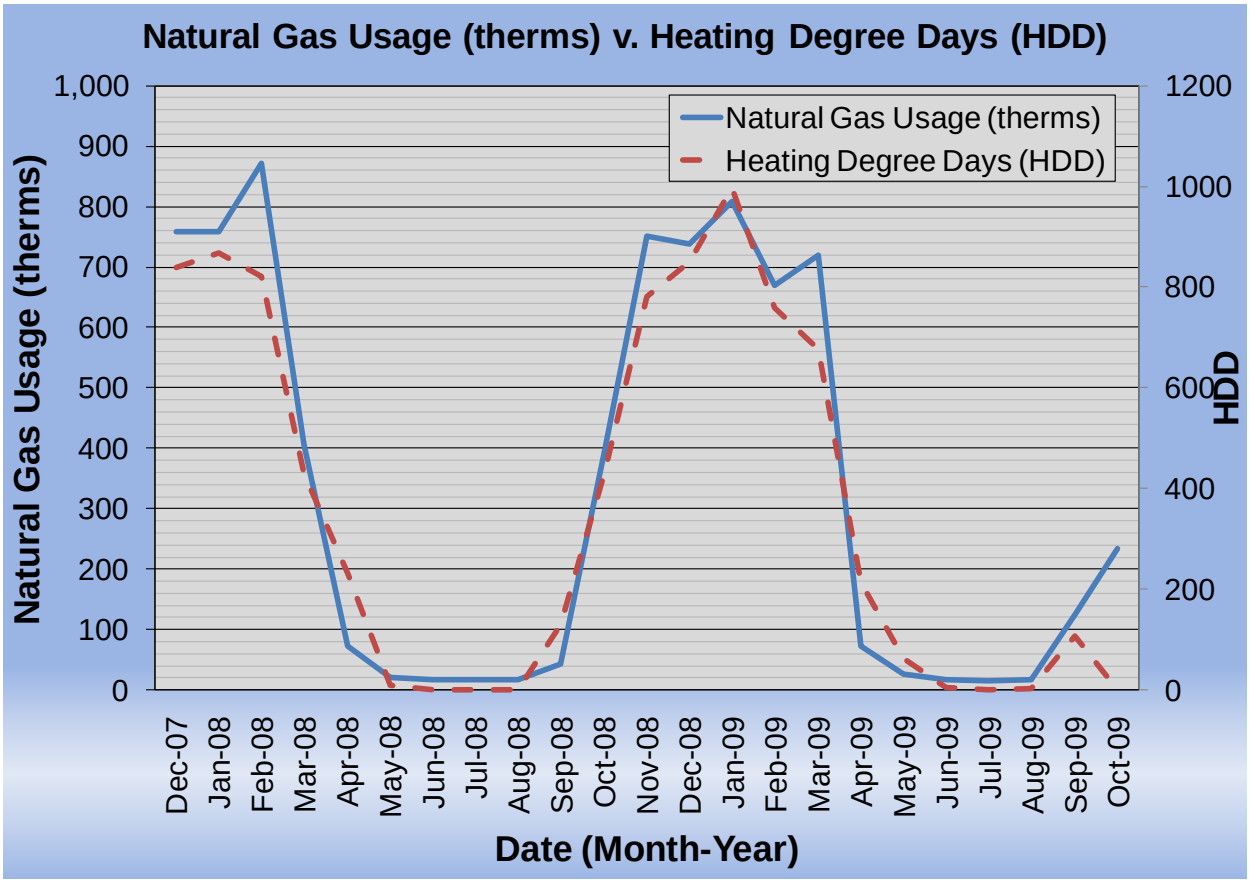
The following are charts that show the annual electric and natural gas load profiles for the South River Rescue Squad Building. For annual electric and natural gas usage please also see Section 1. Historic Energy Consumption.



Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings.

