Steven Winter Associates, Inc.
Architects and Engineers

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

Telephone: (866) 676-1972
Web: www.swinter.com
E-mail: swinter@swinter.com

June 11, 2010

Local Government Energy Program
Energy Audit Report Final

Franklin Lakes Southside Firehouse Building
851 Franklin Lakes Road, Franklin Lakes, NJ 07417

Project Number: LGEA46

Table of Contents

INTRODUCTION

On December 16, 2009 and January 13, 2010 Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment for the Borough of Franklin Lakes municipal buildings. The audit included a review of the:

- Franklin Lakes Municipal Building
- Franklin Lakes Police Station
- Franklin Lakes Recreational Center
- Franklin Lakes Firehouse (Main)
- Franklin Lakes Firehouse (Southside)
- Franklin Lakes DPW
- Franklin Lakes Ambulance Corps.

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

This report addresses the Franklin Lakes Southside Firehouse building located at 851 Franklin Lakes Road, Franklin Lakes, NJ. 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 single-story Franklin Lakes Southside Firehouse building was built in 1973 with a large meeting space added in 2006. The building houses a kitchen, storage rooms, a large lounge area, bathrooms and a three truck garage. The building consists of 6,600 square feet of heated space. The Franklin Lakes Southside Firehouse is occupied sporadically for 25 hours a week by 3 to 10 volunteers.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Borough of Franklin Lakes to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the Franklin Lakes Southside Firehouse 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. For projects awarded on or prior to December 31, 2009 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 Franklin Lakes Southside Firehouse building located at 851 Franklin Lakes Road, Franklin Lakes, NJ. The Franklin Lakes Southside Firehouse building is a single-story building with a floor area of 6,600 square feet.

Based on the field visits performed by the SWA staff on December 16, 2009 and January 13, 2010 and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

From March 2008 to February 2009 the Franklin Lakes Southside Firehouse building consumed 31,712 kWh or $5,911 worth of electricity at an approximate rate of $0.186/kWh and 3,524 therms or $4,993 worth of natural gas at an approximate rate of $1.417/therm. The joint energy consumption for the building, including both electricity and natural gas, was 461 MMBtu of energy that cost a total of $10,905.

SWA has entered energy information about the Franklin Lakes Southside Firehouse building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. This Firehouse facility can be designated as a "Fire Station / Police Station" space type. This space type is not eligible to receive an Energy Star rating because not enough information is available in the database to rate this specific space type. SWA encourages the Borough of Franklin Lakes 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 75.0 kBtu/ft^{2}yr compared to the national average of "Fire Station" space type of 78.0 kBtu/ft^{2}yr. Implementing this report's recommendations will reduce use by approximately 10.9 kBtu/ft^{2}yr, reducing the building's energy consumption to 64.1 kBtu/ft^{2}yr. There may be energy procurement opportunities for the Franklin Lakes Southside Firehouse building to reduce annual electric utility costs, which are $1,154 higher, when compared to the average estimated NJ commercial electric rates.

Based on the assessment of the Franklin Lakes Southside Firehouse, 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

- Replace older sections of roof
- Replace seven original Exhaust Fans with new, using premium efficiency motors
- Replace six original unit heaters in garage, repair room and office with new, using premium efficiency motors
- Upgrade old windows to low-E and double pane with the next major renovation
- Install a garage air cleaning system controlled by CO sensors

Category II Recommendations: Operations and Maintenance

- Maintain garage door air sealing
- Thermally seal conditioned space from attic space by adding insulation above drop ceiling
- Maintain wall insulation by patching any damage or penetrations that may result from weather or age
- Maintain roofs
- Maintain downspouts
- Maintain window weather stripping / air sealing on new windows
- Perform visual inspections to maintain exterior door weather stripping
- 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 **one** Energy Conservation Measure (ECM) for the Franklin Lakes Southside Firehouse building as summarized in the following Table 1. The total investment cost for the ECM with incentives is **$853**. SWA estimates a first year savings of **$504** with a simple payback of **1.7 years**. SWA estimates that implementing the highly recommended ECM will reduce the carbon footprint of the Franklin Lakes Southside Firehouse building by **3,448 lbs of CO_2** which is the equivalent of eliminating enough CO_2 as can be absorbed by 8 trees. SWA also recommends **two** ECM's with a total first year savings of **$4,207** as summarized in Table 2. In addition, there is **one** End of Life ECM summarized in Table 3.

There are various incentives that the Borough of Franklin Lakes could apply for that could also help lower the cost of installing the ECMs, such as enroll in the NJ Smart Start program through the New Jersey Office of Clean Energy. This incentive program can help provide technical assistance for the building in the implementation phase of any energy conservation project. A new NJ Clean Power program, Direct Install, could also assist to cover up to 80% of the capital investment of energy saving measures. These and other incentive programs are outlined in detail in Appendix D.

Renewable ECMs require application approval and negotiations with the utility and proof of performance. There is also a utility-sponsored program that would allow the building to pay for the installation of the PV system through a loan issued by Orange Rockland Electric.

The following two 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 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, $	est. energy & operating 1st year cost 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, $	CO2 reduced, lbs/yr
1a	17 New CFL fixtures to be installed with incentives	RS Means, lit search	853	none at this time	853	2,517	0.5	0	1.3	36	504	5	2,519	1.7	195%	39%	52	1,441	3,448

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, $	est. energy & operating 1st year cost 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, $	CO2 reduced, lbs/yr
1b	3 New occupancy sensors to be installed with incentives	RS Means, lit search	660	60	600	591	0.1	0	0.3	0	110	15	1,648	5.5	175%	12%	0	693	809
2	Install 5 kW Solar Photovoltaic system	Similar Projects	35,000	5,000	30,000	5,900	5.0	0	3.1	0	4,097	25	72,435	7.3	141.5	5.7	11.45	83,991	10,564
	TOTALS		**35,660**		**30,600**	**6,491**	**5.1**	**0**	**3.4**	**0**	**4,207**		**74,083**	**7.3**	**-**	**-**	**-**	**-**	**11,373**

Table 3 – End of Life 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, $	est. energy & operating 1st year cost 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, $	CO2 reduced, lbs/yr
2	Replace 420,000 Btu/hr Boiler W/ 400,000, 85% Eff. Boiler	Boiler Replacement Savings calculator	8,000	700	7,300	0	0	408	6.2	0	578	20	4,818	12.6	-34%	-2%	2%	-1,613	4,774

1. HISTORIC ENERGY CONSUMPTION

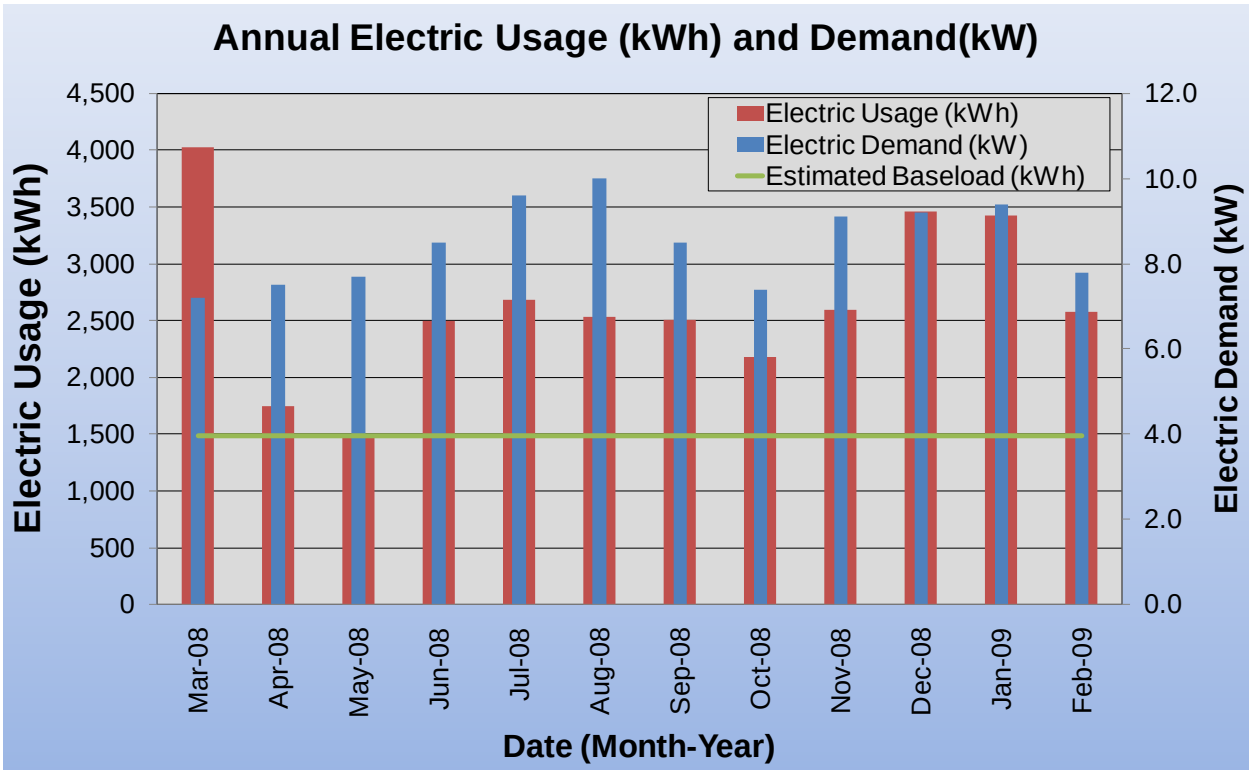
1.1 Energy usage and cost analysis

SWA analyzed utility bills from March 2008 through February 2009 that were received from the utility companies supplying the Franklin Lakes Southside Firehouse with electric and natural gas.

