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June 14, 2010

Local Government Energy Program
Energy Audit Final Report

Fair Lawn Fleet Maintenance Garage
20-05 Saddle River Road

Project Number: LGEA43

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INTRODUCTION

On December 15th and January 6th Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment for the Borough of Fair Lawn Fleet Maintenance Garage. The audit included a review of the:

- Fair Lawn Municipal Building
- Fair Lawn Community Center
- Fair Lawn Senior Center
- Fair Lawn Fleet Maintenance Garage

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

This report addresses the Fair Lawn Fleet Maintenance Garage located at 20-05 Saddle River Rd, Fair Lawn, 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 Fair Lawn Fleet Maintenance Garage building was built in 2001, without major renovations or additions. The building houses several offices in addition to 7 double dump truck size bays. The building consists of 15,900 square feet of heated space. The Fair Lawn Fleet Maintenance Garage is occupied on weekdays by approximately 3 to 5 employees from 7:00 am to 3:30 pm Monday through Friday and only opens on weekends if there is an emergency.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Borough of Fair Lawn to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the Fair Lawn Fleet Maintenance Garage. SWA was informed that the Borough of Fair Lawn has been certified under the Sustainable Jersey program as one of 34 communities state wide to achieve the status.

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 Fair Lawn Fleet Maintenance Garage building located at 20-05 Saddle River Rd, Fair Lawn, NJ. The Fair Lawn Fleet Maintenance Garage building is a single-story building with a floor area of 15,900 square feet. The original structure was built in 2001.

Based on the field visits performed by the SWA staff on December 15th and January 6th 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 Fair Lawn Fleet Maintenance Garage building consumed 85,840 kWh or $14,847 worth of electricity at an approximate rate of $0.173/kWh and 10,263 therms or $14,073 worth of natural gas at an approximate rate of $1.371/therm. The joint energy consumption for the building, including both electricity and natural gas, was 1,319 MMBtu of energy that cost a total of $28,920.

SWA has entered energy information about the Fair Lawn Fleet Maintenance Garage building in the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy benchmarking system. This Vehicle Service / Repair facility is comprised of non-eligible (Other) space type. SWA encourages the Borough of Fair Lawn 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 88.0 kBtu/ft^{2}yr compared to the national average of vehicle service/ repair buildings consuming 77.0 kBtu/ft^{2}yr. Implementing this report's recommendations will reduce use by approximately 17.8 kBtu/ft^{2}yr, which when implemented would bring the building's energy consumption below the national average. There may be energy procurement opportunities for the Fair Lawn Fleet Maintenance Garage building to reduce annual electric utility costs, which are $1,971 higher, when compared to the average estimated NJ commercial utility rates.

Based on the assessment of the Fair Lawn Fleet Maintenance Garage, 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 CO / CO_2 detectors with alarms for the garage, office and break room areas
- Install premium motors when replacements are required

Category II Recommendations: Operations and Maintenance

- Maintain / repair garage doors so that they fully close and are sealed all around
- Maintain the integrity of the exterior wall and roof insulation by patching any damage or penetrations that may result from weather or age. Install a removable, insulated cover (or gravity louvers) for the exhaust fan.

- Maintain roofs and verify water is draining correctly
- Maintain downspouts - repair / install missing downspouts as needed
- Provide weather stripping / air sealing
- 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 **two** Energy Conservation Measures (ECMs) for the Fair Lawn Fleet Maintenance Garage building that is summarized in the following Table 1. The total investment cost for these ECMs with incentives is **$5,341**. SWA estimates a first year savings of **$5,007** with a simple payback of **1.1 years**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the Fair Lawn Fleet Maintenance Garage building by **29,572 lbs of CO_2**, which is equivalent to removing approximately 2 cars from the roads each year or avoiding the need of 72 trees to absorb the annual CO_2 generated. SWA also recommends **three** ECMs with a total first year savings of **$45,967** that is summarized in Table 2.

There are various incentives that the Borough of Fair Lawn 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 80% of the capital investment. The Fleet Maintenance Garage is eligible for Direct Install since the peak energy demand has been well below 200 kW for 12 consecutive months.

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

The following two tables summarize the proposed Energy conservation Measures (ECMs) and their economic relevance.

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
1	Install (2) Drink vending machine energy misers	www.usatech.com and established costs	558	none at this time	558	4,784	1.3	0	1.0	0	828	12	9,932	0.7	1680	140	148	7,583	6,554
2	20 New T8 fixtures to be installed with incentives	RS Means, lit search	5,383	600	4,783	16,801	3.5	N/A	3.6	1,272	4,179	15	62,686	1.1	1211	81	87	44,393	23,018
	TOTALS		**5,941**	**600**	**5,341**	**21,585**	**5**	**0**	**4.6**	**1,272**	**5,007**		**72,618**	**1.1**	**-**	**-**	**-**	**51,975**	**29,572**

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
3	Replace two old refrigerator with an 18 cu ft Energy Star model	Energy Star purchasing and procurement site, similar projects	1,000	0	1,000	700	0.2	0	0.2	0	121	10	1,211	8.3	21	2	4	23	959
4	5 New occupancy sensors to be installed with incentives	RS Means, lit search	1,100	100	1,000	1,382	0.3	0	0.3	0	239	15	3,586	4.2	259	17	23	1,813	1,893
5	Install 50 kW PV Rooftop System, 4300 sqft	Quote / Similar projects	350,000	50,000	300,000	59,000	50.0	0	12.7	0	45,607	25	786,175	6.6	162	6.5	1322	890,393	105,640
	TOTALS		**352,100**		**302,000**	**61,082**	**50.5**	**0**	**13.2**	**0**	**45,967**	**-**	**790,972**	**6.6**	**-**	**-**	**-**	**892,229**	**108,492**

1. HISTORIC ENERGY CONSUMPTION

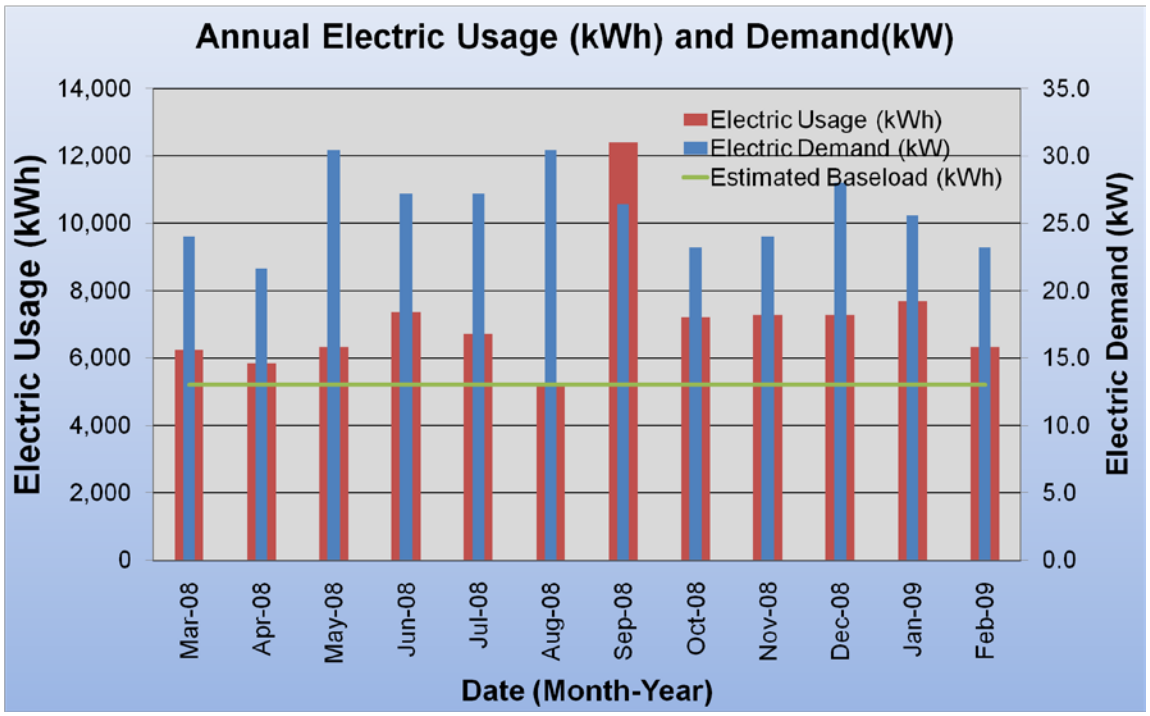
1.1 Energy usage and cost analysis

SWA analyzed utility bills from March 2008 through February 2009 that were received from the utility companies supplying the Fair Lawn Fleet Maintenance Garage with electric and natural gas.

