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June 14, 2010

Local Government Energy Program
Energy Audit Final Report

Fair Lawn Municipal Building
8-01 Fair Lawn Avenue, 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 Municipal Building

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 Municipal Building located at 8-01 Fair Lawn Avenue, 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 two-story Fair Lawn Municipal Building with full basement was built in 1962 with several renovations, the most recent in 2003 which added 2,240 square feet. The 36,112 square foot building houses administrative offices, meeting rooms, a courtroom and full Police Department. The administrative areas are occupied weekdays from 8:30 am to 4:30 pm, with court in session and committee meetings on weekday evenings. There are 60 full-time administrative employees plus 30 to 50 visitors during the day, with up to 100 visitors during court hours. The Police Department operates 24 hours a day, 7 days a week with 20 officers during day and 3 to 5 overnight.

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 cost-effective energy conservation measures for the Fair Lawn Municipal Building.

Launched in 2008, the LGEA Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. For projects awarded on or prior to December 31, 2009 the program will subsidize 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit, after applying eligible NJ SmartStart Buildings incentives, exceeds the remaining cost of the audit, then that additional 25% will also be paid by the program. The Board of Public Utilities (BPUs) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Fair Lawn Municipal Building located at 8-01 Fair Lawn Avenue, Fair Lawn, NJ. The Fair Lawn Municipal Building is a two-story building with a full basement and a floor area of 36,112 square feet. The original structure was built in 1962 with renovations and additions in 1990 and 2003.

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 Municipal Building consumed 809,000 kWh or $126,790 worth of electricity at an approximate rate of $0.157/kWh, and 8,685 therms or $11,951 worth of natural gas at an approximate rate of $1.376/therm. The joint energy consumption for the building, including both electricity and natural gas, was 3,629 MMBtu of energy that cost a total of $138,741.

SWA has entered energy information about the Fair Lawn Municipal 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 Municipal Building facility since it is categorized as a mixed use 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 103.0 kBtu/ft^{2}yr compared to the national average of "Other" space type usage of 104.0 kBtu/ft^{2}yr. Implementing all of this report's recommendations will reduce use by approximately 63.9 kBtu/ft^{2}yr, which when implemented would bring the building's energy consumption to 39.1 kBtu/ft^{2}yr. There may be energy procurement opportunities for the Fair Lawn Municipal Building to reduce annual electric utility costs, which are $5,663 higher, when compared to the average estimated NJ commercial utility rates.

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

Category I Recommendations: Capital Improvement Measures

- Install NEMA premium motors when replacements are required, such as elevator motor
- Install platform and ladder in attic of new addition for proper maintenance access for condensing furnaces

Category II Recommendations: Operations and Maintenance

- Install weep holes in exterior walls
- Upgrade roof flashing as necessary
- Re-point brick veneer on exterior wall where mortar has been damaged/missing

- Add insulation between attic and drop ceiling where missing
- Replace/repair slate roof shingles with synthetic slate, pending decision to replace
- Maintain downspouts - repair/install missing downspouts as needed
- Replace damaged/missing caulking, flashing and weather-stripping on windows as part of regular maintenance program
- Install/replace weather-stripping on all exterior doors and maintain
- Air seal around all plumbing, electrical, HVAC and structural penetrations in walls or ceilings
- 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 **four** Energy Conservation Measures (ECMs) for the Fair Lawn Municipal Building, as summarized in the following Table 1. The total investment cost for these ECMs with incentives is **$163,530**. SWA estimates a first-year savings of **$77,706** with a simple payback of **2.1 years**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the Fair Lawn Municipal Building by **676,564 lbs of CO_2** which is equivalent to removing 56 cars off the road and avoiding CO_2 to be absorbed by 1,647 trees. SWA also recommends **four** ECM's with a total first-year savings of **$44,891,** as summarized in Table 2. There are **four** End of Life ECM's or ECM's with Payback greater than 10 years, with a first-year savings of **$500,** 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. Two programs within NJ SmartStart are Pay for Performance and Direct Install. The Pay for Performance program is a three-tier incentive system, which requires that existing buildings reduce energy consumption by 15%; but for this size building, the study costs would likely exceed the savings. Direct Install is a better option. In order to quality for Direct Install, the Fairlawn Municipal Building must show that their electrical demand did not peak above 200 kW hours within 12 consecutive months prior to application. Based on the latest utility bills the peak demand was often greater than 200kW during summer months. Therefore, the building may need to implement several low-cost energy saving measures to reduce the peak demand below 200 kW before applying for Direct Install. The program can then assist to cover up to 80% of the capital investment for equipment upgrades.

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
1	Replace 2HP Exhaust Fan with New Premium Motor & CO/CO2 Sensor Controls	Motor Master International	1,500	54	1,446	8,994	2.5	0	0.8	0	1,412	20	28,241	1.0	1853	93	98	19,179	12,322
2a	2 New CFL fixtures to be installed with incentives	RS Means, lit search	100	none at this time	100	467	0.1	0	0.0	6	79	5	397	1.3	295	59	74	261	640
3	Replace Five (5) AHU's (including ten, 10HP fan motors) with Three (3), 30 ton Single Zone, Variable Volume AHU's Premium Eff. Motors	RS Means, Motor Master International	167,100	5,850	161,250	483,400	137.0	0	45.7	0	75,894	20	1,517,876	2.1	841	42	NA	947,260	662,258
2b	4 New LED exit sign fixtures to be installed with incentives	RS Means, lit search	813	80	733	981	0.2	0	0.1	167	321	15	4,816	2.3	557	37	44	3,044	1,344
	TOTALS		**169,514**	**5,984**	**163,530**	**493,842**	**139.8**	**0**	**46.6**	**173**	**77,706**		**1,551,329**	**2.1**	**-**	**-**	**-**	**-**	**676,564**

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
4	Retro Commissioning HVAC	LBNL Study	45,140	none at this time	45,140	24,020	7.6	869	4.7	1,806	6,772	15	74,493	6.7	125	8	10	22,266	43,069
5	Install 25 kW Solar Photovoltaic system	Similar Projects	175,000	25,000	150,000	29,500	25.0	0	2.8	0	22,032	25	376,788	6.8	151.2	6.0	12.56	433,628	52,820
6	Replace Glycol Air Cooled Chiller with 90 Ton Air-Cooled Evaporative Chiller	RS Means, Online Research	104,150	2,700	101,450	95,624	27.1	0	9.0	0	15,013	25	375,323	6.8	270	11	14	154,241	131,004
2c	11 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	8,858	275	8,583	4,987	1.0	0	0.5	292	1,075	15	16,125	8.0	88	6%	9	4,067	6,833
	TOTALS		**333,148**	**27,975**	**305,173**	**154,131**	**60.7**	**869**	**17.0**	**2,098**	**44,891**		**502,721**	**6.8**	**-**	**-**	**-**	**-**	**124,733**

Table 3 - End of Life ECM's/Payback > 10 Years																		
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
2d	17 New occupancy sensors to be installed with incentives	RS Means, lit search	3,740	340	3,400	1,907	0.4	0	0.2	0	299	15	4,491	11.4	32	2	4	123	2,613
2e	6 New T8 fixtures to be installed with incentives	RS Means, lit search	1,452	180	1,272	310	0.1	0	0.0	63	111	15	1,669	11.4	31	2	4	37	424
7	Replace 20 HP hot elevator motor with Premium Efficiency	similar projects, DOE Motor Master + International	1,400	113	1,287	557	0.2	0	0.1	0	87	20	1,749	14.7	36	2	3	-10	763
8	Replace 1/20 HP Unit Heater with New	RS Means	150	none at this time	150	11	0.0	0	0.0	0	2	20	36	83.8	-76	-4	NA	-124	16
	TOTALS		**6,742**	**633**	**6,109**	**2,785**	**0.6**	**0**	**0.3**	**63**	**500**		**7,945**	**12.2**	**-**	**-**	**-**	**-**	**3,816**

1. HISTORIC ENERGY CONSUMPTION

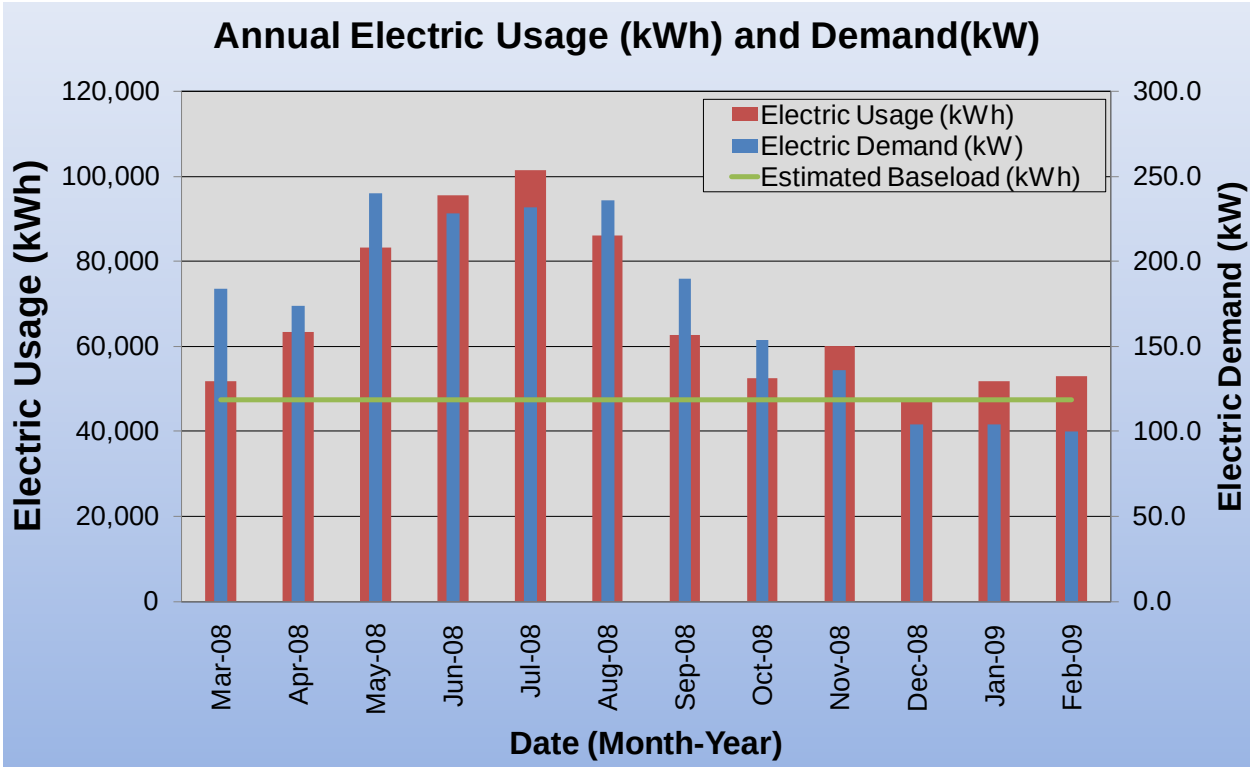
1.1 Energy usage and cost analysis

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

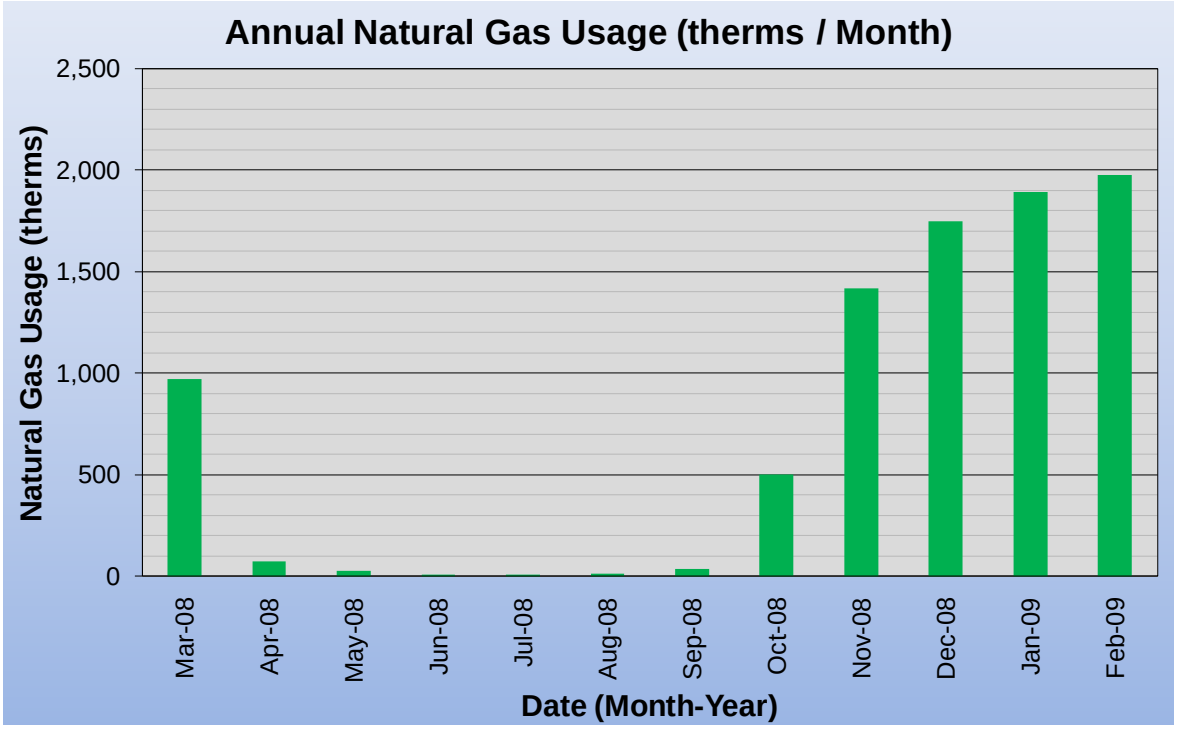
Electricity - The Fair Lawn Municipal Building is currently served by one electric meter. The Fair Lawn Municipal Building currently buys electricity from PSE&G at **an average rate of $0.157/kWh** based on 12 months of utility bills from March 2008 to February 2009. The Fair Lawn Municipal Building purchased **approximately 809,000 kWh or $126,790 worth of electricity** in the previous year. The average monthly demand was 174 kW.

