Steven Winter Associates, Inc.
Architects and Engineers

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

Telephone: (866) 676-1977
Web: www.swinter.com
E-mail: swinter@swinter.com

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Local Government Energy Program
Energy Audit Final Report

Fair Lawn Senior Center
11-05 Gardiner Road, Fair Lawn, NJ

Project Number: LGEA43

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INTRODUCTION

On December 15, 2009 and January 6, 2010 Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment for the Borough of Fair Lawn municipal buildings. The audit included a review of the:

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

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 Senior Center located at 11-05 Gardiner Road, 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 Senior Center building was built in 1977 with additions in 1995 and 1997. The building houses offices, a conference room, game rooms, a dining room, bathrooms and a kitchen area. The building consists of 6,620 square feet of conditioned space. The Fair Lawn Senior Center is occupied weekdays from 8am to 4pm, several hours on weekends and during evening meetings once or twice a week. The building has at least two employees during operating hours and up to 100 visitors daily.

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 Senior Center.

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 Fair Lawn Senior Center building located at 11-05 Gardiner Road, Fair Lawn, NJ. The Fair Lawn Senior Center building is a single-story building with a floor area of 6,620 square feet. The original structure was built in 1977 and additions were made in 1995 and 1997.

Based on the field visits performed by the SWA staff on December 15, 2009 and January 6, 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 Fair Lawn Senior Center building consumed 100,620 kWh or $16,510 worth of electricity at an approximate rate of $0.164/kWh, and 4,114 therms or $5,658 worth of natural gas at an approximate rate of $1.375/therm. The joint energy consumption for the building, including both electricity and natural gas, was 755 MMBtu of energy that cost a total of $22,168.

SWA has entered energy information about the Fair Lawn Senior Center building in the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager energy benchmarking system. A benchmark score could not be calculated for the Senior Center facility since it is categorized as a 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 119.0 kBtu/ft^2yr compared to the national average of "Other" space type of 104.0 kBtu/ft^2yr. Implementing this report's recommendations will reduce use by approximately 28.8 kBtu/ft^2yr, which when implemented would bring the building's energy consumption to 90.2 kBtu/ft^2yr, below the national average. There may be energy procurement opportunities for the Fair Lawn Senior Center building to reduce annual electric utility costs, which are $1,417 higher, when compared to the average estimated NJ commercial utility rates.

Based on the assessment of the Fair Lawn Senior Center, 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 NEMA premium motors when motor replacements for furnace and condenser fans are required

Category II Recommendations: Operations and Maintenance

- 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
- Replace worn weather-stripping where located, especially on exterior doors
- Maintain air-sealing, particularly between the drop ceiling and attic space
- 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 **three** Energy Conservation Measures (ECMs) for the Fair Lawn Senior Center building, as summarized in the following Table 1. The total investment cost for these ECMs with incentives is **$4,921**. SWA estimates a first-year savings of **$1,437** with a simple payback of **3.4 years**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the Fair Lawn Senior Center building by **9,252 lbs of CO_2**. SWA also recommends **four** ECMs with a total first-year savings of **$15,125, as** summarized in Table 2. There is one End of Life ECM, with a first year savings of **$141,** as summarized in Table 3.

There are various incentive programs that the Borough of Fair Lawn could apply for that could also help lower the cost of installing the ECMs, such as the NJ SmartStart 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 and is recommended.

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 PSE&G.

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

Table 1 - Highly Recommended 0-5 Year Payback ECMs																			
ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	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	9 New CFL fixtures to be installed with incentives	RS Means, lit search	488	none at this time	488	2,252	0.5	0	1.2	38	408	5	2,038	1.2	318%	64%	79%	1,369	3,086
1b	10 New LED exit sign fixtures to be installed with incentives	RS Means, lit search	2,033	200	1,833	964	0.2	0	0.5	291	449	15	6,740	4.1	268%	18%	23%	3,454	1,320
1c	13 New occupancy sensors to be installed with incentives	RS Means, lit search	2,860	260	2,600	3,537	0.7	0	1.8	0	580	15	8,702	4.5	235%	16%	21%	4,227	4,846
	TOTALS		**5,381**		**4,921**	**6,753**	**1.4**	**0**	**3.5**	**330**	**1,437**		**17,480**	**3.4**	**-**	**-**	**-**	**-**	**9,252**

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
2	Retro Commissioning HVAC	LBNL Study	8,275	none at this time	8,275	2,406	0.8	411	7.5	331	1,291	15	14,404	6.4	134	9	11	4,578	8,110
3	Install 10 kW Solar Photovoltaic system	Similar Projects	70,000	10,000	60,000	11,800	10	0	6	0	8535	25	147380	7.0	145.6	5.8	12	170,622	21,128
1d	98 New T8 fixtures to be installed with incentives	RS Means, lit search	21,621	2,940	18,681	5,823	1.2	0	3.0	1,709	2,664	15	39,956	7.0	114%	8%	11	12,663	7,977
4	Replace five 5 Ton, 10 SEER Condensers with 5 Ton, SEER 14.5 Condensers	Energy Star Savings calculator	20,285	2,300	17,985	16,067	5.1	0	8.3	0	2,635	14	36,890	6.8	105%	8%	11	7,933	22,012
	TOTALS		**120,181**		**104,941**	**36,096**	**17.1**	**411**	**24.8**	**2,040**	**15,125**		**238,630**	**6.9**	**-**	**-**	**-**	**-**	**59,226**

Table 3 – End of Life ECM																		
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
2e	3 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	2,416	75	2,341	939	0.2	0	0.5	-13	141	15	2,114	16.6	-10	-1	-1	-683	1,286

1. HISTORIC ENERGY CONSUMPTION

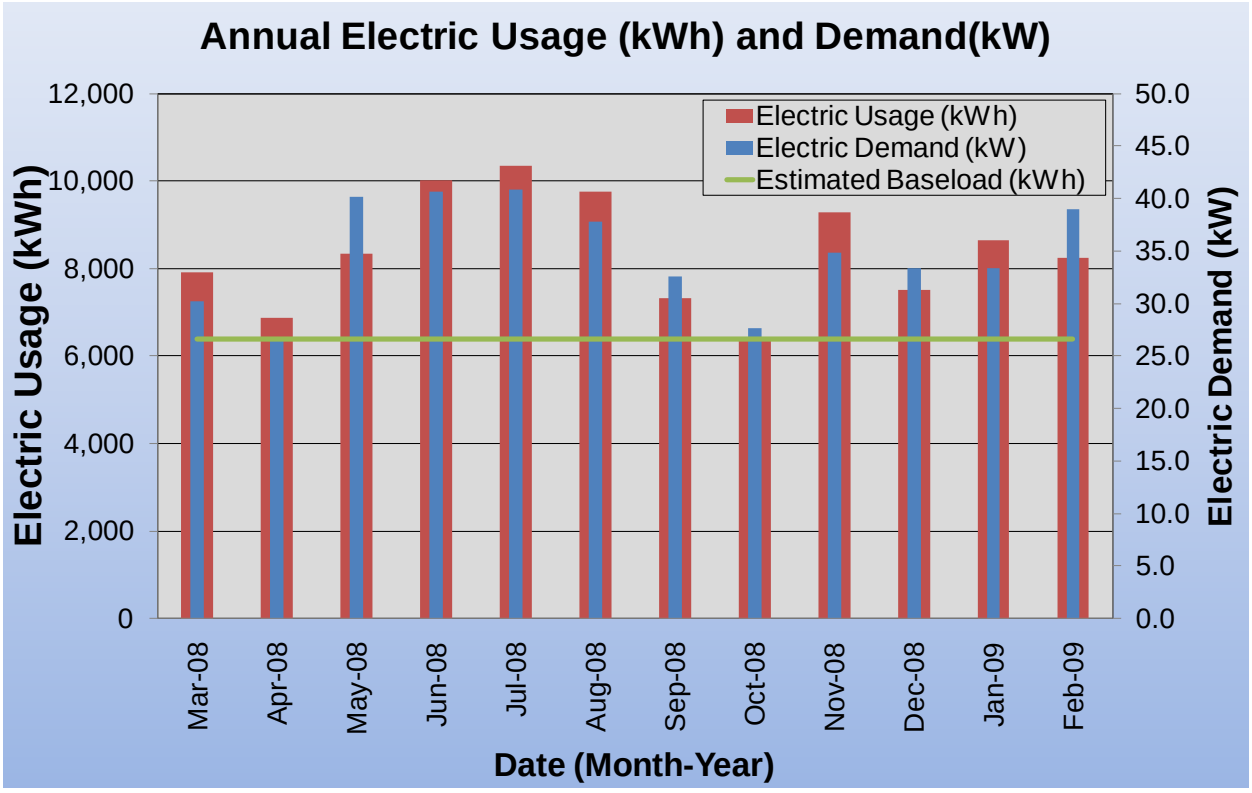
1.1 Energy usage and cost analysis

SWA analyzed utility bills from March 2008 to February 2009 that were received from the utility companies supplying the Fair Lawn Senior Center with electric and natural gas.