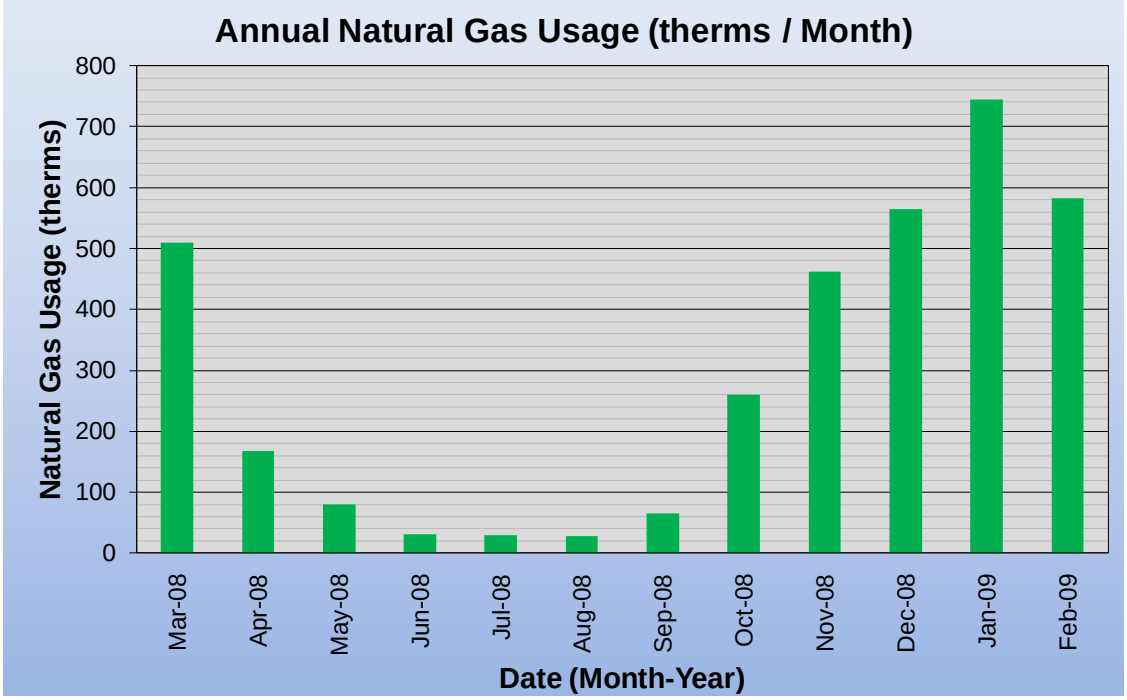
Electricity - The Franklin Lakes Southside Firehouse is currently served by one electric meter. The Franklin Lakes Southside Firehouse building currently buys electricity from Orange Rockland Electric at **an average rate of $0.186/kWh** based on 12 months of utility bills from March 2008 to February 2009. The Franklin Lakes Southside Firehouse building purchased **approximately 31,712 kWh or $5,911 worth of electricity** in the previous year. The average monthly demand was 8.0 kW.

Natural gas - The Franklin Lakes Southside Firehouse is currently served by one meter for natural gas. The Franklin Lakes Southside Firehouse buys natural gas from PSE&G at **an average aggregated rate of $1.417/therm** based on 12 months of utility bills for March 2008 to February 2009. The Franklin Lakes Southside Firehouse purchased **approximately 3,524 therms or $4,993 worth of natural gas** in the previous year.

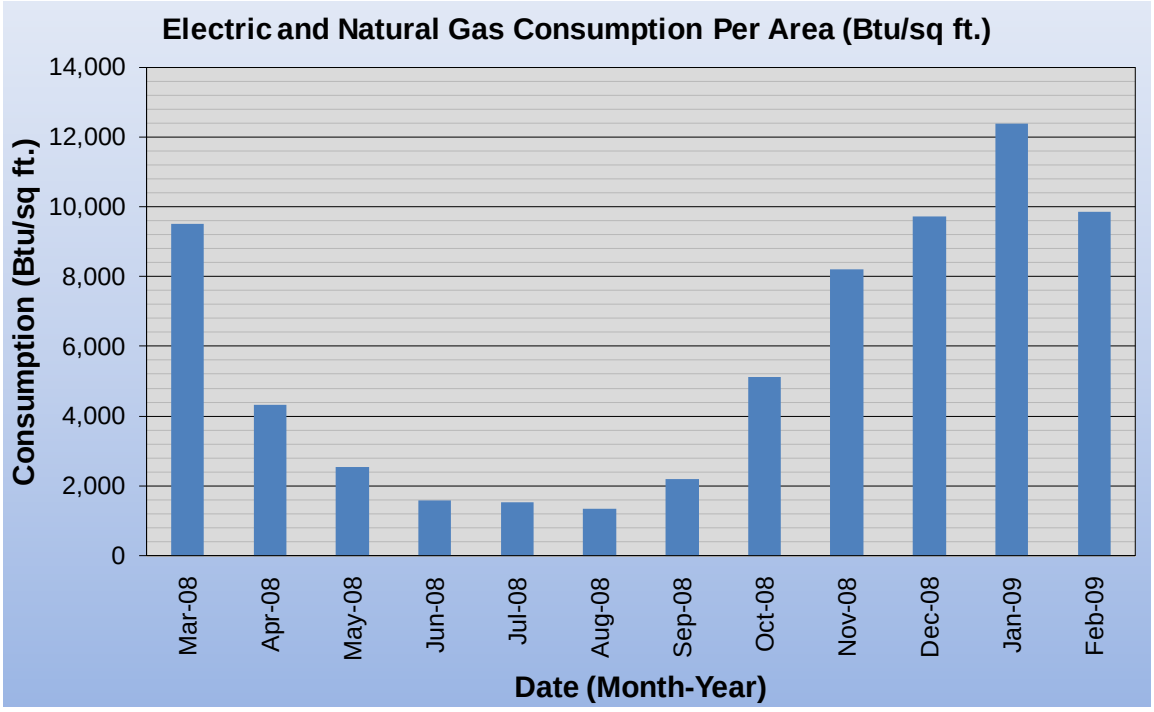
The following chart shows electricity use for the Franklin Lakes Southside Firehouse building based on utility bills for the 12 month period of March 2008 through February 2009.



The following chart shows the natural gas consumption for the Franklin Lakes Southside Firehouse building based on natural gas bills for the 12 month period of March 2008 through February 2009.



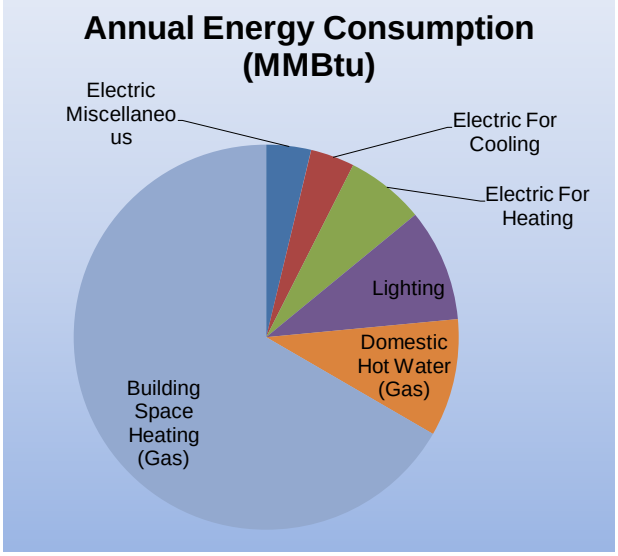
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Franklin Lakes Southside Firehouse building based on utility bills for the 12 month period of March 2008 through February 2009.

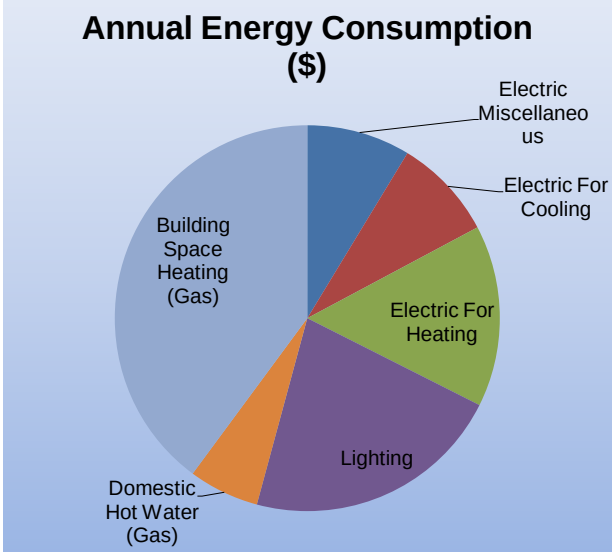


The following table and pie charts show energy use for the Franklin Lakes Southside Firehouse building based on utility bills for the 12 month period of March 2008 through February 2009. Note electrical cost at $55/MMBtu of energy is almost four times as expensive to use as natural gas at $14/MMBtu.

2008 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	17	4%	$947	9%	55
Electric For Cooling	17	4%	$928	9%	55
Electric For Heating	30	7%	$1,663	15%	55
Lighting	43	9%	$2,373	22%	55
Domestic Hot Water (Gas)	45	10%	$644	6%	14
Building Space Heating (Gas)	307	67%	$4,349	40%	14
Totals	461	100%	$10,905	100%	
Total Electric Usage	108	23%	$5,911	54%	55
Total Gas Usage	352	77%	$4,993	46%	14
Totals	461	100%	$10,905	100%	--

Notice that although the lighting is less than 10% of the energy consumption for the building it accounts for 22% of the cost. This is due to the fact that electric rates are much more expensive than gas rates.





1.2 Utility rate

The Franklin Lakes Southside Firehouse building currently purchases electricity from Orange Rockland Electric at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Franklin Lakes Southside Firehouse building currently pays an average

rate of approximately $0.186/kWh based on the 12 months of utility bills of March 2008 through February 2009.

The Franklin Lakes Southside Firehouse building currently purchases natural gas supply from the PSE&G at a 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 Franklin Lakes Southside Firehouse building currently. The average aggregated rate (supply and transport) for the meter is approximately $1.417/therm based on 12 months of utility bills for March 2008 through February 2009.

1.3 Energy benchmarking

SWA has entered energy information about the Franklin Lakes Southside Firehouse building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The Main Firehouse Facility is comprised of non-eligible "Fire Station" space type. Consequently, the Franklin Lakes Southside Firehouse is not eligible to receive a national energy performance rating at this time.

The Site Energy Use Intensity is 75.0 kBtu/ft^{2}yr compared to the national average of "Fire Station" space type buildings, 78.0 kBtu/ft^{2}yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 1.3 kBtu/sqft yr, with an additional 9.6 kBtu/ft^{2}yr from the recommended ECMs. These recommendations could account for at least 10.9 kBtu/ft^{2}yr and therefore reduce the site energy utilization index to 64.1 kBtu/ft^{2}yr.

Per the LGEA program requirements, SWA has assisted the Borough of Franklin Lakes to create an *Energy Star Portfolio Manager* account and share the Franklin Lakes Southside Firehouse 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 Franklin Lakes (user name of "FranklinLakesBoro" with a password of "FRANKLINLAKES") and TRC Energy Services (user name of TRC-LGEA).