Natural gas - The Fair Lawn Municipal Building is currently served by one meter for natural gas. The Fair Lawn Municipal Building buys natural gas from PSE&G at **an average aggregated rate of $1.376/therm** based on 12 months of utility bills for March 2008 to February 2009. The Fair Lawn Municipal Building purchased **approximately 8,685 therms or $11,951 worth of natural gas** in the previous year.

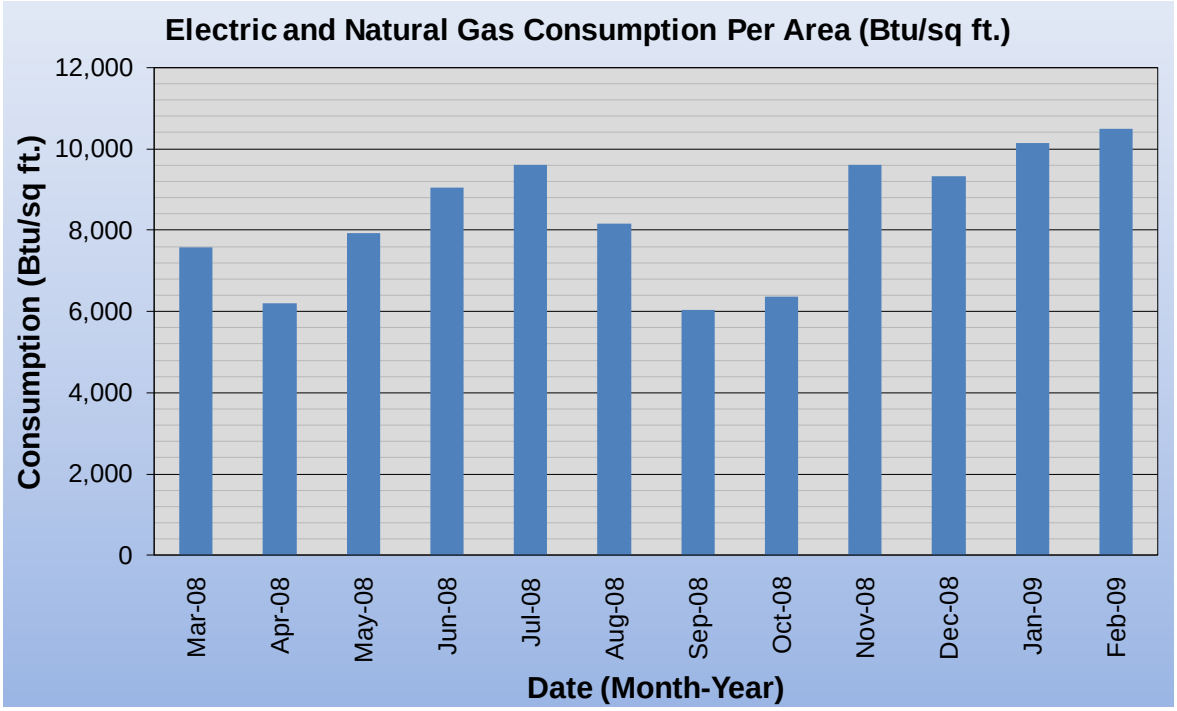
The following chart shows electricity use for the Fair Lawn Municipal Building based on utility bills for the 12 month period of March 2008 to February 2009.



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

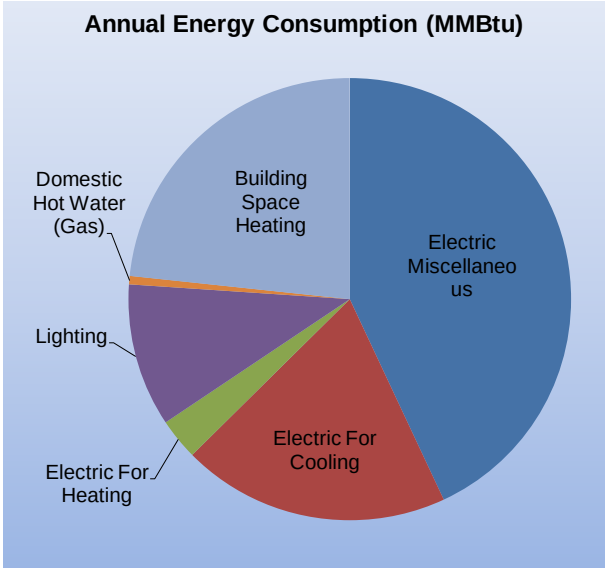


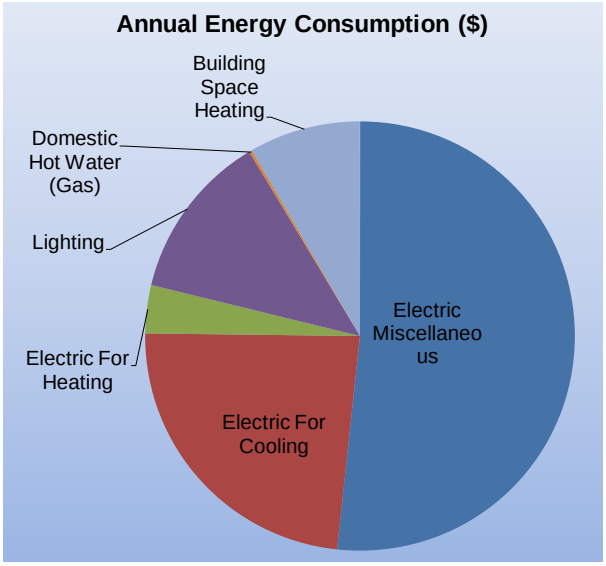
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Fair Lawn Municipal Building based on utility bills for the 12 month period of March 2008 to February 2009.



The following table and pie charts show energy use for the Fair Lawn Municipal Building based on utility bills for the 12 month period of March 2008 to February 2009. Note: electrical cost at $46/MMBtu of energy is more than 3 times as expensive as natural gas at $14/MMBtu.

2008 Annual Energy Consumption/Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	1,511	42%	$69,378	50%	46
Electric For Cooling	710	20%	$32,599	23%	46
Electric For Heating	110	3%	$5,047	4%	46
Lighting	430	12%	$19,766	14%	46
Domestic Hot Water (Gas)	22	1%	$308	0%	14
Building Space Heating	846	23%	$11,643	8%	14
Totals	3,629	100%	$138,740	100%	38
Total Electric Usage	2,761	76%	$126,790	91%	46
Total Gas Usage	868	24%	$11,951	9%	14
Totals	3,629	100%	$138,740	100%	-





1.2 Utility rate

The Fair Lawn Municipal 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 Municipal Building currently pays an average rate of approximately $0.157/kWh based on the 12 months of utility bills of March 2008 to February 2009.

The Fair Lawn Municipal 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 Municipal Building currently. The average aggregated rate (supply and transport) for the meter is approximately $1.376/therm based on 12 months of utility bills for Mar 2008 to Feb 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 Municipal Building in the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager energy benchmarking system. This Municipal Building facility is comprised of both administrative areas and police station areas which use common electrical and gas meters and therefore is an "Other", space type. This building type, or "Other," is 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 Municipal Building is not eligible to receive a national energy performance rating at this time.

The Site Energy Use Intensity is 103.0 kBtu/ft^{2}yr compared to the national average of "Other" space type using 104.0 kBtu/ft^{2}yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 46.6 kBtu/ft^{2}yr, with an additional 17.3 kBtu/ft^{2}yr from all other ECMs. These recommendations would therefore reduce the site energy use intensity to 39.1 kBtu/ft^{2}yr.

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 Municipal Building facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager site information with the Borough of 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 - Municipal Building

Building ID: 1970067
For 12-month Period Ending: February 28, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: March 01, 2010

Facility
Borough of Fair Lawn - Municipal Building
8-01 Fair Lawn
Fair Lawn, NJ 07410

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1962
Gross Floor Area (ft²): 36,112

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	2,809,805
Natural Gas (kBtu)[4]	901,436
Total Energy (kBtu)	3,711,241

Energy Intensity[5]	
Site (kBtu/ft²/yr)	103
Source (kBtu/ft²/yr)	286

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	476

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	34%
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 Municipal Building is a two-story structure with basement constructed in 1962. The building houses the following Borough departments: Police Department, Mayor's office, Borough Manager's office, Municipal Clerk's office, Tax Collector's office, Tax Assessor's office, Department of Public Works Administration office, Health and Human Services department, Building and Construction Office, Engineering office, Finance office, Office of Emergency Management, Fire Chief's office, Fire Prevention Bureau and Borough records and storage space. The Council Chambers and Municipal Court Chambers are also located in this building. An elevator was installed in 1980, there were additional extensions/renovations in 1990 and approximately 2,240 square feet was added to each floor in 2003. The building consists of a total 36,112 square feet of conditioned space.

2.2. Building occupancy profiles

The peak occupancy for the Municipal Building is approximately 60 full time Municipal administrative employees during the daytime, plus visitors (approximately 30 to 50 at any one time during the week) for the various Municipal Departments and the Court Room when it is in session (as many as 100 visitors, 16-18 evenings per month). The administrative part of the building is normally operated Monday - Friday 8:30 am to 4:30 pm, and also evenings for court sessions and committee meetings (7:00 pm to 10:00 pm). The Police Department operates 24 hours/7 days a week with approximately 20 officers/staff working during the day and 3-5 employees working the overnight shift. The Police Department operates an emergency services communications center in the building.

2.3. Building envelope

2.3.1. Exterior Walls

The exterior walls consist of 8” CMU blocks with a brick veneer façade. The original structure consists of masonry wall construction, whereas the 2003 addition was built of masonry and metal stud wall assemblies. The original wall has an aluminum sheet on the inside serving as an insulating moisture barrier. There wasn’t any insulation detected or found documented on drawings.

The exterior walls were inspected and found to be in overall acceptable condition. There weren’t any obvious weep holes detected, which would allow water/moisture to exit the wall assemblies. SWA recommends as part of a capital improvement plan to install weep holes and upgrade flashing as necessary. SWA also recommends re-pointing a few brick veneer areas where the mortar has been washed away.

Brick façade, back corner of Police Department in need of re-pointing

2.3.2. Roof

The Municipal Building sloped roof is the original 1962 slate roof. The slate roof is installed on top of a metal sheet secured to 1-1/2" fiberglass boards/planks supported by steel trusses. Some of the original slate is damaged and some has fallen off. So far, there aren't any major roof leaks and the Borough is evaluating replacement with an updated (yet costly) asphalt shingle roof. There is a small, flat transition section between the original building and the 2003 addition covered by EPDM over 3" polyurethane insulation boards. The 2003 roof addition is covered with synthetic slate pieces to match the look of the original structure. There appear to be a few soffit water leaks in the main building, perhaps caused by the few missing slate pieces.

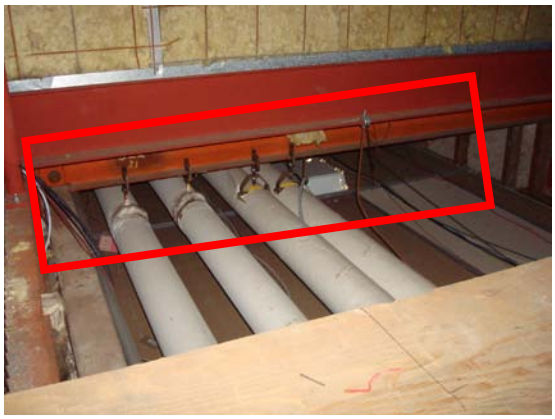
Bird's Eye View of Building, roof dark spots indicate damaged/missing tiles

The insulation in the attic space above the suspended ceiling (composed of 2 ft x 4 ft Armstrong Tegular ceiling tiles) is loose to non-existent in most spaces. The batt insulation above the drop ceiling is missing in many places, and daylight from the office space is visible in the attic, indicating many unsealed penetrations. In various places ceiling tiles have been removed, as seen in room 103. Some of the attic-Air Handling Units (AHUs) are accessible via catwalks in

the attic space, which creates insulation disturbances. Birds have been able to enter the attic space via various soffits and side ventilation panels. SWA recommends temporary slate roof repairs with synthetic slate pieces (similar to the 2003 addition), pending decision to replace it, as well as closing up penetrations and wrapping wire meshes on ventilation panels. Generally, the longevity of a slate roof that is properly maintained is in excess of 100 years. Insulation should be consistent and tight throughout the attic.