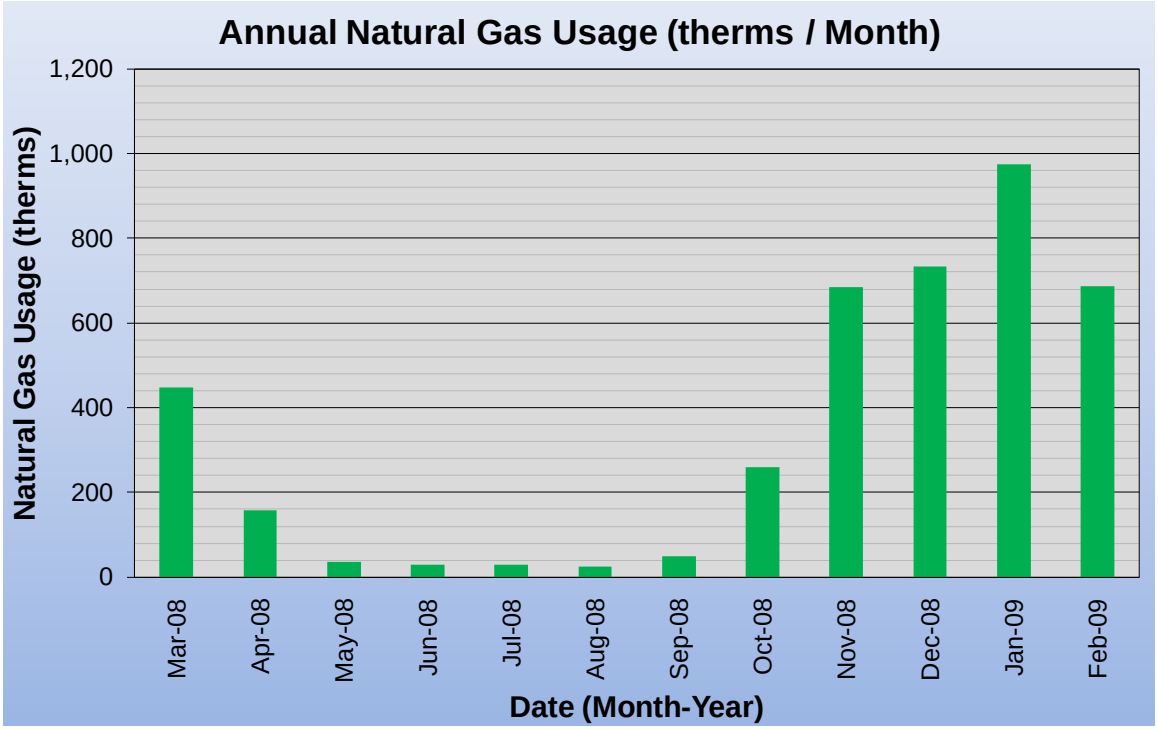
Electricity - The Fair Lawn Senior Center is currently served by one electric meter. The Fair Lawn Senior Center building currently buys electricity from PSE&G at **an average rate of $0.164/kWh** based on 12 months of utility bills from March 2008 to February 2009. The Fair Lawn Senior Center building purchased **approximately 100,620 kWh or $16,510 worth of electricity** in the previous year. The average monthly demand was 32 kW.

Natural gas - The Fair Lawn Senior Center is currently served by one meter for natural gas. The Fair Lawn Senior Center buys natural gas from PSE&G at **an average aggregated rate of $1.375/therm** based on 12 months of utility bills for March 2008 to February 2009. The Fair Lawn Senior Center purchased **approximately 4,114 therms or $5,658 worth of natural gas** in the previous year.

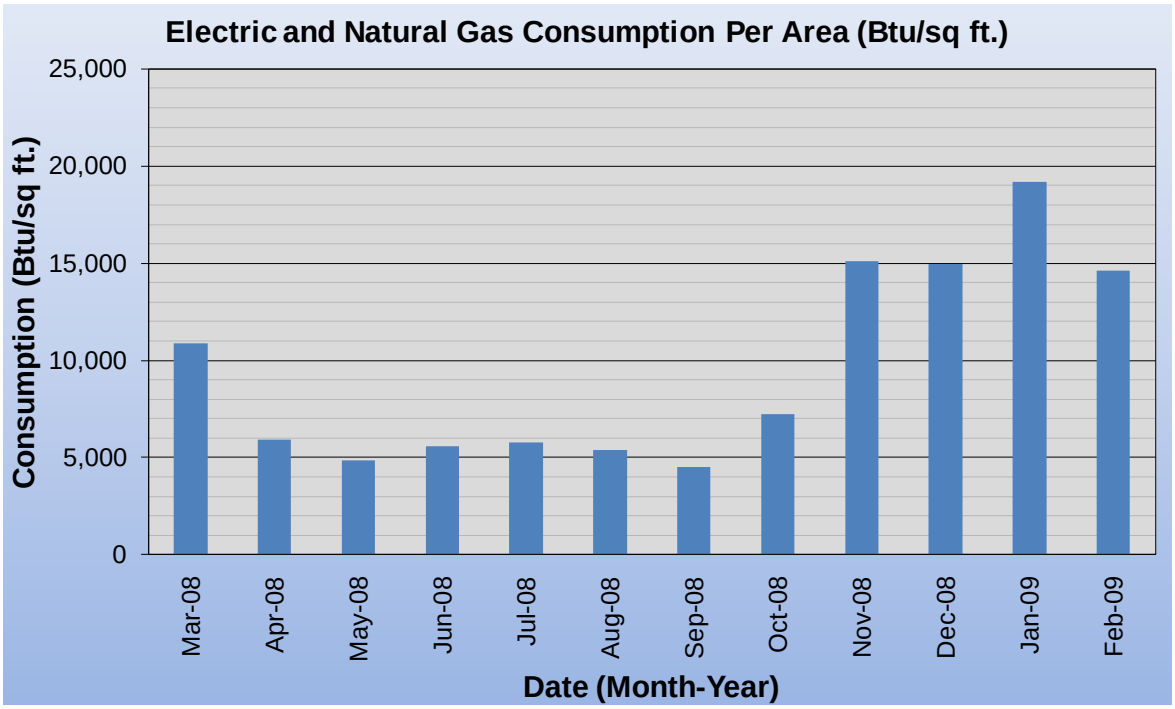
The following chart shows electricity use for the Fair Lawn Senior Center building based on utility bills for the 12 month period of March 2008 to February 2009.



The following chart shows the natural gas consumption for the Fair Lawn Senior Center building based on natural gas bills for the 12 month period of March 2008 to February 2009.

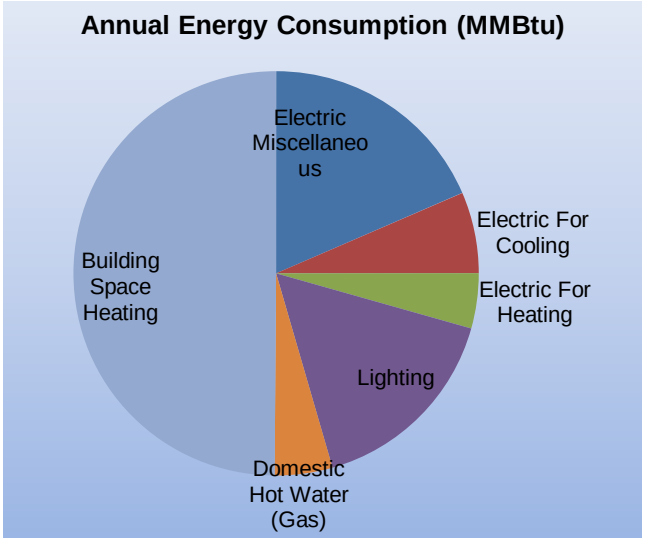


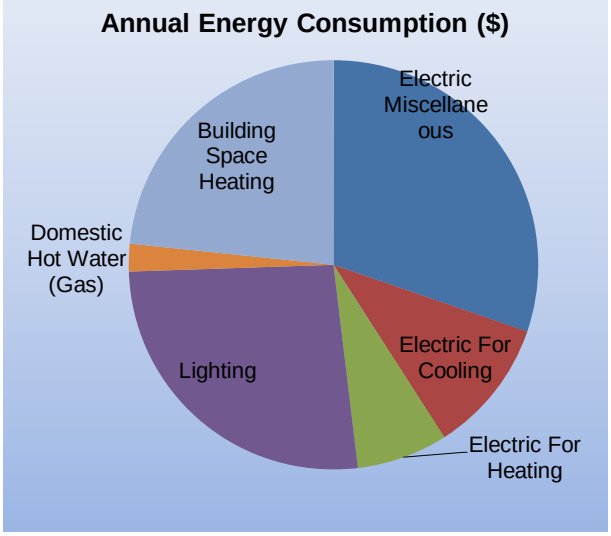
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Fair Lawn Senior Center building based on utility bills for the 12 month period of March 2008 to February 2009.



The following table and pie charts show energy use for the Fair Lawn Senior Center building based on utility bills for the 12 month period of March 2008 to February 2009. Note: electrical cost at $48/MMBtu of energy is more than three times as expensive as natural gas at $14/MMBtu.

2008 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	140	19%	$6,715	30%	48
Electric For Cooling	49	6%	$2,356	11%	48
Electric For Heating	33	4%	$1,592	7%	48
Lighting	122	16%	$5,848	26%	48
Domestic Hot Water (Gas)	35	5%	$479	2%	14
Building Space Heating	377	50%	$5,179	23%	14
Total Electric Usage	343	45%	$16,510	74%	48
Total Gas Usage	411	55%	$5,658	26%	14
Totals	755	100%	$22,168	100%	--





1.2 Utility rate

The Fair Lawn Senior Center 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 Senior Center building currently pays an average rate of approximately $0.164/kWh based on the 12 months of utility bills of March 2008 to February 2009.

The Fair Lawn Senior Center 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 Senior Center building currently. The average aggregated rate (supply and transport) for the meter is

approximately $1.375/therm based on 12 months of utility bills for March 2008 to 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 Senior Center building in the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy benchmarking system. This Senior Center 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 Senior Center is not eligible to receive a national energy performance rating at this time.