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Franklin Lakes - Southside Firehouse

Building ID: 1976337
For 12-month Period Ending: January 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 05, 2010

Facility
Borough of Franklin Lakes - Southside Firehouse
851 Franklin Lakes Road
Franklin Lakes, NJ 07417

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1973
Gross Floor Area (ft²): 6,600

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	106,692
Natural Gas (kBtu)[4]	387,482
Total Energy (kBtu)	494,174

Energy Intensity[5]	
Site (kBtu/ft²/yr)	75
Source (kBtu/ft²/yr)	115

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	31

Electric Distribution Utility
Rockland Electric Co

National Average Comparison	
National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	-26%
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.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The single story 6,600 square feet Southside Firehouse building was built in 1973 and renovated with an addition in 2006. Besides the 3 bay fire truck garage, the building contains a kitchen, bar area, lounge area for volunteer members' activities, bathrooms, an office, a utility room, an engineer's room and storage areas.

2.2. Building occupancy profiles

Occupancy for the Southside Firehouse building is sporadic, usually 3 and up to 10 volunteers for approximately 25 hours per week. There is usually one special event held in the lounge area every couple of months for volunteer fire department members.

2.3. Building envelope

2.3.1. Exterior Walls

There are two typical exterior envelopes. The first and older sections consist of 8"CMU blocks with a 4" brick veneer façade. The original structure consists of masonry wall construction. The drawings for the original structure do not specifically call for insulation to be installed on the exterior walls.

The second exterior façade style (mainly around the new lounge area addition and starting 3 feet off the ground) is made up of Exterior Insulation and Finish Systems (EIFS). The first half of the acronym, "Exterior Insulation" is derived from the fact that the first component installed is a foam insulation board. The 1" foam board is mechanically and / or adhesively attached to the exterior sheathing of the building. In this respect the foam board serves as an exterior insulating layer. Over this foam board is applied a synthetic base-coat material in which is embedded a fiberglass reinforcing mesh. This is typically referred to as the "base-coat". On top of the base coat is applied one or more "finish coats". This is the exterior layer that gives the product its stucco-like appearance. Hence the second part of the acronym "Finish Systems".

EFIS provides many advantages that other exterior finishes and sidings do not. Chief among these are superior energy efficiency and great design flexibility. Studies have shown that EIFS can reduce the air infiltration in a wall by as much as 55%, when compared to standard brick or wood construction. One should bear in mind that an EIFS system is a non-structural component of the wall.

Interior finishes are either exposed CMU or GWB (gypsum wall board). The surrounding 5 ft mansard is finished with asphalt shingles over ½" plywood and 2x wood framing. The interior walls of the crawl space attic are unfinished. Cosmetically the facade is in age appropriate condition. Exterior and interior finishes of the envelope wall were found to be age-appropriate and in good condition.

EIFS wall section and mansard above 4” brick veneer

2.3.2. Roof

The roof on the older sections of the building is a built-up 25-year-old tar flat roof with a silver coating and aluminum edging on 5/8” plywood deck. The flat roof is above a mansard covered by asphalt shingles as mentioned above under section 2.3.1 Exterior Walls. The roof leaks in several places. The 2006 addition has a built-up pitched roof with R-30 batt fiberglass insulation between supporting joists.

Ariel view of roof, new pitched roof in Southwest corner of building

SWA recommends that the Southside Firehouse consider replacing the older roof sections prior to water damaging the wood supports further to the point where they cannot be reused. SWA also recommends at a minimum sealing the lower space from the unconditioned mansard by installing all the missing ceiling tiles.

Missing ceiling tile by kitchen area; roof batt insulation is visible

2.3.3. Base

The building's base is 4" concrete slab-on grade in the new lounge area and 5" thick in the original and rest of the building with a perimeter footing. There weren't any reported problems with water penetration or moisture. The slab edge or perimeter insulation could not be verified.

2.3.4. Windows

The building has a number of aluminum framed double glazed, fixed and operable windows. The few windows installed during the 2006 upgrade are also thermally low-e type. All the windows inspected showed proper caulking and sealing around both interior and exterior perimeters without signs of condensation or other problems. SWA recommends continuing the upgrade for all windows in the building even though the payback for the replacement is in excess of 20 years.

2.3.5. Exterior doors

The aluminum framed exterior doors were generally observed to be in good condition with some older ones needing to have missing or worn weather stripping installed in addition to adjusting doors to properly close in order to decrease the amount of conditioned air that is lost around each door. SWA also recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. Tight seals around the doors will help ensure that the building is kept insulated.

2.3.6. Building air tightness

Based on a visual inspection, the Southside Firehouse building could benefit from tightly sealed windows and doors, ductwork, plumbing and wire penetrations. Any water damage due to condensing un-insulated pipes, condensate lines dripping, plumbing leaks, or roof leaks should be repaired immediately and ceiling tiles should be replaced. Ceiling tiles act as an air barrier containing expensive conditioned air from leaking into ceiling or wall cavities.

In addition to the above mentioned recommendations, SWA suggests air sealing, caulking and / or insulating around all plumbing, electrical, HVAC and structural envelope penetrations. This should include bottom and top plates, recessed light fixtures, electrical boxes and windows.

The air tightness of buildings helps to maximize other implemented energy measures and investments and minimizes long term maintenance and repair cost.

2.4 HVAC Systems

The Franklin Lakes Southside Firehouse occupied spaces are conditioned by hot water heaters and a DX fan coil unit. The garage bays are only heated; offices, lounge and kitchen areas have heating and cooling. There are five thermostats which control the operating of the heating and cooling equipment. The thermostats are located in the radio room, senior's room, and main lounge area and two in the garage.

2.4.1 Heating

The main heat source for the Southside Firehouse is a 420,000 Btu/hr Hydrotherm natural gas boiler, which uses Bell & Gossett pumps to distribute hot water to unit heaters throughout the garage areas, and the fan coil unit in the lounge area.

The boiler was installed in 1973 and is beyond useful operating life. SWA recommends replacing the boiler with a new 400,000 Btu.hr, 85% efficient natural gas boiler.

There are four Trane unit heaters in the building, two in the truck bays, one in the back office and one in the repair room. There are also two ceiling cabinet unit heaters in the truck area. The unit heaters and cabinet heaters use hot water coils as a heat source with small fans to disperse the heat. The heaters are operating beyond their expected useful life and should be replaced with units using premium efficiency motors.

Hot water Unit Heaters in Truck Bay, Hot water heater (left); Cabinet Unit hot water heater (right)

The lounge area is heated by a Payne fan coil unit installed above the ceiling in the bar area with a hot water heating coil sized for 90,000 Btu/hr, which provides forced hot air to the lounge and office areas based on the setpoints of the three thermostats in the occupied spaces. The unit was recently installed and is in good operating condition.

2.4.2 Cooling

The Franklin Lakes Southside Firehouse lounge and office areas are the only areas of the building with cooling. A Payne fan coil unit is installed above the ceiling directly over the bar/kitchen area. The unit provides 3.5 Tons of cooling with an outside condenser to expel the heat to the atmosphere. The condenser was installed in 2006 and has 70% remaining useful life.

Payne Condenser, 3.5 Ton Capacity

2.4.3 Ventilation

The Franklin Lakes Southside Firehouse has several Cook exhaust fans for ventilation, installed on the original flat roof. The fans were not accessible during the field survey due to weather conditions. The fans serve bathrooms, kitchen/bar area and office spaces. The exhaust fans are the original to the building and are beyond their useful life. The fans should be replaced with new fans, using premium efficiency motors.

There is no ventilation system for the garage area. SWA recommends installing an air cleaning system based on CO sensors which sound an alarm prior to CO levels becoming toxic.

2.4.4 Domestic Hot Water

The domestic hot water (DHW) for the Franklin Lakes Southside Firehouse building is provided by a Rheem natural gas fired heater with 30,000 Btu/hr capacity. The heater has 20% estimated useful operating life remaining and appears in good condition.

2.5 Electrical systems

2.5.1 Lighting

Interior Lighting - The Franklin Lakes Southside Firehouse building currently consists of T8 fluorescent fixtures and sporadic use of halogen and incandescent lights. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA recommends replacing the Incandescent and halogen lights with compact fluorescent lights, CFL's, which provide the same amount of light for approximately a third of the energy usage. SWA also recommends adding occupancy sensors to control lighting in spaces with sporadic and infrequent use such as the bathroom, offices and kitchen. 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 LED type. SWA is not recommending any upgrades at this time.

Exterior Lighting - The exterior lighting surveyed during the building audit was mostly high incandescent lights. SWA recommends replacing incandescent lights with CFLs. SWA does not recommend any changes to the automatic timer controls at this time.

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. 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 drink and snack 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. See section 4, Energy Conservation Measures for details on replacing refrigerators and installing energy vending miser devices.

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 often have internal memories or clocks which consume approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all appliances, (other than refrigerators and freezers), be plugged into power strips and turned off each evening just as the lights are turned off. The Franklin Lakes Southside Firehouse 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 Franklin Lakes Southside Firehouse is a single-story building without elevators.

2.5.4 Others electrical systems

There are not currently any other significant energy impacting electrical systems installed at the Franklin Lakes Southside Firehouse building except for a natural gas emergency generator with 33.0 kVA capacity located outside in the back of the building.