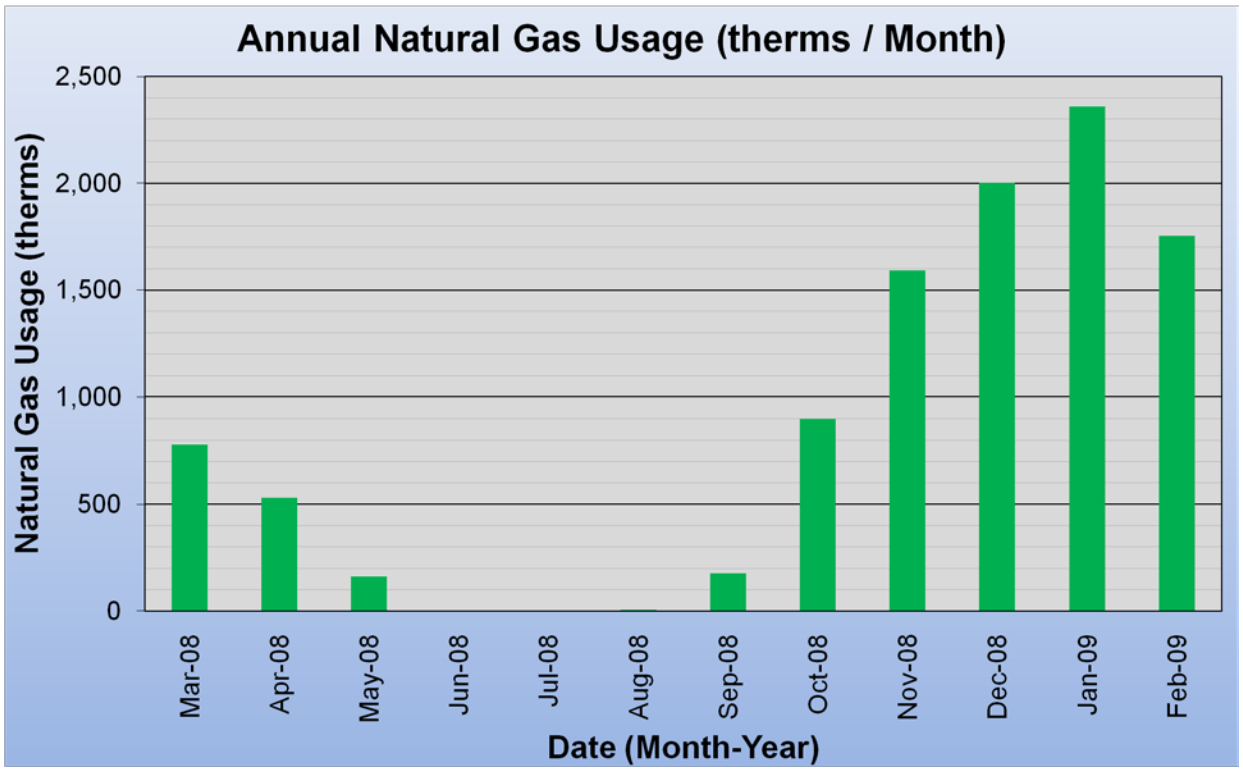
Electricity - The Fair Lawn Fleet Maintenance Garage is currently served by one electric meter. The Fair Lawn Fleet Maintenance Garage building currently buys electricity from PSE&G at **an average rate of $0.173/kWh** based on 12 months of utility bills from March 2008 and February 2009. The Fair Lawn Fleet Maintenance Garage building purchased **approximately 85,840 kWh or $14,847 worth of electricity** in the previous year. The average monthly demand was 24 kW.

Natural gas - The Fair Lawn Fleet Maintenance Garage is currently served by one meter for natural gas. The Fair Lawn Fleet Maintenance Garage also buys natural gas from PSE&G at **an average aggregated rate of $1.371/therm** based on 12 months of utility bills for March 2008 and February 2009. The Fair Lawn Fleet Maintenance Garage purchased **approximately 10,263 therms or $14,073 worth of natural gas** in the previous year.

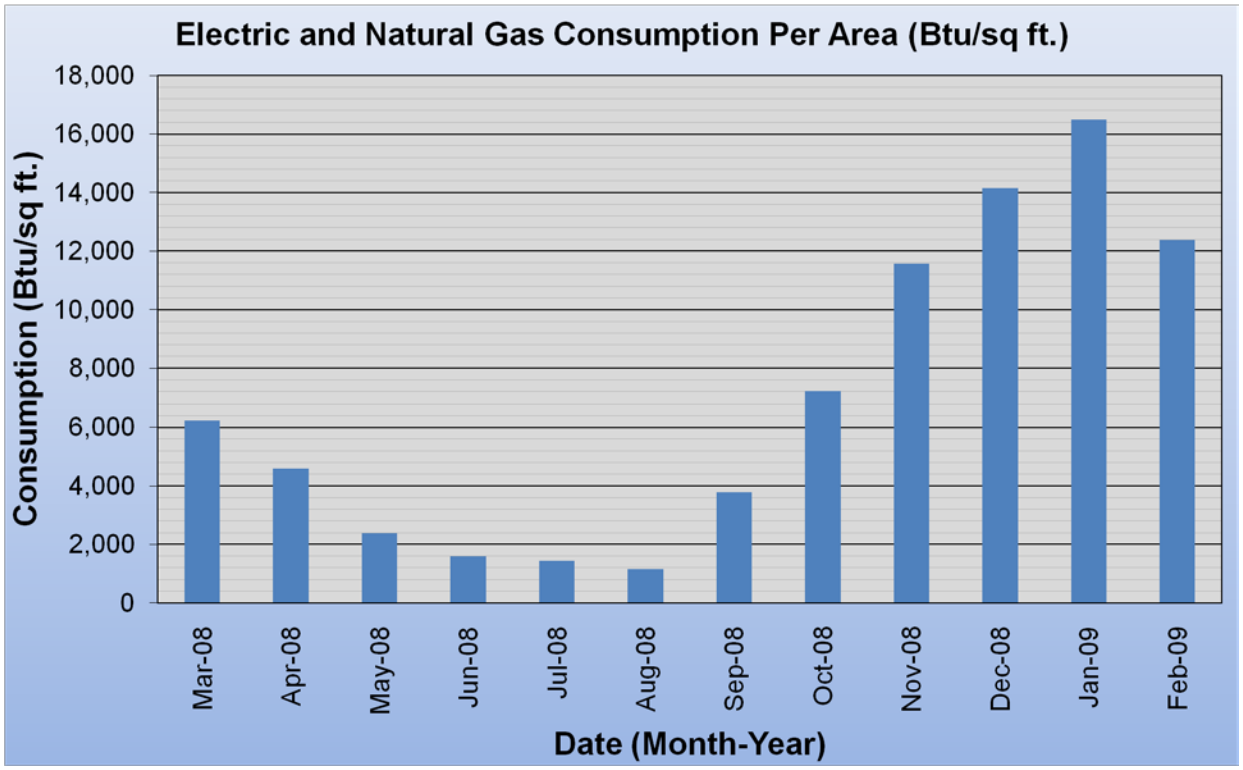
The following chart shows electricity use for the Fair Lawn Fleet Maintenance Garage building based on utility bills for the 12 month period of March 2008 through February 2009.



The following chart shows the natural gas consumption for the Fair Lawn Fleet Maintenance Garage building based on natural gas bills for the 12 month period of March 2008 through February 2009.

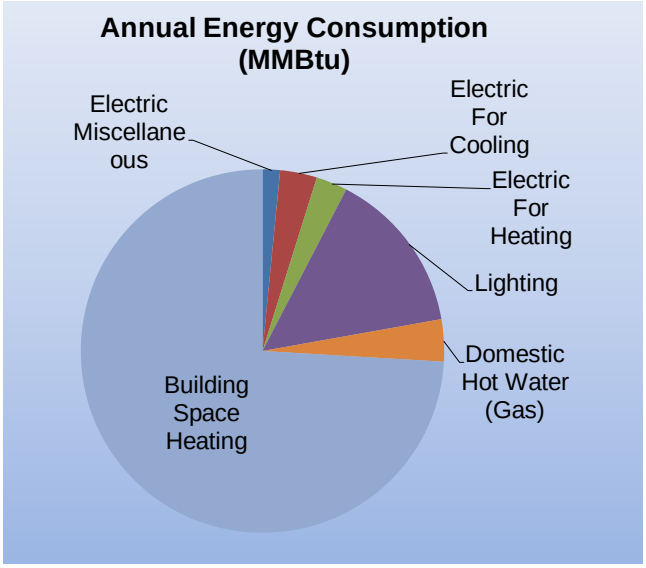


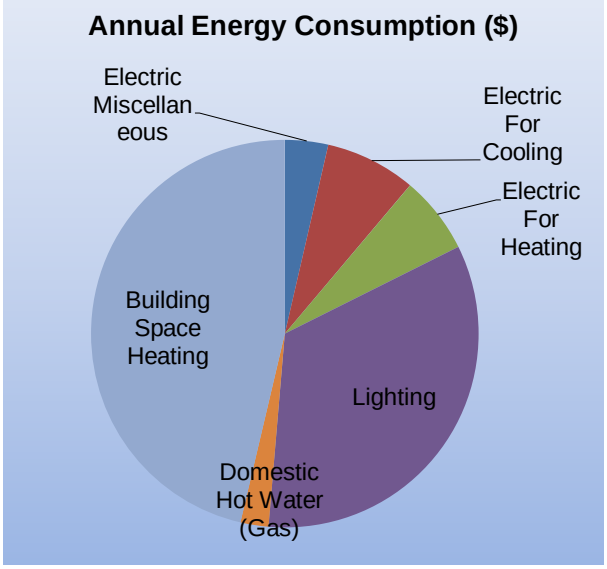
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Fair Lawn Fleet Maintenance Garage building based on utility bills for the 12 month period of March 2008 through February 2009.