The Site Energy Use Intensity is 119.0 kBtu/ft^2/yr compared to the national average of a Senior Center building using 104.0 kBtu/ft^2/yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 3.5 kBtu/sqft yr, with an additional 28.8 kBtu/ft^2/yr from the recommended ECMs. These recommendations therefore reduce the site energy use intensity to 90.2 kBtu/ft^2/yr, which is 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 Senior Center 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 - Senior Center

Building ID: 1973678
For 12-month Period Ending: February 28, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: February 16, 2010

Facility
Borough of Fair Lawn - Senior Center
11-05 Gardiner Road
Fair Lawn, NJ 07410

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1977
Gross Floor Area (ft²): 6,620

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	352,958
Natural Gas (kBtu)[4]	435,121
Total Energy (kBtu)	788,079

Energy Intensity[5]	
Site (kBtu/ft²/yr)	119
Source (kBtu/ft²/yr)	247

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	77

Electric Distribution Utility
Public Service Elec & Gas Co

National Average Comparison	
National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	16%
Building Type	Other

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 Senior Center was constructed in 1977. This single-story structure is the site of many diversified activities, events, programs and services for the older adults, 60 years old and above, and their friends and family members. The Center also operates as a meal site for the senior citizens. Major additions/renovation occurred: in 1995 - a 433 sq ft addition; in 1997 - a 720 sq ft addition; the roof was replaced 2008; two air handlers were added in 2005 and 2008 for the front rooms. The building consists of 6,620 square feet of conditioned space and houses a large conference room, a card room, a billiards room, a game room, a dining room, a kitchen, a pantry, an office, bathrooms and a mechanical/utility room. The furnace room is located in the attic.

2.2. Building occupancy profiles

Occupancy for the entire Fair Lawn Senior Center is approximately 100 Seniors during weekdays from 8 am to 4 pm Monday to Friday, 10:30 am to 3:30 pm Saturdays and 12 pm to 3 pm Sundays. There are occasional evening events. The building is staffed with 2 full time and 13 part time employees to coordinate the Senior Center activities.

2.3. Building envelope

2.3.1. Exterior Walls

The exterior walls consist of 8”CMU blocks with a 1-1/2” insulation layer sandwiched between two types of veneer façades. One type of façade is a ribbed/fluted block veneer wall of earthen color with a metal stud frame with gypsum wall board interior finish in some of the places. Insulation installed, where visible, was consistent with information on the available drawings, namely 5.5” fiberglass batt in the stud cavities. Other wall upper sections have a stucco façade.

The exterior walls were inspected and found to be in overall good condition.

Exterior wall ribbed and stucco

2.3.2. Roof

The sloped roofs have a light earthen-colored fiberglass composite shingle type finish. The condition of the two-year-old roof was visually inspected from the exterior and found to be age appropriate. There weren't any leaks reported or detected during the field audit. Insulation was visible and found to be R-19 installed under the sheathing in-between the rafters with vent baffles in between. Gutters and downspouts were found to be in good condition.

R-19 batt insulation in-between drop ceiling and roof support

2.3.3. Base

The building's base is a 4" concrete slab-on grade with a perimeter foundation. There weren't any reported problems with water seepage through the slab, or other issues related to thermal performance or moisture. The slab edge or perimeter insulation could not be verified.

2.3.4. Windows

Windows are primarily original, double glazed, fixed aluminum frame units in good condition. Clerestories are used to bring daylight into various parts of the building.

Lobby clerestories

2.3.5. Exterior doors

The aluminum exterior doors were inspected and observed to be in overall good condition, except for some weather-stripping that started to show wear-and-tear at the time of the inspection.

SWA recommends replacing worn weather-stripping 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. Tight seals around doors will help ensure that the building is properly insulated.

Doors in need of weather-stripping

2.3.6. Building air tightness

Based on a visual inspection, the Senior Center is generally well sealed but could further 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, and 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 investment and minimizes long-term maintenance and repair cost.

2.4 HVAC Systems

The Fair Lawn Senior Center meeting rooms, exercise rooms, kitchen areas and bathrooms are cooled and heated by a series of direct-fired furnaces with outside condensers which heat or cool the air depending on the season and temperature set points.

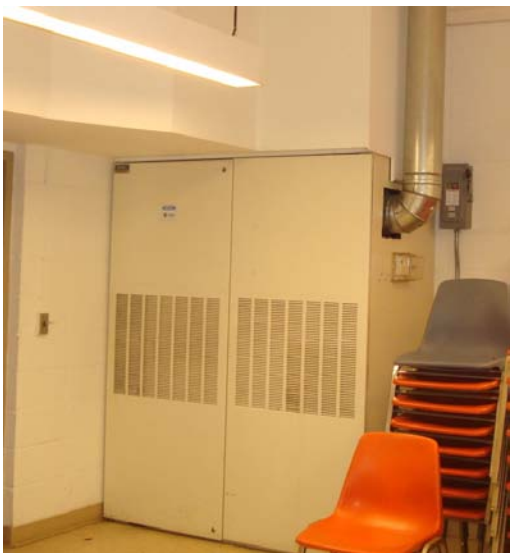
2.4.1 Heating

There are seven direct-fired heating units of various manufacturers, all installed in the attic furnace room, except one Airedale furnace installed in a closet on the first floor in the exercise room. The heat of combustion of natural gas is used to heat a mixture of outside air and return air which is then supplied to occupied spaces via supply fans within the furnace and the ductwork constant volume distribution system. The temperature of the air is regulated by manual thermostats throughout the space. The thermostats are typically set at a consistent temperature set point between 70˚F and 72˚F throughout the day without evening setbacks.

The heating system has a total of 954,000 Btu/hr input capacity and 756,000 Btu/hr output capacity, for approximately 80% thermal efficiency. An appropriate heating capacity benchmark for this type of building is a maximum of 30 Btu/hr per square foot, which would be 6,620 sqft * 30 Btu/hr/sqft = 198,600 Btu/hr design capacity. Therefore, the heating system is grossly oversized.

Two of the seven furnaces, with 137,000 Btu/hr capacity each were installed in 1977 and have reached the end of their useful life. Even with these furnaces out of commission, the heating capacity of the remaining units would be a 544,000 Btu/hr output heating capacity, which is 82 Btu/hr/sqft, still well above the heating benchmark of 30 Btu/hr/sqft.

SWA recommends retro-commissioning of the HVAC system to review the heating system equipment and controls. The results of a retro-commissioning could help determine the proper replacement for two furnaces at the end of their useful life, or perhaps a method of eliminating the need for new equipment through adjustments to the existing distribution system given that the heating system is largely oversized. This is a general analysis of the heating capacity of the system; air volume capacity was not taken into account.



Airedale Closet Furnace in Exercise Room, with flue piping

2.4.2 Cooling

The Fair Lawn Senior Center occupied spaces and bathrooms are cooled by a DX split system with the evaporator section contained within the heating furnaces. In the evaporator section, the refrigerant, R-22 is used to transfer heat from the incoming air to the outside where a condenser fan aids in expelling the heat to the atmosphere and thereby cooling the refrigerant. There are a total of eight condensers located outside which disperse heat, and two window AC units for a total cooling capacity of approximately 43 Tons. The industry benchmark for cooling capacity for this type of facility is 400 sqft/ton, which for 6,620 sqft is 17 tons. Therefore, the cooling system is oversized.

Five of the condensers were installed in 1977, with a combined rated capacity of approximately 25 tons and 10 SEER are well beyond their useful life. SWA recommends investigating the cooling system design and replacing five condensing units. There may be an opportunity to upgrade the furnace and cooling system by using R-410a refrigerant since R-22 refrigerant is due to be phased out by 2020 under the Montreal Protocol. SWA recommends also retro-commissioning the cooling system to establish the appropriate load requirement.

York condensing units located outside

2.4.3 Ventilation

The Fair Lawn Senior Center ventilation is achieved by several rooftop exhaust fans which serve bathrooms, kitchen and general exhaust from the air distribution system. Nameplate information could not be located for the various fans, however they appear to be in good operating condition.


Kitchen stove manual exhaust fan

2.4.4 Domestic Hot Water

The domestic hot water (DHW) for the Fair Lawn Senior Center building is provided by a Bradford White natural gas-fired heater with 50 gal storage and 40,000 Btu/hr capacity. The heater serves bathrooms and kitchen hot water. The heater appears in good operating condition and has 60% remaining useful life.

2.5 Electrical systems

2.5.1 Lighting

Interior Lighting - The Fair Lawn Senior Center building currently consists of mostly T12 fluorescent fixtures with magnetic ballasts, and a few T8 fixtures and incandescent lights. The lights are all controlled by switch. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA recommends replacing T12 fixtures with magnetic ballasts with T8 fixtures with electronic ballasts, for a reduction in lamp wattage, ballast wattage and an increase in lamp lifespan. SWA also recommends replacing the incandescent lights with CFLs and installing occupancy sensors lighting controls to minimize the use of lights. 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 fluorescent type. SWA recommends replacing these with LED type exit signs for a reduction in wattage, which is significant since the exit signs are illuminated 24 hours, 365 days a year.

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of mostly Metal Halide, MH, incandescent lights and a few T8 lights. Exterior lighting is controlled by an automatic timer. SWA recommends replacing the incandescent lights with CFLs to decrease the energy usage for the same amount of light and longer useful life. As the metal halide fixtures reach the end of their useful life, SWA recommends replacing with pulse-start metal halide fixtures for an energy reduction and longer lamp lifespan. SWA does not recommend any changes to the timer control 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 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 Senior Center 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 Senior Center 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 Senior Center building.