3. EQUIPMENT LIST

Inventory

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Cooling	Condensing Unit, 3.5 Tons, R-22, 12 SEER	Outside Back of Building	PAYNE, M#PA12NA042-G, 5104X00400	Electric	Bar & TV Area	2006	70%
Heating / Cooling	DX Fan Coil Unit 1/2 HP	Over Bar	PAYNE, M#PF1MNB042, 1905A70716	Electric	Bar & TV Area	2006	70%
Heating / Cooling	Hot water Coil	Over Bar	PAYNE, M#AXH090-C	Electric	Bar & TV Area	2006	70%
Heating	Hot water pump, 26.5 gpm, 20ft, 1/3 hp	Mech Rm	Bell & Gossett, 60-1-1/2 AA	Electric	All Areas	2008	90%
Heating	**Boiler 420,000 Btu/hr In / 336,000 Btu/hr Out, 80% Eff.**	**EQUIPMENT ROOM**	**HYDROTHERM M#MR-420, MB-2736**	**Natural Gas**	**All Areas**	**1973**	**0%**
Heating	**Unit Heater 1, Hot Water, 10,140 Btu/hr, 1/45 HP**	**Office**	**TRANE, M#SCU**	**Electric**	**Office**	**1973**	**0%**
Heating	**Unit Heater 2, Hot Water, 10,140 Btu/hr, 1/45 HP**	**Repair Room**	**TRANE, M#SCU, 3L-00273**	**Electric**	**Repair Room**	**1973**	**0%**
Heating	**Unit Heater 3, Hot Water, 34,370 Btu/hr, 1/20 HP**	**Truck Area**	**TRANE M#SCU**	**Electric**	**Truck Area**	**1973**	**0%**
Heating	**Unit Heater 4, Hot Water 34,370 Btu/hr, 1/20 HP**	**Truck Area**	**TRANE (HOT WTR), M#SCU**	**Electric**	**Truck Area**	**1973**	**0%**
Heating	**Cabinet Unit Heater 5, Forced Flow Hot Water 36,700 Btu/hr, 135 W**	**Truck Area**	**TRANE M#D16A004, S4D-329170**	**Electric**	**Truck Area**	**1973**	**0%**
Heating	**Cabinet Unit Heater 6, Forced Flow Hot Water, 36,700Btu/hr, 135 W**	**Truck Area**	**TRANE M#D49A004**	**Electric**	**Truck Area**	**1973**	**0%**
Domestic Hot Water	Domestic Hot water heater with Storage, 30,000 BTU/HR	mech rm	Rheem M#21V407, RHNG0799A28972	Natural Gas	All Areas	1998	20%
Generator	Natural Gas Emergency Generator, 33 KVA	outside	Kohler m#30rzg, 2001231	Natural Gas	All Areas Emergency Power	2004	60%
Ventilation	**EF-1, 40W**	**Roof**	**Cook, Gemini 10-10**	**Electric**	**All Areas**	**1973**	**0%**
Ventilation	**EF-2, 40W**	**Roof**	**Cook, Gemini 10-10**	**Electric**	**All Areas**	**1973**	**0%**
Ventilation	**EF-3, 350W**	**Roof**	**Cook, Gemini 16-10**	**Electric**	**All Areas**	**1973**	**0%**

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Ventilation	**EF-4, 190W**	**Roof**	**Cook, Gemini 14-10**	**Electric**	**All Areas**	**1973**	**0%**
Ventilation	**EF-5, 190W**	**Roof**	**Cook, Gemini 14-10**	**Electric**	**All Areas**	**1973**	**0%**
Ventilation	**EF-6, 350W**	**Roof**	**Cook, Gemini 16-10**	**Electric**	**All Areas**	**1973**	**0%**
Ventilation	**EF-7, 350W**	**Roof**	**Cook, Gemini 16-10**	**Electric**	**All Areas**	**1973**	**0%**
Lighting	See details - Appendix A			Electric	All Areas	NA	NA

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 Franklin Lakes Southside Firehouse, SWA has separated the investment opportunities into three recommended categories:

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

Category I Recommendations: Capital Improvements

- Replace 25 year old flat roof, which leaks, has many patches and is beyond its estimated useful life

- Replace seven original Exhaust Fans with new, using premium efficiency motors; due to the fractional horsepower rating of the fans and their infrequent use, the payback for replacement with premium efficiency motors is in excess of 20 years and therefore this upgrade cannot be justified by energy savings alone.

- Replace six original unit heaters in garage, repair room and office with new, using premium efficiency motors; due to the fractional horsepower rating of the fans and their infrequent of use, the payback for replacement with premium efficiency motors is in excess of 20 years and therefore this upgrade cannot be justified by energy savings alone.

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

- Upgrade old windows to low-E and double pane with the next major renovation. This cannot be justified by energy savings alone.

- Install a garage air cleaning system controlled by CO sensors.

Category II Recommendations: Operations and Maintenance

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

- Thoroughly and evenly insulate space (with batt insulation) and plug all penetrations to the outside. SWA recommends properly maintaining exterior wall and roof insulation in an effort to minimize energy loss. Also, install a removable, seasonal, insulated cover (or gravity louvers) for the exhaust fan.

- Maintain roofs - SWA recommends regular maintenance to verify water is draining correctly.

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

- Provide weather stripping / air sealing - 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.

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

- Repair / seal space between drop ceiling and attic – SWA recommends providing additional air sealing, between the drop ceiling and attic space

- 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
1a	Lighting Upgrades - Replace Incandescent and Halogens with CFLs
	Description of Recommended 5-10 Year Payback ECMs
1b	Lighting Upgrades - Install occupancy sensors
2	Install 5 kW PV Panels
End of Life ECM	
3	Replace Boiler with New Boiler 400,000 Btu/hr, 85% Efficiency

ECM# 1a, 1b: *Building Lighting Upgrades*

Description:

On the days of the site visits, SWA completed a lighting inventory of the Franklin Lakes Southside Firehouse building (see Appendix A). SWA recommends replacing 5 halogens in the bar area and 12 incandescent exterior lights with compact fluorescent lamps. For the same lumen output CFLs typically have a third of the wattage of halogen and incandescent lamps. SWA also recommends installing occupancy sensors to control lighting in offices, kitchen areas and bathrooms. An estimated 1/3 of the energy usage can be saved by using occupancy sensor control. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Borough of Franklin Lakes may decide to perform this work with in-house resources from its Maintenance Department.

Installation cost:
Estimated installed cost: $1,453 (includes approx. $700 labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

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, $	est. energy & operating 1st year cost 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, $	CO2 reduced, lbs/yr
1a	17 New CFL fixtures to be installed with incentives	RS Means, lit search	853	none at this time	853	2,517	0.5	N/A	1.3	36	504	5	2,519	1.7	195	39	52	1,441	3,448
1b	3 New occupancy sensors to be installed with incentives	RS Means, lit search	660	60	600	591	0.1	N/A	0.3	0	110	15	1,648	5.5	175	12	16	693	809
	TOTALS		**1,513**	**60**	**1,453**	**3,108**	**0.6**	**0.0**	**1.6**	**36**	**614**		**4,168**	**2.4**				**2,134**	**4,257**

Economics (Some of the options considered with incentives):
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 – OC sensors, wall mounted - $20/control - $60 total*
Options for funding the Lighting 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

ECM#2: *Install 5 kW PV system*

Description:

Currently, the Franklin Lakes Southside Firehouse building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels can be mounted on the building roof facing south 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. SWA presents below the economics, and recommends at this time that Borough of Franklin Lakes further review installing a 5 kW PV system to offset electrical demand and reduce the annual net electric consumption for the building, and review guaranteed incentives from NJ rebates to justify the investment. The Borough of Franklin Lakes may 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. Orange Rockland Electric provides the ability to buy SRECs at $600/MWh or best market offer.

The size of the system was determined using the amount of roof surface area as a limiting factor, as well as the facilities annual base load. A PV system could be installed at a 15˚ south facing angle on a portion of the roof that faces South or West. The installation would be ideal after the original roof is replaced. A commercial multi-crystalline 123 watt panel (17.2 volts, 7.16 amps) has 10.7 square feet of surface area (11.51 watts per square foot). A 5 kW system needs approximately 40 panels which would take up 435 square feet.

Installation cost:

Estimated installed cost: $35,000 (labor included at $3/Watt, totaling $15,000)
Source of cost estimate: Similar projects

Economics (with incentives):

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 cost savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
Install 5 kW Solar Photovoltaic system	Similar Projects	35,000	5,000	30,000	5,900	5.0	0	3.1	0	4,097	25	72,435	7.3	141.5	5.7	11.45	83,991	10,564

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 (123 Watts, Model ND-123UJF). 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 - Renewable Energy Incentive Program, Incentive based on $1.00/watt Solar PV application for systems 5 kW or less. Incentive amount for this application is $5,000 for the Franklin Lakes Police Station.

http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program

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. A total of $3,000/year, based on $600/SREC, has been incorporated in the above costs however it requires proof of performance, application approval and negotiations with the utility.

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

ECM# 3: *Replace Boiler with High Efficiency Boiler*

Description:

On the days of the site visits, SWA completed a survey of all major mechanical equipment. The main heat source for the building, the Hydrotherm natural gas boiler, was installed in 1973 and is well beyond its useful life. SWA recommends replacing the boiler with a 400,000 Btu/hr boiler with an 85% thermal efficiency or greater, which will allow a slightly lower input capacity for a comparable output capacity. Below is the economic potential of this replacement. The Borough of Franklin Lakes may decide to perform this work with in-house resources from its Maintenance Department to obtain savings.

The six hot water unit heaters served by the boiler are estimated to be more than 20 years old. The main efficiency losses in the heating system however are due to the boiler. There is no indication that the hot water coils are leaking, or valves are faulty. Therefore, the unit heaters do not need to be replaced at this time.

Installation cost:
Estimated installed cost: $7,300 (includes approx. $3,000 labor)
Source of cost estimate: RS *Means; Boiler Replacement Savings Calculator, NJ Clean Energy Program*

Economics (Some of the options considered with incentives):

Gas Boiler Replacement																		
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, $	est. energy & operating 1st year cost 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, $	CO2 reduced, lbs/yr
2a	Replace 420,000 Btu/hr NG Boiler W/ conventional unit, (80% Eff.)	Replacement Savings calculator	7,500	none at this time	7,500	0	0.0	119	1.8	0	169	20	3,372	44.5	-55%	-3%	-11%	-5,841	1,392
2b	Incremental difference to replace boiler with 400,000 Btu/hr 85% Eff.	Replacement Savings calculator	500	700	-200	0	0.0	289	4.4	0	410	20	8,190	-0.5	-4195%	-210%	NA	4,228	3,381
2c	**Replace 420,000 Btu/hr Boiler W/ 400,000 85% Eff. Unit**	**Replacement Savings calculator**	**8,000**	**700**	**7,300**	**0**	**0**	**408**	**6.2**	**0**	**578**	**20**	**4,818**	**12.6**	**-34%**	**-2%**	**2%**	**-1,613**	**4,774**

Assumptions: Original boiler efficiency degraded by 10%, to 70% operating efficiency. Used calculator based on typical heating requirements for 6,600 square feet space.

Rebates/financial incentives: *NJ Clean Energy – For Gas Boilers > 300 MB & Min. 85% Efficiency- $1.75/MBH - $700 Total*

Options for funding the Lighting 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 aren't currently any existing renewable energy systems.

5.2 Wind

Description:

There aren't any recommendations for this renewable energy source at this time due to lack of necessary wind conditions in this region.

5.3 Solar Photovoltaic

Solar Panels are recommended to be installed as described in ECM #2.

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 absence of a major cooling system and insufficient domestic hot water use.