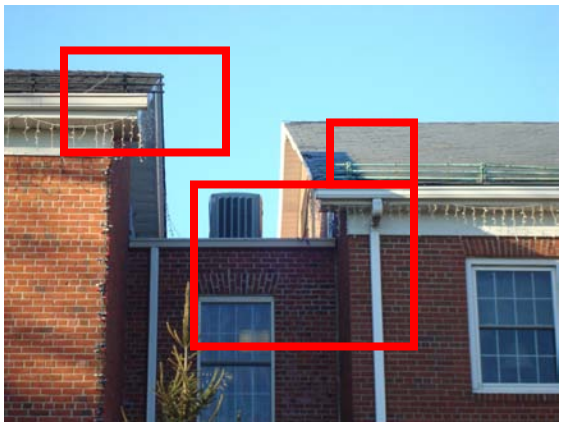
Fiberglass boards/planks supporting slate roof; attic wall Rockwool insulation

Attic outer wall 8” Rockwool insulation; steel trusses supporting slate roof



Missing insulation above ceiling tiles, many unsealed penetrations

Water stains on ceiling tiles



New 2003 roof addition, flat EPDM roof, with missing roof slate tiles on adjoining original roof

Damaged/replaced roof slate tiles

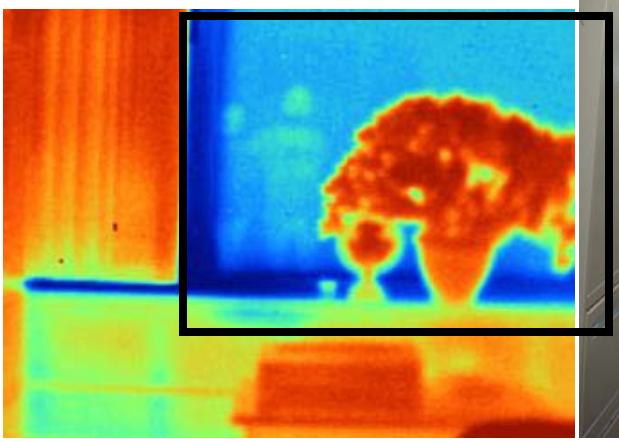
2.3.3. Base

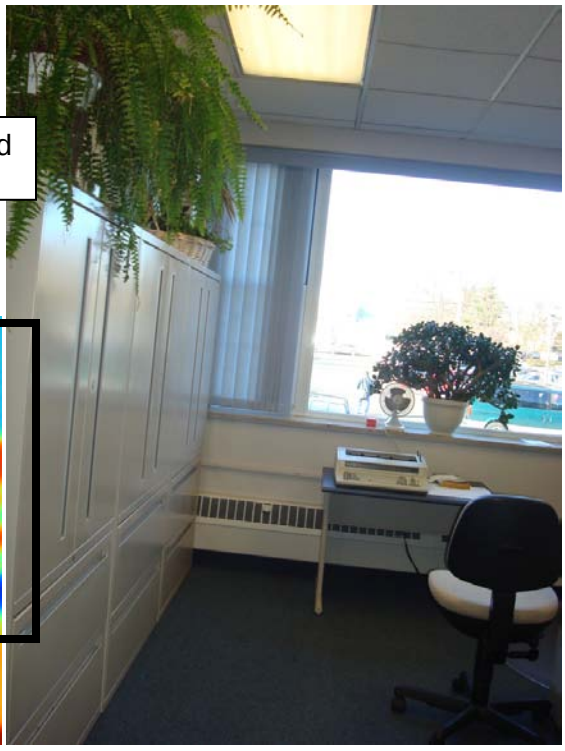
The building's base is a 5" concrete slab in the basement area with a perimeter footing. There weren't any reported problems with water seepage through the slab or other issues related to thermal performance or moisture, including the basement. The slab edge or perimeter insulation could not be verified.

2.3.4. Windows

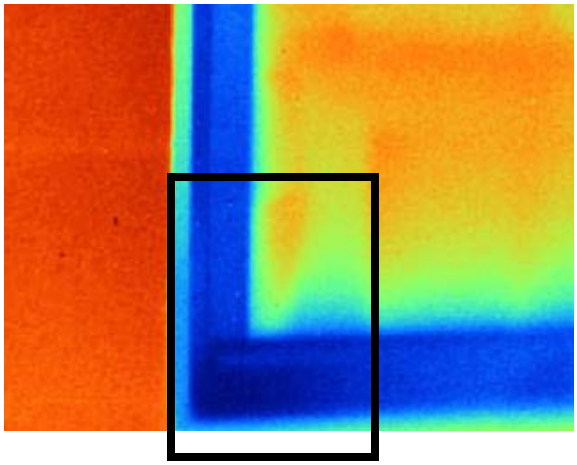
All the original building windows have been replaced. The building contains fixed and double-hung windows. The north-side building windows (approximately 40) are aluminum framed, double glazed (7/8" gap), installed in the late 1980s, but many were installed without a thermal barrier. The south-side building windows were replaced in 1990 with vinyl framed, thermally insulated double-glazed low-e windows. Some of the windows have worn out seals. The window seals are of great concern as infiltration, water, and pests such as the bees are allowed to enter the building. Some of the windows are regularly opened to control the various space temperatures which do not presently accommodate most of the building occupants. SWA recommends that besides fixing the HVAC controls, proper flashing, caulking and weather stripping should be performed on windows as part of a regular maintenance program. The photos below were taken using an Infrared camera, which displays the heat distribution of a space. The blue colors indicate a lower temperature compared to the red and orange colors in the image. The IR images of both the aluminum and vinyl window frames indicate significant thermal leakage.

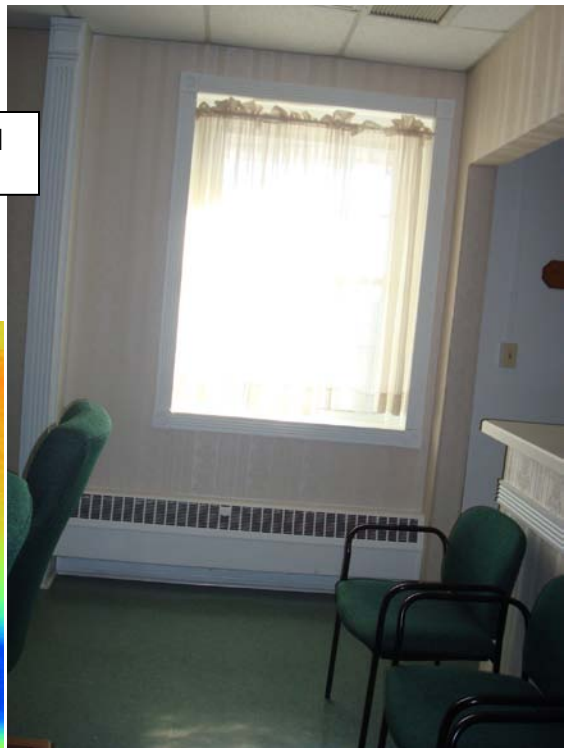
IR image showing a typical un-insulated aluminum framed window





IR image showing a typical low-e vinyl framed window





2.3.5. Exterior doors

The aluminum framed exterior doors were observed to be in good condition, except for some missing or worn weather-stripping. SWA recommends that the exterior doors of the building be weather-stripped in order to decrease the amount of expensive conditioned air that is lost around each door. SWA also recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. Tight seals around the doors will help ensure that the building is kept continuously tight and insulated.

Door weather stripping needs to be checked on regular basis

2.3.6. Building air tightness

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

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

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

2.4 HVAC Systems

The Fair Lawn Municipal Building Police Department, administrative offices, bathrooms, court room and mechanical spaces are heated and cooled by a variety of equipment. The HVAC system consists of condensers, boilers, air handlers and a chiller along with a distribution system made up of pumps, piping and ductwork. The system provides heating and cooling to all occupied areas of the building. As the building was modified and additions made, the HVAC system was modified to accommodate the new loads, but the whole system was not fully integrated—which is evident due to occupant comfort issues.

There are four main thermal zones, one north and one south on each floor, which are controlled and monitored by the building staff using Honeywell manual mercury dial thermostats. The thermostat set points control the operation of the heating and cooling equipment. Due to the fact that the Police Department is active 24 hours a day, 7 days a week, the heating and cooling set points are maintained at a comfortable occupied level throughout the building, at all times. There are no evening setbacks, and according to staff, the air-handling units throughout the building operate at 100% speed, 24 hours a day, regardless of thermostat set point.

2.4.1 Heating

There are two Smith Cast Iron Boilers with a total output of 1,000,000 Btu/hr and 86% thermal efficiency, which serve both the perimeter radiation heating system as well as hot water coils for air handlers. Seven ¼ HP Bell & Gossett distribution pumps carry the hot water to four radiation zones throughout the building which are controlled by four locked thermostats. The boiler and pumps have 60% remaining useful life and appear in good condition.

Smith Hot Water Boilers in Basement Boiler Room

Two, 2 HP Bell & Gossett heating pumps distribute hot water to five air handler heating coils. Return air and outside air mix in the air handler and pass across the heating coil, which transfers the heat to the air stream. The heated air then enters the constant volume ductwork

distribution system to occupied spaces. The air handlers are approaching or are beyond their useful life and should be replaced. See Cooling Section below for more details.

The basement boiler room is heated by a ceiling-mounted hot water unit heater. The heater is beyond its useful life and should be replaced.

The new section of the building, which added 2,240 square feet has an independent heating system. Three condensing furnaces directly heat the air with the combustion of natural gas. The condensing feature indicates that the furnaces use the hot flue gases to preheat the air stream, thereby allowing the unit to operate at 92.1% thermal efficiency. These units have 70% remaining useful life and appear in good condition, however they are located in the attic of the new addition space and are very difficult to access. SWA recommends installing a permanent ladder and platform in order to improve access to the two units, and encourage regular maintenance.

2.4.2 Cooling

The majority of the Fair Lawn Municipal Building occupied spaces is cooled by a TSI Air Cooled Chiller with 92.25 nominal ton capacity and was installed in 1962. The chiller produces chilled glycol, which is used as the cooling medium. The cooled glycol is then pumped with two, 7.5 HP US Electric pumps to the evaporator section of the five air handling units throughout the building, AC-1 through AC-5. The glycol cooling coil absorbs the heat from a mixture of return air and outside air. The conditioned air then enters the constant volume distribution system to occupied spaces.

AC-1 Basement Boiler Room with HW & Glycol Coils

The glycol system and all associated equipment were installed in 1962 and are well beyond their optimum operating life. Two of the five air-handling units are beyond their useful life and the three other units were installed in 1992 and thus approaching the end of their 20-year useful life by 2012. SWA recommends replacing the chiller, pumps and air handling units with a 90 ton high efficiency Evaporative Chiller and three, 30 ton variable volume air handling units. AC-1 and AC-2 in the basement can be replaced with one 30 ton unit and AC-3, 4 and 5 can be

replaced by two 30 ton air handlers. The heating coils would have to be replaced or retrofit to work within the new air handlers.

Also, since new investment must be made into the cooling system with the end of use of the existing chiller and air handlers, it is an opportunity to optimize the cooling system control as well. It was noted by building staff that the current control system is set up so that the air handing unit fans run at 100% speed, 24 hours a day, without evening setbacks. The approximate total fan horsepower of the installed air handlers is over 70 HP. Implementing programmable thermostats with evening setback along with a variable volume air system could produce substantial energy savings while allowing the system to better respond to occupant demands. SWA recommends retro-commissioning the HVAC system to optimize system control as the HVAC system is upgraded.

There are two condensers located outside at ground level which cool the Police Department server room areas and appear in good condition.

The 2003 addition has separate condensing furnaces with evaporator sections, which use rooftop condensers to expel heat to the atmosphere. These furnaces have 70% remaining useful life and appear in good condition. Two of the furnaces, however, are installed in the attic of the new section and are difficult to access. SWA recommends capital investment into a platform and ladder installation for proper maintenance access.

Rooftop Condensing Unit Serving 2003 Addition Area (left)

2.4.3 Ventilation

The Fair Lawn Municipal Building ventilation is achieved by several exhaust fans, which serve bathrooms 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. There is also an exhaust fan in the basement boiler room which is constantly running, and is beyond useful life. SWA recommends replacing the fan with a premium efficiency motor and installing a CO/CO2 detector (with alarm) to control its operation.

2.4.4 Domestic Hot Water

The domestic hot water (DHW) for the Fair Lawn Municipal Building is provided by a Bradford White natural gas-fired heater with 50 gal storage and a capacity of 40,000 Btu/hr. The heater serves bathrooms and pantry sinks 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 Municipal Building currently consists of mostly T8 fixtures and CFL's with sporadic use of T12 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 when the fixtures have reached the end of their useful life. 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 a mixture of LED and fluorescent type. SWA recommends replacing fluorescent fixtures 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, High Pressure Sodium (HPS) and CFL 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. SWA recommends replacing MH and HPS lights with pulse-start metal halide fixtures and lights 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 desktop 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 Municipal Building 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 Municipal Building is a two-story building with full basement, and uses a National hydraulic elevator, with a 2500 lb capacity. The elevator was installed in 1980, and SWA recommends replacing the original 20 HP motor with a new NEMA Premium efficiency 20 HP motor.

2.5.4 Other electrical systems

There are not currently any other significant energy-impacting electrical systems installed at the Fair Lawn Municipal Building.

3. EQUIPMENT LIST

Building System	Description	Location	Make, Model #	Fuel	Space Served	Year Installed	Est. Remaining Useful Life %
Controls	Honeywell, Manual, Universal Energy Product Operating System BMS, manual monitoring in borough hall		NA	Electric	All Areas	1990	20%
Cooling	**TSI Air Cooled Chiller** • **92.25 Nominal Tons, 10 SEER** •Four (4) semi-hermetic compressors, 30 HP each, replaced several times •Two (2) direct expansion evaporators •Eight (8) air cooled condensers, with 1HP Fan Motors	**Outside, Parking Lot Cage**	**RAE Corp. -TSI 30A0CM120P/12-90-A21801**	**Electric**	**All Areas**	**1962**	**0%**
Cooling	**Glycol Pumps, 7.5 HP, 3480 RPM, 85.5% Eff.**	**Outside**	**US electrical Motors M# C538/Cat# DJ7S1AM**	**Electric**	**All Areas**	**1962**	**0%**
Cooling	Condenser, 2.5 Tons	Outside	TRANE xl 1200 TTX730A100A2/B20 292480	Electric	All Areas	1987	10%
Cooling	Condenser 9,000 btu/hr, 0.75 tons	Outside	LG, lsu090ce/701KAED0 0572	Electric	Server Rm	1987	10%
Domestic Hot Water	Bradford White 50 Gallon Hot water heater, 40,000 Btu/hr	Basement Boiler Rm	MI5036EN10/XE428 2987	Natural Gas	All Areas	2001	60%
Elevators	One hydraulic elevator, 20 HP	Basement Elev Machine Rm	National 2500 lbs/Electro hydraulic TypeUv-5, 48J187 /	Electric	All areas	1980	0%
Generator	250 KVA, 200 kW, 100 gal double wall tank , 1800 RPM John Deere Engine	Outside	200REOZJD/219488 3	Diesel	Police Dept., All Areas	2008	90%
Heating	2 Smith Cast Iron Boilers, 500,000 btu/hr, local control panel, 86% Eff., with 7 taps for radiant heat, 1/3 HP Burner	Basement Boiler Rm	SMITH Series 19A, S/N Fa2001-555 & FA2001-409/ Burner JR30A-10HBS51/409/554	Natural Gas/Electric	All Areas, radiant heat	2001	60%
Heating	Seven, (7) Hot water distribution pumps for radiation, 1/4 HP, 1725 RPM	Basement Boiler Rm	Bell & Gossett, P#M10532 /	Electric	All Areas, radiant heat	2001	60%
Heating	Two (2) Hot water pumps, 2HP, 1800 RPM	Basement Boiler Rm	Bell & Gossett, 80BF7/Pump: C04347-01E70	Electric	Air Handler Coils	2001	60%
Heating	**Unit Heater, 1/20 HP motor**	**Basement Boiler Rm**	**Trane UHSA-38W-2C-AC/D90K14649**	**Hot Water**	**All Areas**	**1980**	**0%**
Heating /Cooling	**AC-1 Air Handler, Climate Changer**	**Basement Boiler Rm/ Outside**	**Trane Climate Changer DB10EN3M V3A5R11RRAL/K90 L33209**	**Electric**	**Municipal Building**	**1962**	**0%**