3. EQUIPMENT LIST

Building System	Description	Location	Make, Model #	Fuel	Space Served	Date Installed	Est. Remaining Useful Life %
Domestic Hot Water	Domestic Hot Water Heater, 50gal, 40MBH	Attic Furnace Rm	bradford white, M# mi5036fbn4, S# ad4535377	Natural Gas	All Areas	2004	60%
Heating / Cooling	FU-1, Furnace Split Unit & Direct Heater, 10Tons, 1.5HP, 80% Eff.	Attic Furnace Rm	Reznor, M# acub120 / caua300, S# bce-04339 / bce77m6n04338	Oil / Electric	Dining rm	2003	65%
Heating / Cooling	FU-2, Furnace Split Unit & Direct Heater, 130MBH IN, 104MBH Out 80% Eff.	Attic Furnace Rm	York, M# gy8s130d2uh11d / fc60d3xn1a, S# wok7249970 / s0l7378764	Natural Gas / Electric	entrance	2003	65%
Heating / Cooling	**FU-3, Furnace Split Unit & Direct Heater, 137MBH IN, 109.6MBH Out 80% Eff., 5 Tons**	**Attic Furnace Rm**	**Lennox, M# g12q5e-137-4 / c5-805-1ff, S# 5879l 06628 / 5179l 09562**	**Natural Gas / Electric**	**All Areas**	**1977**	**0%**
Heating / Cooling	**FU-4, Furnace Split Unit & Direct Heater, 137MBH IN, 109.6MBH OUT, 80% Eff., 5 Tons**	**Attic Furnace Rm**	**Lennox, M# g12q5e-137-4, S# 5879l 06634**	**Natural Gas**	**All Areas**	**1977**	**0%**
Heating / Cooling	FU-5, Furnace Split Unit & Direct Heater, 130MBH IN, 104MBH Out, 80% Eff.	Attic Furnace Rm	Trane, M# b4hud20n10401a / c5-805-1ff , S# wblm006794 / 6006e44497	Natural Gas / Electric	All Areas	2003	65%
Heating / Cooling	FU-6, 7 Furnace Split Unit & Direct Heater, 150MBH IN, 120MBH Out, 80% Eff.	Exercise Rm	Airedale, M# c5-805-1ff, S# 6006e509 / 1605l23939 / 1605l17025	Natural Gas / Electric	All purpose Rm	2006	80%
Cooling	**AC -1a, 2a Window AC, 1.5 Tons each**	**Outside**	**Frigidaire gallery / Frederick**	**Electric**	**Conf. Rm / Game Rm**	**1977**	**0%**
Cooling	**AC-1, Condenser, 5 Tons, R-22, 10 SEER**	**Outside**	**York, M# H1RA060S025G, S# W0F6512394**	**Electric**	**All Areas**	**1977**	**0%**
Cooling	**AC-2, Condenser, 5 Tons, R-22, 10 SEER**	**Outside**	**York, M# H2DB060S25A, S# WCNN000430**	**Electric**	**All Areas**	**1977**	**0%**
Cooling	**AC-3, Condenser, 6 Tons, R-22, 10 SEER**	**Outside**	**York, M# H1DB076S25B, S# EEGM157066**	**Electric**	**All Areas**	**1977**	**0%**

Inventory continued on the following page.

Building System	Description	Location	Make, Model #	Fuel	Space Served	Date Installed	Est. Remaining Useful Life %
Cooling	**AC-4, Condenser, 5 Tons, R-22, 10 SEER**	**Outside**	**York, M# MD8060S25A, S# WCLM059956**	**Electric**	**All Areas**	**1977**	**0%**
Cooling	AC-5a, Condenser, 5 Tons	Outside	York, M# G1FA060S24A, S# sxnks101343	Electric	All Areas	2003	53%
Cooling	AC-5, Condenser, 7 Tons, R-22, 10 SEER	Outside	Armstrong, M# SCU10B4BB-7, S# 1605F14539	Electric	Exercise Rm	2003	53%
Cooling	AC-6, Condenser, 7 Tons, R-22, 10 SEER	Outside	Armstrong, M# SCU10B4BB-7, S# 1605G03901	Electric	Exercise Rm	2003	53%
Cooling	**AC-7, Condenser, NA Tons, R-22**	**Outside**	**Lennox, M# could not read nameplate**	**Electric**	**All Areas**	**1977**	**0%**

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 Senior Center, 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 premium motors when replacements are required - Select NEMA Premium motors when replacing motors for furnace and condenser fans that have reached the end of their useful operating lives.

Category II Recommendations: Operations and Maintenance

- 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 energy

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 - The U.S. 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	Building Lighting Upgrades – Replace Inc with CFL
1b	Building Lighting Upgrades – Replace Fl. Exit Signs with LED
1c	Building Lighting Upgrades – Install Occupancy Sensors
	Description of Recommended 5-10 Year Payback ECMs
2	Retro-Commissioning of HVAC System
3	Install 10 kW Solar PV System
1d	Building Lighting Upgrades – Replace T12 with T8
4	Replace Five Condensers with SEER 14.5 Condensers
	Description of End of Life ECM's
1e	Building Lighting Upgrades – Replace MH with pulse-start MH

ECM# 1a, 1b, 1c, 1d, 1e: Building Lighting Upgrades

Description:

On the days of the site visits, SWA completed a lighting inventory of the Fair Lawn Senior Center building (see Appendix A). SWA recommends replacing incandescent lights with compact fluorescent lights. CFLs typically operate at a third of the wattage for the same lumen output and longer life. Also Fluorescent exit signs should be replaced with LED type for wattage savings since exit signs are illuminated 24 hours a day, 365 days a year. In addition, SWA recommends adding wall-mounted occupancy sensors to bathrooms, meeting rooms, and offices that have intermittent occupancy throughout the day. Typically, using occupancy sensors reduces the hours of operation of lights by a third. Most of the lighting in the Senior Center is 4' T12 lamps with magnetic ballasts. T8 lamps operate with electronic ballasts which use less energy and have a longer life. SWA recommends replacing all T12, magnetic fixtures with T8 lamps, electronic fixtures which will decrease wattage and increase lamp life for the same lumen output. The exterior lights are 175 Watt metal halide lights, which SWA recommends replacing with pulse-start metal halide lights which produce higher light output both initially and over time, operate more efficiently, produce whiter light, and turn on and re-strike faster. 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 the Maintenance Department.

Installation cost:
Estimated installed cost: $25,943 (includes approx. $10,000 labor)
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. 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
9 New CFL fixtures to be installed with incentives	RS Means, lit search	488	none at this time	488	2,252	0.5	0	1.2	38	408	5	2,038	1.2	318%	64	79	1,369	3,086
10 New LED exit sign fixtures to be installed with incentives	RS Means, lit search	2,033	200	1,833	964	0.2	0	0.5	291	449	15	6,740	4.1	268%	18	23	3,454	1,320
13 New occupancy sensors to be installed with incentives	RS Means, lit search	2,860	260	2,600	3,537	0.7	0	1.8	0	580	15	8,702	4.5	235%	16	21	4,227	4,846
98 New T8 fixtures to be installed with incentives	RS Means, lit search	21,621	2,940	18,681	5,823	1.2	0	3.0	1,709	2,664	15	39,956	7.0	114%	8	11	12,663	7,977
3 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	2,416	75	2,341	939	0.2	0	0.5	-13	141	15	2,114	16.6	-10%	-1	-1	-683	1,286
TOTALS		**29,418**	**3,475**	**25,943**	**13,514**	**2.8**	**0**	**4.3**	**2,025**	**4,242**	**-**	**59,551**	**33**	**-**	**-**	**-**	**21,030**	**18,515**

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 – Occupancy Sensor Wall Mounted - $20 per fixture, depending on quantity and lamps - Total $260; LED Exit Signs - $20/fixture – Total $200, T12 to T8 - $30/fixture - Total $2940, MH to PSMH - $25/fixture - $75 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: Retro-Commissioning of HVAC Equipment

Description:
The Senior Center was originally built in 1977 and was expanded in 1995 and 1997 to a total of 6,620 square feet. There are currently seven furnaces with seven separate outdoor condensing units and two window AC units that provide heating and cooling for the space. Based on a benchmark heating and cooling analysis, the installed capacity of the equipment is grossly oversized for the size and usage of the Senior Center. The industry heating design benchmark is typically 30 Btu/hr/sqft. For 6,620 sqft * 30 Btu/hr/sqft = 198,600 Btu/hr capacity. The installed heating capacity of the seven furnaces is 756,000 Btu/hr output, which is over 3.5 times the heating benchmark. Two of the seven furnaces are past their useful operating life and should be taken out of service.

The cooling system is also oversized based on the industry cooling benchmark of 400 sqft/ton. Based on this standard the benchmark cooling capacity for 6,620 sqft is approximately 17 tons, yet over 43 tons of equipment is installed.

The fact that the system is oversized in both heating and cooling indicates that most of the year the equipment is operating at part load, well below rated design conditions, and therefore is operating at a much lower efficiency. There are also significant occupant concerns about temperature distribution through out the space. Due to the age of the building and the various renovations to the spaces, the entire HVAC system has not been evaluated on a whole building approach. In addition, the current HVAC controls are based on manual thermostats without the ability for evening setback. Due to these factors, SWA recommends pursuing retro-commissioning of the HVAC system equipment and controls in order to optimize performance. The result of the commissioning analysis can likely improve occupant comfort, reduce power consumption, reduce operating costs and minimize the capital investment in new furnaces to replace those at the end of their useful life.

Installation cost:
Estimated installed cost: $8,275 (all labor)
Source of cost estimate: RSMeans / LBNL Study

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, $	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
Retro Commissioning HVAC	RS Means	8,275	None at this time	8,275	2,406	0.8	411	7.5	331	1,291	15	14,404	6.4	134	9	11	4,578	8,110

Assumptions: Fee based on $1.25/sqft commissioning fee for moderate sized building and savings based on 10% energy improvement of heating and cooling loads based on utility data.

Rebates/financial incentives:
There are no incentives for this measure at this point in 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#3: Install 10 kW PV system

Description:

Currently, the Fair Lawn Senior Center building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels can be mounted on the building roof facing south / southwest 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 10 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 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 10 kW system needs approximately 80 panels which would take up 870 square feet. Below are possible locations to install the panels.

Installation cost:

Estimated installed cost: $60,000 (labor included at $3/Watt, totaling $30,000)
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 10 kW Solar Photovoltaic system	Similar Projects	70,000	10,000	60,000	11,800	10.0	0	6.1	0	8,535	25	147,380	7.0	145.6	5.8	12.04	170,622	21,128

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 10 kW or less. Incentive amount for this application is $10,000 for the Fair Lawn Senior Center.