The following table and pie charts show energy use for the Fair Lawn Fleet Maintenance Garage building based on utility bills for the 12 month period of March 2008 through February 2009. Note electrical cost at $51/MMBtu of energy is more than 3 times as expensive to use as natural gas at $14/MMBtu.

2009 Annual Energy Consumption / Costs					
	MMBtu	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Electric Miscellaneous	21	2%	$1,042	4%	51
Electric For Cooling	43	3%	$2,186	8%	51
Electric For Heating	37	3%	$1,868	6%	51
Lighting	192	15%	$9,751	34%	51
Domestic Hot Water (Gas)	49	4%	$677	2%	14
Building Space Heating	977	74%	$13,396	46%	14
Total Electric Usage	293	22%	$14,847	51%	51
Total Gas Usage	1,026	78%	$14,073	49%	14
Totals	1,319	100%	$28,920	100%	--





1.2 Utility rate

The Fair Lawn Fleet Maintenance Garage building currently purchases electricity from PSE&G at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Fair Lawn Fleet Maintenance Garage building currently pays an average rate of approximately $0.173/kWh based on the 12 months of utility bills of March 2008 through February 2009.

The Fair Lawn Fleet Maintenance Garage 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 Fair Lawn Fleet Maintenance Garage building currently. The average aggregated rate (supply and transport) for the meter is approximately $1.371/therm based on 12 months of utility bills for March 2008 through February 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 Fair Lawn Fleet Maintenance Garage building in the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy benchmarking system. This (Vehicle Service / Repair) facility is comprised of non-eligible (Other) space type. This building type 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 Fair Lawn Fleet Maintenance Garage is not eligible to receive a national energy performance rating at this time.

The Site Energy Use Intensity is 88 kBtu/sq ft yr compared to the national average of a Service/Vehicle Repair 77 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 4.6 kBtu/sqft yr, with an additional 13.2 kBtu/sq ft yr from the recommended ECMs. These recommendations could account for at least 17.8 kBtu/sq ft yr and therefore reduce the site energy utilization index to 70.2 kBtu/sqft/yr, well below the national average.

Per the LGEA program requirements, SWA has assisted the Borough of Fair Lawn to create an Energy Star Portfolio Manager account and share the Fair Lawn Fleet Maintenance Garage 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 Fair Lawn (user name of "FairlawnBorough" with a password of "fairlawn") and TRC Energy Services (user name of TRC-LGEA).

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Fair Lawn - Maintenance/Storage Facility

Building ID: 1973693
For 12-month Period Ending: February 28, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: January 26, 2010

Facility
Borough of Fair Lawn - Maintenance/Storage Facility
20-05 Saddle River Road
Fair Lawn, NJ 07410

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 2001
Gross Floor Area (ft²): 15,900

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	305,948
Natural Gas (kBtu)[4]	1,099,782
Total Energy (kBtu)	1,405,730
Energy Intensity[5]	
Site (kBtu/ft²/yr)	88
Source (kBtu/ft²/yr)	137
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	105
Electric Distribution Utility	
Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	77
National Average Source EUI	150
% Difference from National Average Source EUI	-9%
Building Type	Service (Vehicle Repair/Service, Postal Service)

Stamp of Certifying Professional

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

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 Fleet Maintenance Garage is a one level building with mezzanine storage areas. The building consists of 15,900 square feet of space. The garage was built in 2001 and it houses the following areas: an administrative office, a multipurpose room / lunchroom, a locker room, a bathroom, a pantry, a mechanical room, a tank storage room, equipment storage areas and 7 double dump truck size bays: 3 bays open to the storage garage and four bays open to the main garage.

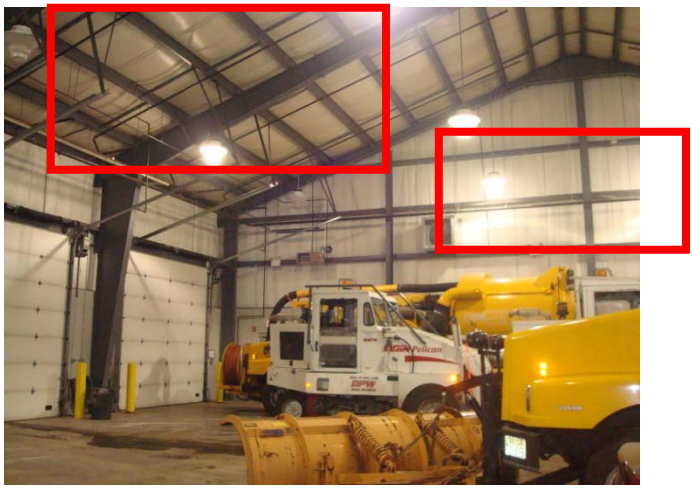
2.2 Building Occupancy profiles

The peak occupancy for the Fleet Maintenance Garage is approximately 19 employees with generally 3-5 employees in the building at any onetime. The building is generally operated from 7:00 am to 3:30 pm Monday through Friday for 56 hours / week (excluding emergencies). The building may be utilized during nights and weekends for emergencies.

2.3 Building Envelope

2.3.1 Exterior Walls

The bottom 9'-8" building wall is constructed of split face decorative 12" block masonry units (CMUs) with different earth-tone color accent bands. The exterior side has rain-guard waterproofing applied to it. The balance of the 22 ft exterior wall is covered by an insulated metal panel wall system also insulated with batt fiberglass insulation R-19 on the inside per Butler building Stylwall II flat panel system. The panel has an earthen color texture coat finish. At the time of the field inspection the exterior walls appeared to be in good condition with proper flashing and drainage including 6" aluminum gutters to 5" leader to a concrete splash block.



Roof / ceiling and wall batt insulation

2.3.2 Roof

The building has a VSR architectural standing-seam metal pitched roof system made up of 16" wide metal strips of a Mojave tan color. According to the building drawings, the roof insulation is R-30 batt fiberglass insulation supported by a sky-web system in different roof sections. This

2001 roof looked age appropriate, with gutters in visually good condition. There weren't any reported roof leaks.

2.3.3 Base

The building's base is a 4" concrete slab-on grade with a perimeter footing. There weren't any reported problems with water seepage through the slab or other issues related to thermal performance or moisture. There are 2" of rigid board insulation at the interior of the foundation walls and extending 2 feet from the foundation walls under the slab. This is standard for this type of structure. SWA does not recommend any additional insulation as it would not be cost effective. The slab edge or perimeter insulation could not be verified.

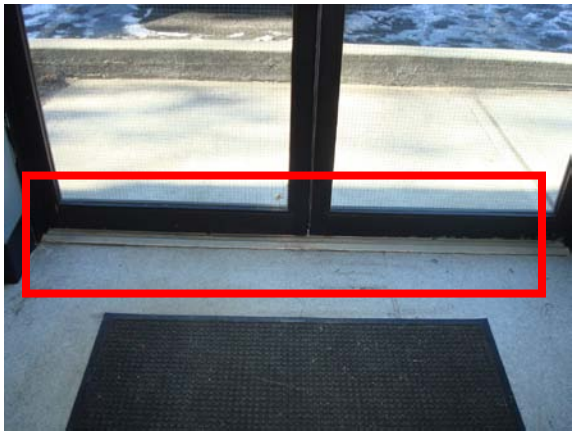
2.3.4 Windows

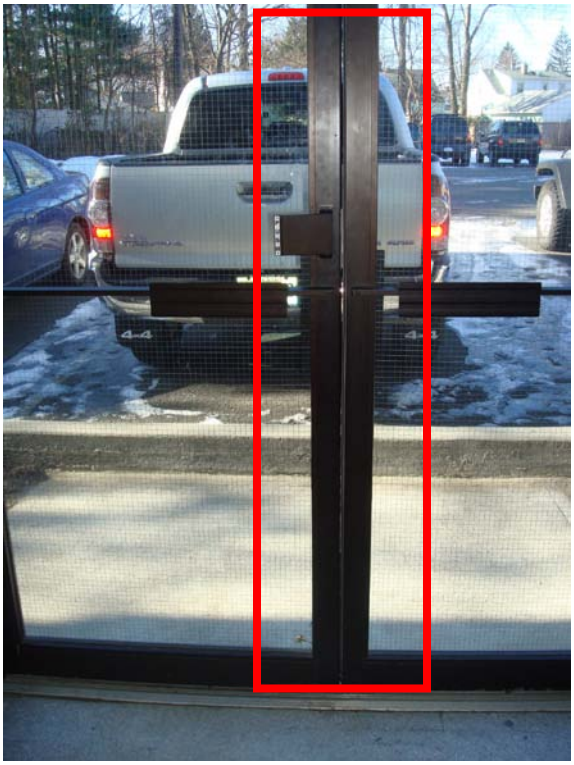
The building contains Energy Star Anderson commercial grade sand-tone colored double hung windows model TW 30310 with double-glazing and low-e (U-value of 0.34). The office vestibule and front entrance area has a number of aluminum framed thermally insulated tempered glass storefront windows. The windows appeared to be in good condition. According to specifications, all of the windows are installed with thermal breaks. There weren't any comfort related complaints or signs of condensation found. There weren't any visible damage to the window frames or to the caulking.