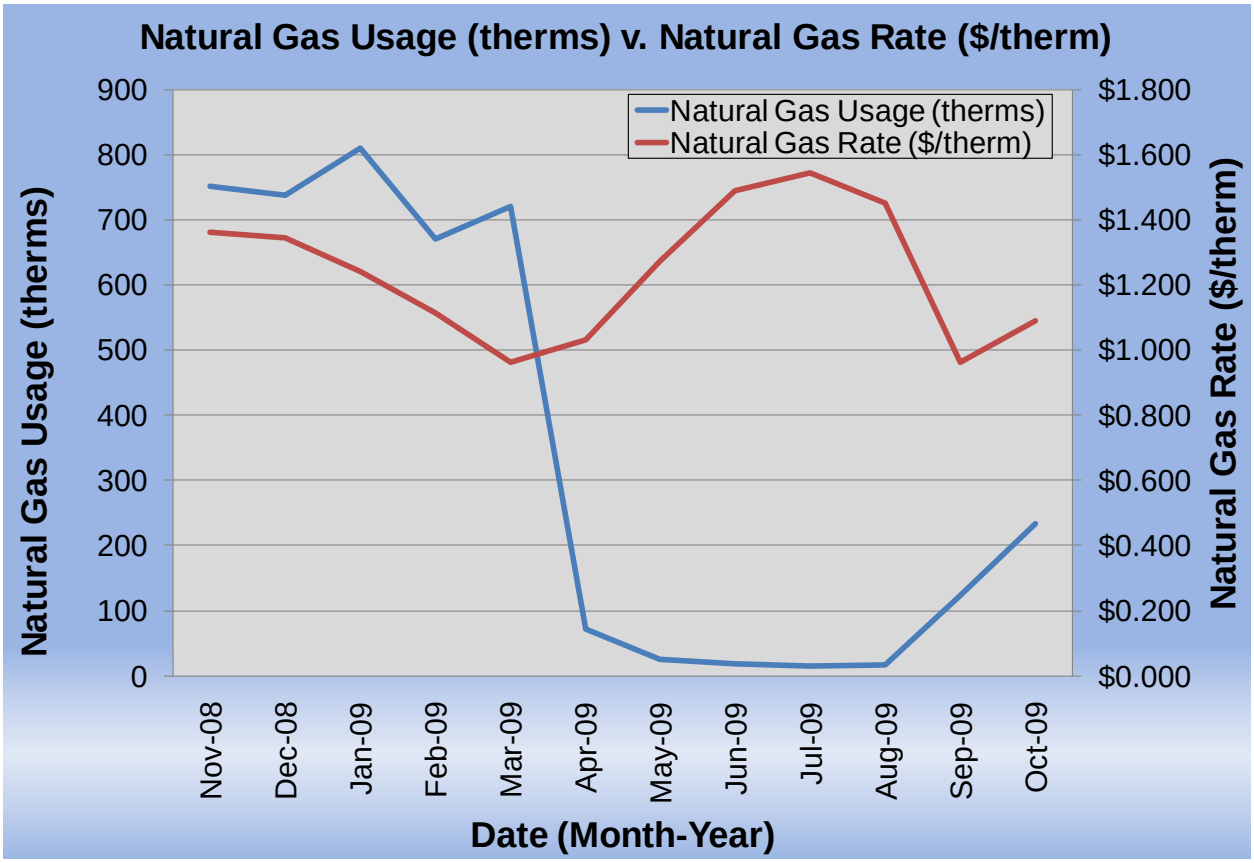
The following is a chart of the natural gas load profile for the building, peaking in the coldest months of the year and a chart showing natural gas consumption following the “heating degree days” curve. Some utility bills have more than one month estimated and combined.





6.2. Tariff Analysis

Currently, natural gas is provided to the Rescue Squad Building via one gas meter with the PSE&G acting as the supply and also the transport company. Gas is provided by the PSE&G at a general and very competitive service rate. The suppliers' general service rate for natural gas charges a market-rate price based on use and the Rescue Squad Building billing does not breakdown demand costs for all periods. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the natural gas prices increase during the heating months when natural gas is used by the boiler and the furnace units. Some high gas price per therm fluctuations in the summer may be due to high energy costs that recently occurred and low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months. Some of the cap payments are excluded from the following chart.

