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**Local Government Energy Program
Energy Audit Report**

***Township of Mount Holly
Municipal building
Mount Holly, NJ 08060***

Project Number: LGEA54



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INTRODUCTION

On March 10, 2010 Steven Winter Associates, Inc. (SWA) performed an energy audit and assessment for the Municipal building. The building is located at 23 Washington St, Mount Holly, NJ 08060 in Sussex County. 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 three-story (including a partial basement,) 11,351 square feet Township Municipal Building was originally constructed in the 1930s with additions/alterations completed in the 1970s. It houses administrative offices, the tax office, the vital statistic office, the municipal court and the police department. The building occupancy is approximately 21 employees approximately 168 hours per week.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Township of Mount Holly to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the 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. The Program will subsidize 75% of the cost of the audit. If the net cost of the installed measures recommended by the audit exceeds the remaining cost of the audit, then that additional 25% will also be paid by the program. The Board of Public Utilities (BPU's) 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 Municipal Building located at 23 Washington St, Mount Holly, NJ 08060. The three-story 11,351 square foot Municipal Building was originally constructed in the 1930s with additions/alterations completed in the 1970s. It houses administrative offices, the tax office, the vital statistic office, the municipal court and the police department.

Based on the field visits performed by the SWA staff on March 10th 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 and cooling energy use.

From March 2008 to February 2009 the Municipal building consumed 195,300 kWh or \$32,998 worth of electricity at an approximate rate of \$0.169/kWh, 241 therms or \$470 worth of natural gas at an approximate rate of \$1.954/therm, and the annual fuel oil#2 use during this period was estimated to be 2,563 gallons (approx. 3,588 therms) worth \$5,503 at an approximate rate of \$2.147/gallon. The joint energy consumption for the building, including both electricity and natural gas was 1,049MMBtu of energy that cost a total of \$38,971.

SWA has entered energy information about the Municipal building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The building received a performance rating of 46. Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). SWA encourages the Township of Mount Holly to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

The Site Energy Use Intensity is 93.0 kBtu/ft²yr compared to the national average of "Office" buildings consuming 90.0 kBtu/ft²yr. Implementing the recommendations included in this report will reduce the building energy consumption by approximately 26.2 kBtu/ft²yr. There may be energy procurement opportunities for the Municipal building to reduce annual utility costs, which are \$3,800 higher, when compared to the average estimated NJ commercial utility rates.

Based on the assessment of the 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 new or repair existing VAV box or control damper in Second Floor Office
- Replace heating terminal units
- Replace hot water heating pumps
- Replace elevator equipment
- Install premium motors when replacements are required
- Replace single pane windows

Category II Recommendations: Operations and Maintenance

- Water levels in the expansion tanks and the integrity of the tank bladder should be checked
- Tighten belts on all RTU and exhaust fans
- Change filters on RTUs quarterly
- Use ENERGY STAR® labeled appliances
- Provide weather stripping / air sealing
- Preventative exterior wall maintenance
- Chimney flashing should be evaluated and fixed or replaced
- Add metal type flashing to recently installed rubber membrane lip at the eave transition from synthetic slate roof finish
- Refinish or replace deteriorated exterior woodwork, moldings and trim
- Maintain downspouts
- 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 **7** Energy Conservation Measures (ECMs) for the Municipal building as summarized in Table 1. The total investment cost for these ECMs is **\$36,477**. SWA estimates a first year savings of **\$10,253** with a simple payback of **3.6 years**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the Municipal building by **66,384lbs of CO₂**, which is equivalent to removing more than 6 cars from the roads each year. SWA also recommends **1** ECM with payback greater than 5 years summarized in Table 2, that results in a first year savings of **\$2,044**.

Institutional buildings with an average annual peak demand over 200 kW (Municipal building peak demand is about 47 kW) are eligible to participate in the NJ Clean Energy Pay for Performance program. Incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum performance threshold of 15% savings has been achieved. To participate, select a Program Partner from an approved partner list and submit Application Package with your Partner's assistance. Reducing 15% of the energy use at Municipal building will be challenging without undertaking significant investment.

There are various incentives the Township of Mount Holly could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the Borough apply for the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project.

Additionally, a new NJ Clean Power program, Direct Install, could also assist to cover up to 80% of the capital investment.

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

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

Table 1 - Highly Recommended 0-5 Year Payback ECMs																			
ECM #	ECM description	source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime 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
3	15 New CFL fixtures to be installed with incentives	RS Means, lit search	622	none at this time	622	3,285	0.7	0	1.0	979	1,534	5	7,669	0.4	1133	226	246	6,363	4,500
4	1 New LED exit sign fixtures to be installed with incentives	RS Means, lit search	151	20	131	302	0.1	0	0.1	89	140	15	2,106	0.9	1513	100	108	1,521	414
1	Install 1 Drinks vending machine miser and 1 snacks vending miser	www.usatech.com and established costs	458	none at this time	458	2,643	0.8	0	0.6	0	513	12	6,153	0.9	1,243	104	112	4,646	3,621
5	40 New occupancy sensors to be installed with incentives	RS Means, lit search	8,800	800	8,000	13,131	2.7	0	3.9	0	2,219	15	33,288	3.6	316	100	27	18,113	17,990
6	15 New motion sensors to be installed with incentives	RS Means, lit search	3,300	300	3,000	4,737	1.0	0	1.4	0	800	15	12,007	3.7	300	20	26	6,419	6,489
7	Replace (2) 3 Hp hot water circulator pump motors with Premium Efficiency	similar projects, DOE International Motor Master selection & savings analysis	714	108	606	890	0.2	0	0.3	0	150	20	3,008	4.0	396	20	25	1,632	1,219
2	205 New T8 fixtures to be installed with incentives	RS Means, lit search	29,811	6,150	23,661	23,467	4.9	0	7.1	930	4,896	15	73,446	4.8	210	14	19	33,956	32,150
TOTALS			43,855	7,378	36,477	48,455	10.4	0	14.4	1,998	10,253		137,677	3.6				72,650	66,384

Table 2 - Recommended 5-10 Year Payback ECMs																			
ECM #	ECM description	source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime 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
8.1	Replace boiler with modulating high efficiency oil-fired boiler	Similar Projects	22,000	0	22,000	0	0.0	960	11.8	0	2,044	25	51,096	10.8	132	5	8	13,590	21,489

Assumptions: Discount Rate: 3.2% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines

1. HISTORIC ENERGY CONSUMPTION

1.1. Energy usage and cost analysis

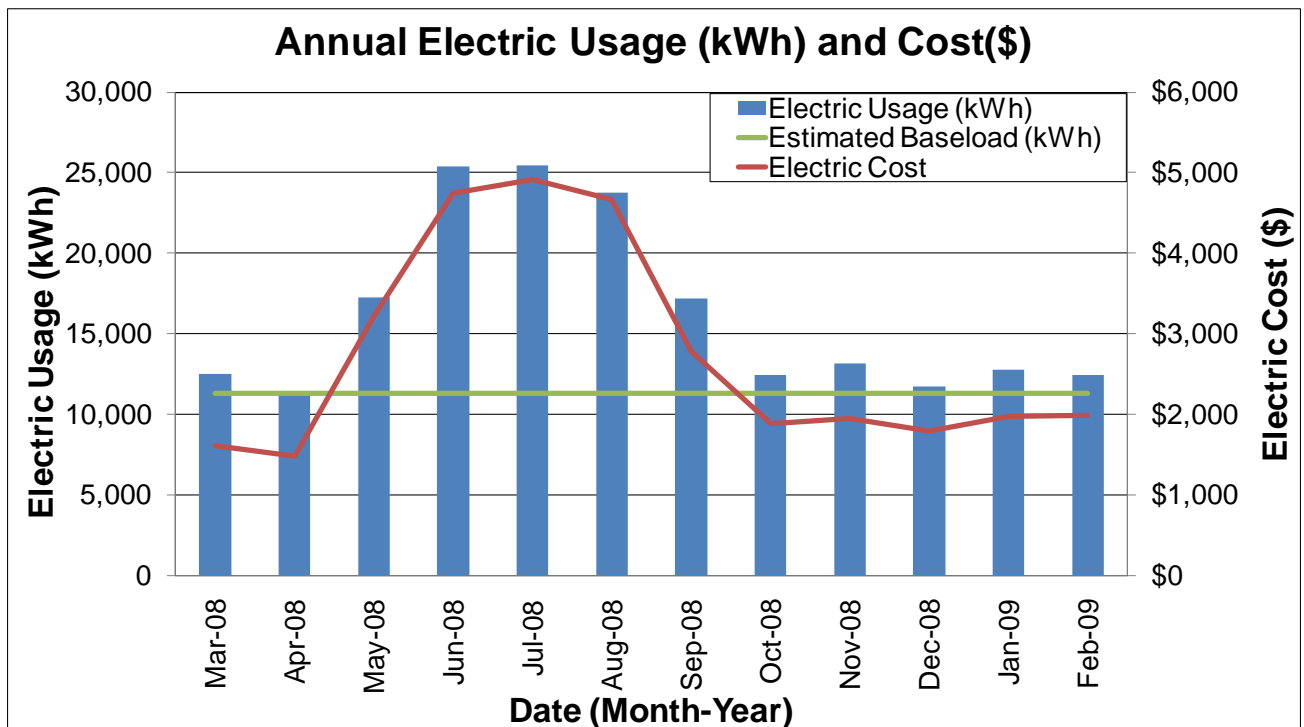
SWA analyzed utility bills from March 2008 through February 2009 that were received from the PSE&G for the electricity usage, PSE&G for the natural gas, and Majestic Oil Co, Inc. supplying the Municipal building with fuel oil #2.

Electricity - The Municipal building is currently served by one electric meter. The Township currently buys electricity from PSE&G at an **average rate of \$0.169/kWh** based on 12 months of utility bills from March 2008 to February 2009. The Township purchased **approximately 195,300 kWh or \$32,998 worth of electricity** in the previous year for the Municipal building. The average monthly demand was 47 kW.

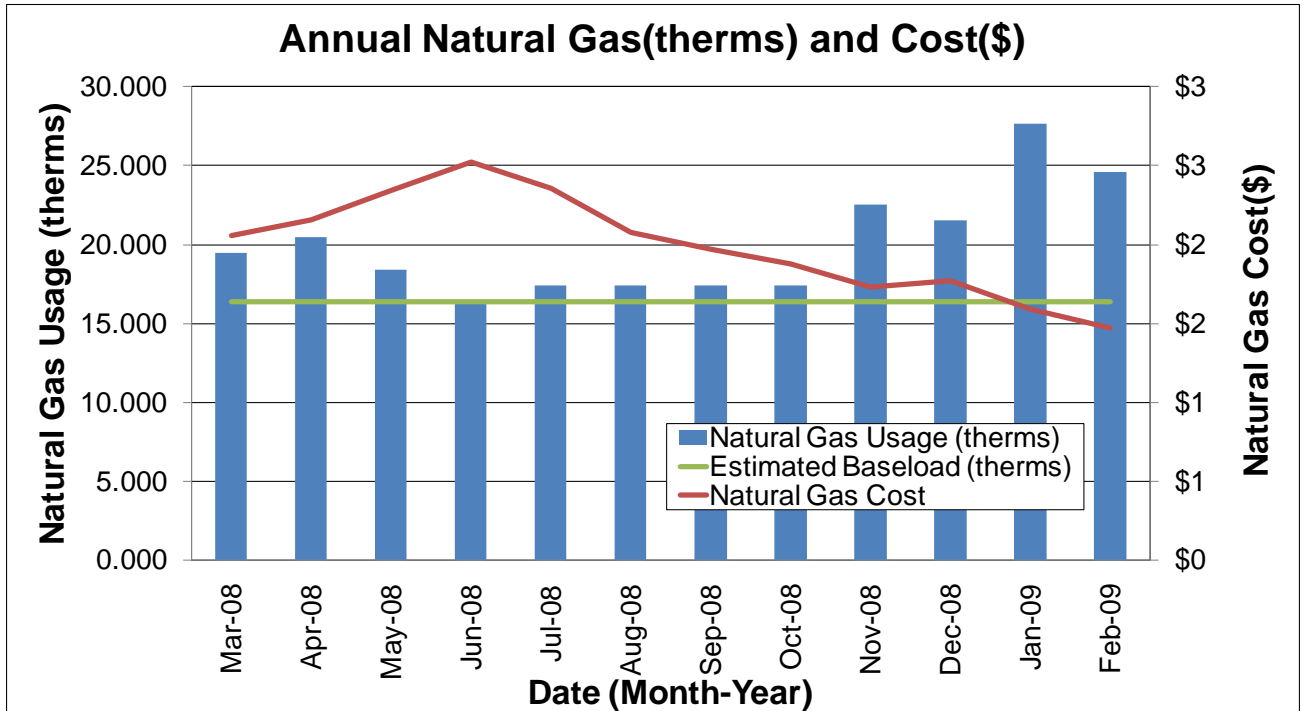
Natural gas & Fuel Oil #2 - The Municipal building is currently served by one natural gas meter which serves to fuel the domestic hot water tank. The Township currently buys natural gas from PSE&G at an **average aggregated rate of \$1.954/therm** based on 12 months of gas bills for March 2008 to February 2009. The Township purchased **approximately 241 therms or \$470 worth of natural gas** in the previous year for the Municipal building.