2.3.5 Exterior doors

The aluminum framed exterior doors and metal doors were observed to be in good condition except for some missing or worn weather-stripping. SWA also recommends checking the weather-stripping of each door (including garage doors) on a regular basis and replacing any broken seals immediately. Tight seals around the doors will help ensure that the building is kept continuously tight and insulated.

Door weather stripping in need of replacement





2.3.6 Building air tightness

Based on a visual inspection, the building was observed to be a relatively well-sealed building. There weren't any major observed deficiencies of air tightness within the building besides some of the exterior doors. Also, additional calking is recommended around the office through the wall heat pump.

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 Fair Lawn Fleet Maintenance Garage is heated by ceiling hung natural gas fired heaters in both garages and the machine room. Direct fired split units provide heat and cooling for the office and break room respectively. Manually controlled exhaust fans are located in garages as well as oil storage room and bathrooms.

2.4.1 Heating

The main garage area heating is provided by six ceiling mounted Reznor natural gas heaters (installed in 2001), 125,000 Btu/hr input capacity, which use 20' exhaust piping along parabolic deflectors to distribute heat and are controlled by manual thermostats. The storage garage area, or the cold box, contains four Reznor natural gas unit heaters with fans to distribute heat, which are rarely used since the room is kept just above freezing. The office and break room heating is provided by two Lennox direct –fired split units which use natural gas to create heat and fans to distribute the hot air through ductwork in a constant volume system. During operating hours, the occupied spaces are kept at 67 deg, while at night they are set back to 62 degrees.

Main garage ceiling mounted heaters

2.4.2 Cooling

The Fair Lawn Fleet Maintenance Garage building office and break room are air conditioned by two Lennox split units with a Trane 7.5 ton condenser. The office area has an independent wall-mounted Trane unit. Both systems use R-22 refrigerant as coolant.

2.4.3 Ventilation

The Fair Lawn Fleet Maintenance Garage ventilation is achieved via natural cross ventilation and several exhaust fans on manual variable speed dials. SWA recommends installation of several CO / CO_2 detectors with alarms for the garage, office and break room areas which automatically power the exhaust fans when concentrations exceed ASHRAE standards.

Greenheck exhaust variable speed control for exhaust fans (left) &
Programmable thermostat for heaters (right)

2.4.4 Domestic Hot Water

The domestic hot water (DHW) for the Fair Lawn Fleet Maintenance Garage building is provided by an AO Smith natural gas fired heater with 50 gal storage and a 40,000 Btu/hr capacity. This heater has 40% estimated useful operating life left and appears in satisfactory condition. Considerations should be given to replacing it with a high efficiency condensing type gas fired heater when it has reached the end of its operating life.

2.5 Electrical systems

2.5.1 Lighting

Interior Lighting - The Fair Lawn Fleet Maintenance Garage building currently consists of mostly T8 fluorescent fixtures and metal halide lamps for the garage spaces. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA recommends replacing the metal halide lamps and ballast for T8 fixtures in order to save energy and allow for occupancy sensor control. Metal halides cannot work with sensor control due to a required warm up time. 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 found to be a mix of CFL and metal halide fixtures. Exterior lighting is controlled by photocells. SWA is not recommending at this time any upgrades to the exterior lighting or photocells.

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 Drinks 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. See section 4, Energy Conservation Measures for details on replacing refrigerators and installing energy misers on vending 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 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 Fair Lawn Fleet Maintenance Garage 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 Fair Lawn Fleet Maintenance Garage 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 Fair Lawn Fleet Maintenance Garage.

3. EQUIPMENT LIST

Building System	Description	Location	Make / Model	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Cooling	AC-2, Condenser, 7.5Tons, 28.8RLA	Outside	Trane, M#hs-29-090-2y, S#5601g03752	Electric	Lunch rm & locker rm	2001	40%
Heating / Cooling	AHU-1,2, Two (2) Direct fire heating and split DX cooling units, R-22, 200MBH IN, 160MBH OUT, 80% Eff.	furnace rm	Lennox, M#g24-200a-1, S#6301g00084	Electric	offices & lunchroom	2001	40%
Heating / Cooling	AC-1, Wall mounted heating / cooling unit	Super-intendent Office	Trane, M#ptec-1n-1a	Electric	Superinten dent office	2001	40%
Heating	UH-1, Unit Heater, 2.2kW	furnace rm	Qmark, M#muh0321	Electric	Furnace Rm	2001	40%
Heating	Five (5) Ceiling Hung Unit Heaters, 1.9Amps, 83% Eff.	oil rm & storage garage	Reznor, M# 60-75	Natural Gas	oil rm & storage garage	2001	40%
Heating	Six (6) ceiling Hung Unit Heaters, using flue gas to distribute heat, 125MBH, 80% Eff.	Main garage ceiling	Reznor, M#tr125	Natural Gas	Main Garage	2001	40%
Domestic Hot Water	Domestic Hot Water Heater, 50gal, 40 MBH IN	furnace rm	AO Smith, M#pgcg50-m00n01000, S#mf01-0049389-246	Natural Gas	All areas	2001	40%
Air Compressor	Air Compressor, 269gal, 15HP, 91%Eff.	Storage garage	Saylor-Beall, M#cb-tl-91524, S#9y-10-ro1	Electric	all equipment	2001	70%
Ventilation	EF-4,5,6, Three (3) Exhaust Fans, manual control, infrequent use, 1080rpm, 0.5HP	Garage Wall	Greenheck, M#sbe-1h30-5	Electric	Main garage & Storage garage	2001	40%
Ventilation	EF-1,2,3, Three (3) Exhaust Fans, manual control, infrequent use, 325Watts	Garage Wall	Greenheck, M#csb-255	Electric	bathroom, offices	2001	40%

Building System	Description	Location	Make, Model (HVAC)	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Ventilation	EF-8, Exhaust Fan	Oil Rm	Trane	Electric	Oil Rm	2001	40%
Ventilation	Four (4) ceiling fans, 110 Watts	Main & Storage garage	Trane, M#4c855a	Electric	Main & Storage garage	2001	40%
Lighting	See Appendix A	All		Electric	All		Varies, 40% on average

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 Fair Lawn Fleet Maintenance Garage, 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

- Install CO / CO_2 detectors with alarms for the garage, office and break room areas with an option to turn on / off the Garage exhaust fan as a safety feature.

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

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 - 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.

- 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.

- 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 Energy Misers on (2) electric Vending Machines
2	Replace (20) garage Metal Halide fixtures with (20) 4-lamp T8 fixtures
	Description of Recommended 5-10 Year Payback ECMs
3	Replace (2) old refrigerators with new Energy Star refrigerators
4	Install (5) New Lighting Occupancy Sensors
5	Install 50 kW Photovoltaic Rooftop System

ECM#1: Install Vending Misers

Description:
The Fair Lawn Fleet Maintenance Garage building has two drink vending machines located in the Cafeteria / break room. 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 and ensure the product stays cold.

Installation cost:

Estimated installed cost: $558 (includes $200 in labor)
Source of cost estimate: www.usatech.com and established costs

Economics (without incentives):

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Install (2) Drink vending machine energy misers	www.usatech.com and established costs	558	none at this time	558	4,784	1.3	0	1.0	0	828	12	9,932	0.7	1680	140	148	7,583	6,554

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.

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# 2 & 4: Building Lighting Upgrades

Description:

On the days of the site visits, SWA completed a lighting inventory of the Fair Lawn Fleet Maintenance Garage building (see Appendix A). SWA recommends replacing the main garage Metal Halide fixtures with T8 fixtures and electronic ballasts if it is cost justified, as well as installing occupancy sensors for bathrooms, offices and locker rooms to reduce the incident of lights being left on when the spaces are unoccupied. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Borough of Fair Lawn may decide to perform this work with in-house resources from its Maintenance Department to obtain savings.

Installation cost:
Estimated installed cost: $5,783 (includes approx. $70 labor cost per T8 fixture, totaling $1400)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program; Quoted bids

Economics (Some of the options considered 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, $	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
20 New T8 fixtures to be installed with incentives	RS Means, lit search	5,383	600	4,783	16,801	3.5	0	3.6	1,272	4,179	15	62,686	1.1	1211	81	87	44,393	23,018
5 New occupancy sensors to be installed with incentives	RS Means, lit search	1,100	100	1,000	1,382	0.3	0	0.3	0	239	15	3,586	4.2	259	17	23	1,813	1,893
TOTALS		**6,483**	**700**	**5,783**	**18,183**	**3.7**	**0**	**3.9**	**1,272**	**4,418**	**-**	**66,272**	**1.3**	**-**	**-**	**-**	**46,206**	**24,911**

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 2 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

NJ Clean Energy - T5 and T8 lamps with electronic ballast in existing facilities ($10-30 per fixture, depending on quantity and lamps)- Maximum incentive amount is $1,020.
PSE&G - T5 and T8 lamps with electronic ballast in existing facilities ($50 per fixture, depending on quantity and lamps) Maximum incentive amount is $550.
NJ Clean Energy - Wall Mounted occupancy sensors ($25 per control) - Maximum incentive amount is $425.