Building System	Description	Location	Make, Model #	Fuel	Space Served	Year Installed	Est. Remain-ing Useful Life %
Heating/ Cooling	**AC-2 Air Handler, Climate Changer**	**Basement Boiler Rm/ Outside**	**Trane Climate Changer DB12EN3M V3A5L11LLAL/K90 L33210**	**Electric**	**1st Floor**	**1962**	**0%**
Heating/ Cooling	**AC-3 10 HP standard motor 1745 rpm**	**Attic**	**Trane Climate Changer CCDB12CN3M H3A1L11LLAM/Mar athon H61N/K90L33211**	**Electric**	**All areas**	**1992**	**10%**
Heating/ Cooling	**AC-4, 15 HP standard motor 1745 rpm**	**Attic**	**Trane Climate Changer CCD0820N3M-H31RKKN MARATHON WVL/K90L33212**	**Electric**	**All areas**	**1992**	**10%**
Heating/ Cooling	**AC-5/supply fan marathon 10HP 1745 86.5% eff**	**Attic**	**TRANE CLIMATE CHANGER CCDB14C7EM H3B1L01LLAM /h61n /**	**Electric**	**Council Chambers**	**1992**	**10%**
Heating/ Cooling	Condensing Furnace 60KBTU/ 54 KBTU, 92.1 AFUE	BASEMENT STORAGE	Trane XR90, TUX060C936D/CON D TE34436C75B25220 /2402HKG7G, 6002G84813	Electric/ Natural Gas	New Addition Basement	2003	70%
Heating/ Cooling	Condensing Furnace 60KBTU/ 54 KBTU, 92.1 AFUE	ATTIC/CON D ON ROOF	Trane XR90, TUX060C936D/CON D TE34436C75B25221 /2402HKG7G,/6002 G84814	Electric/ Natural Gas	New Addition	2003	70%
Heating/ Cooling	Condensing Furnace 60KBTU/ 54 KBTU, 92.1 AFUE	ATTIC/CON D ON ROOF	Trane XR90, TUX060C936D/CON D TE34436C75B25222 /2402HKG7G, /6002G84815	Electric/ Natural Gas	New Addition	2003	70%
Lighting	See Appendix A	All Areas	See Appendix A	Electric	All areas	NA	NA
Ventilation	**Constant exhaust fan, 2HP, 1740 RPM**	**Basement Boiler Rm**	**Cat H607**	**Electric**	**Boiler Rm**	**1962**	**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 Municipal Building, 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 II Recommendations: Operations and Maintenance

- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives
- Install platform and ladder in attic of new addition for proper maintenance access for two condensing furnaces; this will ensure that units operate at optimum efficiency throughout equipment useful life

Category II Recommendations: Operations and Maintenance

- Install weep holes in exterior wall, which will allow a pathway for trapped moisture to exit the structure
- Upgrade roof flashing as located

- Re-point brick veneer on exterior wall where mortar has been damaged/missing in order to maintain integrity and appearance of the brick structure

- Add insulation in missing spaces between attic space and drop ceiling in order to thermally isolate the conditioned air path from the unconditioned air path

- Replace/repair slate roof shingles - SWA recommends regular maintenance to verify water is draining correctly and shingles are not missing or damaged

- Maintain downspouts – SWA recommends repair/installation of 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.

- Air-seal around all plumbing, electrical, HVAC and structural penetrations- SWA recommends as part of the maintenance program to install proper flashing and seal wall penetrations wherever necessary in order to keep insulation dry and effective.

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

- Provide water-efficient fixtures and controls - Adding controlled on/off timers on all lavatory faucets is a cost-effective way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures/appliances will save both energy and money through reduced energy consumption for water heating, while also decreasing water/sewer bills.

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

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

- Create an energy educational program - that teaches how to minimize energy use. 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
1	Replace 2HP Exhaust fan with Premium Efficiency
2a	Building Lighting Upgrades – Replace Inc with CFL
3	Replace Five AHU's with Three Variable Volume AHU's
2b	Building Lighting Upgrades – Replace Fl. Exit Signs with LED
	Description of Recommended 5-10 Year Payback ECMs
4	Retro Commissioning of HVAC System
5	Install 25 kW Solar PV System
6	Replace Air Cooled Chiller with New 90 Ton Evaporative Pre-Cooling Chiller
2c	Building Lighting Upgrades – Replace MH & HPS with pulse-start MH
	Description of End of Life ECM's/Payback > 10 Years
2d	Building Lighting Upgrades – Install Occupancy Sensors
2e	Building Lighting Upgrades –Replace T12 with T8
7	Replace 20 HP Elevator motor w/ Premium Efficiency
8	Replace Boiler Room 1/20 HP Unit Heater

ECM#1 & 7: Install Premium Efficiency Motors for New Exhaust Fan & Elevator Motor

Description:

The boiler room exhaust fan is beyond its useful life and should be replaced with a new exhaust fan with NEMA premium efficiency 2 HP motor. The fan currently runs at all times, and therefore a CO/CO_2 sensor should be installed to limit the fans operation. The existing elevator motor is beyond its useful life and should be replaced with a new 20 HP NEMA premium efficiency motor. Premium efficiency motors typically have 6% efficiency improvement for only a faction more cost than conventional motors. Below is the economic analysis of the motor replacements.

Installation cost:

Estimated installed cost: $2,900, (including $1,160 labor)
Source of cost estimate: RS Means Cost Estimation and DOE Motor Master International selection & savings analysis

Economics (with 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	Replace 2HP Exhaust Fan with New Premium eff Motor & CO/CO2 Sensor Controls	Motor Master International	1,500	54	1,446	8,994	2.5	0	0.8	0	1,412	20	28,241	1.0	1853	93	98	19,179	12,322
7	Replace 20 HP elevator motor with Premium Efficiency	similar projects, DOE Motor Master + International	1,400	113	1,287	557	0.2	0	0.1	0	87	20	1,749	14.7	36	2	3	-10	763
	TOTALS		**2,900**		**2,733**	**9,551**	**2.7**	**0**	**0.9**	**0**	**1,499**		**29,990**	**1.8**	**-**	**-**	**-**	**-**	**13,085**

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. The DOE Motor Master International selection and calculator was used with the assumption that both pumps operate for the cooling and heating seasons.

Rebates/financial incentives:

NJ Clean Energy – NEMA 2 HP Motor - $54/motor, NEMA 20 HP Motor - $113/motor

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# 2a, 2b, 2c, 2d, 2e: Building Lighting Upgrades

Description:

On the days of the site visits, SWA completed a lighting inventory of the Fair Lawn Municipal 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 the four 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. The exterior lights are 175 Watt Metal Halide and High Pressure Sodium 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. Although payback is slightly greater than 10 years, 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. There is sporadic use of T12 fixtures in the Municipal Building, lamps with magnetic ballasts. T8 lamps operate with electronic ballasts which use less energy and have a longer life. As the T12 lamps reach the end of their useful life, SWA recommends replacing the fixture with T8 lamps and electronic fixtures which will decrease wattage and increase lamp life for the same lumen output. 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: $14,963 (includes approx. $6,000 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
2 New CFL fixtures to be installed with incentives	RS Means, lit search	100	none at this time	100	467	0.1	0	0.0	6	79	5	396	1.3	295%	59%	74	260	640
4 New LED exit sign fixtures to be installed with incentives	RS Means, lit search	813	80	733	981	0.2	0	0.1	167	321	15	4,814	2.3	557%	37%	44	3,043	1,344
11 New pulse start metal halide fixtures to be installed with incentives	RS Means, lit search	8,858	275	8,583	4,987	1.0	0	0.5	292	1,075	15	16,120	8.0	88%	6%	9	4,063	6,833
17 New occupancy sensors to be installed with incentives	RS Means, lit search	3,740	340	3,400	1,907	0.4	0	0.2	0	299	15	4,491	11.4	32%	2%	4	123	2,613
6 New T8 fixtures to be installed with incentives	RS Means, lit search	1,452	180	1,272	310	0.1	0	0.0	63	111	15	1,669	11.4	31%	2%	4	37	424
TOTALS		14,963	875	14,088	8,653	1.8	0.0	0.8	527	1,886		27,491	7.5					11,854

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 $340; LED Exit Signs - $20/fixture – Total $80, T12 to T8 - $30 /fixture - Total $180, MH to PSMH - $25/fixture - $275 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 # 3: Replace AC-1 through AC-5 with Three 30 Ton Packaged Variable Volume Air Handling Units

Description:

The five air handling units which supply heated and cooled air to the Municipal Building are at, or are approaching the end of useful life. The equipment is therefore operating at low efficiency and all fan motors are constant speed. The current operation is that the air handler fans run 24 hours a day at 100% speed, regardless of heating or cooling requests. This is a significant waste of energy and not enhancing the comfort conditions. SWA recommends replacing AC-1 and AC-2 in the Basement boiler room with a new 30 ton packaged variable volume air handling unit, and replacing AC-3, 4, and 5 with a two new 30 ton, variable volume packaged air handling units, using premium efficiency motors for all fans. The air handlers can be retrofit to operate with the existing heating system, and the new Air-cooled evaporative chiller; See ECM #6 for details. Having variable volume air handler indicates that the supply fans will have variable speed drives which will allow fan speed to fluctuate depending on the demand with a minimum position for outside air intake. The controls of the HVAC system will have to be modified to work with a variable volume air supply, and this will have to be considered in the retro-commissioning analysis; See ECM #4 for details.

Installation cost:
Estimated installed cost: $167,100 (including $45,000 labor)
Source of cost estimate: RSMeans/Motor Master International

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
Replace Five (5) AHU's (including ten, 10HP fan motors) with Three (3), 30 ton Single Zone, Variable Volume AHU's Premium Eff. Motors	RS Means, Motor Master International	167,100	5,850	161,250	483,400	137.0	0	45.7	0	75,894	20	1,517,876	2.1	841	42	NA	947,260	662,258

Assumptions: RS Means variable volume packaged unit installed cost, Motor Master International for reduction in operating hours by 85% for two 10 HP fans on each unit, 100 HP total, and improved fan efficiency by 6%.

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 # 4: Retro-Commissioning of HVAC Equipment

Description:
The Municipal Building was originally built in 1962 and was expanded in 2003 to a total of 36,112 square feet. There are currently five air-handling units and three furnaces which serve the heating and cooling for occupied spaces. There are four zones in the original building, with two on each floor for North and South. There are separate thermostats for the new addition to the west as depicted in the photo below. Based on 36,211 square feet of space with a variety of occupants and functions, including a 24-hour Police Department, the zones do not seem to be adequate. There are significant complaints about comfort in both the heating and cooling season, with drastic extremes on the north and south sides of the building.

Current thermal zone arrangement for Municipal Building

The following HVAC existing equipment is beyond useful life:

- Cooling
  - Air Cooled Chiller
  - Two Glycol Pumps
- Heating and Cooling
  - AC-1 to AC-5 Air Handling Units
- Minor Equipment
  - Hydraulic Elevator 20 HP Motor
  - Hot water Unit Heater
  - Exhaust Fan, 2 HP

Due to the age of the building and various renovations, the entire HVAC system has not been evaluated on a whole building approach. In addition, there are occupant comfort concerns, equipment sizing concerns, and almost all major HVAC equipment is at the end of optimum operating life. SWA recommends pursuing retro-commissioning of the HVAC system equipment and controls in order to optimize performance and make educated decisions for equipment replacement and upgrades.

Installation cost:
Estimated installed cost: $45,140 (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	LBNL Study	45,140	none at this time	45,140	24,020	7.6	869	4.7	1,806	6,772	15	74,493	6.7	125	8	10	22,266	43,069

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.

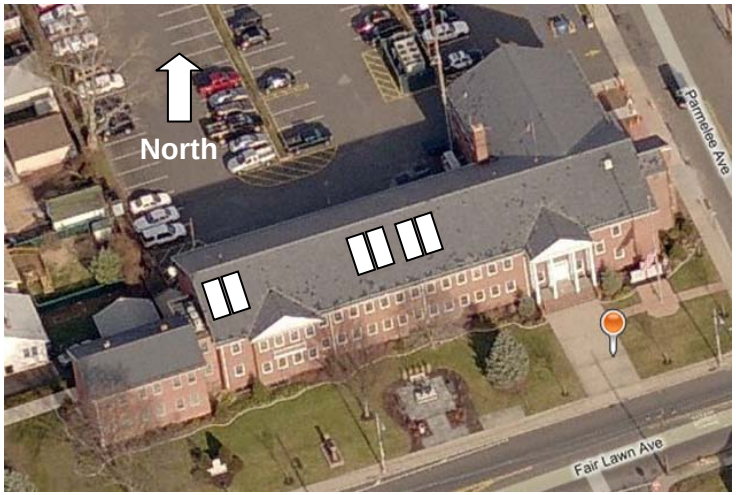
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#5: Install 25 kW PV system

Description:

Currently, the Fair Lawn Municipal Building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels can be mounted on the building slated roof south and/or west 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 25 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. Roof repair/ replacement is necessary before considering mounting solar panels; the solar contractor should investigate the integrity of the roof before installation. 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 25 kW system needs approximately 200 panels which would take up 2,174 square feet. Below are possible locations to install the panels.



Installation cost:

Estimated installed cost: $150,000 (labor included at $3/Watt, totaling $75,000)
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 25 kW Solar Photovoltaic system	Similar Projects	175,000	25,000	150,000	29,500	25.0	0	2.8	0	22,032	25	376,788	6.8	151.2	6.0	12.56	433,628	52,820

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 25 kW or less. Incentive amount for this application is $25,000 for the Fair Lawn Municipal Building.