The Municipal building receives oil deliveries from Majestic Oil Co, Inc which serves to fuel the boilers. The Township currently buys fuel oil #2 at an **estimated average aggregated rate of \$2.147/gallon (or 1.533/therm)** for the 12 months of March 2008 to February 2009. The Township purchased **approximately 2,563 gallons (approx. 3,588 therms) or \$5,503 worth of fuel oil #2** for the Municipal building.

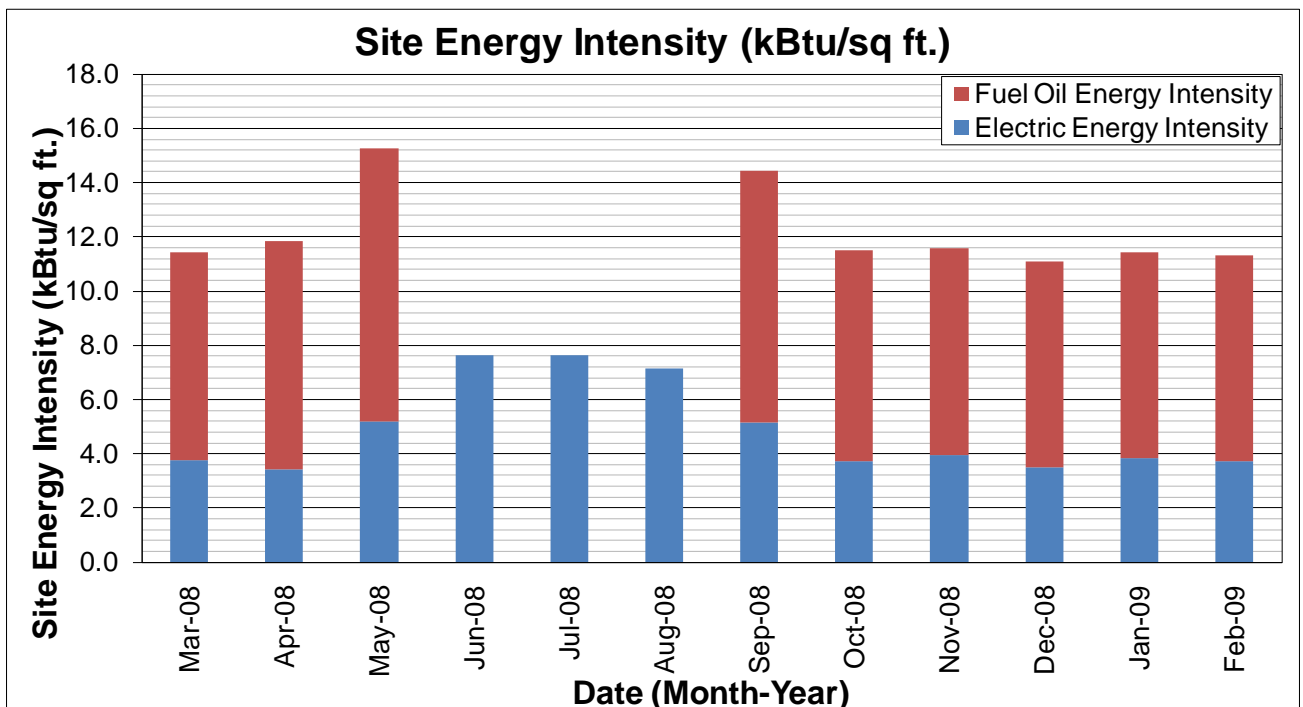
The following chart shows electricity use for the Municipal building based on utility bills for the 12 month period of March 2008 to February 2009.



The following chart shows the natural gas energy used for the Municipal building based on receipts for the 12 month period of March 2008 to February 2009.

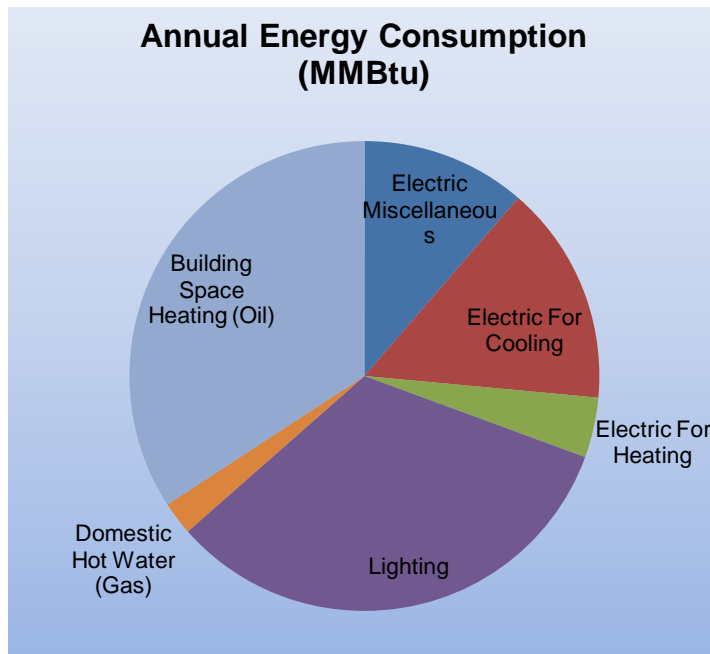


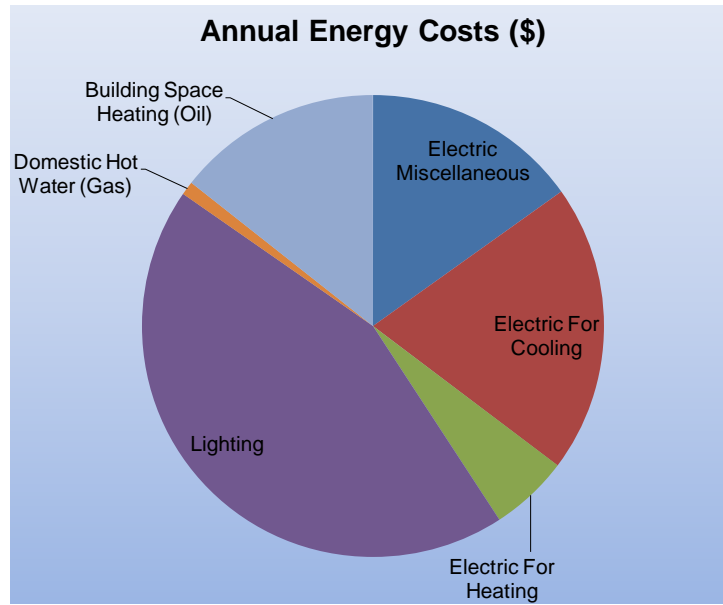
The following chart shows combined natural gas, fuel oil #2, and electric consumption in Btu/sq ft for the Municipal building based on utility bills for the 12 month period of March 2008 to February 2009.