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 #3: Replace Old Refrigerators with Energy Star Models

Description:

On the day of the site visit, SWA observed that there are two old refrigerators, one in the kitchen and another in the main garage which is not Energy Star rated (using approximately 350 kWh/yr each). 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 refrigerators 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: $1,000 (includes $50/ unit labor, $100 total)
Source of cost estimate: Manufacturer and Store established costs

Economics:

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
Replace two old refrigerator with two 18 cu ft Energy Star models	Energy Star purchasing and procurement site, similar projects	1,000	None at this time	1,000	700	0.2	0	0.2	0	121	10	1,211	8.3	21	2	4	23	959

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 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#5: Install 50 kW PV system

Description:

Currently, the Fair Lawn Fleet Maintenance Garage 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. SWA presents below the economics, and recommends at this time that Borough of Fair Lawn further review installing a 50 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 Fair Lawn Fleet Maintenance Garage building is not eligible for a 30% federal tax credit. Instead, the Borough of Fair Lawn 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. PSE&G 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 on a portion of the sloped roof that faces South or West. 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 50 kW system needs approximately 400 panels which would take up 4,348 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: $350,000, (labor included at $3/Watt, totaling $150,000)
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 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 50 kW PV Rooftop System, 4300 sqft	Quote / Similar projects	350,000	50,000	300,000	59,000	50.0	0	12.7	0	45,607	25	786,175	6.6	162	6.5	1322	890,393	105,640

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 50kW or less. Incentive amount for this application is $50,000 for the Fair Lawn Fleet Maintenance Garage.

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 1000kWh (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 $35,400 / year, based on $600/SREC, has been incorporated in the above costs for the Fleet Maintenance Garage 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

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

Pleases see the above recommended 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 absence of a major cooling system and insufficient domestic hot water use.

5.6 Geothermal

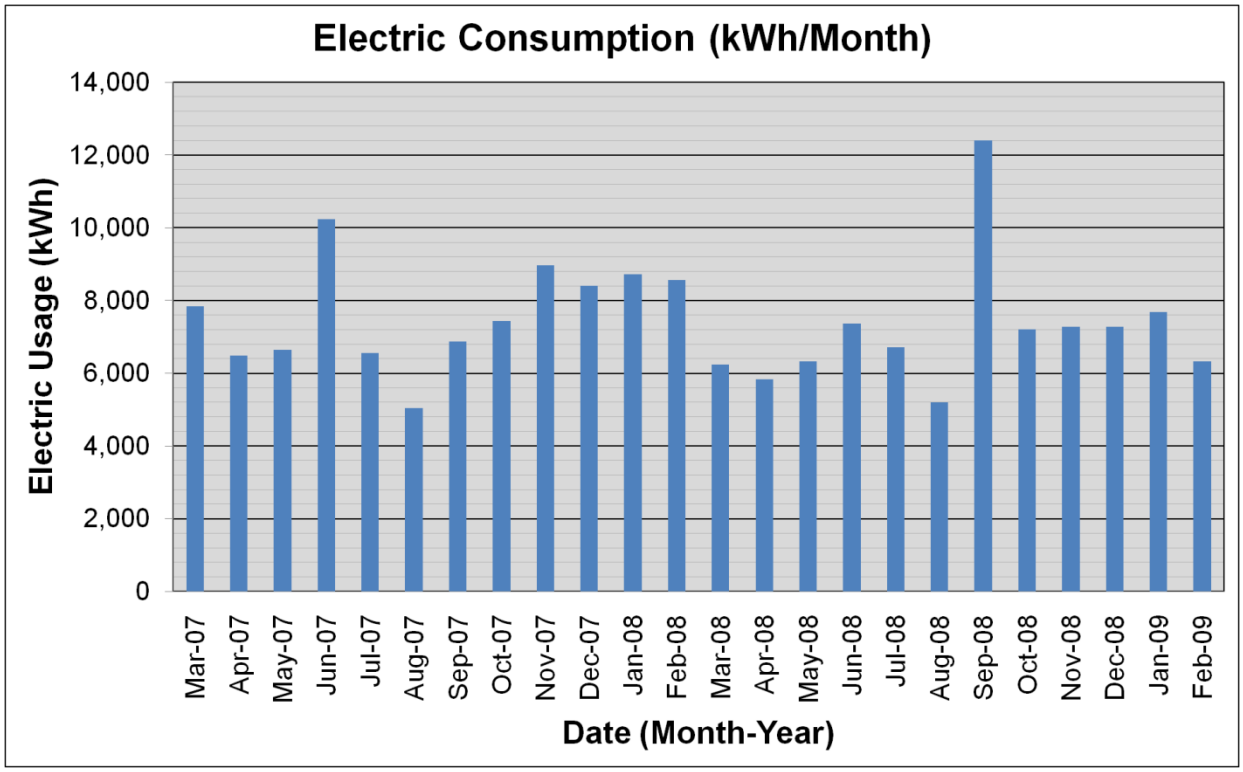
Description:

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

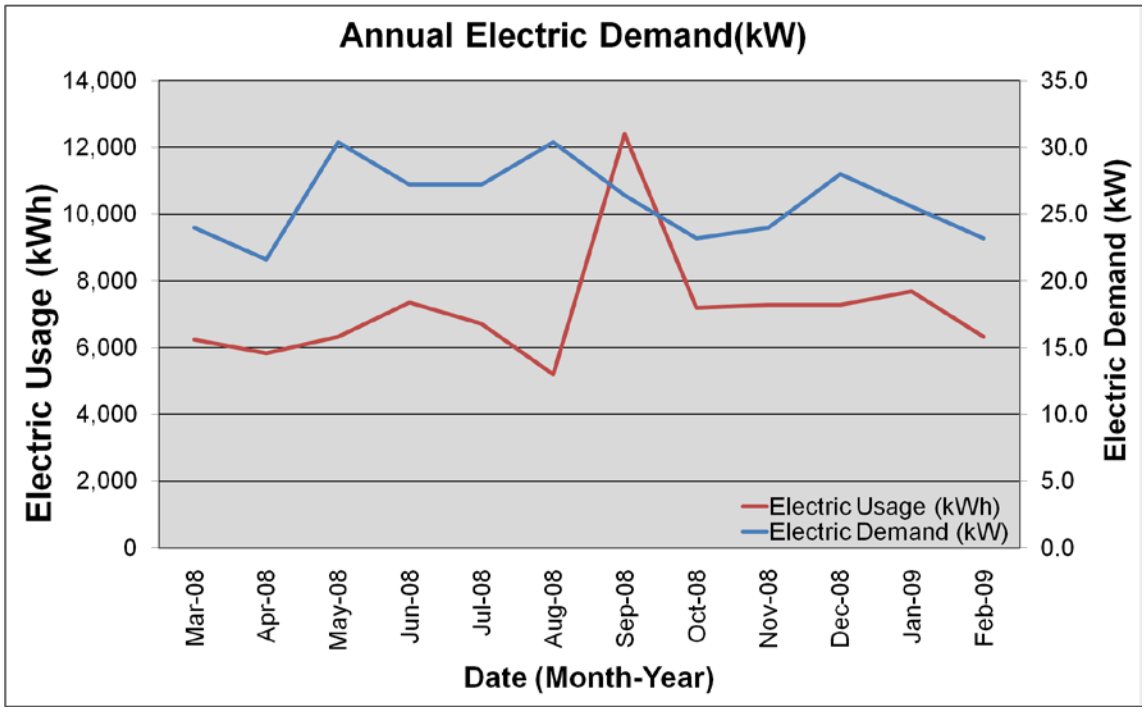
6.1 Load profiles

The following are charts that show the annual electric and natural gas load profiles for the Fair Lawn Fleet Maintenance Garage.