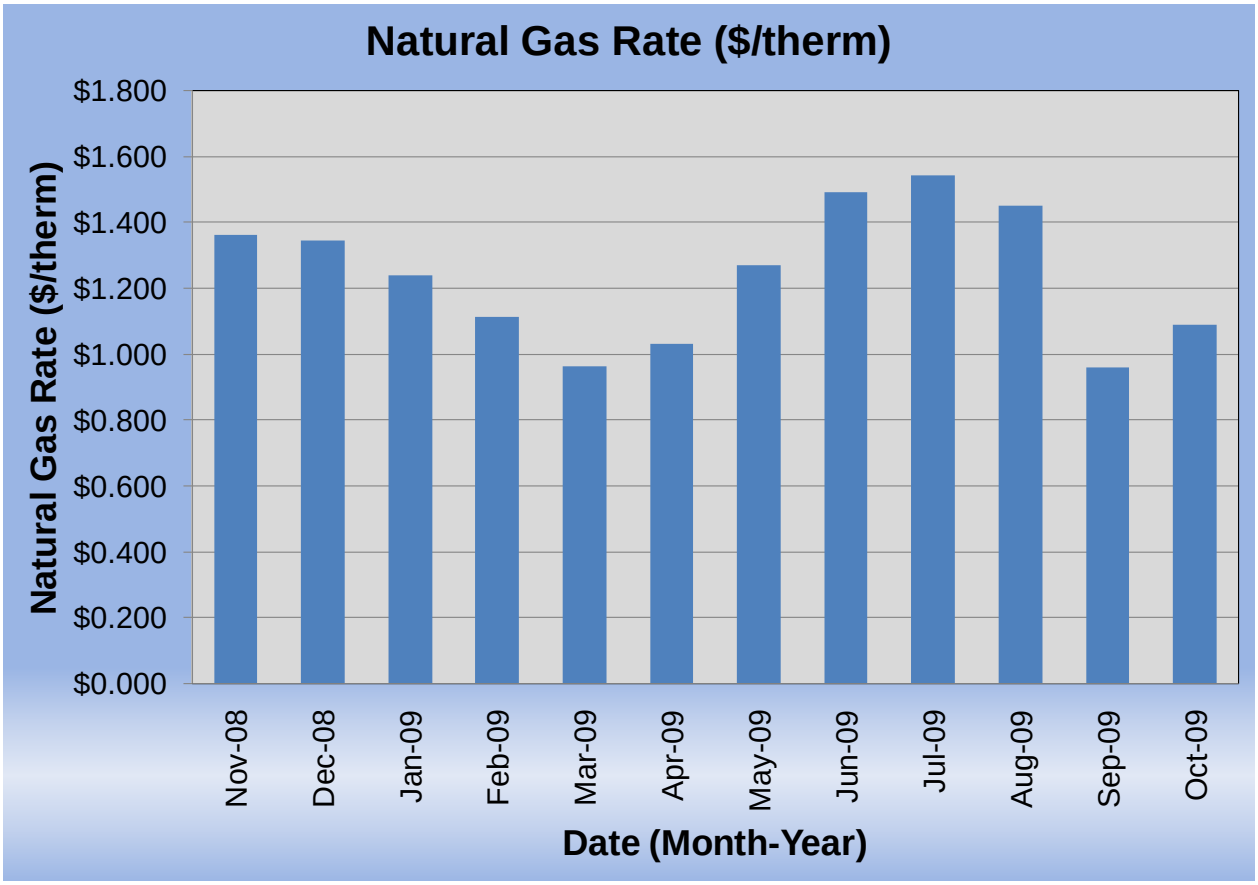


The Rescue Squad Building is direct-metered and currently purchases electricity from the South River Electric Utility at a general service rate. The general service rate for electric charges is market-rate based on use and the Rescue Squad Building does not track a breakdown of demand costs. Demand prices are generally reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the electricity prices increase during the cooling months when electricity is used by air conditioning systems.