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 $17,400/year, based on $600/SREC, has been incorporated in the above costs for the Municipal Building 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 # 6: Replace TSI 92.25 Ton Air Cooled Chiller with New 90 Ton Evaporative Pre-Cooling Chiller

Description:

The existing Air Cooled Chiller with a rated capacity of 92.25 Tons is well beyond its useful life. SWA recommends replacing the chiller with a 90 Ton Evaporative Cooling Glycol Chiller, which can replace the chiller in the same location in the parking lot cage. The evaporative cooling feature lowers the temperature across the condenser coil, improving the efficiency of the cooling cycle by an estimated 30%, and increasing the useful life of the compressor. The cost includes auxiliary equipment such as pumps and piping rework.

Installation cost:
Estimated installed cost: $104,000 (including $20,000 labor)
Source of cost estimate: RSMeans/Online Research

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
Replace Glycol Air Cooled Chiller with 90 Ton Air-Cooled Evaporative Pre-Cooler Chiller	RS Means, Online Research	104,150	2,700	101,450	95,624	27.1	0	9.0	0	15,013	25	375,323	6.8	270	11	14	154,241	131,004

Assumptions: RS Means replacement cost for 100 Ton Air Cooled Evaporative Pre-Cooling Chiller. Assume a 30% efficiency improvement over conventional air-cooled chiller for 1007 full load operating hours from 0.86 kW/ton to 1.12 kW/ton.

Rebates/financial incentives: NJ Clean Energy - Electric Air Cooled Chillers – Assume 1.12 kW/Ton rating at less than 150 tons; $30/ton, $2,700 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

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 intermittent use of domestic hot water throughout the building to justify the expenditure.

5.5 Combined Heat and Power

Description:

Based on previous experience CHP is not cost effective for this type and size building.

5.6 Geothermal

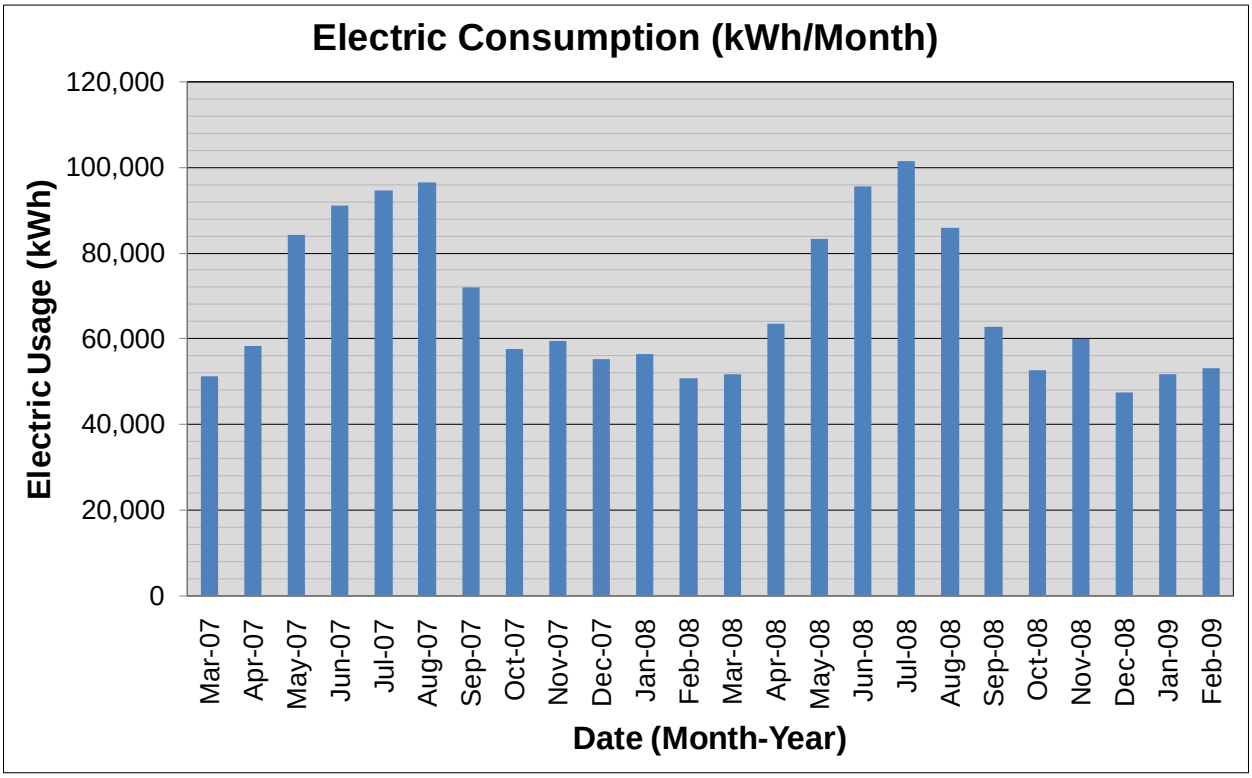
Description:

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.

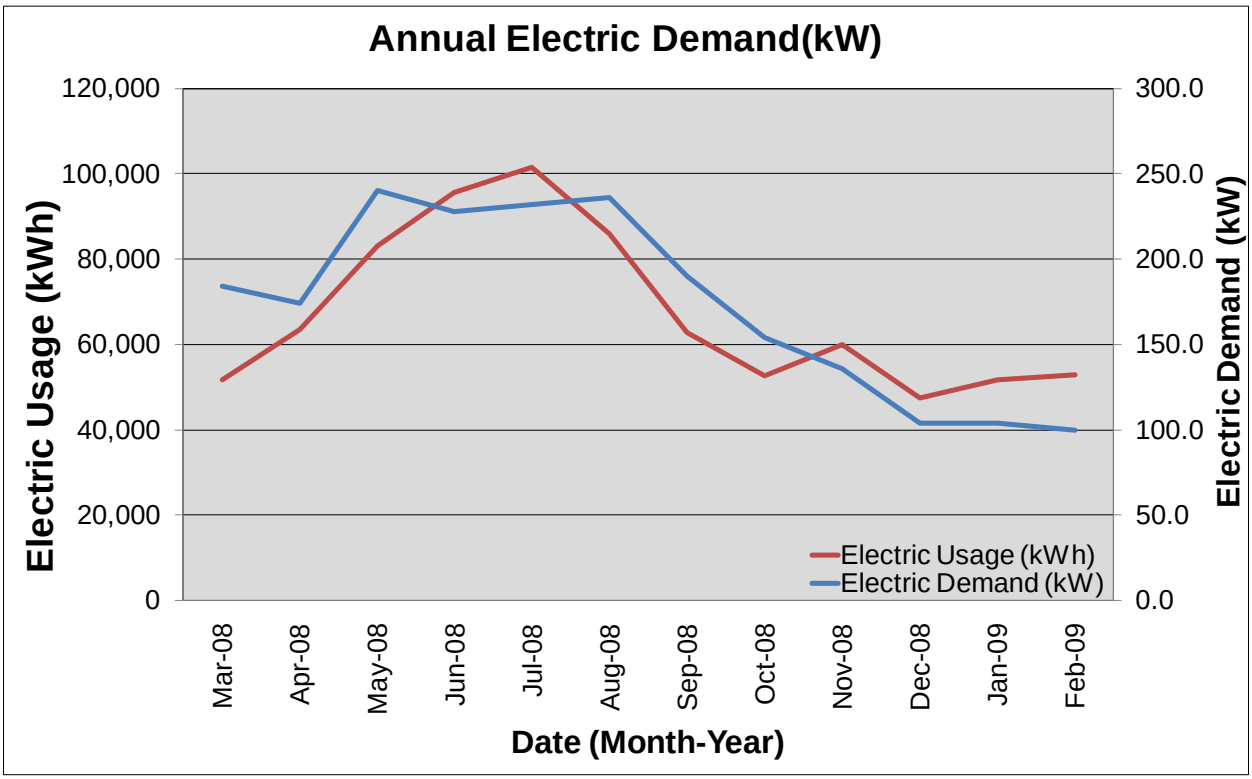
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1 Load profiles

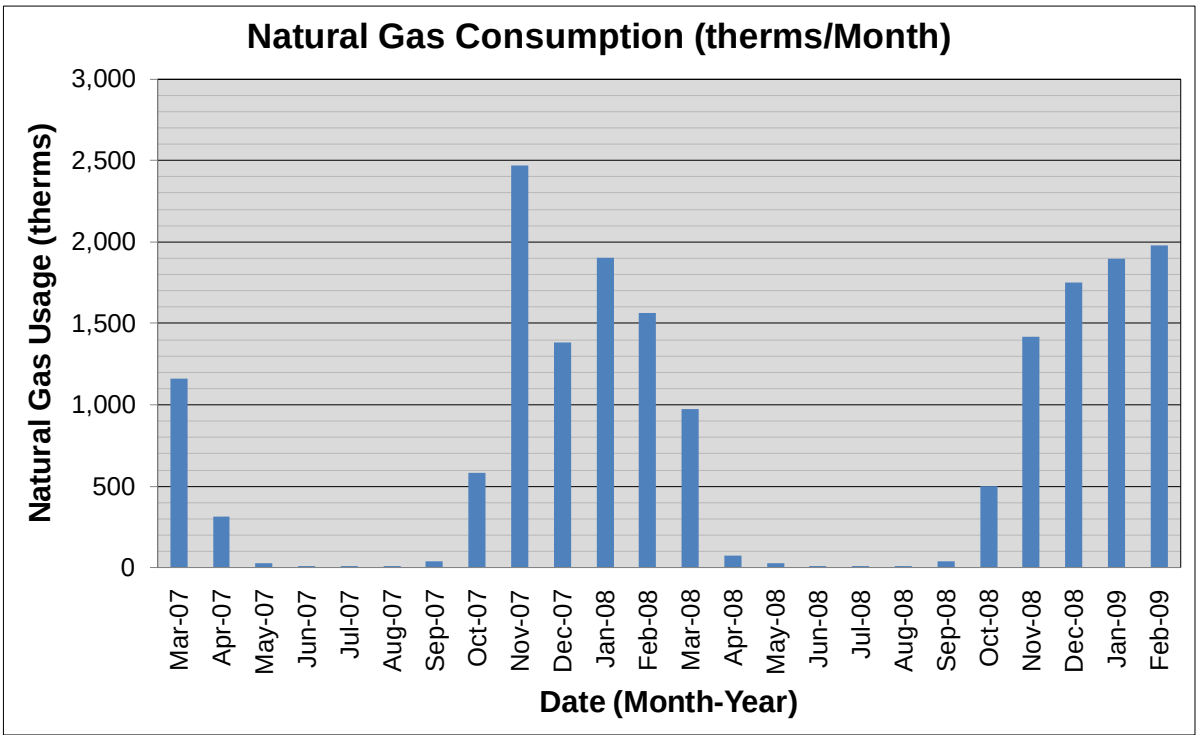
The following are charts that show the electric and natural gas load profiles for the Fair Lawn Municipal Building. The electrical consumption is greatest in summer months when condensers are needed for cooling.

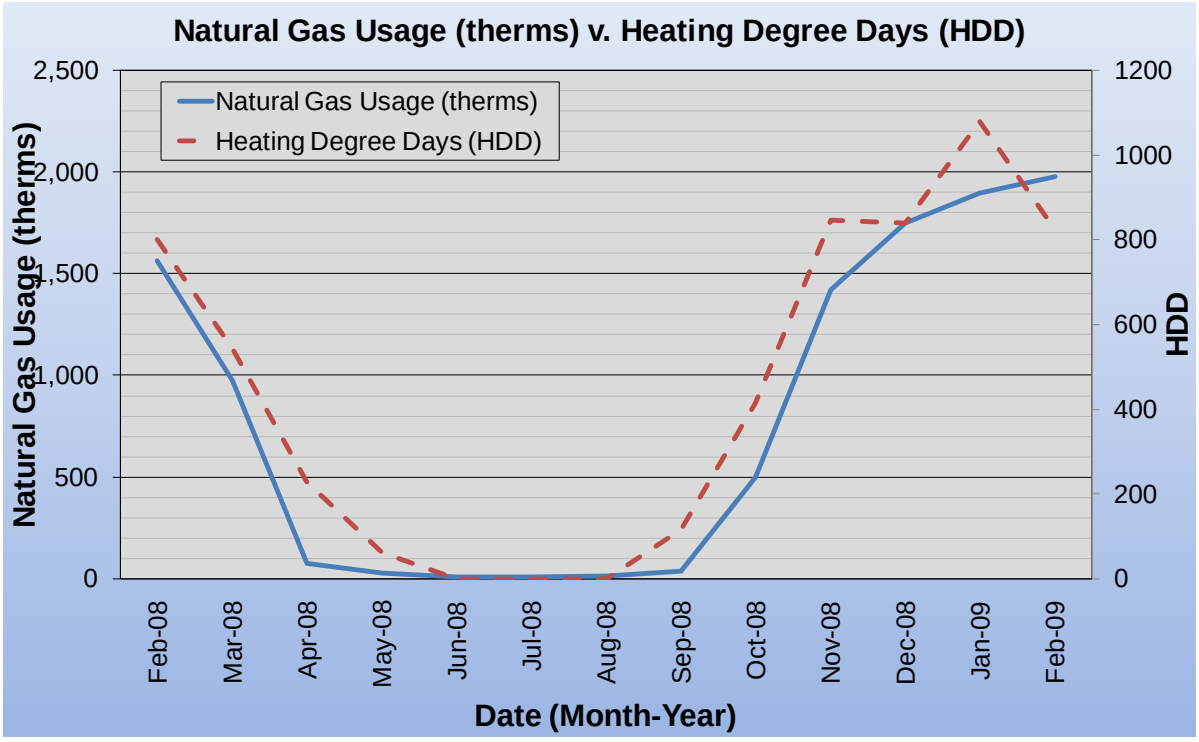


Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings. Also, note on the following chart how the electrical demand peaks (except for a few unusual fluctuation anomalies) follow the electrical consumption and are a steady draw.