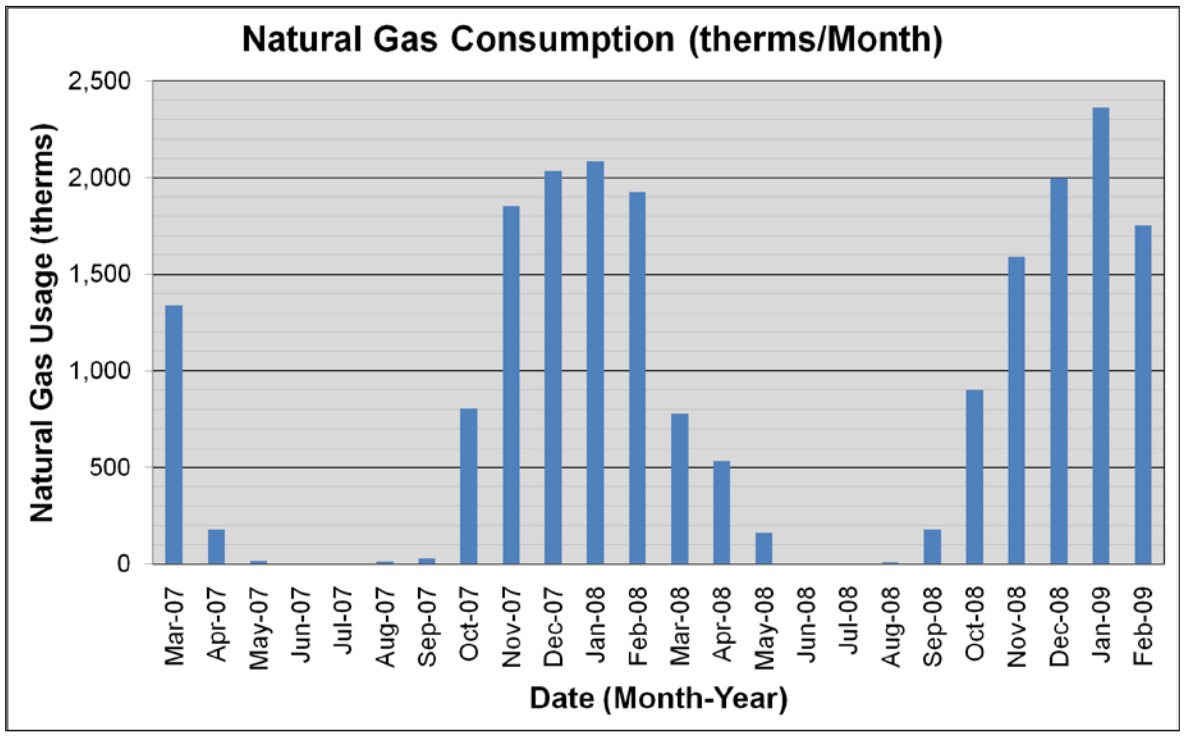


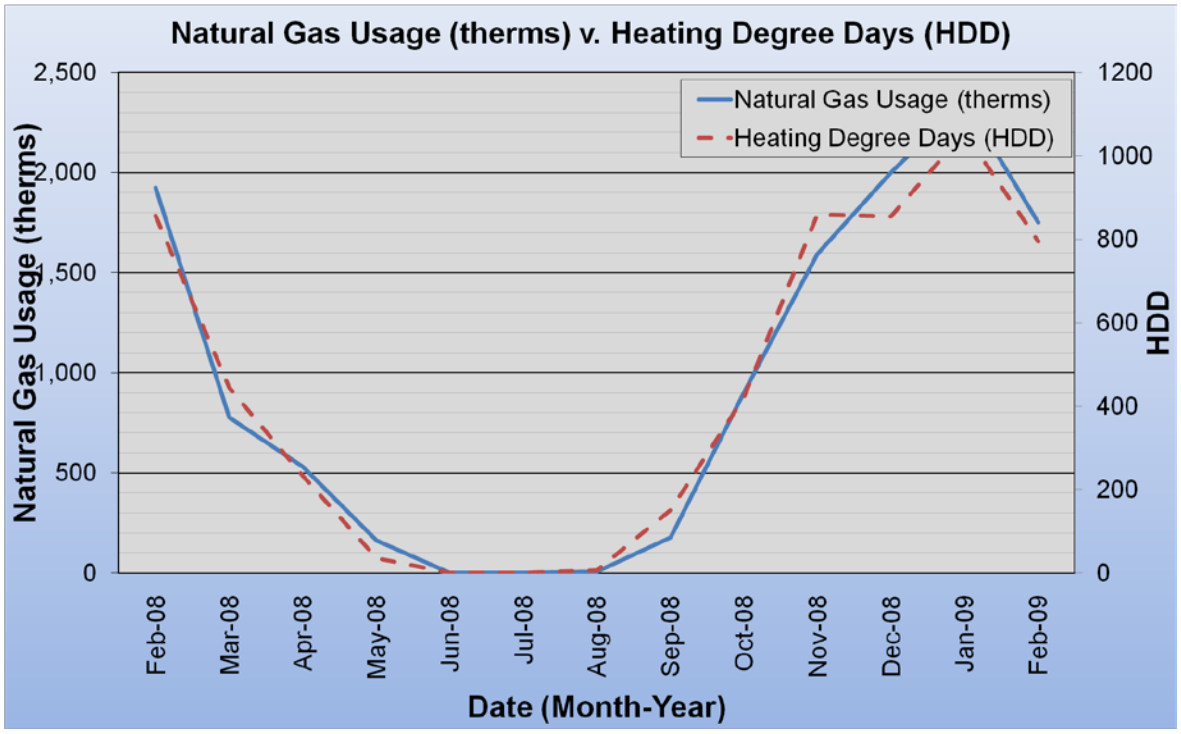
Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings.

Also, 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.



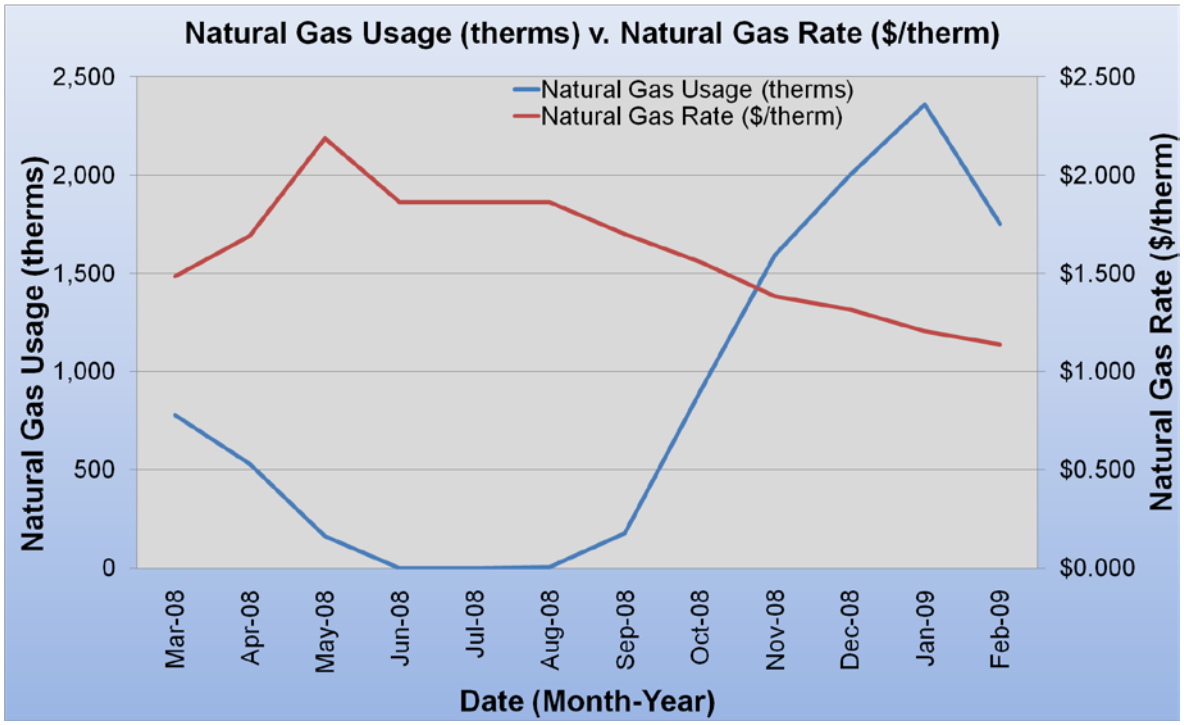
The following is a chart of the natural gas annual load profile for the building, peaking in the coldest months of the year and a chart showing natural gas consumption following the “heating degree days” curve. Some utility bills have more than one month estimated and combined.



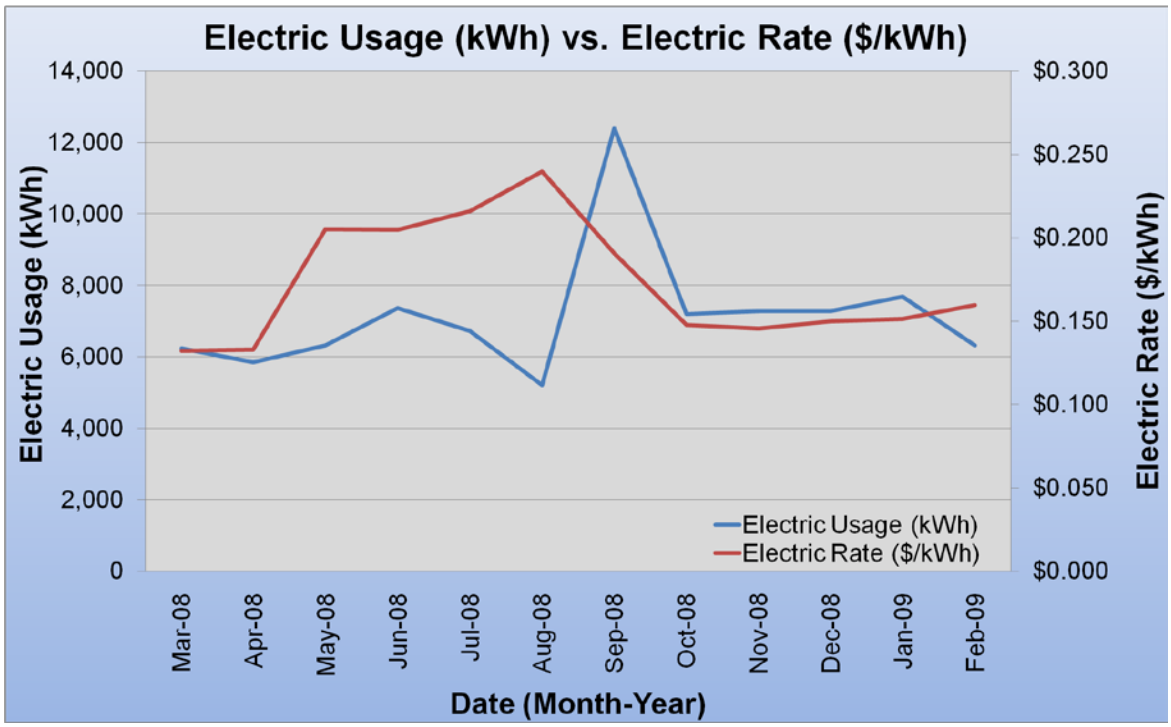


6.2 Tariff analysis

Currently, natural gas is provided to the Fair Lawn Fleet Maintenance Garage 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 Fair Lawn Fleet Maintenance Garage 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. Thus the building pays for fixed costs such as meter reading charges during the summer months. Below is a normalized chart to display the rate fluctuations.