The following table and pie charts show energy use for the Municipal building based on utility bills (and fuel receipts) for the 12 month period of March 2008 to February 2009. Note electrical cost at \$50/MMBtu of energy is more than 3.1 times as expensive to use as gas/fuel oil at \$16/MMBtu. A blended rate of natural gas and fuel oil #2 was used to calculate numbers in this chart.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	\$	% \$	\$/MMBtu
Electric Miscellaneous	119	11%	\$5,896	15%	50
Electric For Cooling	159	15%	\$7,857	20%	50
Electric For Heating	43	4%	\$2,149	6%	50
Lighting	345	33%	\$17,097	44%	50
Domestic Hot Water (Gas)	24	2%	\$375	1%	16
Building Space Heating (Oil)	359	34%	\$5,597	14%	16
Totals	1,049	100%	\$38,971	100%	
Total Electric Usage	666	64%	\$32,999	85%	50
Total Gas Usage	383	36%	\$5,973	15%	16
Totals	1,049	100%	\$38,971	100%	





1.2. Utility rate

The Township currently purchases electricity from PSE&G at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Township currently pays an average rate of approximately \$0.169/kWh based on the 12 months of utility bills of March 2008 to February 2009.

The Township currently purchases natural gas supplied by PSE&G at the prevailing market rates for natural gas. The average aggregated rate for the natural gas is approximately \$1.95/therm based on 12 months of natural gas bills for March 2008 to February 2009.

The Township currently purchases fuel oil #2 supplied by Majestic Oil Co, Inc. at the prevailing market rates for fuel oil #2. The average aggregated rate (supply and transport) for the oil is estimated approximately \$2.147/gallon (\$1.56/therm) for March 2008 to February 2009.

1.3. Energy benchmarking

SWA has entered energy information about the Municipal building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. The building received a performance score of 46. Buildings achieving an Energy Star rating of 75 or higher, and professionally verified to meet current indoor environmental standards, are eligible to apply for the Energy Star award and receive the Energy Star plaque that conveys superior energy performance to students, parents, taxpayers, and employees. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification to the United States Green Building Council (USGBC).

The Site Energy Use Intensity is 93.0 kBtu/sqft compared to the national average intensity of similar type buildings consuming 90.0 kBtu/sqft. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 14.4 kBtu/sqft with an additional 11.8 kBtu/sqft from the other recommended measures. These recommendations could account for at least 26.2 kBtu/sq ft yr reduction, which when implemented would make the building energy consumption even lower.

SWA has created the Portfolio Manager site information for the Township of Mount Holly. Access is also allowed to TRC. This information can be accessed at the following: <https://www.energystar.gov/istar/pmpam/> with the following:

Username: MountHollyTownship

Password: MOUNTHOLLYTOWNSHIP



STATEMENT OF ENERGY PERFORMANCE

Mount Holly Township - Municipal Building

Building ID: 2243922
For 12-month Period Ending: February 28, 2009¹
Date SEP becomes ineligible: N/A

Date SEP Generated: April 13, 2010

Facility	Facility Owner	Primary Contact for this Facility
Mount Holly Township - Municipal Building 23 Washington St Mount Holly, NJ 08060	N/A	N/A

Year Built: 1930
Gross Floor Area (ft²): 11,351

Energy Performance Rating² (1-100): 46

Site Energy Use Summary³

Electricity - Grid Purchase (kBtu)	683,521
Fuel Oil (No. 2) (kBtu)	346,514
Natural Gas (kBtu) ⁴	24,976
Total Energy (kBtu)	1,055,011

Energy Intensity⁵

Site (kBtu/ft ² /yr)	93
Source (kBtu/ft ² /yr)	234

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	131
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Electric Distribution Utility

Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	90
National Average Source EUI	227
% Difference from National Average Source EUI	3%
Building Type	Office

Meets Industry Standards⁶ 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 this report are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, PE facility inspection, and notarizing the SEP) and we hereby suggest that you reduce this time to a minimum. Send comments (including OMB control number) to the Director, Collection Strategies Division, U.S., EPA, (8222), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

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

2. FACILITY AND SYSTEMS DESCRIPTION

This section gives an overview of the current state of the facility and systems. Please refer to the Proposed Further Recommendations section for recommendations for improvement.

Based on visits from SWA on March 10, 2010, the following data was collected and analyzed.

2.1. Building Characteristics

The three-story (including a partial basement,) 11,351 square foot Township Municipal Building was originally constructed in the 1930s with additions/alterations completed in the 1970s. It houses administrative offices, the tax office, the vital statistic office, the municipal court and the police department.



Front and Left Side Façade



Partial Rear Façade (typ.)



Partial Left Side Façade (typ.)



Partial Right Side Façade (typ.)

2.2. Building occupancy profiles

The building occupancy is approximately 21 employees approximately 168 hours per week.

2.3. Building envelope

Due to *unfavorable* weather conditions (min. 18 deg. F delta-T in/outside and no/low wind), no exterior envelope infrared (IR) images were taken during the field audit

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

2.3.1. Exterior Walls

The exterior wall envelope is mostly constructed of brick veneer and some stucco accents, over a steel frame with 3-1/2 inches of fiberglass batt cavity insulation. The interior is mostly painted gypsum wallboard.

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

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall acceptable, age-appropriate condition with only a few areas of uncontrolled moisture, air-leakage or other energy-compromising issues located mostly at the rear of the building.

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



Cracked/deteriorated bricks and mortar joints due to water infiltration through window sills and chimney flashing.



Mold/water damage on interior gypsum wallboard and exterior stucco finish due to uncontrolled water infiltration through the roof area.

2.3.2. Roof

The building's roof is predominantly a medium-pitch shed and gable type over a steel structure, with a synthetic slate shingle finish. It was replaced recently. No detectable attic/ceiling insulation, and five inches of fiberglass roof insulation were recorded.

Note: Roof insulation levels could visually be verified in the field by non-destructive methods.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall good condition, with only two areas of uncontrolled moisture, air-leakage or other energy-compromising issues.

The following specific roof problem spots were identified:



Rubber membrane instead of metal flashing installed with pocket for water and debris to collect and potentially leak into the building.



Deteriorating crown/fascia molding.

2.3.3. Base

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

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

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in good/ age appropriate condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

2.3.4. Windows

The building contains basically one type of window.

1. Double-hung and casement type windows with a wood frame, clear single glazing and no interior or exterior shading devices. The windows are original.

Windows, shading devices, sills, related flashing and caulking were inspected as far as accessibility allowed for signs of moisture, air-leakage and other energy compromising issues. Overall, the windows were found to be in poor/ age appropriate condition.