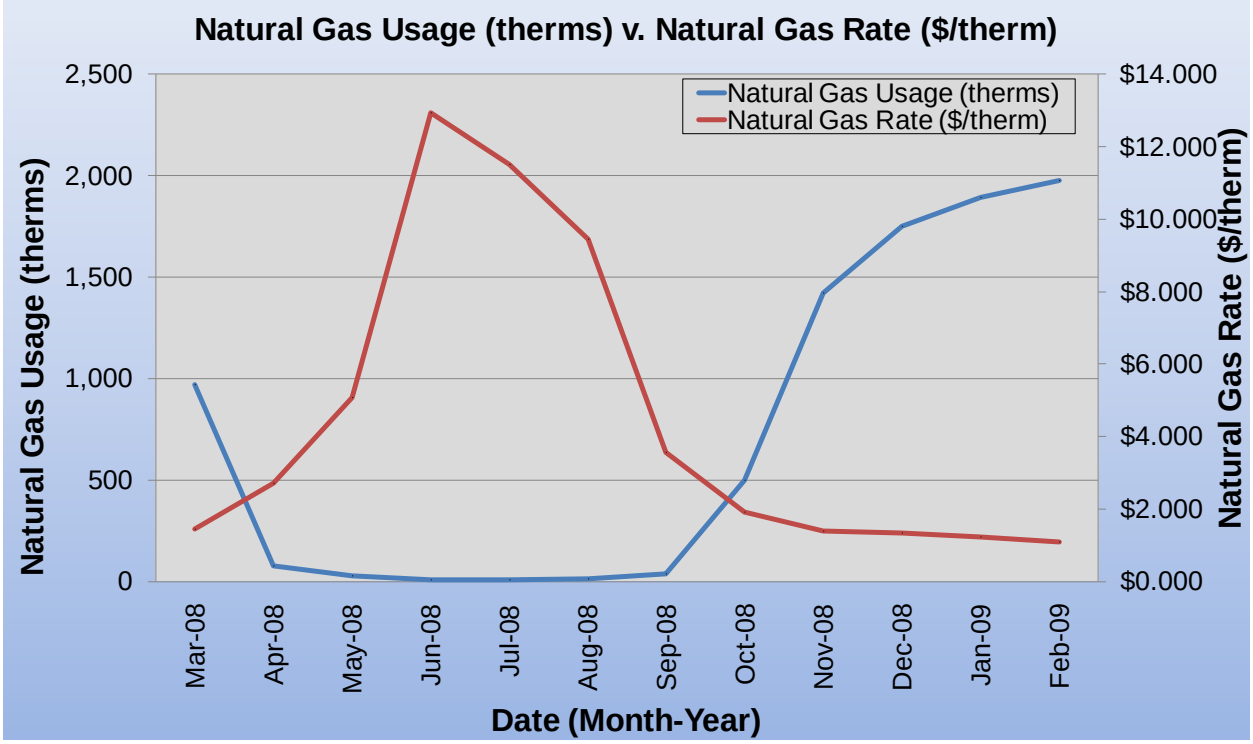
The following is a chart of the natural gas annual load profile for the building, peaking in the coldest months of the year and a chart showing natural gas consumption following the “heating degree days” curve. Some utility bills have more than one month estimated and combined.



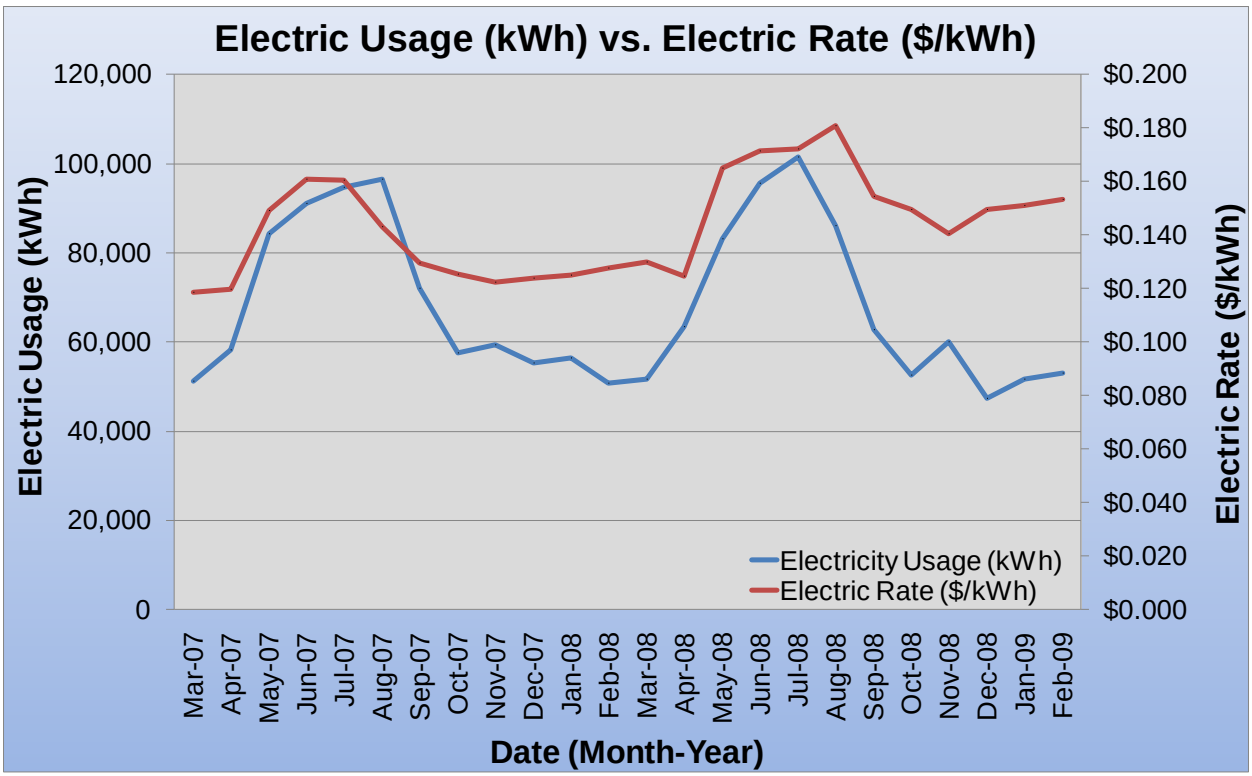


6.2 Tariff analysis

Currently, natural gas is provided to the Fair Lawn Municipal Building via one gas meter with the PSE&G acting as the supply and also the transport company. Gas is provided by the PSE&G at a general service rate. The suppliers' general service rate for natural gas charges a market-rate price based on use and the Fair Lawn Municipal 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 rate drops with increased consumption. The high gas price per therm in the summer is due to low use caps for the non-heating months as seen in May through August. Thus the building pays for fixed costs such as meter reading charges during the summer months.



The Fair Lawn Municipal 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 Municipal 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. The electricity rates follow the electric consumption, peaking in the summer months.



6.3 Energy Procurement strategies

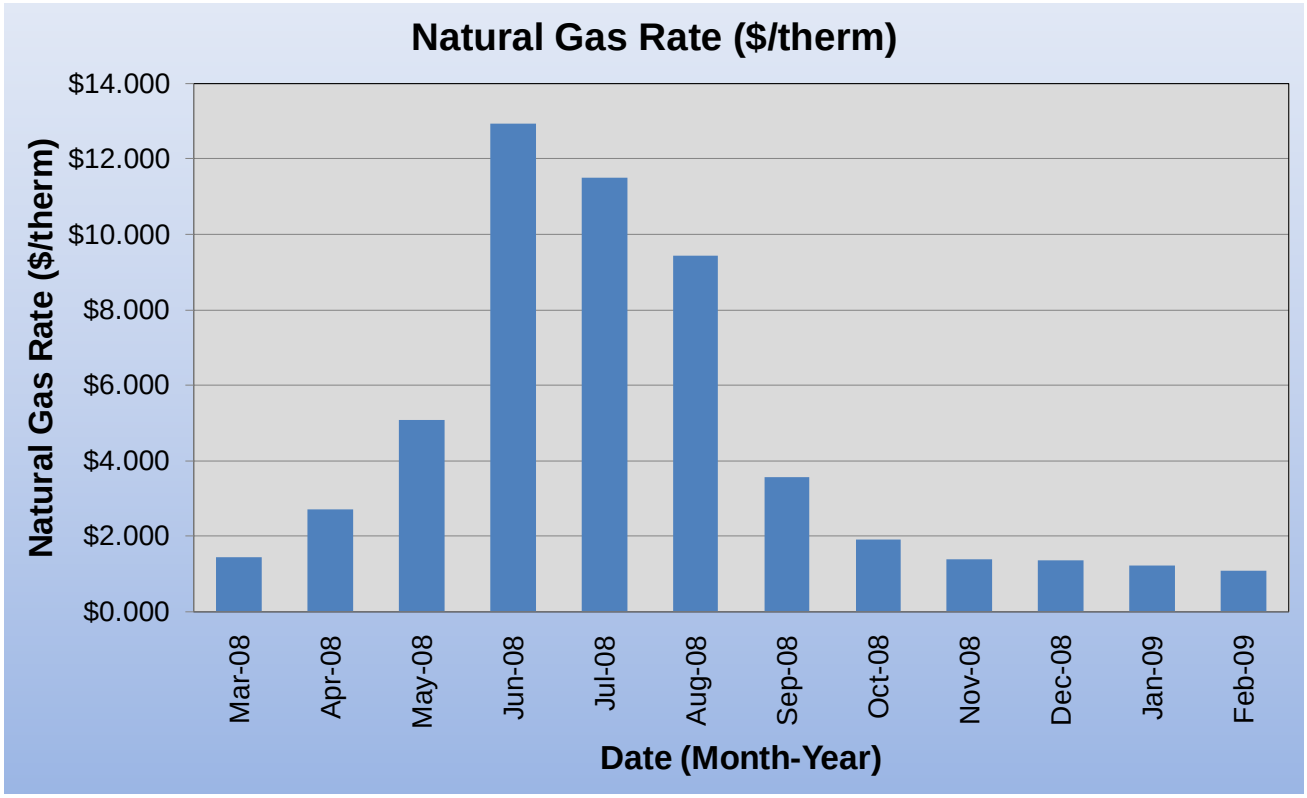
The Fair Lawn Municipal Building receives natural gas via one incoming meter. The PSE&G provides both gas supply and transport. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement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

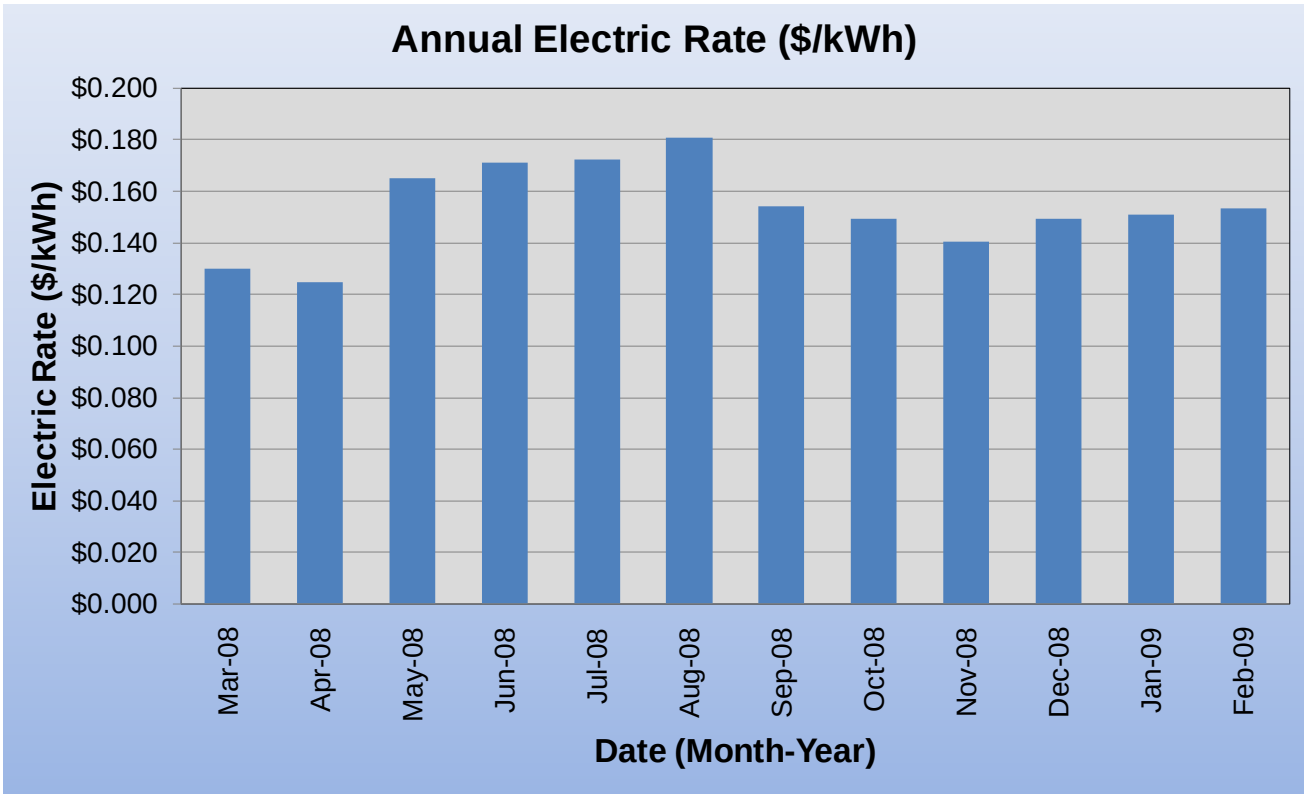
Electricity is purchased via one incoming meter directly for the main Fair Lawn Municipal Building from PSE&G without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations up to 31% over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 90% 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 Municipal Building annual electric costs are $5,663 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 Municipal Building. 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, due to the high electric usage, the Fair Lawn Municipal Building is eligible for enrollment in a Demand Response Program, which requires the ability to shed a minimum of 150 kW of electric demand when requested by the utility during peak demand periods. Demand Response could be an option if the Borough of Fair Lawn installs a back-up natural gas emergency generator that allows 150 kW load-shed on demand. The following charts show the Fair Lawn Municipal Building monthly spending per unit of energy from March 2008 to February 2009.