The Fair Lawn Fleet Maintenance Garage building is direct-metered and currently purchases electricity from PSE&G at a general service rate. The general service rate for electric charges are market-rate based on use and the Fair Lawn Fleet Maintenance Garage 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.



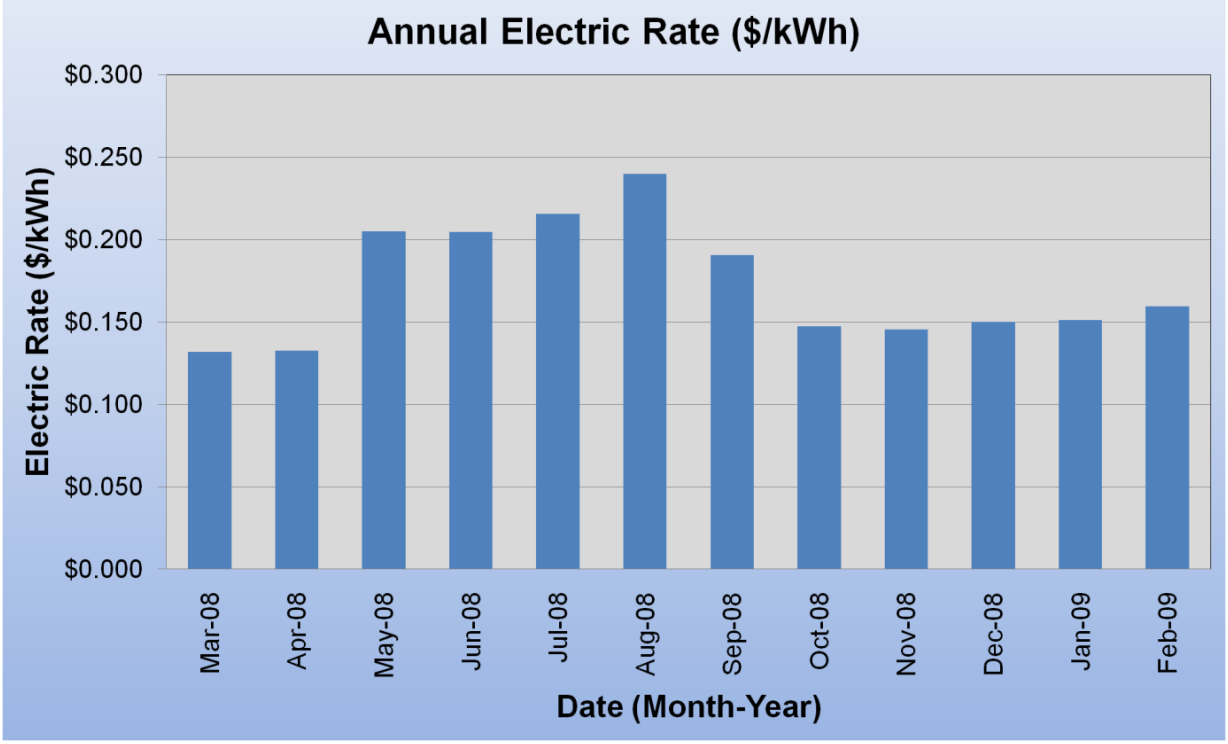
6.3 Energy Procurement strategies

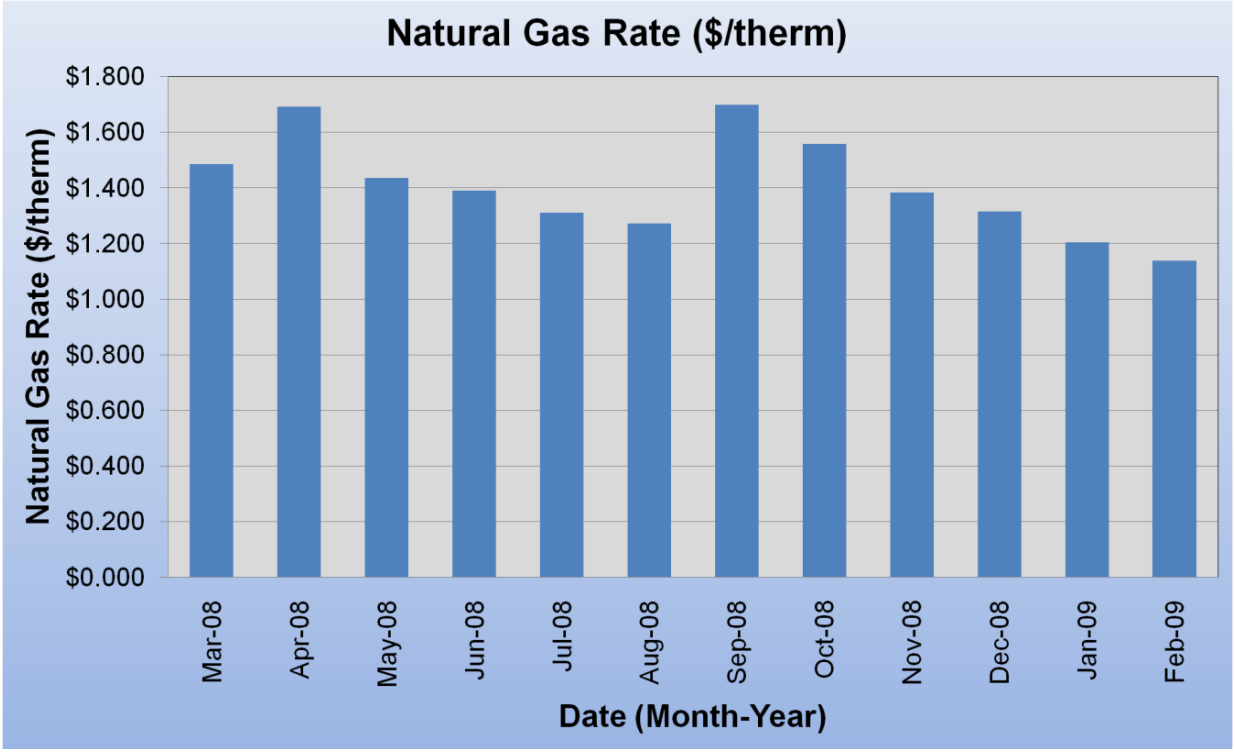
The Fair Lawn Fleet Maintenance Garage building receives natural gas via one incoming meter. The PSE&G supplies the gas and transports it. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner.

Electricity is also purchased via one incoming meter directly for the main Fair Lawn Fleet Maintenance Garage building from PSE&G 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 25% over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 27% 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 Fair Lawn Fleet Maintenance Garage building annual utility costs are $1,971 higher for electric, when compared to the average estimated NJ commercial utility rates.

SWA recommends that the Borough of Fair Lawn 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 Fair Lawn Fleet Maintenance Garage. Appendix B contains a complete list of third party energy suppliers for the Borough of Fair Lawn service area. The Borough of Fair Lawn 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.

Also, the Fair Lawn Fleet Maintenance Garage 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 Fair Lawn may install a large enough back-up emergency generator. The following charts show the Fair Lawn Fleet Maintenance Garage building monthly spending per unit of energy from March 2008 to Feb 2009.