The following specific window problem spots were identified:



Single-glazed window with ineffective frame

2.3.5. Exterior doors

The building contains only one type of exterior door.

1. Metal type exterior doors. They are located throughout the building.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in acceptable/ age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots were identified:



Missing/worn weather-stripping

2.3.6. Building air tightness

Overall the field auditors found the building to be reasonably air-tight with a few areas of suggested improvements. Please refer to the Proposed Further Recommendations section for recommendations for improvement.

The air tightness of buildings helps maximize all other implemented energy measures and investments, and minimizes potentially costly long-term maintenance.

2.4. HVAC Systems

The Municipal Building is a two-story building (with an attic) built in 1930. An addition at the rear of the building which houses the police department was constructed in 1975. The Municipal Building is heated by an oil-fired hot water boiler system and cooled by (2) packaged rooftop units. There is also some supplemental heat provided by electric reheat coils located in the basement RTU ductwork and a few hot water cabinet unit heaters at the entries.

2.4.1 Heating

The majority of the rooms on the first and second floors are heated via hot water finned-tube radiation located just above floor level and below the windows. Each room has a thermostat to modulate the heating control valve for the finned-tube radiation. There is a packaged DX rooftop unit with electric heat that provides conditioned air to the basement level via ductwork. The basement level has some hot water heating, but most of the rooms in the Police Department contain supplemental duct-mounted electric reheat coils in the cooling system ductwork. The radiation and reheat coils were installed as part of the renovation and addition in 1976 and are in fair condition.

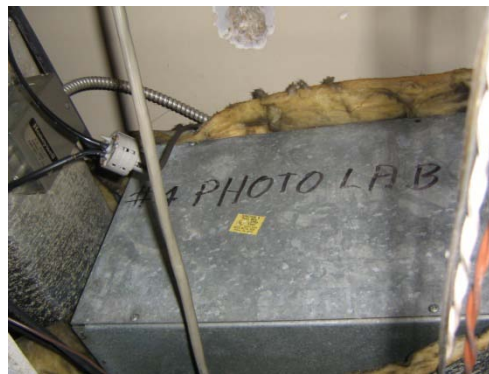
The three (3) building entry points have ceiling-mounted or floor-mounted cabinet unit heaters for local temperature control. These units are in fair to good condition.

The source of heat in the building is an oil-fired fire-in-tube hot water boiler system located in the Basement level mechanical room. The boiler is rated for 1,080 MBH and is fed from an exterior underground oil storage tank adjacent to the mechanical room. The boiler system was installed circa 1976 and is in poor condition. There is a hole in the outer casing of the boiler that is degrading over time. According to its age, the boiler is operating beyond its expected service life of 30 years, as published in the 2007 ASHRAE HVAC Applications Handbook. SWA recommends that this boiler be replaced. Since the boiler room contains a small gas service and meter, it is recommended that the boiler be replaced with a gas-fired high efficiency condensing boiler and that PSE&G is contacted regarding the adequacy of the existing service to handle the new boiler or if a service upgrade is required.



Oil -Fired Boiler and Photo of Hole in Outer Jacket

The heating hot water is circulated by one of two floor-mounted pumps that operate in lead-lag fashion. The pumps are beyond their expected service life but are in fair to good condition. SWA recommends these pumps are replaced. Replacement of the pumps themselves will not yield energy savings, but utilizing premium efficiency motors on the pumps will yield significant energy savings.



Duct Mounted Electric Reheat Coil

2.4.2 Cooling

Cooling for the building is provided by the two (2) packaged DX cooling rooftop units located on the roof of the Police Department addition. The rooftop units feed the VAV boxes throughout the building which then distribute the air to the various spaces and zones which they serve. There is a 25-ton rooftop unit that serves the first & second floors, and a 12.5-ton rooftop unit serving the basement level. This equipment was installed in 2008 and is in excellent condition.



Rooftop units

It should be noted that on the day of the field visit, there was a complaint about the performance of the cooling system in a second floor office at the front of the building. This office is at the end of the ductwork run from the 25-ton rooftop cooling unit. Because of the historic nature of the ceiling, a ceiling was not installed in this room, and the duct terminates with a wall-mounted register. The room contains a thermostat, but there does not appear to be any method of throttling the airflow in this room in response to the thermostat. It should be further investigated if there is a VAV box for this room in an adjacent ceiling space. If so, the box should be repaired to respond to the room thermostat. If not, a new box or control damper should be installed in the ductwork supplying this room that will respond to the room thermostat.

2.4.3 Ventilation

Ventilation air for the building is provided by the two (2) packaged rooftop units mentioned in the cooling section above. One of the units contains an electric heating coil, presumably to preheat the ventilation air after it enters the unit.

There is one (1) exhaust fan on the roof serving the toilet rooms and other miscellaneous areas in the building. This fan was installed in 2008 and is in excellent condition.



Rooftop exhaust fan

2.4.4 Domestic Hot Water

There is a single, gas-fired tank-type domestic water heater located in the mechanical room on the basement level of the building. This heater serves the lavatories in toilet rooms on all levels as well as three (3) janitor's sinks. The hot water piping is also connected to sinks in the jail cells, which are reportedly not in use at this time. The heater has a 75-gallon capacity and is equipped with a recirculation pump. This heater was installed in 2007 and is in very good condition.



Gas-fired water heater

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting - The Municipal building currently contains mostly T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacement of these fixtures with more high performance T8 fluorescent fixtures with electronic ballasts. There are also fixtures found to contain incandescent bulbs. SWA recommends upgrading these fixtures with compact fluorescent bulbs. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA recommends installing occupancy sensors in closets, offices and areas where payback on savings is justified. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion or sound is detected within a set time period. See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

Exit Lights – Most exit signs were found to be LED type.

Exterior Lighting - The exterior lighting surveyed during the building audit were wall mounted sconces containing incandescent bulbs. SWA recommends replacing incandescent bulbs with compact fluorescents.

2.5.2. Appliances and process

Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the ENERGY STAR® label. For example, ENERGY STAR® refrigerators use as little as 315 kWh / yr. When compared to the average electrical consumption of older equipment, ENERGY STAR® equipment results in a large savings. Building management should select ENERGY STAR® label appliances and equipment when replacing: refrigerators, printers, computers, copy machines, etc. More information can be found in the “Products” section of the ENERGY STAR® website at: <http://www.energystar.gov>. SWA recommends consulting with the vendor that supplies all vending machines, requesting ENERGY STAR® models when the contract is due for renewal. Also, energy vending miser devices are now available for conserving energy usage by Drinks and Snacks vending machines. When equipped with the vending miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR® qualified machines.

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. SWA recommends all computers and all appliances (i.e. coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off.