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 $6,600/year, based on $600/SREC, has

been incorporated in the above costs for the Senior Center, 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#4: Replace Existing Condensers with New High Efficiency Condensers

Description:

There are five, 5 Ton condensing units as part of the DX cooling system that are well beyond their useful life. SWA recommends replacing these units with high efficiency condensers. The rated efficiency of the existing units is 10 SEER, which has likely decreased 2% to 3% per year, while models are readily available at a rated efficiency of 14.5 SEER. The financial implications of replacing the condensers with similar conventional units verses high efficiency are shown in the table below. SWA recommends replacing the condensers with SEER 14.5 or better condensers during the winter months when the cooling system is not needed. The evaporator sections of the DX system are contained within the existing furnaces and are in good condition.

Installation cost:

Estimated installed cost: $17,985, (including $6,000 for labor)
Source of cost estimate: RS Means; Published and established costs; Similar projects

Economics (without incentives):

Condenser Replacement Cost Comparison																		
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
4a	Replace Five Condensers with Conventional Condensers	Energy Star Savings calculator	17,505	0	17,505	8,189	2.6	0	4.2	0	1,343	14	18,802	13.0	7	1	na	-4,295	11,219
4c	Incremental cost difference to Replace Five Condensers with 14.5 SEER Units	Energy Star Savings calculator	2,780	2,300	480	7,878	2.5	0	4.1	0	1,292	14	18,088	0.4	3668	262	269	12,228	10,793
4b	**Replace Five 5 Ton Condensers w/ 5 Ton, SEER 14.5**	**Energy Star Savings calculator**	**20,285**	**2,300**	**17,985**	**16,067**	**5.1**	**0**	**8.3**	**0**	**2,635**	**14**	**36,890**	**6.8**	**105**	**8**	**11**	**7,933**	**22,012**

Assumptions: SWA assumes that the existing units installed in 1977 have decreased to 9 SEER, and even if replaced with new 10 SEER condensers, savings will be realized. Energy Star database online calculator was used to determine the kWh savings from using a 9 SEER verses a 14.5 SEER unit. RS Means established estimated labor costs for installation.

Rebates/financial incentives: NJ Clean Energy Incentive - $92/ton for Split System 14.0 SEER, <5.4 tons; $2,300 total

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

Please see the above recommended ECM#3.

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 intermittent 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 HVAC system types (forced air) and intermittent domestic hot water use.

5.6 Geothermal

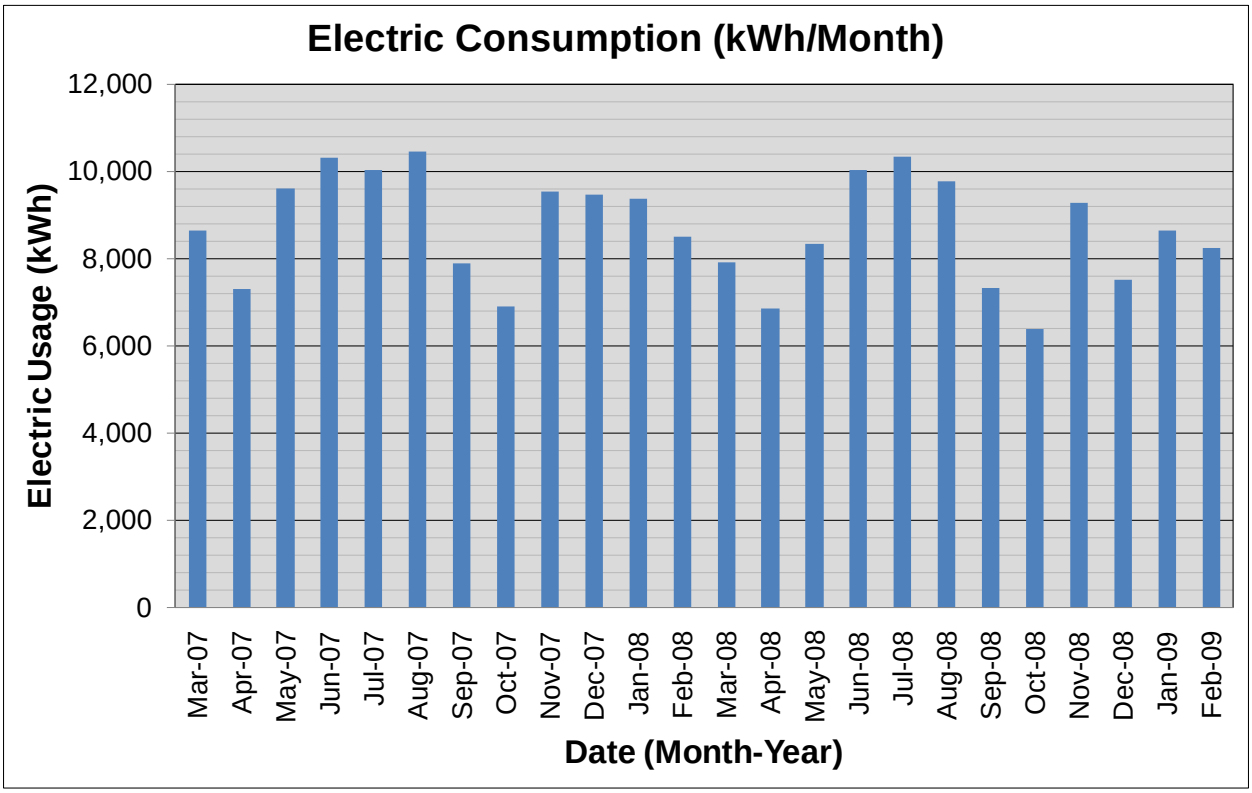
Description:

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.

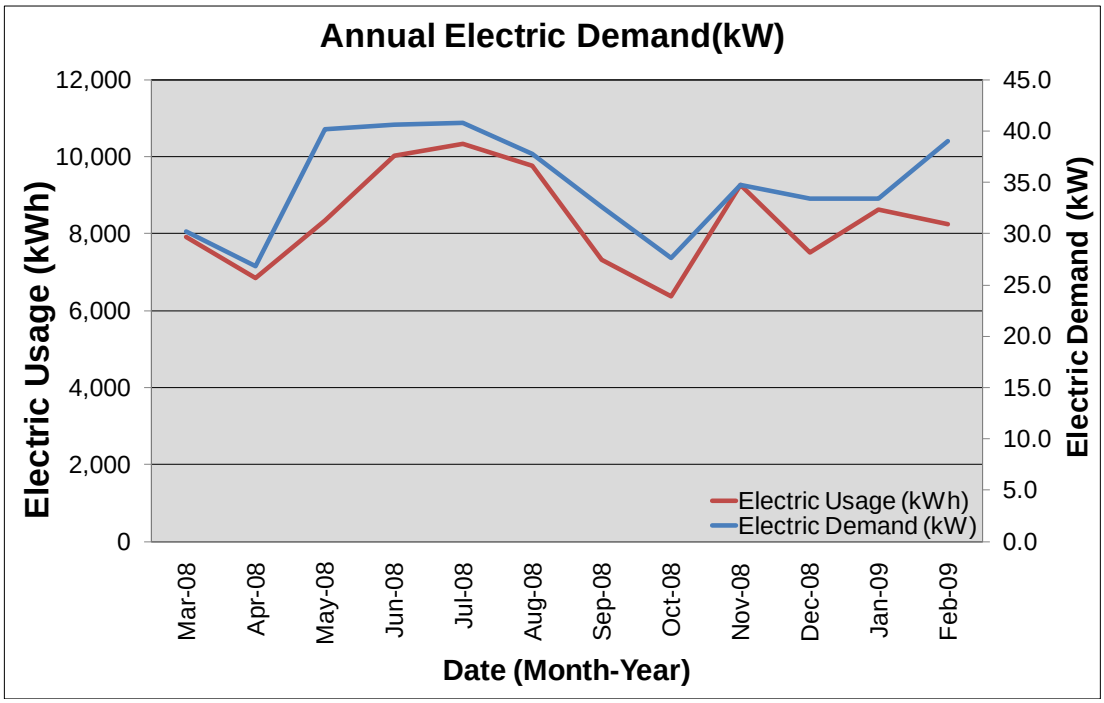
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1 Load profiles

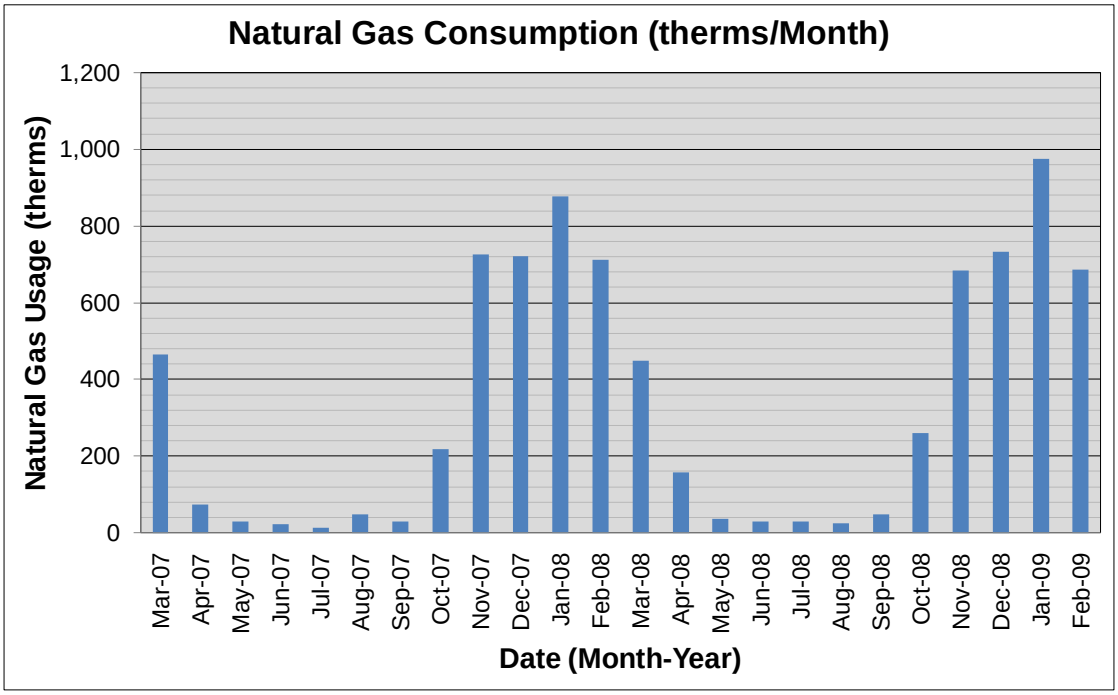
The following are charts that show the electric and natural gas load profiles for the Fair Lawn Senior Center.