5.6 Geothermal

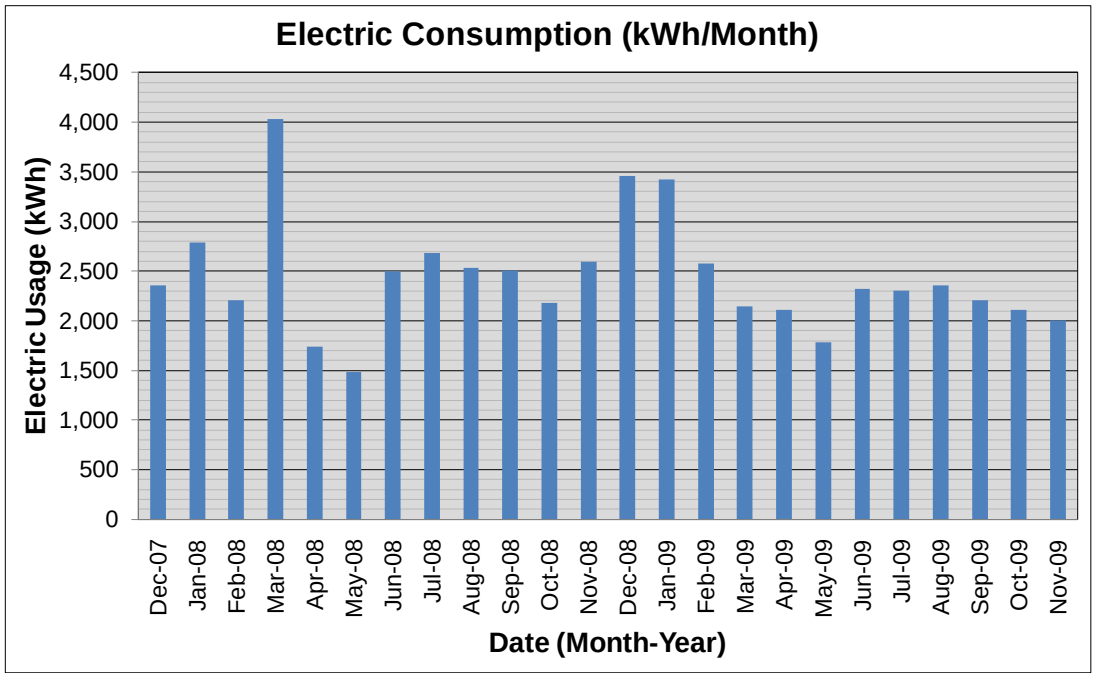
Description:

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.

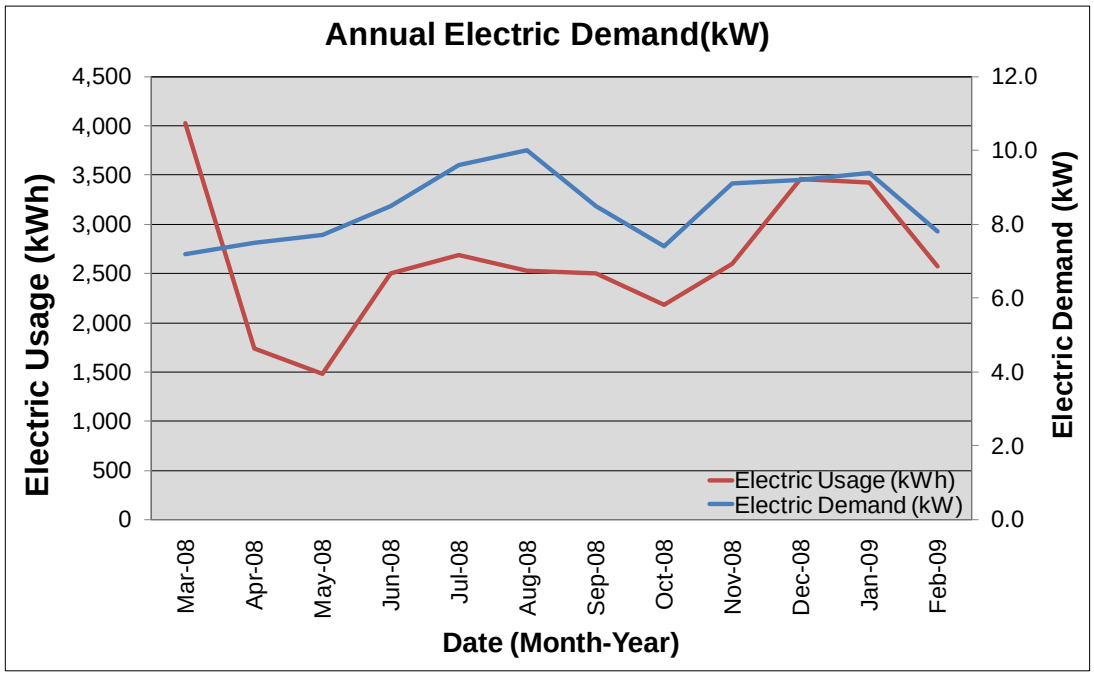
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1 Load profiles

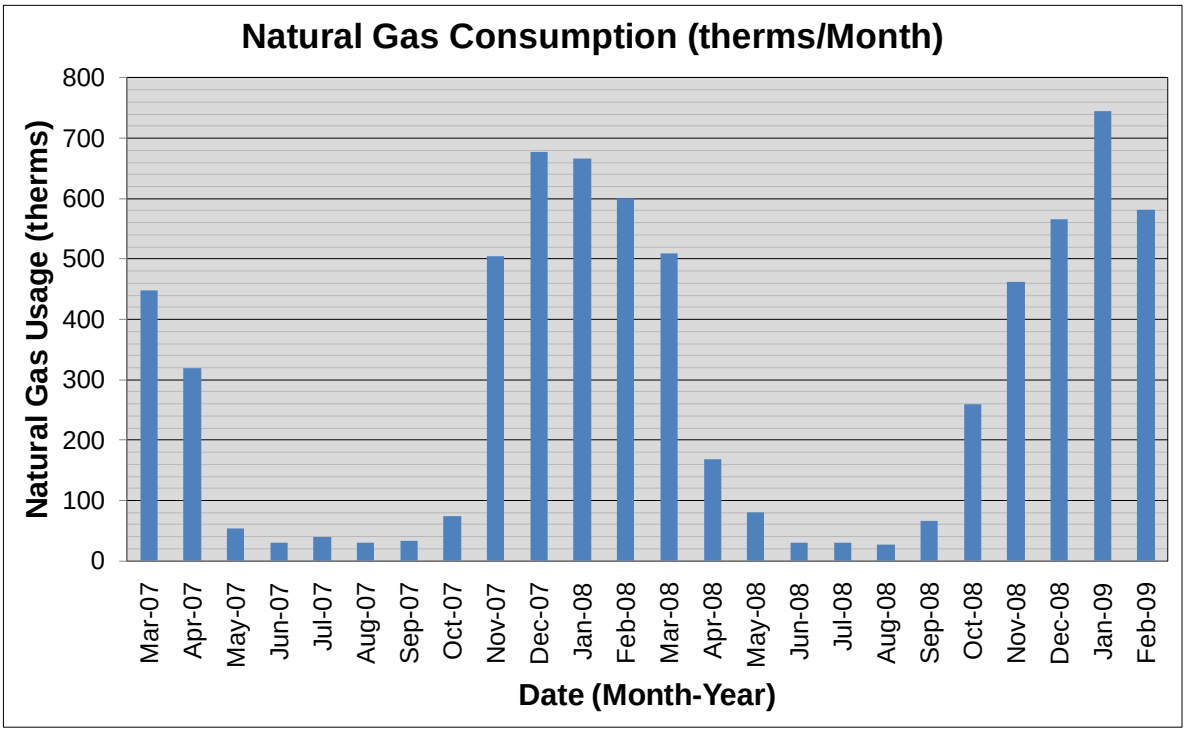
The following are charts that show the electric and natural gas load profiles for the Franklin Lakes Southside Firehouse.

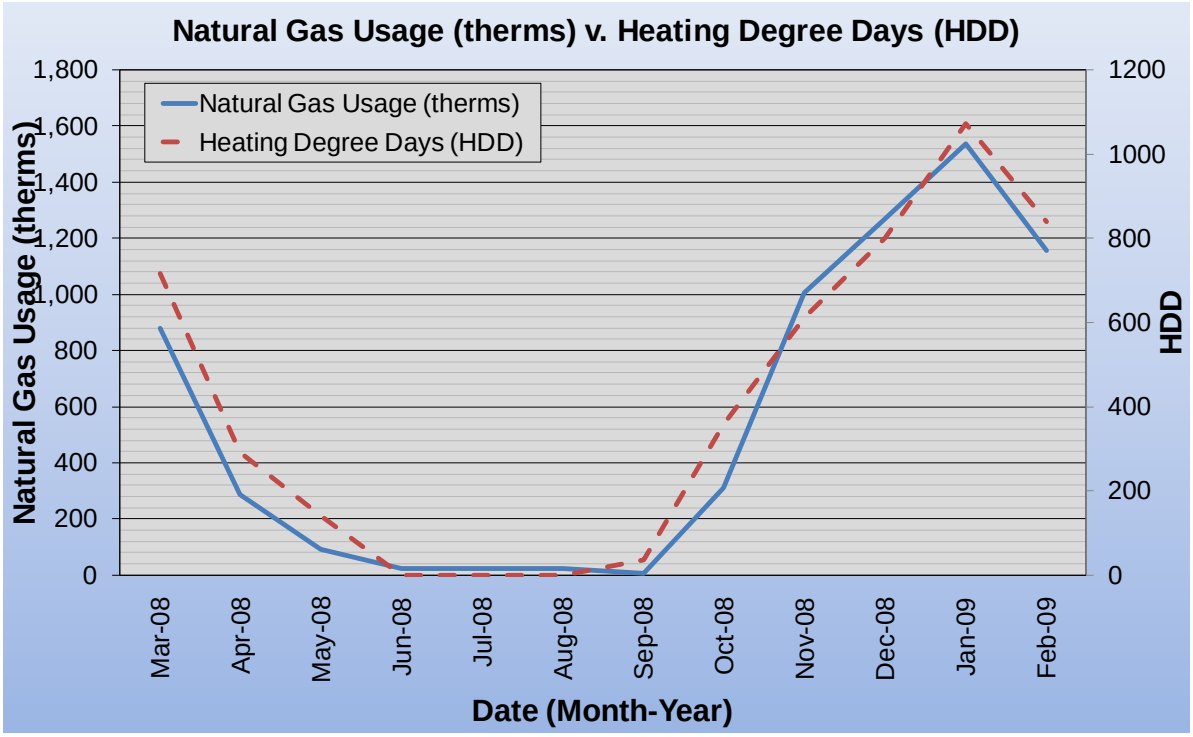


Note on the following chart how the electrical demand peaks (except for a few unusual fluctuation anomalies) follow the electrical consumption and are a steady draw.