6.3. Energy Procurement strategies

The Rescue Squad Building receives natural gas via one incoming meter. PSE&G supplies the gas and transports it. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. Electricity is also purchased via one incoming meter directly for the main Rescue Squad Building from South River Electricity Company without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric rates were estimated by the Borough of South River over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 24% over the most recent 12 month period. Some of these fluctuations may have been caused by adjustments between estimated and actual meter readings; others may be due to unusual high and recent escalating energy costs. The average estimated NJ commercial utility rates for electric and gas are $0.150/kWh and $1.550/therm respectively. The Rescue Squad Building annual utility costs are competitive when compared to the average estimated NJ commercial utility rates. SWA recommends that the Borough of South River further explore opportunities of purchasing both natural gas and

electricity from ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Rescue Squad Building. Appendix B contains a complete list of third party energy suppliers for the Borough of South River service area. The Borough of South River may want to consider partnering with other school districts, municipalities, boroughs and communities to aggregate a substantial electric and natural gas use for better leveraging in negotiations with ESCOs and of improving the pricing structures. This sort of activity is happening in many parts of the country and in New Jersey. Also, the Rescue Squad Building would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time to shed a minimum of 150 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option. The following chart show the Rescue Squad Building monthly natural gas spending per unit of energy in 2009. Electric rates were estimated by the Borough at a constant rate of $0.130/kWh.



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 & established specialized equipment material & 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, 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

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Truck Bay (1)	Parabolic	E	8'T12	10	2	80	S	8	365	24	1,840	5,373	T8	Parabolic	8'T8	E	OS	10	2	59	6	365	13	1310	2869	1548	956	2504
2	1	Kitchen (2)	Parabolic	E	4'T8	2	4	32	S	8	365	13	282	823	N/A	Parabolic	4'T8	E	S	2	4	32	8	365	13	282	823	0	0	0
3	1	Kitchen (2)	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
4	1	Meeting Rm (3)	Recessed	E	4'T8	8	4	32	S	8	365	13	1,128	3,294	N/A	Recessed	4'T8	E	S	8	4	32	8	365	13	1128	3294	0	0	0
5	1	Bathroom Women (4)	Recessed	M	4'T12	1	4	40	T	3	365	24	184	201	T8	Recessed	4'T8	E	T	1	4	32	3	365	13	141	154	47	0	47
6	1	Storage Rm (4)	Recessed	N	Inc	1	1	40	S	2	365	0	40	29	N/A	Recessed	CFL	N	S	1	1	40	2	365	0	40	29	0	0	0
7	1	Truck Bay (5)	Parabolic	E	8'T12	8	2	80	S	8	365	24	1,472	4,298	T8	Parabolic	8'T8	E	OS	8	2	59	6	365	13	1048	2295	1238	765	2003
8	1	Truck Bay (5)	Exit Sign	N	LED	2	1	5	N	24	365	1	12	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
9	1	Truck Bay (5)	Parabolic	E	4'T8	1	2	32	S	8	365	6	70	204	N/A	Parabolic	4'T8	E	S	1	2	32	8	365	6	70	204	0	0	0
10	1	Bathroom Men (6)	Recessed	E	4'T12	1	4	40	T	3	365	24	184	201	T8	Recessed	4'T8	E	T	1	4	32	3	365	13	141	154	47	0	47
11	B	Meeting Rm /lounge (10	Recessed	E	4'T8	6	4	32	S	4	365	13	846	1,235	C	Recessed	4'T8	E	OS	6	4	32	3	365	13	846	926	0	309	309
12	B	Meeting Rm /lounge (10	Screw-in	N	Inc	9	1	65	D	4	365	0	585	854	CFL	Screw-in	CFL	N	D	9	1	20	4	365	0	180	263	591	0	591
13	B	Storage Rm (11)	Parabolic	E	4'T8	2	2	32	S	2	365	6	140	102	N/A	Parabolic	4'T8	E	S	2	2	32	2	365	6	140	102	0	0	0
14	B	Office (12)	Parabolic	E	4'T8	2	4	32	S	4	365	13	282	412	N/A	Parabolic	4'T8	E	S	2	4	32	4	365	13	282	412	0	0	0
15	B	Office (13)	Parabolic	E	4'T8	3	2	32	S	4	365	6	210	307	N/A	Parabolic	4'T8	E	S	3	2	32	4	365	6	210	307	0	0	0
16	Ext	façade ()	exterior	N	MH	4	1	100	T	12	365	25	500	2,190	PSMH	Exterior	PSMH	N	T	4	1	65	12	365	14	316	1384	806	0	806
17	B	Meeting Rm (10)	Exit Sign	N	led	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
Totals:						62	40	684				194	7,787	19,735						62	40	546			139	6,158	13,428	**4,277**	**2,030**	**6,307**

Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space

TO USERS: ONCE ALL ROOMS ARE ADDED, DELETE ROWS NOT USED. MAKE SURE TO DELETE ENTIRE ROW, DO NOT SHIFT CELLS!

Legend:

Fixture Type	Lamp Type	Control Type	Ballast Type	Retrofit Category
Exit Sign	LED	N (None)	N/A (None)	N/A (None)
Screw-in	Inc (Incandescent)	S (Switch)	E (Electronic)	T8 (Installl new T8)
Pin	1'T5	OS (Occupancy Sensor)	M (Magnetic)	T5 (Install new T5)
Parabolic	2'T5	T (Timer)		CFL (Install new CFL)
Recessed	3'T5	PC (Photocell)		LEDex (Install new LED Exit)
2'U-shape	4'T5	D (Dimming)		LED (Install new LED)
Circiline	2'T8	DL (Daylight Sensor)		D (Delamping)
Exterior	3'T8	M (Microphonic Sensor)		C (Controls Only)
HID (High Intensity Discharge)	4'T8			
	6'T8			
	8'T8			
	2'T12			
	3'T12			
	4'T12			
	6'T12			
	8'T12			
	CFL (Compact Fluorescent Lightbulb)			
	MR16			
	Halogen			
	MV (Mercury Vapor)			
	MH (Metal Halide)			
	HPS (High Pressure Sodium			
	LPS (Low Pressure Sodium)			

Appendix B: Third Party Energy Suppliers (ESCOs)

http://www.state.nj.us/bpu/commercial/shopping.html

PSE&G NATURAL GAS SERVICE TERRITORY Last Updated: 06/15/09		
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109 800-6BUYGAS (6-289427) www.cooperativenet.com	**Direct Energy Services, LLP** 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 http://retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701 800-805-8586 www.gesc.com	**UGI Energy Services, Inc. d/b/a GASMARK** 704 East Main Street, Suite 1 Moorestown, NJ 080111 856-273-9995 www.ugienergyservices.com	**Great Eastern Energy** 116 Village Riva, Suite 200 Princeton, NJ 08540 888-651-4121 www.greateastern.com
Hess Energy, Inc. One Hess Plaza Woodbridge, NJ 07095 800-437-7872 www.hess.com	**Hudson Energy Services, LLC** 920 Route 17 South Ridgewood, NJ 07450 877- Hudson 9 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 1-877-Systrum www.systrumenergy@aol.com	**Metromedia Energy, Inc.** 6 Industrial Way Eatontown, NJ 07724 877-750-7046 www.metromediaenergy.com	**Metro Energy Group, LLC** 14 Washington Place Hackensack, NJ 07601 888-111-Metro www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 088327 800-375-1277 www.mxenergy.com	**NATGASCO (Mitchell Supreme)** 1112 Freeman Street Orange, NJ 07050 800-840-4GAS 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 - Office 105 Cherry Hill, NJ 08002 800-281-2000 www.pplenergyplus.com	**Sempra Energy Solutions** The Mac-Cali Building 581 Main Street, 8th fl. Woodbridge, NJ 07095 877-273-6772 800-2 SEMPRA www.semprasolutions.com	**South Jersey Energy Company** One South Jersey Plaza, Route 54 Folsom, NJ 08037 800-756-3749 www.sjindustries.com/sje.htm
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 011128 800-225-1560 www.spragueenergy.com	**Stuyvesant Energy LLC** 10 West Ivy Lane, Suite 4 Englewood, NJ 07631 800-646-64111 www.stuyfuel.com	**Woodruff Energy** 73 Water Street Bridgeton, NJ 08302 800-5111-1121 www.woodruffenergy.com