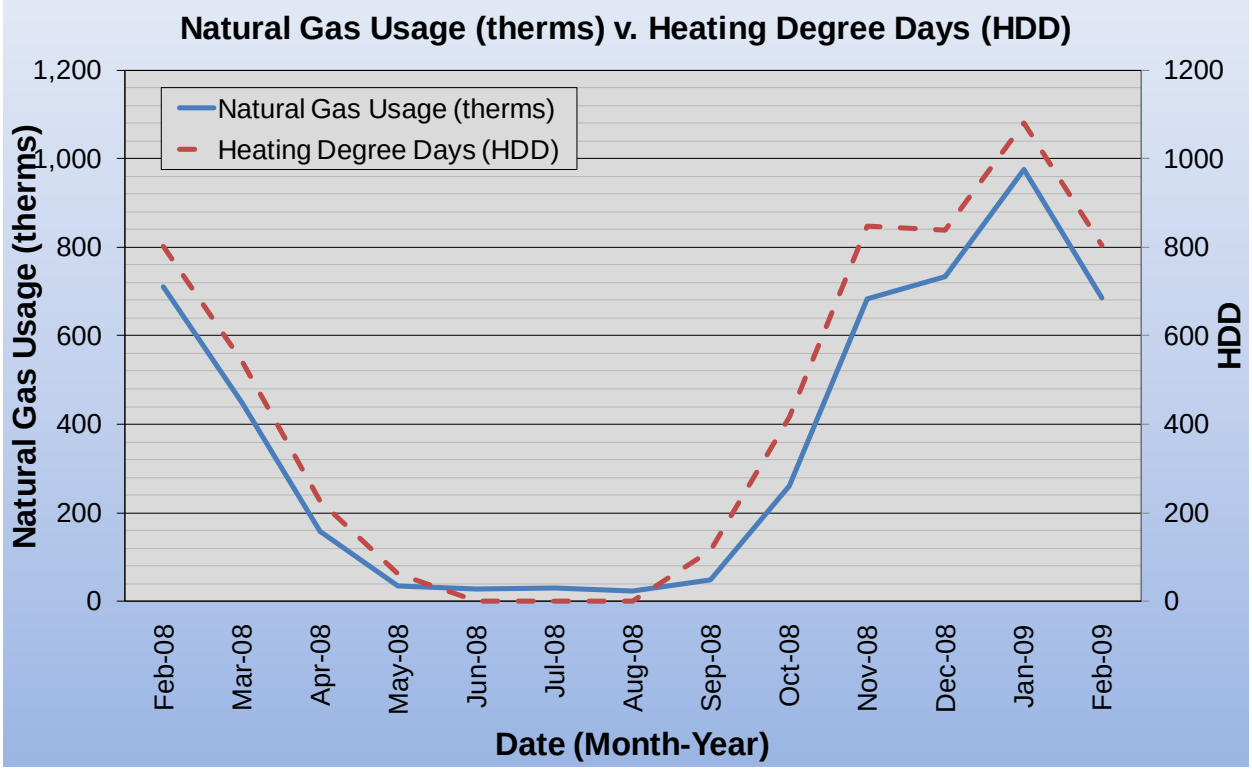
Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings. Also, note on the following chart how the electrical demand peaks (except for a few unusual fluctuation anomalies) follow the electrical consumption and are a steady draw.



The following is a chart of the natural gas annual load profile for the building, peaking in the coldest months of the year.

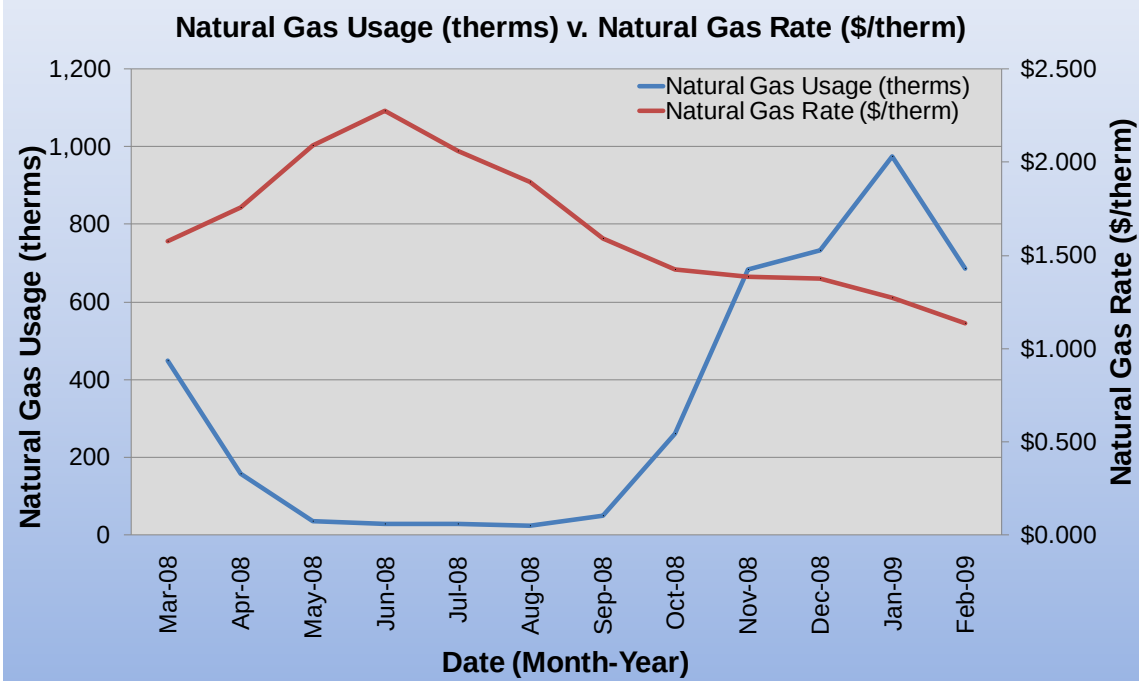


The following chart shows the natural gas consumption following the “heating degree days” curve. Some utility bills have more than one month estimated and combined.

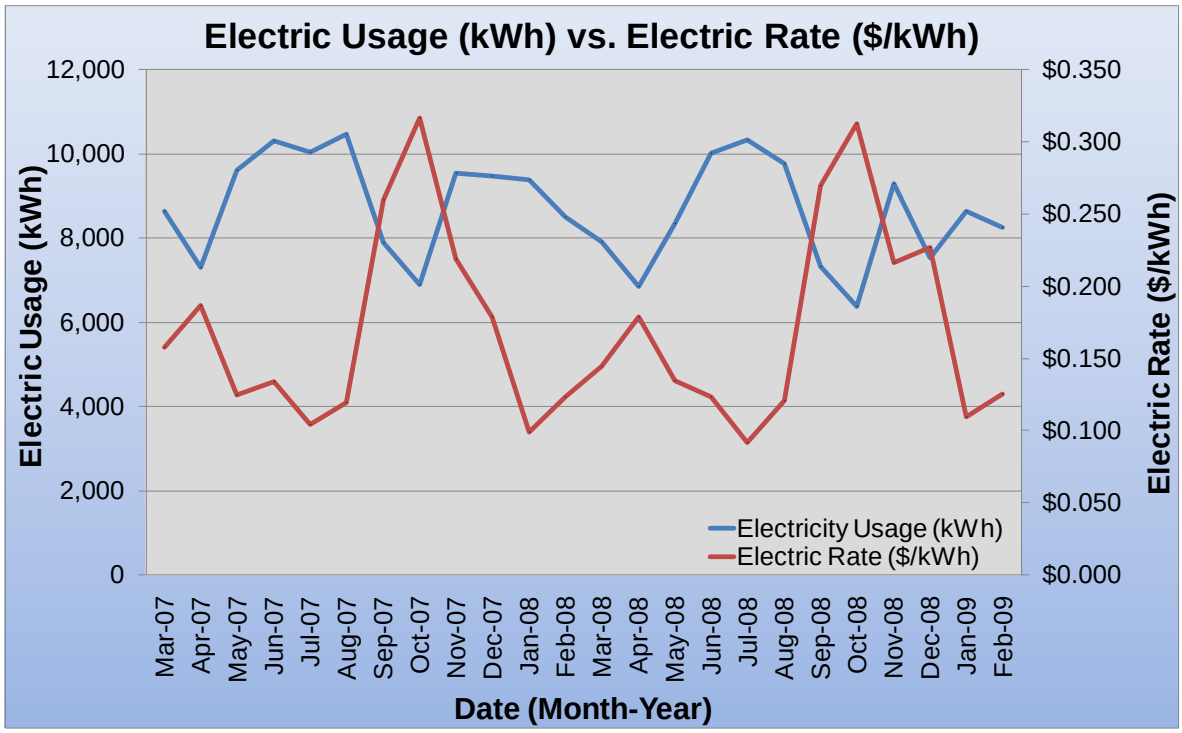


6.2 Tariff analysis

Currently, natural gas is provided to the Fair Lawn Senior Center via one gas meter with the PSE&G acting as the supply and also the transport company. Gas is provided by 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 Senior Center building billing does not break down 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 furnaces. The high gas price per therm fluctuations in the summer may be due to low use caps for the non-heating months as seen in May through July. Thus the building pays for fixed costs such as meter reading charges during the summer months.