Natural Gas Rate ($/therm)
$14.000
$12.000
$10.000
$8.000
$6.000
$4.000
$2.000
$0.000
Natural Gas Rate ($/therm)
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)
$0.200
$0.180
$0.160
$0.140
$0.120
$0.100
$0.080
$0.060
$0.040
$0.020
$0.000
Electric Rate ($/kWh)
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	2	Office Area (210)	Parabolic	E	4'T8	8	2	32	S	9	260	6	560	1,310	N/A	Parabolic	4'T8	E	S	8	2	32	9	260	6	560	1310	0	0	0
2	2	Office Area (210A)	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	2	Office Area (208)	Parabolic	E	4'T8	2	2	32	S	9	260	6	140	328	N/A	Parabolic	4'T8	E	S	2	2	32	9	260	6	140	328	0	0	0
4	2	Office (208A)	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
5	2	Mechanical Rm ()	Screw-in	N	CFL	5	1	23	S	2	260	0	115	60	N/A	Screw-in	CFL	N	S	5	1	23	2	260	0	115	60	0	0	0
6	2	Office Area (216)	Parabolic	E	4'T8	17	4	32	S	9	260	13	2,397	5,609	N/A	Parabolic	4'T8	E	S	17	4	32	9	260	13	2397	5609	0	0	0
7	2	Office (216A)	Parabolic	E	4'T8	3	4	32	S	9	260	13	423	990	N/A	Parabolic	4'T8	E	S	3	4	32	9	260	13	423	990	0	0	0
8	2	Office (216)	Exit Sign	E	LED	3	1	5	N	24	365	1	18	158	N/A	Exit Sign	LED	E	N	3	1	5	24	365	1	18	158	0	0	0
9	2	Staircase ()	4'U-shape	E	4'T8	1	2	32	S	16	260	6	70	291	N/A	4'U-Shape	4'T8	E	S	1	2	32	16	260	6	70	291	0	0	0
10	2	Staircase ()	Screw-in	N	CFL	1	1	15	S	16	260	0	15	62	N/A	Screw-in	CFL	N	S	1	1	15	16	260	0	15	62	0	0	0
11	2	Hallway ()	Exit Sign	N	LED	3	1	5	N	24	365	1	18	158	N/A	Exit Sign	LED	N	N	3	1	5	24	365	1	18	158	0	0	0
12	2	Hallway ()	4'U-shape	E	4'T8	13	2	32	S	16	260	6	910	3,786	N/A	4'U-Shape	4'T8	E	S	13	2	32	16	260	6	910	3786	0	0	0
13	2	Meeting Rm (215)	Parabolic	E	4'T8	6	2	32	OS	8	260	6	420	874	N/A	Parabolic	4'T8	E	OS	6	2	32	8	260	6	420	874	0	0	0
14	2	Office Area (211)	Parabolic	E	4'T8	7	2	32	S	9	260	6	490	1,147	N/A	Parabolic	4'T8	E	S	7	2	32	9	260	6	490	1147	0	0	0
15	2	Office Area (211)	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
16	2	Office Area (209)	Parabolic	E	4'T8	6	2	32	S	8	260	6	420	874	N/A	Parabolic	4'T8	E	S	6	2	32	8	260	6	420	874	0	0	0
17	2	Office (209)	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
18	2	Office Area (207)	Parabolic	E	4'T8	16	2	32	S	9	260	6	1,120	2,621	N/A	Parabolic	4'T8	E	S	16	2	32	9	260	6	1120	2621	0	0	0
19	2	Office (207A)	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
20	2	Office (206)	Parabolic	E	4'T8	9	2	32	S	9	260	6	630	1,474	N/A	Parabolic	4'T8	E	S	9	2	32	9	260	6	630	1474	0	0	0
21	2	Office (206B)	Parabolic	E	4'T8	5	2	32	S	9	260	6	350	819	N/A	Parabolic	4'T8	E	S	5	2	32	9	260	6	350	819	0	0	0
22	2	Office (206A)	Parabolic	E	4'T8	3	2	32	S	9	260	6	210	491	N/A	Parabolic	4'T8	E	S	3	2	32	9	260	6	210	491	0	0	0
23	2	Office (204)	Parabolic	E	4'T8	3	2	32	S	9	260	6	210	491	N/A	Parabolic	4'T8	E	S	3	2	32	9	260	6	210	491	0	0	0
24	2	Office (204A)	Parabolic	E	4'T8	9	2	32	S	9	260	6	630	1,474	N/A	Parabolic	4'T8	E	S	9	2	32	9	260	6	630	1474	0	0	0
25	2	Office (204B)	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
26	2	Office (205)	Parabolic	E	4'T8	7	2	32	S	9	260	6	490	1,147	N/A	Parabolic	4'T8	E	S	7	2	32	9	260	6	490	1147	0	0	0
27	2	Office (203)	Parabolic	E	4'T8	2	2	32	S	9	260	6	140	328	N/A	Parabolic	4'T8	E	S	2	2	32	9	260	6	140	328	0	0	0
28	2	Office (201)	Parabolic	E	4'T8	10	2	32	S	9	260	6	700	1,638	N/A	Parabolic	4'T8	E	S	10	2	32	9	260	6	700	1638	0	0	0
29	2	Court Room ()	Pin	N	CFL	16	2	9	S	8	260	0	288	599	N/A	Pin	CFL	N	S	16	2	9	8	260	0	288	599	0	0	0
30	2	Court Room ()	Screw-in	N	CFL	20	1	23	S	8	260	0	460	957	N/A	Screw-in	CFL	N	S	20	1	23	8	260	0	460	957	0	0	0
31	2	Court Room ()	Pin	N	CFL	8	2	9	S	9	260	0	144	337	N/A	Pin	CFL	N	S	8	2	9	9	260	0	144	337	0	0	0
32	2	Court Room ()	Exit Sign	N	Fl.	4	2	15	N	24	365	4	136	1,191	LEDex	Exit Sign	LED	N	N	4	1	5	24	365	1	24	210	981	0	981
33	2	Court Room Stair ()	Screw-in	N	CFL	2	1	23	S	16	260	0	46	191	N/A	Screw-in	CFL	N	S	2	1	23	16	260	0	46	191	0	0	0
34	2	judge chamber ()	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
35	2	security entrance ()	Recessed	M	8'T12	4	1	80	S	4	260	20	400	416	T8	Recessed	8'T8	E	S	4	1	59	4	260	6	260	270	146	0	146
36	2	Staircase ()	4'U-shape	E	4'T8	1	2	32	S	16	260	6	70	291	N/A	4'U-Shape	4'T8	E	S	1	2	32	16	260	6	70	291	0	0	0
37	2	Staircase ()	Screw-in	N	CFL	1	1	15	S	16	260	0	15	62	N/A	Screw-in	CFL	N	S	1	1	15	16	260	0	15	62	0	0	0
38	2	Bathroom Men ()	Recessed	E	4'T8	2	2	32	S	9	260	6	140	328	C	Recessed	4'T8	E	OS	2	2	32	7	260	6	140	246	0	82	82
39	2	Bathroom Men ()	4'U-shape	E	4'T8	1	2	32	S	9	260	6	70	164	C	4'U-Shape	4'T8	E	OS	1	2	32	7	260	6	70	123	0	41	41
40	2	Elevator ()	Recessed	E	4'T8	3	2	32	S	8	260	6	210	437	N/A	Recessed	4'T8	E	S	3	2	32	8	260	6	210	437	0	0	0
41	2	Lobby ()	Recessed	E	4'T8	2	1	32	S	8	260	3	70	146	N/A	Recessed	4'T8	E	S	2	1	32	8	260	3	70	146	0	0	0
42	2	Bathroom Women ()	Recessed	E	4'T8	2	2	32	S	9	260	6	140	328	C	Recessed	4'T8	E	OS	2	2	32	7	260	6	140	246	0	82	82
43	2	Bathroom Women ()	4'U-shape	E	4'T8	1	2	32	S	9	260	6	70	164	C	4'U-Shape	4'T8	E	OS	1	2	32	7	260	6	70	123	0	41	41
44	2	Janitor's Closet ()	Screw-in	E	CFL	1	1	15	S	2	260	0	15	8	N/A	Screw-in	CFL	E	S	1	1	15	2	260	0	15	8	0	0	0
45	B	sprinkler ()	Screw-in	E	CFL	1	1	15	S	2	260	0	15	8	N/A	Screw-in	CFL	E	S	1	1	15	2	260	0	15	8	0	0	0
46	B	voltage ()	Screw-in	E	CFL	1	1	15	S	2	260	0	15	8	N/A	Screw-in	CFL	E	S	1	1	15	2	260	0	15	8	0	0	0
47	B	Janitor's Closet ()	Screw-in	E	CFL	1	1	15	S	2	260	0	15	8	N/A	Screw-in	CFL	E	S	1	1	15	2	260	0	15	8	0	0	0
48	B	Bathroom Men ()	Recessed	E	4'T8	2	2	32	S	9	260	6	140	328	C	Recessed	4'T8	E	OS	2	2	32	7	260	6	140	246	0	82	82
49	B	Bathroom Men ()	4'U-shape	E	4'T8	1	2	32	S	9	260	6	70	164	C	4'U-Shape	4'T8	E	OS	1	2	32	7	260	6	70	123	0	41	41
50	B	Bathroom Women ()	Recessed	E	4'T8	2	2	32	S	9	260	6	140	328	C	Recessed	4'T8	E	OS	2	2	32	7	260	6	140	246	0	82	82

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)
51	B	Bathroom Women ()	4'U-shape	E	4'T8	1	2	32	S	9	260	6	70	164	C	4'U-Shape	4'T8	E	OS	1	2	32	7	260	6	70	123	0	41	41
52	B	Mechanical Rm ()	Recessed	E	4'T8	2	2	32	S	2	260	6	140	73	N/A	Recessed	4'T8	E	S	2	2	32	2	260	6	140	73	0	0	0
53	B	Hallway ()	4'U-shape	E	4'T8	14	2	32	S	16	260	6	980	4,077	N/A	4'U-Shape	4'T8	E	S	14	2	32	16	260	6	980	4077	0	0	0
54	B	Hallway ()	Exit Sign	N	LED	3	1	5	N	24	365	1	18	158	N/A	Exit Sign	LED	N	N	3	1	5	24	365	1	18	158	0	0	0
55	B	Staircase 1 ()	4'U-shape	N	4'T8	2	2	32	S	16	260	6	140	582	N/A	4'U-Shape	4'T8	N	S	2	2	32	16	260	6	140	582	0	0	0
56	B	Staircase 2 ()	Screw-in	N	CFL	2	1	15	S	16	260	0	30	125	N/A	Screw-in	CFL	N	S	2	1	15	16	260	0	30	125	0	0	0
57	B	Staircase 2 ()	Screw-in	N	CFL	2	1	15	S	16	260	0	30	125	N/A	Screw-in	CFL	N	S	2	1	15	16	260	0	30	125	0	0	0
58	B	Mechanical Rm ()	Recessed	E	4'T8	1	2	32	S	2	260	6	70	36	N/A	Recessed	4'T8	E	S	1	2	32	2	260	6	70	36	0	0	0
62	B	Mechanical Rm ()	Screw-in	N	CFL	3	1	23	S	2	260	0	69	36	N/A	Screw-in	CFL	N	S	3	1	23	2	260	0	69	36	0	0	0
63	B	Mechanical Rm ()	Screw-in	N	CFL	3	1	23	S	2	260	0	69	36	N/A	Screw-in	CFL	N	S	3	1	23	2	260	0	69	36	0	0	0
64	B	Meeting Rm (B5)	Parabolic	E	4'T8	15	2	32	S	8	260	6	1,050	2,184	N/A	Parabolic	4'T8	E	S	15	2	32	8	260	6	1050	2184	0	0	0
65	B	Office (B5A)	Recessed	E	4'T8	12	2	32	S	9	260	6	840	1,966	N/A	Recessed	4'T8	E	S	12	2	32	9	260	6	840	1966	0	0	0
66	B	Office (B7)	Recessed	E	4'T8	6	2	32	S	9	260	6	420	983	N/A	Recessed	4'T8	E	S	6	2	32	9	260	6	420	983	0	0	0
67	B	Office (B7A)	Recessed	E	4'T8	4	2	32	S	9	260	6	280	655	N/A	Recessed	4'T8	E	S	4	2	32	9	260	6	280	655	0	0	0
68	B	Storage Rm (B16)	Screw-in	N	cfl	1	2	23	S	2	260	0	46	24	N/A	Screw-in	CFL	N	S	1	2	23	2	260	0	46	24	0	0	0
69	B	Office (B18)	4'U-shape	E	4'T8	8	2	32	S	9	260	6	560	1,310	C	4'U-Shape	4'T8	E	OS	8	2	32	7	260	6	560	983	0	328	328
70	B	TV Room (B20)	Recessed	E	4'T8	6	2	32	S	5	260	6	420	546	C	Recessed	4'T8	E	OS	6	2	32	4	260	6	420	410	0	137	137
71	B	Office (B9)	Recessed	E	4'T8	9	2	32	S	9	260	6	630	1,474	N/A	Recessed	4'T8	E	S	9	2	32	9	260	6	630	1474	0	0	0
72	B	Storage Rm ()	Recessed	E	4'T8	13	2	32	S	2	260	6	910	473	N/A	Recessed	4'T8	E	S	13	2	32	2	260	6	910	473	0	0	0
73	1	Lobby ()	Recessed	E	4'T8	1	3	32	S	8	260	10	106	220	N/A	Recessed	4'T8	E	S	1	3	32	8	260	10	106	220	0	0	0
74	1	Staircase ()	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
75	1	Hallway ()	4'U-shape	E	4'T8	23	2	32	S	16	260	6	1,610	6,698	N/A	4'U-Shape	4'T8	E	S	23	2	32	16	260	6	1610	6698	0	0	0
76	1	Hallway ()	Exit Sign	N	LED	5	1	5	N	24	365	1	30	263	N/A	Exit Sign	LED	N	N	5	1	5	24	365	1	30	263	0	0	0
77	1	Office Area (112)	Recessed	E	4'T8	16	3	32	S	9	260	10	1,696	3,969	N/A	Recessed	4'T8	E	S	16	3	32	9	260	10	1696	3969	0	0	0
78	1	Office (112A)	Recessed	E	4'T8	8	4	32	S	9	260	13	1,128	2,640	N/A	Recessed	4'T8	E	S	8	4	32	9	260	13	1128	2640	0	0	0
79	1	Office Area (109)	Recessed	E	4'T8	7	2	32	S	9	260	6	490	1,147	N/A	Recessed	4'T8	E	S	7	2	32	9	260	6	490	1147	0	0	0
80	1	Office (111)	Recessed	E	4'T8	4	2	32	S	9	260	6	280	655	C	Recessed	4'T8	E	OS	4	2	32	7	260	6	280	491	0	164	164
81	1	Office (107)	Recessed	E	4'T8	7	2	32	S	9	260	6	490	1,147	C	Recessed	4'T8	E	OS	7	2	32	7	260	6	490	860	0	287	287
82	1	Office Area (110)	Recessed	E	4'T8	18	2	32	S	9	260	6	1,260	2,948	N/A	Recessed	4'T8	E	S	18	2	32	9	260	6	1260	2948	0	0	0
83	1	Office (110A)	Recessed	E	4'T8	4	4	32	S	9	260	13	564	1,320	N/A	Recessed	4'T8	E	S	4	4	32	9	260	13	564	1320	0	0	0
84	1	Lunch Rm (110B)	Recessed	E	4'T8	2	2	32	S	8	260	6	140	291	N/A	Recessed	4'T8	E	S	2	2	32	8	260	6	140	291	0	0	0
85	1	Planning (105)	Recessed	E	4'T8	8	2	32	S	8	260	6	560	1,165	N/A	Recessed	4'T8	E	S	8	2	32	8	260	6	560	1165	0	0	0
86	1	Storage Rm (105A)	Recessed	E	4'T8	5	2	32	S	2	260	6	350	182	N/A	Recessed	4'T8	E	S	5	2	32	2	260	6	350	182	0	0	0
87	1	Storage Rm (103)	Recessed	E	4'T8	2	2	32	S	2	260	6	140	73	N/A	Recessed	4'T8	E	S	2	2	32	2	260	6	140	73	0	0	0
88	1	Office Area (106)	Parabolic	E	4'T8	8	2	32	S	9	260	6	560	1,310	N/A	Parabolic	4'T8	E	S	8	2	32	9	260	6	560	1310	0	0	0
89	1	Office (106A)	Parabolic	E	4'T8	2	2	32	S	9	260	6	140	328	N/A	Parabolic	4'T8	E	S	2	2	32	9	260	6	140	328	0	0	0
90	1	Office (101)	Parabolic	E	4'T8	6	2	32	S	9	260	6	420	983	N/A	Parabolic	4'T8	E	S	6	2	32	9	260	6	420	983	0	0	0
91	1	Office (104)	Parabolic	E	4'T8	6	2	32	S	9	260	6	420	983	N/A	Parabolic	4'T8	E	S	6	2	32	9	260	6	420	983	0	0	0
92	1	Office Area (104X)	Parabolic	E	4'T8	10	2	32	S	8	260	6	700	1,456	N/A	Parabolic	4'T8	E	S	10	2	32	8	260	6	700	1456	0	0	0
93	1	Office (102)	Parabolic	E	4'T8	6	2	32	S	8	260	6	420	874	N/A	Parabolic	4'T8	E	S	6	2	32	8	260	6	420	874	0	0	0
94	1	Office (100)	Parabolic	E	4'T8	6	2	32	S	8	260	6	420	874	N/A	Parabolic	4'T8	E	S	6	2	32	8	260	6	420	874	0	0	0
95	1	Staircase ()	Pin	E	CFL	2	2	15	S	16	260	0	60	250	N/A	Pin	CFL	E	S	2	2	15	16	260	0	60	250	0	0	0
96	1	Bathroom Men ()	Recessed	E	4'T8	2	2	32	S	9	260	6	140	328	C	Recessed	4'T8	E	OS	2	2	32	7	260	6	140	246	0	82	82
97	1	Bathroom Men ()	4'U-shape	E	4'T8	1	2	32	S	9	260	6	70	164	C	4'U-Shape	4'T8	E	OS	1	2	32	7	260	6	70	123	0	41	41
98	1	Bathroom Women ()	Recessed	E	4'T8	2	2	32	S	9	260	6	140	328	C	Recessed	4'T8	E	OS	2	2	32	7	260	6	140	246	0	82	82
99	1	Bathroom Women ()	4'U-shape	E	4'T8	1	2	32	S	9	260	6	70	164	C	4'U-Shape	4'T8	E	OS	1	2	32	7	260	6	70	123	0	41	41
100	1	Hallway ()	Parabolic	E	4'T8	2	1	32	S	24	365	3	70	613	N/A	Parabolic	4'T8	E	S	2	1	32	24	365	3	70	613	0	0	0