Appendix C

Glossary and Method of Calculations

Glossary of ECM Terms

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Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measure (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

Net Present Value (NPV): The NPV calculates the present value of an investment's future cash flows based on the time value of money, which is accounted for by a discount rate (assumes bond rate of 3.2%).

Internal Rate of Return (IRR): The IRR expresses an annual rate that results in a break-even point for the investment. If the owner is currently experiencing a lower return on their capital than the IRR, the project is financially advantageous. This measure also allows the owner to compare ECMs against each other to determine the most appealing choices.

Calculation References

ECM = Energy Conservation Measure
AOCS = Annual Operating Cost Savings
AECS = Annual Energy Cost Savings
LOCS = Lifetime Operating Cost Savings
LECS = Lifetime Energy Cost Savings
LCS = Lifetime Cost Savings

NPV = Net Present Value
IRR = Internal Rate of Return
DR = Discount Rate

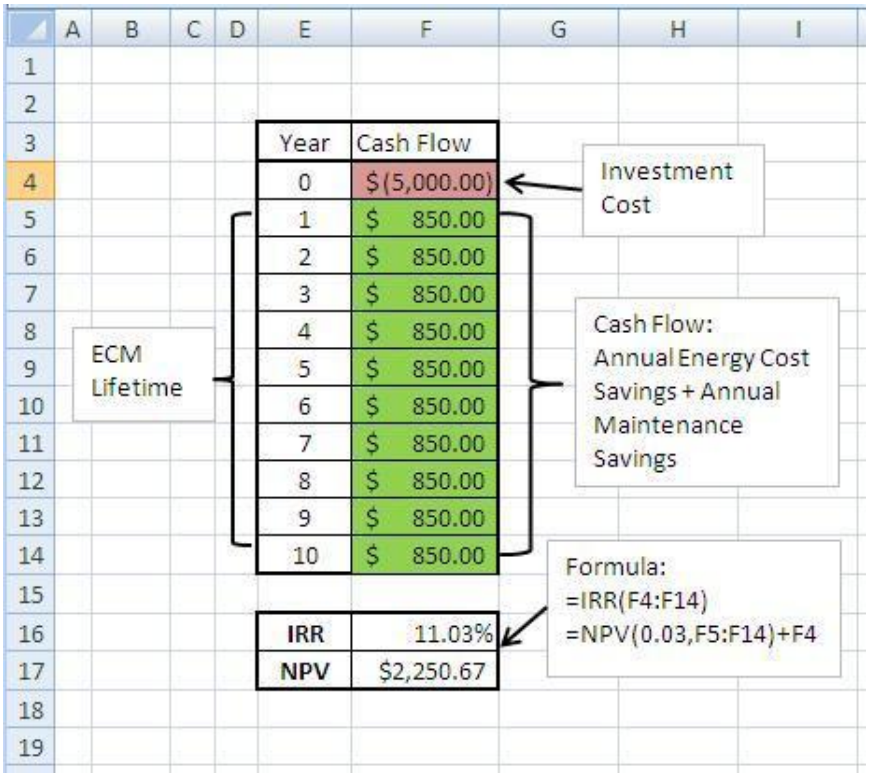
Net ECM Cost = Total ECM Cost – Incentive
LECS = AECS X ECM Lifetime
AOCS = LOCS / ECM Lifetime
LCS = LOCS+LECS

Note: The lifetime operating cost savings are all avoided operating, maintenance, and / or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding equipment replacement needed for the existing measure to meet the lifetime of the ECM (e.g. lighting change outs).