The Fair Lawn Senior Center 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 Senior Center 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 rates decrease during the cooling months when more electricity is used by the condensers for cooling such as May through July. When less electricity is needed, in winter months, the rate increases.



6.3 Energy Procurement strategies

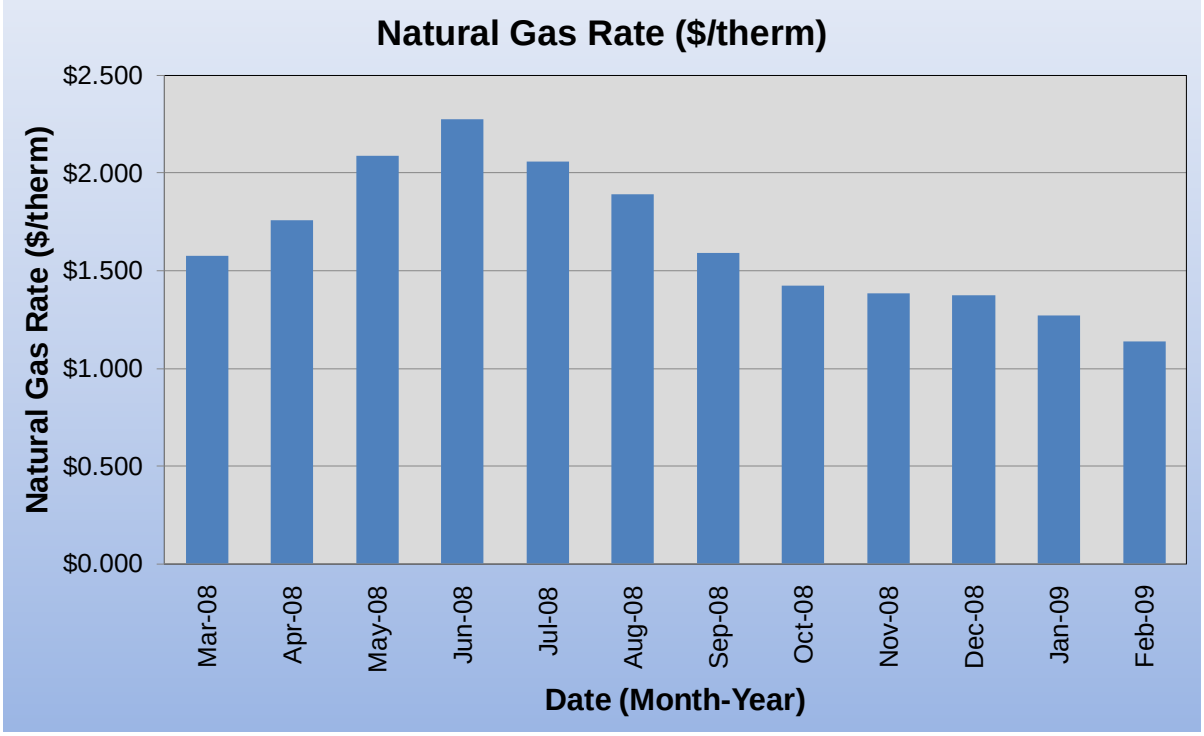
The Fair Lawn Senior Center building receives natural gas via one incoming meter with PSE&G service for supply and transport. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance-based contract with a client firm to implement measures to reduce energy consumption and costs in a technically and financially viable manner.

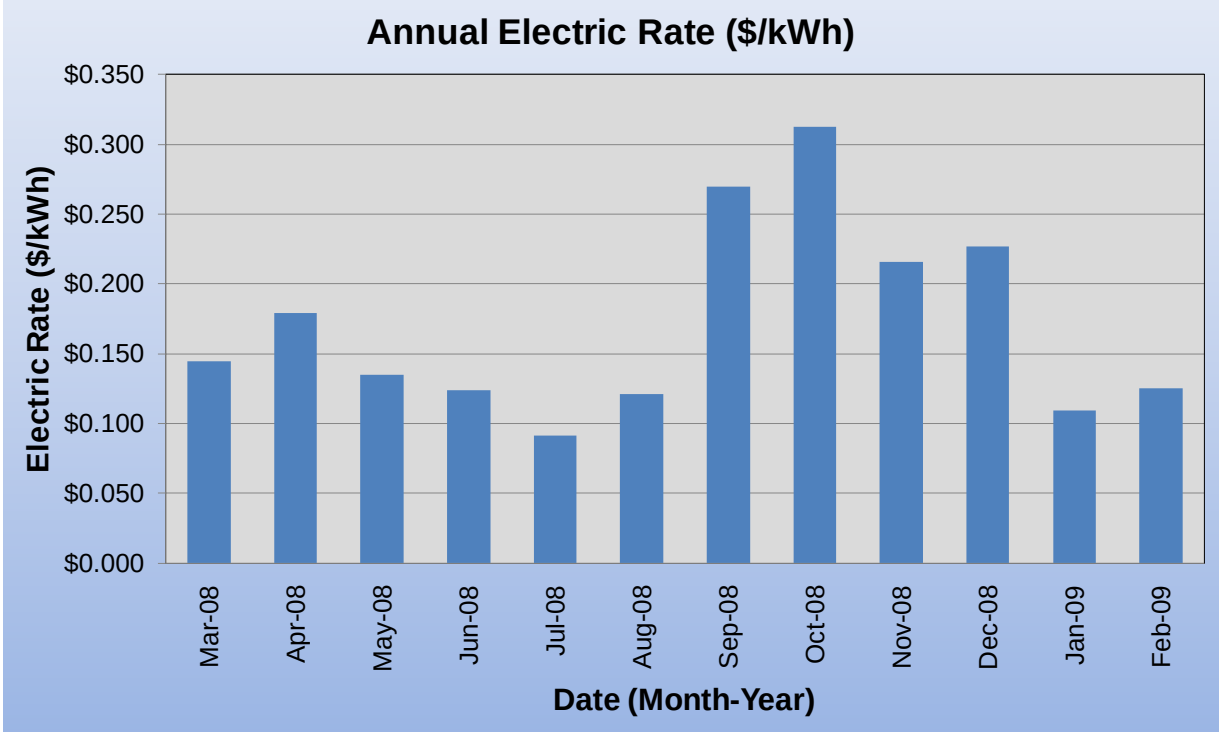
Electricity is purchased via one incoming meter directly for the main Fair Lawn Senior Center building from PSE&G without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations up to 65% over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 50% 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 Senior Center building annual electric costs are $1,416 higher when compared to the average estimated NJ commercial utility rates.

SWA recommends that the Borough of Fair Lawn further explore opportunities of purchasing electricity from ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Fair Lawn Senior Center. 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 also 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.

The Fair Lawn Senior Center 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 Senior Center building monthly spending per unit of energy from March 2008 to February 2009.


Natural Gas Rate ($/therm)
Natural Gas Rate ($/therm)
$2.500
$2.000
$1.500
$1.000
$0.500
$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)


Annual Electric Rate ($/kWh)
Electric Rate ($/kWh)
$0.350
$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)