2.5.3. Elevators

There is one (1) 15 horsepower elevator located in the building. The elevator is part of the construction of the addition and was installed in 1975. The Township of Mount Holly may wish to consider replacement of this unit as part of a capital improvement project.

3. EQUIPMENT LIST

Inventory

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	Oil Boiler	Mechanical Room	Kewanee Boiler Rating 1080 mbh, 32 HP, 65-70% eff., Type 3R6-KO SN P-5336, 115V, 1PH, 12A Firing Range 5.2-10.4 GPH	Oil	Municipal Bldg	1976	0%
Heating	Boiler Burner	Mechanical Room	Kewanee Boiler Model KFO.33-762-0 1/3 blower horsepower 5.2-10.4 gph oil firing range	Oil	Municipal Bldg	1976	0%
Heating	Pump	Mechanical Room	Armstrong Pumps Model #1.5F4030 SN 84994 3HP, 67GPM, 1750 RPM 230/460 3PH	Electric	Municipal Bldg	1976	0%
Heating	Pump	Mechanical Room	Marathon Electric Model #WVL182TTDR7026 DG 3HP, 1730 RPM, 208-230/460 3PH	Electric	Municipal Bldg	1976	0%
Ventilation	Window Fan	Mechanical Room	Dayton Model #8M209R 1/30 HP, 115V, 1PH	Electric	Mech Room	1976	0%
Domestic Hot Water	Domestic Water Heater	Mechanical Room	Bradford White Model #75T80B3N SN DK9777323 75 gallon, Input 76000 btu/hr	Gas	Municipal Bldg	2007	75%
Domestic Hot Water	Recirculation Pump	Mechanical Room	Armstrong Pumps SN ZQE48S17D1048N 1/12 HP, 115V, 1725 RPM E6312, LR37479	Electric	Municipal Bldg	2007	70%

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Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Cooling & Ventilation	Rooftop Unit #1	Roof	York Model #Y22AC04A SN NOB8641338 460V, 3 PH	Electric	Municipal Bldg	2008	87%
Cooling & Ventilation	Rooftop Unit #2	Roof	York Model #DH150E18S4UAD3 C SN NOB8630375 460V, 3 PH	Electric	Municipal Bldg	2008	87%
Ventilation	Exhaust Fan (EF1)	Roof	Cook Model #135CPS SN 076SN883789-00/0000701 2080 CFM, 1725 RPM, 1 HP 460V 3PH	Electric	Municipal Bldg	2008	90%
Elevator	Elevator	Elevator Room	Quality Elevator Model #11-80-15 SN F47635 460V 3PH, 15 HP	Electric	Municipal Bldg	1975	0%
Heating	Elec Reheat Coil (Qty-2)	Duct Mtd	Chromolox Model # DHFO 3.3 KW, 460V, 3PH	Electric	Police Station	1975	0%
Heating	Elec Reheat Coil (Qty-2)	Duct Mtd	Chromolox Model # DHFO 10.0 KW, 460V, 3PH	Electric	Police Station	1975	0%
Heating	Elec Reheat Coil (Qty-1)	Duct Mtd	Chromolox Model # DHFO 6.6 KW, 460V, 3PH	Electric	Police Station	1975	0%
Heating	Elec Reheat Coil (Qty-1)	Duct Mtd	Chromolox Model # DHFO 8.9 KW, 460V, 3PH	Electric	Police Station	1975	0%
Heating	Force Flow Cabinet Heater Hot Water Heating Coil with Fan Motor	Ceiling	Trane Model #02-D-11 1/60 HP, 50W, 120V, 1PH	Electric	Side Entrance	1975	0%
Heating	Force Flow Cabinet Heater Hot Water Heating Coil with Fan Motor	Ceiling	Trane Model #03-E-46 1/35 HP, 100W, 120V, 1PH	Electric	Side Entrance	1975	0%

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Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
HVAC	Force Flow Cabinet Heater Hot Water Heating Coil with Fan Motor	Wall	Trane Model #06-N-46 1/22 HP, 100W, 120V, 1PH	Elec	Front Entrance	1975	0%
Lighting	See details - Appendix A	building	-	Electric	Building		

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 Municipal building, SWA has separated the investment opportunities into three recommended categories:

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

Category I Recommendations: Capital Improvements

- Install new or repair existing VAV box or control damper in Second Floor Office as mentioned in the Cooling section above, on the day of the field visit, there was a complaint about the performance of the cooling system in a second floor office at the front of the building. This office is at the end of the ductwork run from the 25-ton rooftop cooling unit. Investigate if there is a VAV box for this room in an adjacent ceiling space. If so, the box should be repaired to respond to the room thermostat. If not, a new box or control damper should be installed in the ductwork supplying this room such that the box or damper will respond to the room thermostat.
- Replace heating terminal units - such as baseboard radiators and cabinet unit heaters. This equipment is in fair condition, but age and wear have reduced the heat transfer capacity. This equipment should be replaced with more modern equipment suited for the intended use. These changes cannot be justified based on energy savings alone. However, replacement is recommended to improve the overall efficiency of the heating system. This is a replacement in kind recommendation which offers negligible energy savings.
- Replace hot water heating pumps - the pump bodies are beyond their expected lives and are therefore likely to have wear that could lead to maintenance issues. SWA recommends that the pumps are replaced as part of a capital improvements project.
- There is one (1) elevator located in the building. The elevator was originally manufactured and installed in 1975. Although there would be some efficiency to be gained by replacing the elevator equipment, the infrequent use of the elevator would yield insignificant energy savings. In addition, considering its date of manufacture, further study for compliance with current codes should be further studied. Therefore, SWA recommends that this equipment be considered for replacement as part of a capital improvement project.
- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives.
- Replace single pane windows - SWA evaluated, as part of a capital improvement plan, replacing 67 single-pane windows with newer models with thermal breaks, dual glazing and a low-e rating. These windows appear to be original to the building. In context of other energy measures proposed in this report and in an effort to maximize the cost-benefit factor for improvements, SWA recommends that these windows be replaced with the next major capital improvement/renovation project. Windows considered for replacement should have the following outline specifications besides conforming to local code and regulations. The clear, low-e, argon filled dual glazing should be 2 independent panes. Air infiltration shall not exceed 0.10 cfm/sf of unit. The conductive thermal transmittance (U-Value) shall not be

more than 0.51 Btu/hr sq ft °F. Selected windows need to comply with local historical architectural requirements and match the existing windows in style and character.