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)
101	1	Meeting Rm ()	Parabolic	E	4'T8	7	2	32	OS	8	365	6	490	1,431	N/A	Parabolic	4'T8	E	OS	7	2	32	8	365	6	490	1431	0	0	0
102	1	Office Area ()	Parabolic	E	4'T8	2	2	32	S	24	365	6	140	1,226	N/A	Parabolic	4'T8	E	S	2	2	32	24	365	6	140	1226	0	0	0
103	1	Office (119)	Parabolic	E	4'T8	4	2	32	S	24	365	6	280	2,453	N/A	Parabolic	4'T8	E	S	4	2	32	24	365	6	280	2453	0	0	0
104	1	Office (121)	Parabolic	E	4'T8	4	2	32	S	16	365	6	280	1,635	N/A	Parabolic	4'T8	E	S	4	2	32	16	365	6	280	1635	0	0	0
105	1	Office (118)	Screw-in	N	CFL	6	2	15	S	16	365	0	180	1,051	N/A	Screw-in	CFL	N	S	6	2	15	16	365	0	180	1051	0	0	0
106	1	Office (118A)	Parabolic	E	4'T8	5	2	32	S	24	365	6	350	3,066	N/A	Parabolic	4'T8	E	S	5	2	32	24	365	6	350	3066	0	0	0
107	1	Hallway ()	Recessed	E	4'T8	3	2	32	S	24	365	6	210	1,840	N/A	Recessed	4'T8	E	S	3	2	32	24	365	6	210	1840	0	0	0
108	1	Hallway ()	4'U-shape	E	4'T8	2	2	32	S	24	365	6	140	1,226	N/A	4'U-Shape	4'T8	E	S	2	2	32	24	365	6	140	1226	0	0	0
109	1	Staircase ()	Screw-in	N	CFL	1	1	23	S	24	365	0	23	201	N/A	Screw-in	CFL	N	S	1	1	23	24	365	0	23	201	0	0	0
110	1	Men's Locker Room ()	Recessed	E	4'T8	3	1	32	S	8	365	3	105	307	N/A	Recessed	4'T8	E	S	3	1	32	8	365	3	105	307	0	0	0
111	1	Hallway ()	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
113	B	Office (B2)	Parabolic	E	4'T8	2	2	32	S	24	365	6	140	1,226	N/A	Parabolic	4'T8	E	S	2	2	32	24	365	6	140	1226	0	0	0
114	B	Office Area ()	4'U-shape	E	4'T8	5	2	32	S	24	365	6	350	3,066	N/A	4'U-Shape	4'T8	E	S	5	2	32	24	365	6	350	3066	0	0	0
115	B	Office ()	4'U-shape	E	4'T8	3	2	32	S	24	365	6	210	1,840	N/A	4'U-Shape	4'T8	E	S	3	2	32	24	365	6	210	1840	0	0	0
116	B	Office ()	4'U-shape	E	4'T8	3	2	32	S	9	365	6	210	690	N/A	4'U-Shape	4'T8	E	S	3	2	32	9	365	6	210	690	0	0	0
117	B	Meeting Rm ()	4'U-shape	E	4'T8	2	2	32	S	16	365	6	140	818	N/A	4'U-Shape	4'T8	E	S	2	2	32	16	365	6	140	818	0	0	0
118	B	Office (B6)	Recessed	E	4'T8	4	2	32	S	9	365	6	280	920	N/A	Recessed	4'T8	E	S	4	2	32	9	365	6	280	920	0	0	0
119	B	Office (B8)	Recessed	M	4'T12	2	2	40	S	9	365	15	190	624	T8	Recessed	4'T8	E	S	2	2	32	9	365	6	140	460	164	0	164
120	B	Men's Locker Room ()	Recessed	E	4'T8	5	2	32	S	8	365	6	350	1,022	C	Recessed	4'T8	E	OS	5	2	32	6	365	6	350	767	0	256	256
121	B	Hallway ()	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
122	B	Showers Women ()	4'U-shape	E	4'T8	1	2	32	S	8	365	6	70	204	N/A	4'U-Shape	4'T8	E	S	1	2	32	8	365	6	70	204	0	0	0
123	B	Showers Women ()	Recessed	E	2'T8	1	2	17	S	8	365	3	37	108	N/A	Recessed	2'T8	E	S	1	2	17	8	365	3	37	108	0	0	0
124	B	Storage Rm ()	Recessed	E	4'T8	6	2	32	S	2	365	6	420	307	N/A	Recessed	4'T8	E	S	6	2	32	2	365	6	420	307	0	0	0
125	B	Storage Rm ()	Recessed	E	CFL	2	2	15	S	2	365	0	60	44	N/A	Recessed	CFL	E	S	2	2	15	2	365	0	60	44	0	0	0
126	B	Mechanical Rm ()	Screw-in	E	CFL	3	1	23	S	2	365	0	69	50	N/A	Screw-in	CFL	E	S	3	1	23	2	365	0	69	50	0	0	0
127	B	Mechanical Rm (B112)	Screw-in	E	CFL	3	1	23	S	2	365	0	69	50	N/A	Screw-in	CFL	E	S	3	1	23	2	365	0	69	50	0	0	0
128	B	Storage Rm ()	Parabolic	E	4'T8	4	2	32	S	2	365	6	280	204	N/A	Parabolic	4'T8	E	S	4	2	32	2	365	6	280	204	0	0	0
129	B	Storage Rm vault ()	Screw-in	N	CFL	6	1	15	S	2	365	0	90	66	N/A	Screw-in	CFL	N	S	6	1	15	2	365	0	90	66	0	0	0
129	Ext	Exterior ()	Screw-in	N	HPS	4	1	250	T	16	365	63	1,252	7,312	PSMH	Screw-in	PSMH	N	T	4	1	175	16	365	38	852	4976	2336	0	2336
130	Ext	Exterior ()	Screw-in	N	MH	4	1	175	T	16	365	44	876	5,116	PSMH	Screw-in	PSMH	N	T	4	1	115	16	365	25	560	3270	1845	0	1845
131	Ext	Exterior ()	Screw-in	N	MH	3	1	100	T	16	365	25	375	2,190	PSMH	Screw-in	PSMH	N	T	3	1	65	16	365	14	237	1384	806	0	806
132	Ext	Exterior ()	Screw-in	N	CFL	6	1	23	T	16	365	0	138	806	N/A	Screw-in	CFL	N	T	6	1	23	16	365	0	138	806	0	0	0
133	Ext	Exterior ()	Screw-in	N	Inc	2	1	60	T	16	365	0	120	701	CFL	Screw-in	CFL	N	T	2	1	20	16	365	0	40	234	467	0	467
Totals:						**628**	**238**	**4,139**				**759**	**42,439**	**126,163**						**628**	**237**	**3,890**			**678**	**41,203**	**117,510**	**6,746**	**1,907**	**8,653**

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)	36,112		
Average Power Cost ($/kWh)	0.1570		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	16,124	10,670	**5,455**
Exterior Power (watts)	2,761	1,827	**934**
Total Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	110,039	106,841	**8,653**
Lighting Power (watts)	39,678	39,376	**302**
Lighting Power Density (watts/SF)	1.10	1.09	**0.01**
Estimated Cost of Fixture Replacement ($)	11,223		
Estimated Cost of Controls Improvements ($)	3,740		
Total Consumption Cost Savings ($)	**1,886**		

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

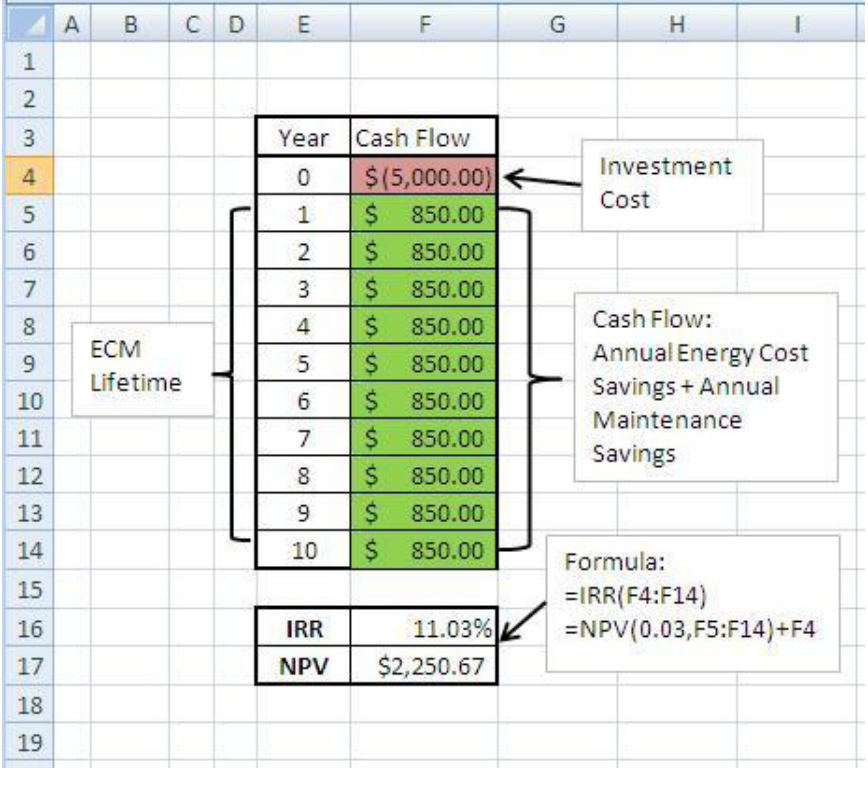
Note: The lifetime operating cost savings are all avoided operating, maintenance, and/or component replacement costs over the lifetime of the ECM. This can be the sum of any annual operating savings, recurring or bulk (i.e. one-time repairs) maintenance savings, or the savings that comes from avoiding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