Annual Electric Rate ($/kWh)
Electric Rate ($/kWh)
$0.300
$0.250
$0.200
$0.150
$0.100
$0.050
$0.000
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Date (Month-Year)


Natural Gas Rate ($/therm)
Natural Gas Rate ($/therm)
$1.800
$1.600
$1.400
$1.200
$1.000
$0.800
$0.600
$0.400
$0.200
$0.000
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Date (Month-Year)

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	Oil rm (1)	Parabolic	E	4'T8	4	2	32	S	9	260	6	280	655	N/A	Parabolic	4'T8	E	S	4	2	32	9	260	6	280	655	0	0	0
2	1	Oil rm (1)	Parabolic	E	4'T8	4	2	32	S	9	260	6	280	655	N/A	Parabolic	4'T8	E	S	4	2	32	9	260	6	280	655	0	0	0
3	1	Oil rm (1)	Exit Sign	N	LED	1	1	5	S	9	260	1	6	14	N/A	Exit Sign	LED	N	S	1	1	5	9	260	1	6	14	0	0	0
4	1	Garage (2)	Screw-in	N	MH	20	1	400	S	9	260	100	10,000	23,400	T8	Parabolic	4'T8	E	S	20	4	32	9	260	13	2820	6599	16801	0	16801
5	1	Garage (2)	Exit Sign	N	LED	2	1	5	S	24	365	1	12	105	N/A	Exit Sign	LED	N	S	2	1	5	24	365	1	12	105	0	0	0
6	1	Garage (2)	Parabolic	E	4'T8	13	2	32	S	9	260	6	910	2,129	N/A	Parabolic	4'T8	E	S	13	2	32	9	260	6	910	2129	0	0	0
7	1	Garage (2)	Parabolic	E	2'T8	1	2	17	S	9	260	3	37	87	N/A	Parabolic	2'T8	E	S	1	2	17	9	260	3	37	87	0	0	0
8	1	Garage Storage (3)	Screw-in	N	MH	16	1	400	S	9	200	100	8,000	14,400	PSMH	Screw-in	MH	N	S	16	1	400	9	200	100	8000	14400	0	0	0
9	1	Garage Storage (3)	Parabolic	E	4'T8	6	2	32	S	9	200	6	420	756	N/A	Parabolic	4'T8	E	S	6	2	32	9	200	6	420	756	0	0	0
10	1	Garage Storage (3)	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
11	1	Garage Storage (3)	Screw-in	N	CFL	1	1	26	S	9	200	0	26	47	N/A	Screw-in	CFL	N	S	1	1	26	9	200	0	26	47	0	0	0
12	1	Mechanical Rm (3)	Parabolic	E	4'T8	3	2	32	S	2	260	6	210	109	N/A	Parabolic	4'T8	E	S	3	2	32	2	260	6	210	109	0	0	0
13	1	Office (4)	Parabolic	E	4'T8	5	3	32	S	9	260	10	530	1,240	C	Parabolic	4'T8	E	OS	5	3	32	7	260	10	530	930	0	310	310
14	1	Bathroom (5)	Recessed	E	4'T8	1	3	32	S	9	260	10	106	248	C	Recessed	4'T8	E	OS	1	3	32	7	260	10	106	186	0	62	62
15	1	Men's Locker Rm (6)	Recessed	E	4'T8	4	3	32	S	8	260	10	424	882	C	Recessed	4'T8	E	OS	4	3	32	6	260	10	424	661	0	220	220
16	1	Men's Locker Rm (6)	4'U-shape	E	4'T8	2	2	32	S	8	260	6	140	291	C	4'U-Shape	4'T8	E	OS	2	2	32	6	260	6	140	218	0	73	73
17	1	Hallway (7)	Exit Sign	N	LED	1	1	5	S	24	365	1	6	53	N/A	Exit Sign	LED	N	S	1	1	5	24	365	1	6	53	0	0	0
18	1	Hallway (7)	4'U-shape	E	4'T8	2	2	32	S	16	260	6	140	582	N/A	4'U-Shape	4'T8	E	S	2	2	32	16	260	6	140	582	0	0	0
19	1	Lunch Rm (8)	Parabolic	E	4'T8	13	3	32	S	8	260	10	1,378	2,866	C	Parabolic	4'T8	E	OS	13	3	32	6	260	10	1378	2150	0	717	717
20	1	Vestibule (8)	4'U-shape	E	4'T8	2	2	32	S	12	260	6	140	437	N/A	4'U-Shape	4'T8	E	S	2	2	32	12	260	6	140	437	0	0	0
21	Ext	Exterior ()	Screw-in	N	MH	10	1	175	PC	12	260	44	2,190	6,833	N/A	Screw-in	MH	N	PC	10	1	175	12	260	44	2190	6833	0	0	0
22	Ext	Exterior ()	Screw-in	N	CFL	4	1	26	PC	12	260	0	104	324	N/A	Screw-in	CFL	N	PC	4	1	26	12	260	0	104	324	0	0	0
23	1	DPW Garage ()	Screw-in	N	INC	4	1	75	S	2	260	0	300	156	CFL	Screw-in	INC	N	S	4	1	75	2	260	0	300	156	0	0	0
Totals:												**339**	**25,651**	**56,375**											**252**	**18,471**	**38,192**	**16,801**	**1,382**	**18,183**

Proposed Lighting Summary Table			
Total Surface Area (SF)	15,900		
Average Power Cost ($/kWh)	0.1730		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	7,157	7,157	**0**
Exterior Power (watts)	2,294	2,294	**0**
Total Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	49,218	31,035	**18,183**
Lighting Power (watts)	23,357	16,177	**7,180**
Lighting Power Density (watts/SF)	1.47	1.02	**0.45**
Estimated Cost of Fixture Replacement ($)	5,383		
Estimated Cost of Controls Improvements ($)	1,100		
Total Consumption Cost Savings ($)	**4,418**		

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 ELECTRICAL SERVICE TERRITORY Last Updated: 06/15/09		
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095 (800) 437-7872 www.hess.com	**BOC Energy Services, Inc.** 1135 Mountain Avenue Murray Hill, NJ 011374 (800) 247-2644 www.boc.com	**Commerce Energy, Inc.** 4400 Route 9 South, Suite 100 Freehold, NJ 07728 (800) 556-84113 www.commerceenergy.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446 (888) 635-0827 www.newenergy.com	**Direct Energy Services, LLC** 120 Wood Avenue Suite 611 Iselin, NJ 08830 (866) 547-2722 www.directenergy.com	**FirstEnergy Solutions Corp.** 300 Madison Avenue Morristown, NJ 0113113 (800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640 (877) 569-2841 www.glacialenergy.com	**Integrys Energy Services, Inc.** 99 Wood Ave, South, Suite 802 Iselin, NJ 08830 (877) 763-9977 www.integrysenergy.com	**Strategic Energy, LLC** 55 Madison Avenue, Suite 400 Morristown, NJ 011360 (888) 925-9115, www.sel.com
Liberty Power Holdings, LLC Park 80 West, Plaza II, Suite 200 Saddle Brook, NJ 07663 (866) 769-31139 www.libertypowercorp.com	**Pepco Energy Services, Inc.** 112 Main St. Lebanon, NJ 08833 (800) ENERGY-9 (363-7499) www.pepco-services.com	**PPL EnergyPlus, LLC** 811 Church Road Cherry Hill, NJ 08002 (800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions The Mac-Cali Building 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) 800-756-3749 www.south jerseyenergy.com	**Suez Energy Resources NA, Inc.** 333 Thornall Street 6th Floor Edison, NJ 08837 (888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 080113 (856) 273-9995 www.ugienergyservices.com	**American Powernet Management, LP** 437 North Grove St. Berlin, NJ 08009 (800) 437-7872 www.hess.com	**ConEdison Solutions** Cherry Tree, Corporate Center 1135 State Highway 38 Cherry Hill, NJ 08002 (888) 665-0955 www.conedsolutions.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450 212-1138-3124 www.creditsuisse.com	**Sprague Energy Corp.** 12 Ridge Road Chatham Township NJ 011328 (800) 225-1560 www.spragueenergy.com	

Appendix C: Glossary and Method of Calculations & Glossary of ECM Terms

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

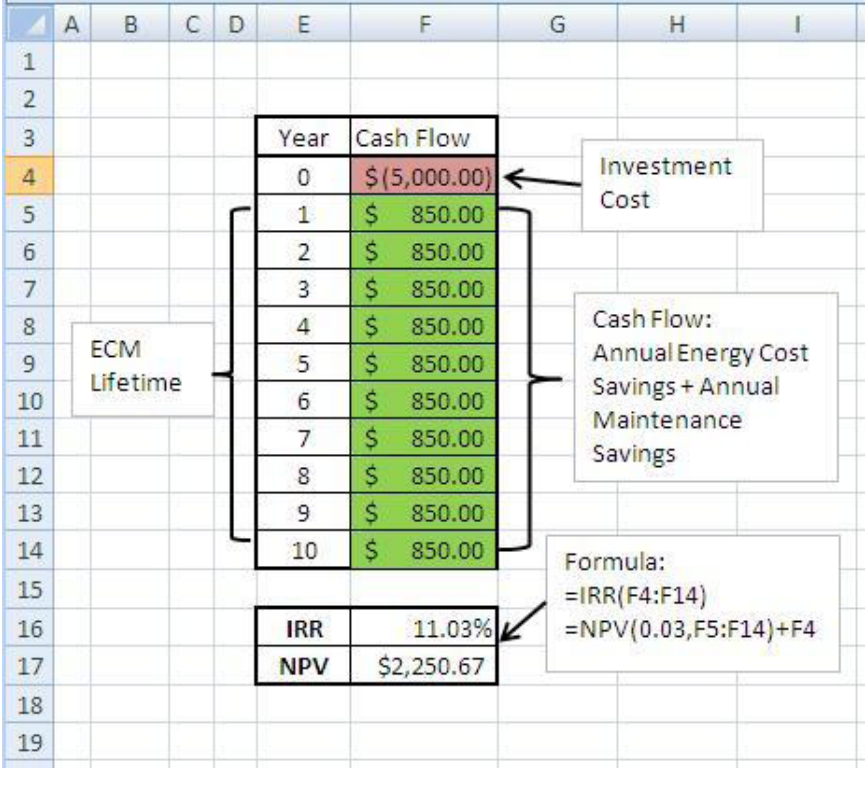
Note: The lifetime operating cost savings are all avoided operating, maintenance, and / or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding 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.

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