Category II Recommendations: Operations and Maintenance

- Water levels in the expansion tank and the integrity of the tank bladder should be checked to confirm proper operation.
- Tighten belts on all RTU and exhaust fans – tightening belts on belt-driven exhaust fans can maximize overall efficiency of the equipment.
- Change filters on RTUs quarterly to ensure efficient operation of the fans and cooling sections and ensure adequate air delivery to the space.
- Use ENERGY STAR® labeled appliances - such as ENERGY STAR® refrigerators that should replace older energy inefficient equipment.
- 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.
- Preventative exterior wall maintenance - SWA recommends as part of the maintenance program to install proper flashing, correct masonry efflorescence and seal wall cracks and penetrations wherever necessary in order to keep insulation dry and effective. SWA recommends having any deteriorated or missing stone and masonry cavities appropriately filled or re-pointed with mortar or caulk to minimize and prevent water and moisture infiltration into the envelope assemblies.
- Chimney flashing should be evaluated and fixed or replaced. Once the source for the water damage on the right side façade has been determined and eliminated all affected wall and ceiling elements need to be restored or replaced if necessary.
- Add metal type flashing to recently installed rubber membrane lip at the eve transition from synthetic slate roof finish. The current detail allows water and debris to collect in a membrane pocket which potentially could lead to premature membrane failure and water damage.
- Refinish or replace deteriorated exterior woodwork, moldings and trim to minimize and prevent water and moisture infiltration into wall or roof assemblies.
- Maintain downspouts - Repair / install missing downspouts as needed to prevent water / moisture infiltration and insulation damage.
- Use smart power electric strips - in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time.

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

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Table 1 - Highly Recommended 0-5 Year Payback ECMs
3	15 New CFL fixtures to be installed with incentives
4	1 New LED exit sign fixtures to be installed with incentives
1	Install 1 Drinks vending machine miser and 1 snacks vending miser
5	40 New occupancy sensors to be installed with incentives
6	15 New motion sensors to be installed with incentives
7	Replace (2) 3 Hp hot water circulator pump motors with Premium Efficiency
2	205 New T8 fixtures to be installed with incentives
Table 2 - Recommended 5-10 Year Payback ECMs	
8.1	Replace boiler with modulating high efficiency oil-fired boiler
Table 3 - Recommended Over 10 Year Payback and End of Life Cycle ECMs	
8.2	Replace oil-fired boiler with (2) condensing gas-fired boilers

ECM#1: *Install Drinks and Snack Vending Misers*

Description:

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

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

Installation cost:

Estimated installed cost: \$458 (including \$200 in labor costs)

Source of cost estimate: www.usatech.com and established costs

Economics (without incentives):

ECM #	ECM description	source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime energy cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
1	Install 1 Drinks vending machine miser and 1 snacks vending miser	www.usatech.com and established costs	458	none at this time	458	2,643	0.8	0	1	0	444	12	5,328	1.0	1,063	89	97	3,962	3,621

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

Rebates/financial incentives:

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

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation

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

ECM#2, 3, 4, 5, & 6: Building Lighting Upgrades

Description:

On the days of the site visit, SWA completed a lighting inventory of the Municipal building (see Appendix A). The existing lighting consists of mostly T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacement with more efficient high performance T8 fluorescent fixtures with electronic ballasts. SWA recommends replacing the few incandescent bulbs found in the building with compact fluorescent bulbs. SWA also recommends the installation of occupancy sensors and motion sensors in order to reduce operating hours of fixtures and kWh. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Township of Mount Holly may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor, to obtain savings.

Estimated installed cost: \$42,683

Source of cost estimate: *RS Means; Published and established costs, NJ Clean Energy Program*

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
2	205 New T8 fixtures to be installed with incentives	RS Means, lit search	29,811	6,150	23,661	23,467	4.9	0	7.1	930	4,896	15	73,446	4.8	210	14	19	33,956	32,150
3	15 New CFL fixtures to be installed with incentives	RS Means, lit search	622	none at this time	622	3,285	0.7	0	1.0	979	1,534	5	7,669	0.4	1133	226	246	6,363	4,500
4	1 New LED exit sign fixtures to be installed with incentives	RS Means, lit search	151	20	131	302	0.1	0	0.1	89	140	15	2,106	0.9	1513	100	108	1,521	414
5	40 New occupancy sensors to be installed with incentives	RS Means, lit search	8,800	800	8,000	13,131	2.7	0	3.9	0	2,219	15	33,288	3.6	316	100	27	18,113	17,990
6	15 New motion sensors to be installed with incentives	RS Means, lit search	3,300	300	3,000	4,737	1.0	0	1.4	0	800	15	12,007	3.7	300	20	26	6,419	6,489
	TOTALS		42,683	7,270	35,413	44,922	9.4	0	13.5	1,998	9,590	-	128,516	3.7	-	-	-	66,372	61,544

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 4 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

*NJ Clean Energy - Wall Mounted occupancy and motion sensors (\$20 per control)
Maximum incentive amount is \$1,100.*

*NJ Clean Energy - T8 lamps with electronic ballast in existing facilities (\$10-30 per fixture, depending on quantity and lamps)
Maximum incentive amount is \$6,150.*

*NJ Clean Energy – LED exit signs (\$20 per fixture)
Maximum incentive amount is \$20.*

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#7: Install Premium Efficiency Motors on Heating Hot Water Circulators

Description:

The boiler room houses two (2) floor-mounted circulator pumps as part of the hot water heating system to serve the hot water coils and other hot water terminal units listed in this report. The pumps are in relatively good condition. These pumps are in fair to good condition. Each pump is rated at 3 Hp. Each set operates in a lead-lag fashion. All pump motors are standard efficiency. The Mount Holly Municipal Building will realize energy savings by utilizing premium efficiency motors for the pumps.

Installation cost:

Estimated installed cost: \$714

Source of cost estimate: Similar projects 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
7	Replace (2) 3 Hp hot water circulator pump motors with Premium Efficiency	similar projects, DOE International Motor Master selection & savings analysis	714	108	606	890	0.2	0	0.3	0	150	20	3,008	4.0	396	20	25	1,632	1,219

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 one of each set of heating water pumps operates for the heating season. According to weather bin data for Maguire AFB, Trenton, NJ, each set of pumps considered should operate for approximately 4,000 hours per year.

Rebates/financial incentives:

*NJ Clean Energy – Premium three-phase motors (\$45-\$700 per motor)
Maximum incentive amount is \$108.*

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#8.1 (Option 1): *Replace Boiler with Two (2) New High Efficiency Oil-Fired Boilers*

Description:

The current hot water boiler is 34 years old and is in poor condition. Also, the unit is relatively inefficient as compared to more modern equipment. SWA recommends providing two (2) packaged cast iron sectional boilers with modulating burners in the boiler room (similar to Weil-McLain Model WGO), sized in accordance with the building heating load. This will provide energy savings by providing a thermal efficiency of approximately 85% versus the estimated 65-70% of the currently operating boiler. These boilers would incorporate a two-pass flue gas design, would be CSD-1 code-compliant with low water cutoff and manual high level aquastat.