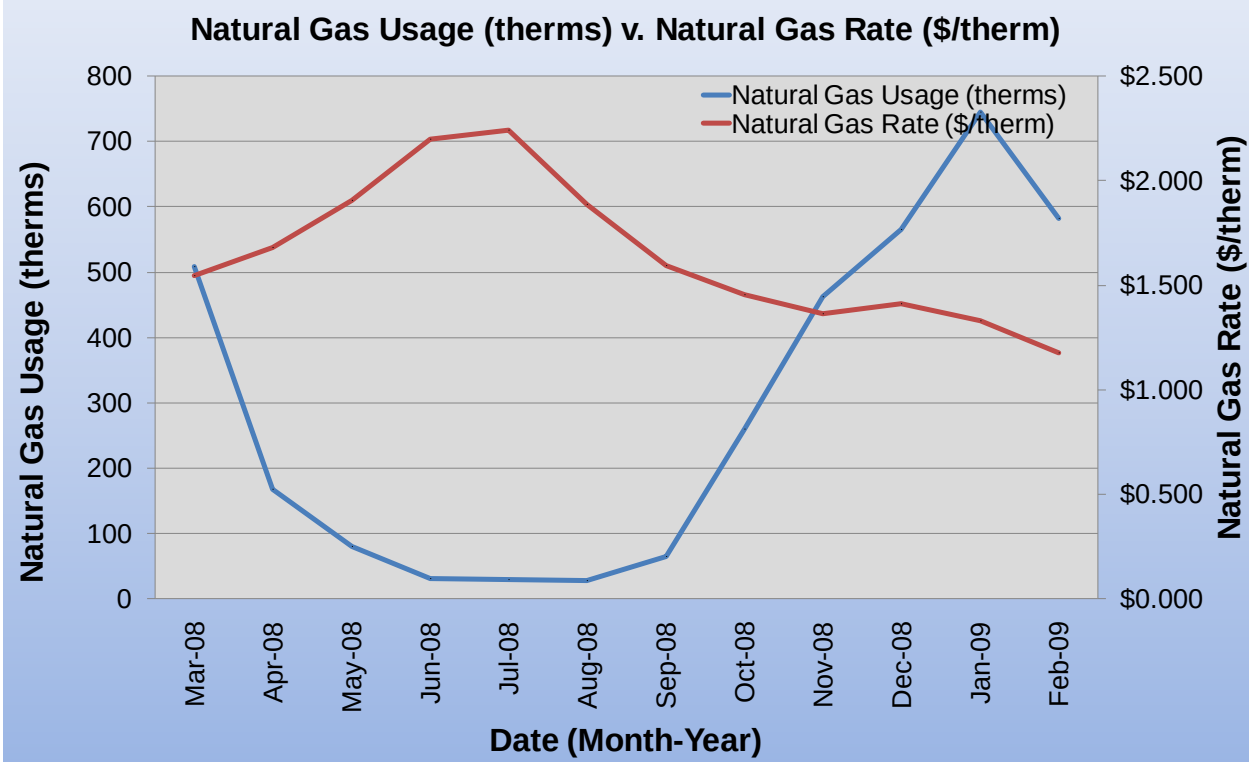
The following is a chart of the natural gas annual load profile for the building, peaking in the coldest months of the year and a chart showing natural gas consumption following the “heating degree days” curve.





6.2 Tariff analysis

Currently, natural gas is provided to the Franklin Lakes Southside Firehouse 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 service rate. The suppliers' general service rate for natural gas charges a market-rate price based on use and the Franklin Lakes Southside Firehouse 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 hot water boiler units. The 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 as seen in June and July. Thus the building pays for fixed costs such as meter reading charges during the summer months. The following chart displays the rate fluctuations.



The Franklin Lakes Southside Firehouse building is direct-metered and currently purchases electricity from Orange Rockland Electric at a general service rate. The general service rate for electric charges are market-rate based on use and the Franklin Lakes Southside Firehouse building billing does show a breakdown of demand costs. Demand prices are 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 the HVAC condensing units and air handlers. Electric rate peaks during winter months, such as December through February can be due to peak charges in the evening when lighting is need for more hours than during the summer.

6.3 Energy Procurement strategies

The Franklin Lakes Southside Firehouse building receives natural gas via one incoming meter. The 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.

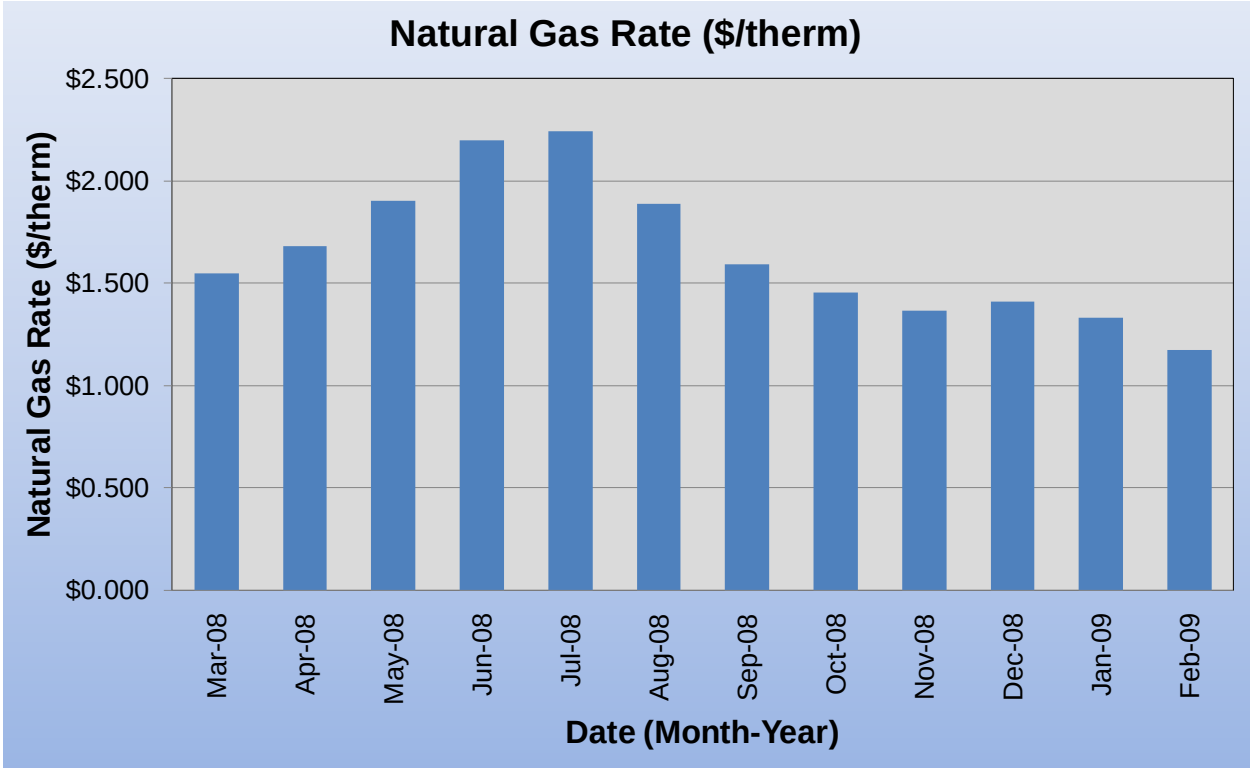
Electricity is purchased via one incoming meter directly for the main Franklin Lakes Southside Firehouse building from Orange Rockland Electric without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations up to 68% over the most recent 12 month period. Natural gas bill analysis also shows fluctuations up to 48% over the most recent 12 month period. Some of these fluctuations may be due to unusually 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 Franklin Lakes Southside Firehouse building annual electric costs are $1,154 higher when compared to the average estimated NJ commercial utility rates.

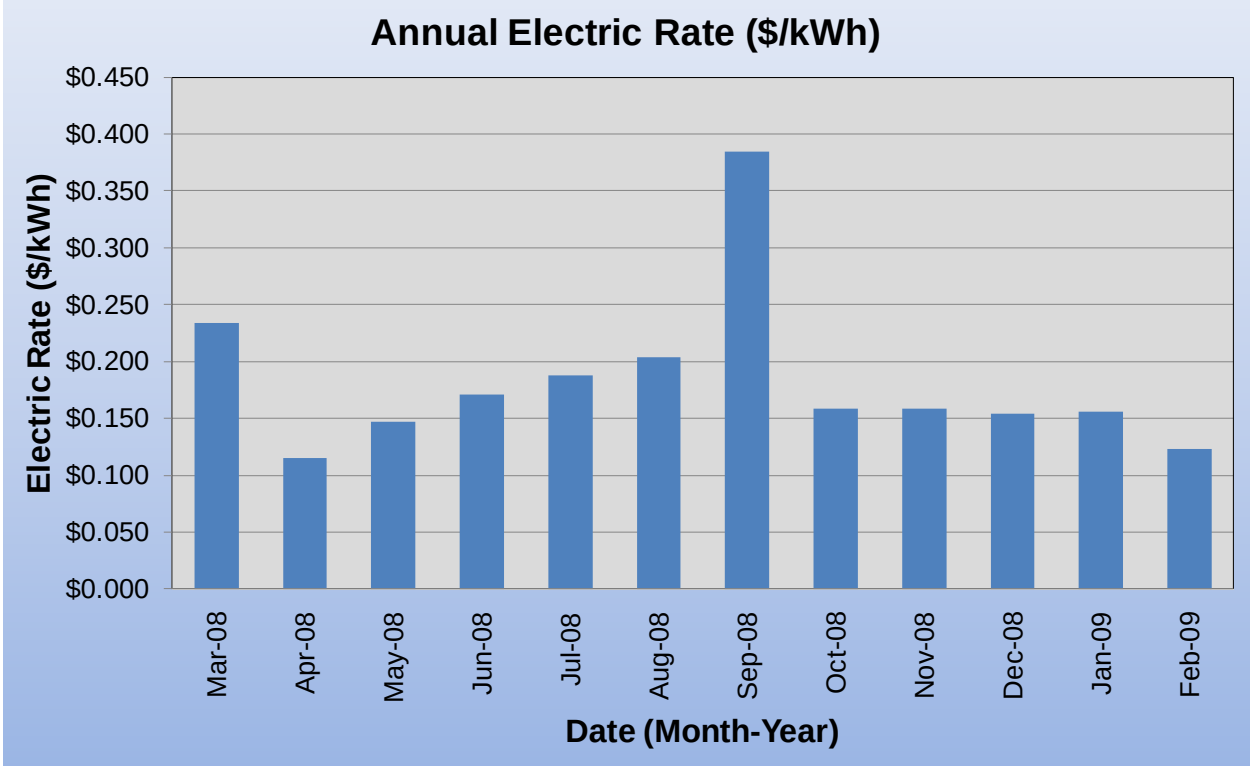
SWA recommends that the Borough of Franklin Lakes further explore opportunities of purchasing both natural gas and electricity from ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Franklin Lakes Southside Firehouse. Appendix B contains a complete list of third party energy suppliers for the Borough of Franklin Lakes service area.