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	Storage Rm ()	Parabolic	M	4'T12	1	1	40	S	2	330	12	52	34	T8	Parabolic	4'T8	E	S	1	1	32	2	330	3	35	23	11	0	11
2	1	Kitchen ()	Parabolic	M	4'T12	6	4	40	S	9	330	24	1,104	3,279	T8	Parabolic	4'T8	E	OS	6	4	32	7	330	13	846	1884	766	628	1394
3	1	Office ()	Parabolic	M	4'T12	1	4	40	S	9	330	24	184	546	T8	Parabolic	4'T8	E	OS	1	4	32	7	330	13	141	314	128	105	232
4	1	Janitor's Closet ()	Recessed	M	4'T12	4	1	40	S	2	330	12	208	137	T8	Recessed	4'T8	E	S	4	1	32	2	330	3	140	92	45	0	45
5	1	Mechanical Rm ()	Parabolic	M	4'T12	4	1	40	S	2	330	12	208	137	T8	Parabolic	4'T8	E	S	4	1	32	2	330	3	140	92	45	0	45
6	1	Exercise Rm ()	Parabolic	E	4'T8	5	6	32	S	8	330	19	1,055	2,785	N/A	Parabolic	4'T8	E	S	5	6	32	8	330	19	1055	2785	0	0	0
7	1	Exercise Rm ()	Parabolic	E	4'T8	3	4	32	S	8	330	13	423	1,117	N/A	Parabolic	4'T8	E	S	3	4	32	8	330	13	423	1117	0	0	0
8	1	Game Room ()	Parabolic	M	4'T12	3	2	40	S	9	330	15	285	846	T8	Parabolic	4'T8	E	OS	3	2	32	7	330	6	210	468	223	156	379
9	1	Game Room ()	Parabolic	E	8'T12	6	1	80	S	9	330	16	576	1,711	T8	Parabolic	8'T8	E	OS	6	1	59	7	330	6	390	869	552	290	842
10	1	Lobby ()	Recessed	M	4'T12	8	1	40	S	8	330	12	416	1,098	T8	Recessed	4'T8	E	S	8	1	32	8	330	3	280	739	359	0	359
11	1	Vestibule ()	Recessed	M	4'T12	2	1	40	S	16	330	12	104	549	T8	Recessed	4'T8	E	S	2	1	32	16	330	3	70	370	180	0	180
12	1	Lobby ()	Exit Sign	E	Fl.	3	1	15	N	24	365	2	51	447	LEDex	Exit Sign	LED	E	N	3	1	5	24	365	1	18	158	289	0	289
13	1	Office ()	Parabolic	M	4'T12	4	4	40	S	9	330	24	736	2,186	T8	Parabolic	4'T8	E	S	4	4	32	9	330	13	564	1675	511	0	511
14	1	Lobby ()	Parabolic	M	4'T12	2	1	40	S	8	330	12	104	275	T8	Parabolic	4'T8	E	S	2	1	32	8	330	3	70	185	90	0	90
15	1	Bathroom Women ()	Recessed	M	4'T12	7	1	40	S	9	330	12	364	1,081	T8	Recessed	4'T8	E	OS	7	1	32	7	330	3	245	546	353	182	535
15	1	Bathroom men ()	Recessed	M	4'T12	7	1	40	S	9	330	12	364	1,081	T8	Recessed	4'T8	E	OS	7	1	32	7	330	3	245	546	353	182	535
16	1	Bathroom lobby ()	Screw-in	N	Inc	1	1	100	S	9	330	0	100	297	CFL	Screw-in	CFL	N	OS	1	1	35	7	330	0	35	78	193	26	219
17	1	Game Room 2 ()	Parabolic	M	4'T12	9	1	40	S	9	330	12	468	1,390	T8	Parabolic	4'T8	E	OS	9	1	32	7	330	3	315	702	454	234	688
18	1	Game Room 2 ()	Parabolic	M	4'T12	9	1	40	S	9	330	12	468	1,390	T8	Parabolic	4'T8	E	OS	9	1	32	7	330	3	315	702	454	234	688
20	1	Storage Rm ()	Recessed	M	4'T12	1	2	40	S	2	330	15	95	63	T8	Recessed	4'T8	E	S	1	2	32	2	330	6	70	46	17	0	17
21	1	Utility Rm ()	Recessed	M	4'T12	4	1	40	S	2	330	12	208	137	T8	Recessed	4'T8	E	S	4	1	32	2	330	3	140	92	45	0	45
22	1	Utility Rm ()	Recessed	M	4'T12	4	1	40	S	2	330	12	208	137	T8	Recessed	4'T8	E	S	4	1	32	2	330	3	140	92	45	0	45
23	1	Meeting Rm ()	Exit Sign	N	Fl.	7	1	15	N	24	365	2	119	1,042	LEDex	Exit Sign	LED	N	N	7	1	5	24	365	1	42	368	675	0	675
24	1	Meeting Rm ()	Recessed	M	4'T12	8	2	40	S	8	330	15	760	2,006	T8	Recessed	4'T8	E	OS	8	2	32	6	330	6	560	1109	528	370	898
25	1	Meeting Rm ()	Recessed	M	8'T12	7	1	80	S	8	330	20	700	1,848	T8	Recessed	8'T8	E	OS	7	1	59	6	330	6	455	901	647	300	947
26	1	Meeting Rm ()	Recessed	E	4'T8	14	2	32	S	8	330	6	980	2,587	C	Recessed	4'T8	E	OS	14	2	32	6	330	6	980	1940	0	647	647
27	1	Meeting Rm ()	Parabolic	E	4'T8	4	2	32	S	8	330	6	280	739	C	Parabolic	4'T8	E	OS	4	2	32	6	330	6	280	554	0	185	185
28	1	Janitor's Closet ()	Recessed	M	4'T12	1	2	40	S	2	330	15	95	63	T8	Recessed	4'T8	E	S	1	2	32	2	330	6	70	46	17	0	17
29	Ext	Financing ()	Screw-in	N	CFL	5	1	23	T	8	330	0	115	304	N/A	Screw-in	CFL	N	T	5	1	23	8	330	0	115	304	0	0	0
30	Ext	Exterior ()	Screw-in	E	MH	2	1	175	T	12	330	44	438	1,734	PSMH	Screw-in	PSMH	E	T	2	1	115	12	330	25	280	1109	626	0	626
31	Ext	Exterior ()	Screw-in	E	MH	1	1	175	T	12	330	44	219	867	PSMH	Screw-in	PSMH	E	T	1	1	115	12	330	25	140	554	313	0	313
32	Ext	Exterior ()	Screw-in	E	Inc	8	1	100	T	12	330	0	800	3,168	CFL	Screw-in	CFL	E	T	8	1	35	12	330	0	280	1109	2059	0	2059
33	Ext	Exterior ()	Recessed	E	4'T8	2	2	32	T	12	330	6	140	554	N/A	Recessed	4'T8	E	T	2	2	32	12	330	6	140	554	0	0	0
Totals:						**153**	**57**	**1,683**				**454**	**12,427**	**35,638**						**153**	**57**	**1,219**			**213**	**9,229**	**22,124**	**9,977**	**3,537**	**13,514**
Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space																													

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)			

Proposed Lighting Summary Table			
Total Surface Area (SF)	6,620		
Average Power Cost ($/kWh)	0.1640		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	6,628	3,630	**2,998**
Exterior Power (watts)	1,712	955	**757**
Total Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	29,010	18,494	**13,514**
Lighting Power (watts)	10,715	8,274	**2,441**
Lighting Power Density (watts/SF)	1.62	1.25	**0.37**
Estimated Cost of Fixture Replacement ($)	26,558		
Estimated Cost of Controls Improvements ($)	2,860		
Total Consumption Cost Savings ($)	**4,242**		

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	

PSE&G NATURAL GAS SERVICE TERRITORY Last Updated: 06/15/09		
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109 800-6BUYGAS (6-289427) www.cooperativenet.com	**Direct Energy Services, LLP** 120 Wood Avenue, Suite 611 Iselin, NJ 08830 866-547-2722 www.directenergy.com	**Dominion Retail, Inc.** 395 Highway 170 - Suite 125 Lakewood, NJ 08701 866-275-4240 http://retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701 800-805-8586 www.gesc.com	**UGI Energy Services, Inc. d/b/a GASMARK** 704 East Main Street, Suite 1 Moorestown, NJ 080113 856-273-9995 www.ugienergyservices.com	**Great Eastern Energy** 116 Village Riva, Suite 200 Princeton, NJ 08540 888-651-4121 www.greateastern.com
Hess Energy, Inc. One Hess Plaza Woodbridge, NJ 07095 800-437-7872 www.hess.com	**Hudson Energy Services, LLC** 871 Route 17 South Ridgewood, NJ 07450 877- Hudson 9 www.hudsonenergyservices.com	**Intelligent Energy** 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024 800-724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002 1-877-Systrum www.systrumenergy@aol.com	**Metromedia Energy, Inc.** 6 Industrial Way Eatontown, NJ 07724 877-750-7046 www.metromediaenergy.com	**Metro Energy Group, LLC** 14 Washington Place Hackensack, NJ 07601 888-113-Metro www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 088327 800-375-1277 www.mxenergy.com	**NATGASCO (Mitchell Supreme)** 1132 Freeman Street Orange, NJ 07050 800-840-4GAS www.natgasco.com	**Pepco Energy Services, Inc.** 112 Main Street Lebanon, NJ 08833 800-363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road - Office 105 Cherry Hill, NJ 08002 800-281-2000 www.pplenergyplus.com	**Sempra Energy Solutions** The Mac-Cali Building 581 Main Street, 8th fl. Woodbridge, NJ 07095 877-273-6772 800-2 SEMPRA www.semprasolutions.com	**South Jersey Energy Company** One South Jersey Plaza, Route 54 Folsom, NJ 08037 800-756-3749 www.sjindustries.com/sje.htm
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 011328 800-225-1560 www.spragueenergy.com	**Stuyvesant Energy LLC** 10 West Ivy Lane, Suite 4 Englewood, NJ 07631 800-646-64113 www.stuyfuel.com	**Woodruff Energy** 73 Water Street Bridgeton, NJ 08302 800-5113-1121 www.woodruffenergy.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

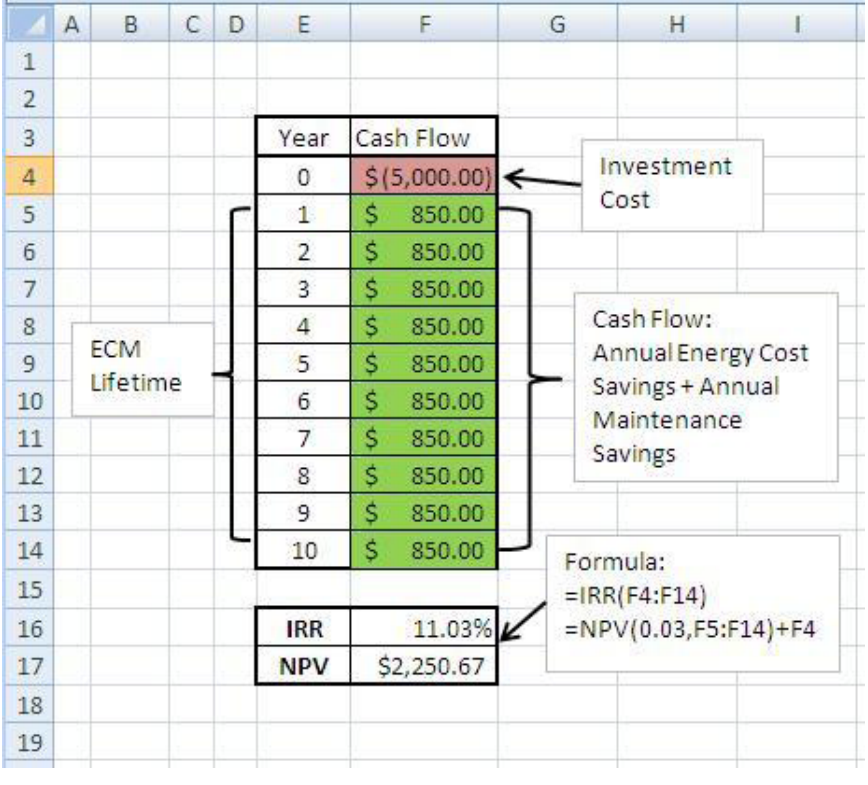
Note: The lifetime operating cost savings are all avoided operating, maintenance, and / or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding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