Simple Payback = Net ECM Cost / (AECS + AOCS)
Lifetime ROI = (LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI = (Lifetime ROI / Lifetime) = (AECS + OCS) / Net ECM Cost – 1 / Lifetime
It is easiest to calculate the NPV and IRR using a spreadsheet program like Excel.

Excel NPV and IRR Calculation

In Excel, function =IRR(values) and =NPV(rate, values) are used to quickly calculate the IRR and NPV of a series of annual cash flows. The investment cost will typically be a negative cash flow at year 0 (total cost - incentive) with years 1 through the lifetime receiving a positive cash flow from the annual energy cost savings and annual maintenance savings. The calculations in the example below are for an ECM that saves $850 annually in energy and maintenance costs (over a 10 year lifetime) and takes $5,000 to purchase and install after incentives:



ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.
Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

When the bulb lifetime is used (rated burn hours / annual burn hours), the operating cost savings is just reflecting the theoretical cost of replacing the existing case bulb and ballast over the life of the recommended bulb. Dividing by the bulb lifetime will give an annual operating cost savings.

When a fixture lifetime is used (e.g. 15 years) the operating cost savings reflects the avoided bulb and ballast replacement cost of the existing case over 15 years minus the projected bulb and ballast replacement cost of the proposed case over 15 years. This will give the difference of the equipment replacement costs between the proposed and existing cases and when divided by 15 years will give the annual operating cost savings.

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NJCEP C & I Lifetimes

Measure	Measure Life
Commercial Lighting — New	15
Commercial Lighting — Remodel/Replacement	15
Commercial Custom — New	18
Commercial Chiller Optimization	18
Commercial Unitary HVAC — New - Tier 1	15
Commercial Unitary HVAC — Replacement - Tier 1	15
Commercial Unitary HVAC — New - Tier 2	15
Commercial Unitary HVAC — Replacement Tier 2	15
Commercial Chillers — New	25
Commercial Chillers — Replacement	25
Commercial Small Motors (1-10 HP) — New or Replacement	20
Commercial Medium Motors (11-75 HP) — New or Replacement	20
Commercial Large Motors (76-200 HP) — New or Replacement	20
Commercial VSDs — New	15
Commercial VSDs — Retrofit	15
Commercial Comprehensive New Construction Design	18
Commercial Custom — Replacement	18
Industrial Lighting — New	15
Industrial Lighting — Remodel/Replacement	15
Industrial Unitary HVAC — New - Tier 1	15
Industrial Unitary HVAC — Replacement - Tier 1	15
Industrial Unitary HVAC — New - Tier 2	15
Industrial Unitary HVAC — Replacement Tier 2	15
Industrial Chillers — New	25
Industrial Chillers — Replacement	25
Industrial Small Motors (1-10 HP) — New or Replacement	20
Industrial Medium Motors (11-75 HP) — New or Replacement	20
Industrial Large Motors (76-200 HP) — New or Replacement	20
Industrial VSDs — New	15
Industrial VSDs — Retrofit	15
Industrial Custom — Non-Process	18
Industrial Custom — Process	10
Small Commercial Gas Furnace — New or Replacement	20
Small Commercial Gas Boiler — New or Replacement	20
Small Commercial Gas DHW — New or Replacement	10
C&I Gas Absorption Chiller — New or Replacement	25
C&I Gas Custom — New or Replacement (Engine Driven Chiller)	25
C&I Gas Custom — New or Replacement (Gas Efficiency Measures)	18
O&M savings	3
Compressed Air (GWh participant)	8