The Borough of Franklin Lakes may want to consider partnering with other school districts, municipalities, townships 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.

In addition, the Franklin Lakes Southside Firehouse building would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time (without a large capital investment) 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. Demand Response could be an option in the future when the Borough of Franklin Lakes may install a large enough back-up emergency generator.

The following charts show the Franklin Lakes Southside Firehouse building monthly spending per unit of energy from March 2008 to February 2009.





7. METHOD OF ANALYSIS

7.1 Assumptions and tools

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

7.2 Disclaimer

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

THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, 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	tv room ()	screw-in	N	cfl	10	1	70	S	6	260	0	700	1,092	N/A	Screw-in	CFL	N	S	10	1	70	6	260	0	700	1092	0	0	0
2	1	kitchen ()	screw-in	N	cfl	12	1	70	S	6	260	0	840	1,310	C	Screw-in	CFL	N	OS	12	1	70	5	260	0	840	983	0	328	328
3	1	kitchen ()	pin	N	hal	5	1	50	S	6	260	13	315	491	CFL	Pin	CFL	N	S	5	1	15	6	260	0	75	117	374	0	374
4	1	bathroom ()	screw-in	N	cfl	3	1	85	S	6	260	0	255	398	C	Screw-in	CFL	N	OS	3	1	85	5	260	0	255	298	0	99	99
5	1	mech rm ()	Recessed	E	4't8	2	1	32	S	2	260	3	70	36	N/A	Recessed	4'T8	E	S	2	1	32	2	260	3	70	36	0	0	0
6	1	truck office ()	Recessed	E	4't8	6	2	32	S	6	260	6	420	655	C	Recessed	4'T8	E	OS	6	2	32	5	260	6	420	491	0	164	164
7	1	()	Recessed	E	4't8	27	2	32	S	6	260	6	1,890	2,948	N/A	Recessed	4'T8	E	S	27	2	32	6	260	6	1890	2948	0	0	0
8	1	()	Recessed	E	8't8	4	4	59	S	6	260	26	1,048	1,635	N/A	Recessed	8'T8	E	S	4	4	59	6	260	26	1048	1635	0	0	0
9	1	()	Recessed	E	4't8	4	1	32	S	6	260	3	140	218	N/A	Recessed	4'T8	E	S	4	1	32	6	260	3	140	218	0	0	0
10	1	kitchen ()	exit sign	N	led	3	1	5	N	24	260	1	18	112	N/A	Exit Sign	LED	N	N	3	1	5	24	260	1	18	112	0	0	0
11	1	truck bay ()	exit sign	N	led	2	1	5	N	24	260	1	12	75	N/A	Exit Sign	LED	N	N	2	1	5	24	260	1	12	75	0	0	0
12	Ext	Exterior ()	screw-in	N	inc	6	1	60	T	16	260	0	360	1,498	CFL	Screw-in	CFL	N	T	6	1	20	16	260	0	120	499	998	0	998
13	Ext	Exterior ()	screw-in	N	inc	3	1	75	S	16	260	0	225	936	CFL	Screw-in	CFL	N	S	3	1	25	16	260	0	75	312	624	0	624
14	Ext	Exterior ()	screw-in	N	inc	2	1	75	T	16	260	0	150	624	CFL	Screw-in	CFL	N	T	2	1	25	16	260	0	50	208	416	0	416
15	Ext	Exterior ()	screw-in	N	cfl	4	1	32	T	16	260	0	128	532	N/A	Screw-in	CFL	N	T	4	1	32	16	260	0	128	532	0	0	0
16	Ext	Exterior ()	screw-in	N	inc	1	1	40	T	16	260	0	40	166	CFL	Screw-in	CFL	N	T	1	1	15	16	260	0	15	62	104	0	104
Totals:						**94**	**21**	**754**				**59**	**6,611**	**12,729**						**94**	**21**	**554**			**46**	**5,856**	**9,621**	**2,517**	**591**	**3,108**
Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space																													

Proposed Lighting Summary Table			
Total Surface Area (SF)	6,600		
Average Power Cost ($/kWh)	0.1860		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	3,756	1,614	**2,142**
Exterior Power (watts)	903	388	**515**
Total Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	8,972	8,007	**3,108**
Lighting Power (watts)	5,708	5,468	**240**
Lighting Power Density (watts/SF)	0.86	0.83	**0.04**
Estimated Cost of Fixture Replacement ($)	853		
Estimated Cost of Controls Improvements ($)	660		
Total Consumption Cost Savings ($)	**614**		

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

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

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
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

Third Party Electric Suppliers for Orange Rockland Service Territory	Telephone & Web Site
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07097	(800) 437-7872 www.hess.com
Liberty Power Holdings, LLC Park 80 West, Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-03799 www.libertypowercorp.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com
Suez Energy Resources NA, Inc. 333 Thornal Street, 6th Floor Edison, NJ 08837	(888) 999-8374 www.suezenergyresources.com

Appendix C: Glossary and Method of Calculations

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.

Gas Rate and Electric Rate ($/therm and $/kWh): The gas rate and electric rate used in the financial analysis is the total annual energy cost divided by the total annual energy usage for the 12 month billing period studied. The graphs of the monthly gas and electric rates reflect the total monthly energy costs divided by the monthly usage, and display how the average rate fluctuates throughout the year. The average annual rate is the only rate used in energy savings calculations.

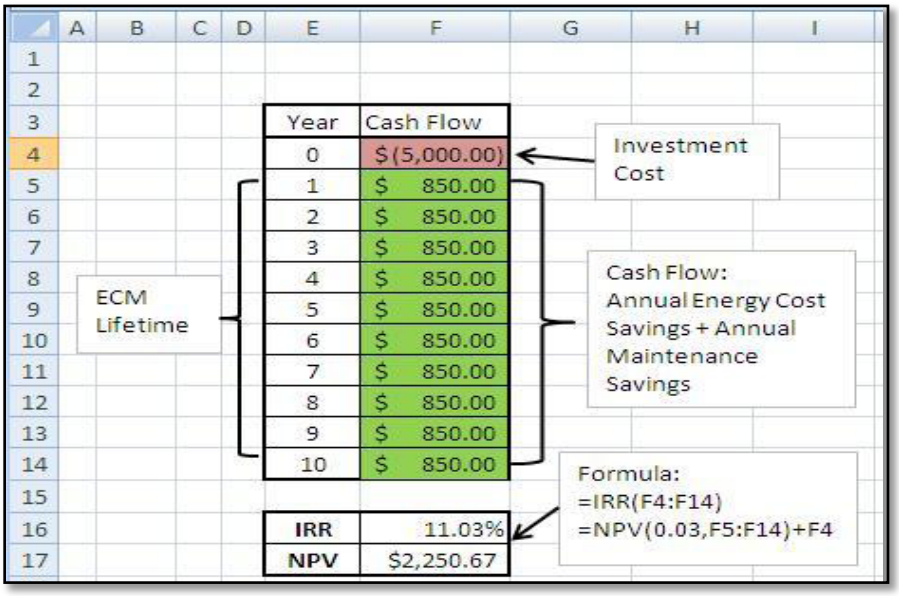
Calculation References

Term	Definition
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
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)]

* 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).

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:



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years
Incentive 1:	NJ Renewable Energy Incentive Program (REIP), for systems of size 50kW or less, $1/Watt incentive subtracted from installation cost
Incentive 2:	Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume $600/Megawatt hour consumed per year for a maximum of 15 years; added to annual energy cost savings for a period of 15 years. (Megawatt hour used is rounded to nearest 1,000 kWh)
Assumptions:	A Solar Pathfinder device is used to analyze site shading for the building and determine maximum amount of full load operation based on available sunlight. When the Solar Pathfinder device is not implemented, amount of full load operation based on available sunlight is assumed to be 1,180 hours in New Jersey.

Total lifetime PV energy cost savings =
kWh produced by panel * [$/kWh cost * 25 years + $600/Megawatt hour /1000 * 15 years]

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.

New Jersey Clean Energy Program Commercial & Industrial Lifetimes

Measure	Life Span
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

Appendix D: Incentive Programs

New Jersey Clean Energy Pay for Performance

The NJ Clean Energy Pay for Performance (P4P) Program relies on a network of Partners who provide technical services to clients. LGEA participating clients who are not receiving Direct Energy Efficiency and Conservation Block Grants are eligible for P4P. SWA is an eligible Partner and can develop an Energy Reduction Plan for each project with a whole-building traditional energy audit, a financial plan for funding the energy measures and an installation construction schedule.

The Energy Reduction Plan must define a comprehensive package of measures capable of reducing a building's energy consumption by 15+%. P4P incentives are awarded upon the satisfactory completion of three program milestones: submittal of an Energy Reduction Plan prepared by an approved Program Partner, installation of the recommended measures and completion of a Post-Construction Benchmarking Report. The incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum 15%performance threshold savings has been achieved.

For further information, please see: http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings .

Direct Install 2010 Program

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC and other equipment with energy efficient alternatives. The program pays **up to 80%** of the retrofit costs, including equipment cost and installation costs. See all applicable DI measures on the following pages.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 200 kW** within 12 months of applying
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies
    - Electric: Atlantic City Electric, Jersey Central Power & Light, Orange Rockland Electric, PSE&G
    - Natural Gas: Elizabethtown Gas, New Jersey Natural Gas, PSE&G, South Jersey Gas

For the most up to date information on contractors in New Jersey who participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

Smart Start

New Jersey's SmartStart Building Program is administered by New Jersey's Office of Clean Energy. The program also offers design support for larger projects and technical assistance for smaller projects. If your project specifications do not fit into anything defined by the program, there are even incentives available for custom projects.

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings.

Renewable Energy Incentive Program

The Renewable Energy Incentive Program (REIP) provides incentives that reduce the upfront cost of installing renewable energy systems, including solar, wind, and sustainable biomass. Incentives vary depending upon technology, system size, and building type. Current incentive levels, participation information, and application forms can be found at the website listed below.

Solar Renewable Energy Credits (SRECs) represent all the clean energy benefits of electricity generated from a solar energy system. SRECs can be sold or traded separately from the power, providing owners a source of revenue to help offset the cost of installation. All solar project owners in New Jersey with electric distribution grid-connected systems are eligible to generate SRECs. Each time a system generates 1,000 kWh of electricity an SREC is earned and placed in the customer's account on the web-based SREC tracking system.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/renewable-energy/home/home.

Utility Sponsored Programs

Check with your local utility companies for further opportunities that may be available.

Federal and State Sponsored Programs

Other federal and state sponsored funding opportunities may be available, including BLOCK and R&D grant funding. For more information, please check http://www.dsireusa.org/.

LIGHTING

Proposed Fixture
2' T8 1-lamp with EB
2' T8 2-lamp with EB
2' T8 3-lamp with EB
2' T8 4-lamp with EB
4' T8 1-lamp with EB
4' T8 2-lamp with EB
4' T8 3-lamp with EB
4' T8 4-lamp with EB
2' T8 1-lamp with EB plus reflector
4' T8 1-lamp with EB plus reflector
4' T8 2-lamp with EB plus reflector
4' T8 3-lamp with EB plus reflector
8' T8 2-lamp with EB
4' T8 4-lamp with EB plus reflector
4' T8 6-lamp with EB plus reflector
8' T8 2-lamp with EB plus reflector
2' T8 U-Lamp with EB
4' T8 2-lamp w/ HPEB
4' T8 2-lamp w/ HPEB plus reflector
4' T8 4-lamp w/ HPEB
4' T8 4-lamp w/ HPEB plus reflector
54T5HO 2-lamp and fixture
54T5HO 3-lamp and fixture
T8 3-lamp fixture with EB & reflector
T8 4-lamp fixture with EB & reflector
54T5HO 4-lamp and fixture
5W CF Screw-in Quad Lamp
5W CF Screw-in Torpedo or R20 Lamp
CF 7-1L SCREW IN CFL
CF 9-1L SCREW IN CFL
CF 13-1L SCREW IN CFL
CF 18-1L SCREW IN CFL
CF 22-1L SCREW IN CFL
CF 26-1L SCREW IN CFL
CF 28-1L SCREW IN CFL
CF 32-1L SCREW IN CFL
CF 36-1L SCREW IN CFL
CF 42-1L SCREW IN CFL
CF 7-1L SCREW IN CFL DIMMABLE
CF 18-1L SCREW IN CFL DIMMABLE
CF 23-1L SCREW IN CFL DIMMABLE
18W CIRCLINE w/ dome
32W CIRCLINE w/ dome
40W CIRCLINE w/ dome
58W CIRCLINE w/ dome
28W CF Exterior Floodlight w/PE
1 LAMP T5 HIGH BAY HO FIXTURE
2 LAMP T5 HIGH BAY HO FIXTURE
3 LAMP T5 HIGH BAY HO FIXTURE
4 LAMP T5 HIGH BAY HO FIXTURE
5 LAMP T5 HIGH BAY HO FIXTURE
6 LAMP T5 HIGH BAY HO FIXTURE
MH PS (320 W) RETRO.
MH PS (250W) RETRO.
MH PS (200 W) RETRO.
MH PS (175 W) RETRO.
NEW MH PS (320 W) FIXTURE
NEW MH PS (250 W) FIXTURE
NEW MH PS (200 W) FIXTURE
NEW MH PS (175 W) FIXTURE
42W Halogen Lamp (12 V System)
50W Halogen Lamp (12 V System)
65W Halogen Lamp (12 V System)
LED Exit Sign Retrofit Kit
LED Universal Exit Sign
LED EXIT Sign w/ Batt. Backup

LIGHTING CONTROLS

Proposed Sensor
Occ. Sensor Ceiling Mount (line volt)
Occ. Sensor Ceiling Mount (low volt)
Dual Tech. Occ.Sens Ceiling (line v)
Dual Tech. Occ.Sens Ceiling (low v)
Occ. Sens. Wall/Corner Mount (line v)
Occ. Sens. Wall/Corner Mount (low v)
Dual Tech Occ.Sens Wall/Corner (line v)
Dual Tech Occ.Sens Wall/Corner (low v)
Occupancy Sensor Wall Switch
Dual Tech Occ. Sensor Wall Switch
Occ.Sensor for High Bay Fixtures
Photocell Control w/ Dimmable Balast
Programmable Time Clock
Add'l Power Pack (a.k.a. Relay)

VFDS

Lookup
VFD for 1 HP Motor
VFD for 1.5 HP Motor
VFD for 2 HP Motor
VFD for 3 HP Motor
VFD for 5 HP Motor
VFD for 7.5 HP Motor
VFD for 10 HP Motor

GAS MEASURES

Measure Description
Low Intensity IR Heating Unit (Gas)
Gas-Fired Furnace
Gas-Fired Boiler

HVAC & HW CONTROLS

Equipment Type
Outside Economizer
Demand Control Ventilation
Programmable Thermostats

Pipe Wrap

0.75
1
1.25
1.5
2
2.5
3
4
6
8

MOTORS

Motor Description
Open Drip Proof - 1200 RPM - 5 HP
Open Drip Proof - 1200 RPM - 7.5 HP
Open Drip Proof - 1200 RPM - 10 HP
Open Drip Proof - 1800 RPM - 1.5 HP
Open Drip Proof - 1800 RPM - 2 HP
Open Drip Proof - 1800 RPM - 3 HP
Open Drip Proof - 1800 RPM - 5 HP
Open Drip Proof - 1800 RPM - 7.5 HP
Open Drip Proof - 1800 RPM - 10 HP
Open Drip Proof - 3600 RPM - 7.5 HP
Open Drip Proof - 3600 RPM - 10 HP
Enclosed, Fan-Cooled - 1200 RPM - 2 HP
Enclosed, Fan-Cooled - 1200 RPM - 3 HP
Enclosed, Fan-Cooled - 1200 RPM - 5 HP
Enclosed, Fan-Cooled - 1200 RPM - 7.5 HP
Enclosed, Fan-Cooled - 1200 RPM - 10 HP
Enclosed, Fan-Cooled - 1800 RPM - 3 HP
Enclosed, Fan-Cooled - 1800 RPM - 5 HP
Enclosed, Fan-Cooled - 1800 RPM - 7.5 HP
Enclosed, Fan-Cooled - 1800 RPM - 10 HP
Enclosed, Fan-Cooled - 3600 RPM - 7.5 HP
Enclosed, Fan-Cooled - 3600 RPM - 10 HP

OIL/PROPANE MEASURES

Measure /Capacity (Btus)
Oil-Fired Furnace
60,001 to 80,000
80,001 to 100,000
100,001 to 120,000
120,001 to 140,000
Propane-Fired Furnace
25,000 to 40,000
40,001 to 60,000
60,001 to 80,000
80,001 to 100,000
100,001 to 120,000
120,001 to 140,000
Oil-Fired Boiler
75,000 to 100,000
100,001 to 150,000
150,001 to 225,000
225,001 to 300,000
300,001 to 400,000
400,001 to 500,000
Propane-Fired Boiler
75,000 to 100,000
100,001 to 150,000
150,001 to 225,000
225,001 to 300,000
300,001 to 400,000
400,001 to 500,000

HOT WATER MEASURES
Low-flow Showerhead
Low-flow faucet aerators
Low-flow Kitchen Pre-Rinse Spray Valves

Fuel Economizer Control

Models	For Use with	Fuel	For HVAC Sizes	
IntelliCon-HW+	Resid. Hot Water Sys	Oil/Gas	<300	kBTU/hr
IntelliCon-LCH	Lt. Comm. Hot Water Sys.	Oil/Gas	300-2500	kBTU/hr
IntelliCon-CHW	Comm. Hot Water Sys.	Oil/Gas	>2500	kBTU/hr
IntelliCon-LCS	Lt. Comm. Steam Boilers	Oil/Gas	<2500	kBTU/hr
IntelliCon-CHS	Comm. Steam Boiler Sys.	Oil/Gas	>2500	kBTU/hr
IntelliCon-FA	Res/Comm. Forced Air Heat Sys.	Oil/Gas	all sizes	
IntelliCon-AC	Resid. Central AC	Electric	0-5	tons
IntelliCon-CAC	Comm. Central AC	Electric	>5	tons
IntelliCon-RU	Refrigeration Units	Electric	all sizes	

REFRIGERATION

Measure Description
Evaporator/Compressor Controller for one Cooler
Incremental Cost for each additional Cooler
First Cooler/Freezer Door Heater Control
Incremental Cost for each additional Cooler/Freezer Heater Circuit

PACKAGED HVAC

Equipment Type
2.5-Ton Packaged Unitary A/C (Elec.)
3-Ton Packaged Unitary A/C (Elec.)
4-Ton Packaged Unitary A/C (Elec.)
5-Ton Packaged Unitary A/C (Elec.)
7.5-Ton Packaged Unitary A/C (Elec.)
10-Ton Packaged Unitary A/C (Elec.)
12-Ton Packaged Unitary A/C (Elec.)
15-Ton Packaged Unitary A/C (Elec.)
2.5-Ton Packaged Unit (Elec. AC/Gas Heat)
3-Ton Packaged Unit (Elec. AC/Gas Heat)
4-Ton Packaged Unit (Elec. AC/Gas Heat)
5-Ton Packaged Unit (Elec. AC/Gas Heat)
7.5-Ton Packaged Unit (Elec. AC/Gas Heat)
10-Ton Packaged Unit (Elec. AC/Gas Heat)
12-Ton Packaged Unit (Elec. AC/Gas Heat)
15-Ton Packaged Unit (Elec. AC/Gas Heat)
2-Ton Electric Split System A/C
2.5-Ton Electric Split System A/C
3-Ton Electric Split System A/C
4-Ton Electric Split System A/C
5-Ton Electric Split System A/C
7.5-Ton Electric Split System A/C
2-Ton Air Source Heat Pump
2.5-Ton Air Source Heat Pump
3-Ton Air Source Heat Pump
4-Ton Air Source Heat Pump
5-Ton Air Source Heat Pump
7.5-Ton Air Source Heat Pump
2.5-Ton Water Source Heat Pump
3-Ton Water Source Heat Pump
4-Ton Water Source Heat Pump
5-Ton Water Source Heat Pump
7.5-Ton Water Source Heat Pump