Installation cost:

Estimated installed cost: \$22,000
 Source of cost estimate: Similar projects

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
8.1	Replace boiler with modulating high efficiency oil-fired boiler	Similar Projects	22,000	0	22,000	0	0.0	960	11.8	0	2,044	25	51,096	10.8	132	5	8	13,590	21,489

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. SWA used fuel oil bills to determine annual usage and costs. The efficiency of the existing boiler is in the range of 65-70%, and a new high efficiency oil water heater similar to the one mentioned above would operate with an efficiency of approximately 85%.

Rebates/financial incentives:

*NJ Clean Energy does not offer rebates for oil-fired heating
 Maximum incentive amount is \$0.*

Options for funding ECM:

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

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

ECM#8.2 (Option 2): Replace Boiler with Natural Gas-Fired Condensing Boiler

Description:

The current hot water boiler is 34 year old and is in poor condition. Also, the unit is relatively inefficient and has a larger carbon footprint as compared to modern natural gas-fired condensing boilers and should be replaced to achieve energy savings. The existing boiler room contains a natural gas service that serves the domestic water heater. An upgrade to condensing boilers of minimum 85% combustion efficiency cannot be justified by energy savings alone. However, replacement is strongly recommended along with upgrades to other portions of the heating system.

The new high efficiency condensing boilers should have a guaranteed minimum thermal efficiency of 85% at the worst case boiler operating conditions, such as mid-fire or high-fire conditions with a return water temperature in the range of 140-160 degrees Fahrenheit, and efficiencies of up to 95% achievable with lower return water temperatures. The boiler should be Low NOx certified with a 5:1 turndown burner, PVC direct venting and direct exhaust, hydronic safety controls and interface systems. The boiler shall have compact design for easy retrofit installation, with sectional aluminum block, ASME relief valve, stainless steel burner as a minimum. The air blower should be variable speed combustion with easily removable access panels. Model shall be similar to Weil-McLain Ultra Series 3, 230 MBH, (2) boilers total.

Installation cost:

Estimated installed cost: \$38,000

Source of cost estimate: Manufacturer's data and similar projects

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
8.2a	Replace oil-fired boiler with (2) condensing gas-fired boilers	Similar Projects	38,000	920	37,080	-3,960	0.0	4,077	15.0	0	942	25	200,267	39.4	440	18	-3	-20,675	44,928
8.2b	Incremental Cost to Replace oil-fired boiler with (2) condensing gas-fired boilers	Similar Projects	4,000	920	3,080	-4,200	0.0	4,077	12.9	0	473	25	199,253	6.5	6369	255	15	5,159	42,120
8.2	Cost to Replace oil-fired boiler with (2) condensing gas-fired boilers	Similar Projects	42,000	1,840	40,160	-8,160	0.0	8,154	27.9	0	1,415	25	399,520	28.4	895	36	-1	-15,516	87,048

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

Rebates/financial incentives:

*NJ Clean Energy – Gas-fired boilers <300 MBH (\$2.00 per MBH but not less than \$300 per unit)
Maximum incentive amount is \$310.*

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.nicleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings>

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There are not currently any existing renewable energy systems.

5.2. Wind

Description:

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

5.3. Solar Photovoltaic

A solar PV system is not recommended for this building due to the historic nature of the roof and due to lack of substantial flat roof for panel installation.

5.4. Solar Thermal Collectors

Description:

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

5.5. Combined Heat and Power

Description:

CHP is not applicable for this building because of insufficient thermal baseload.

5.6. Geothermal

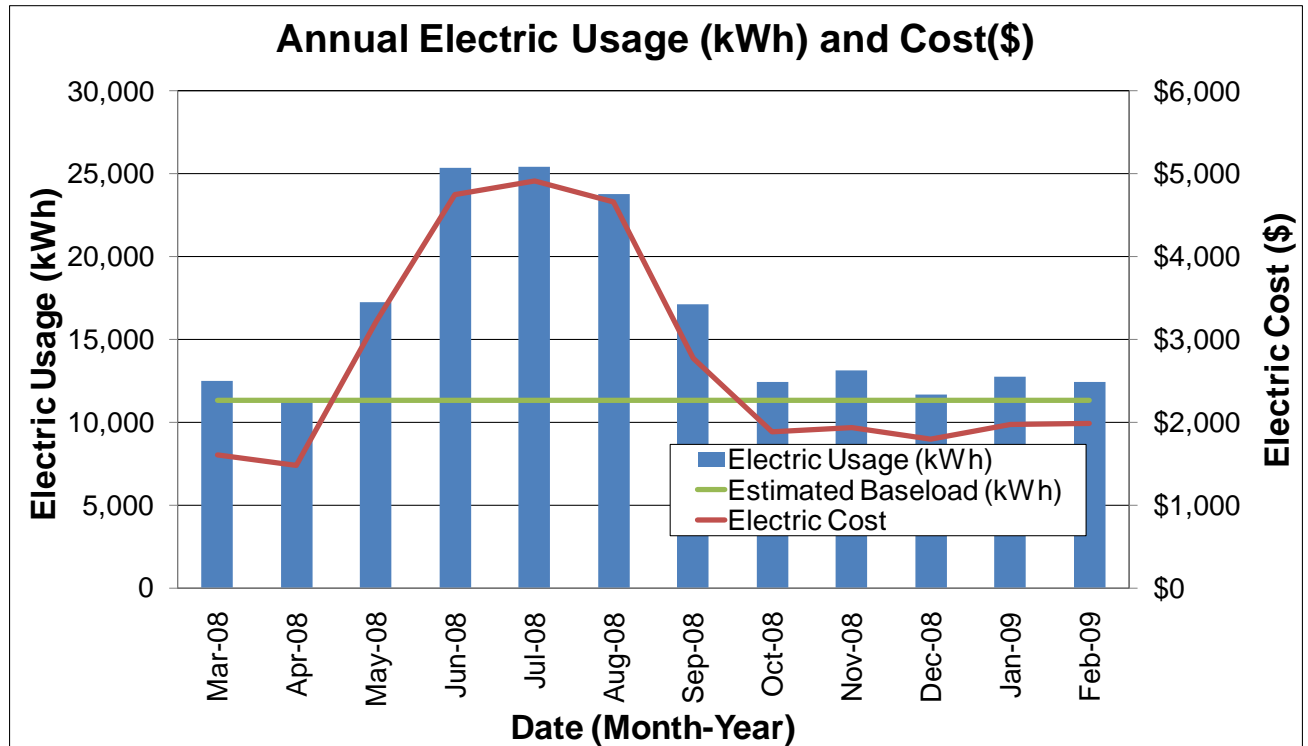
Description:

Geothermal was not considered for this building since the existing RTUs have a significant number of remaining years of operating life and the usage may be significantly reduced depending on the design.

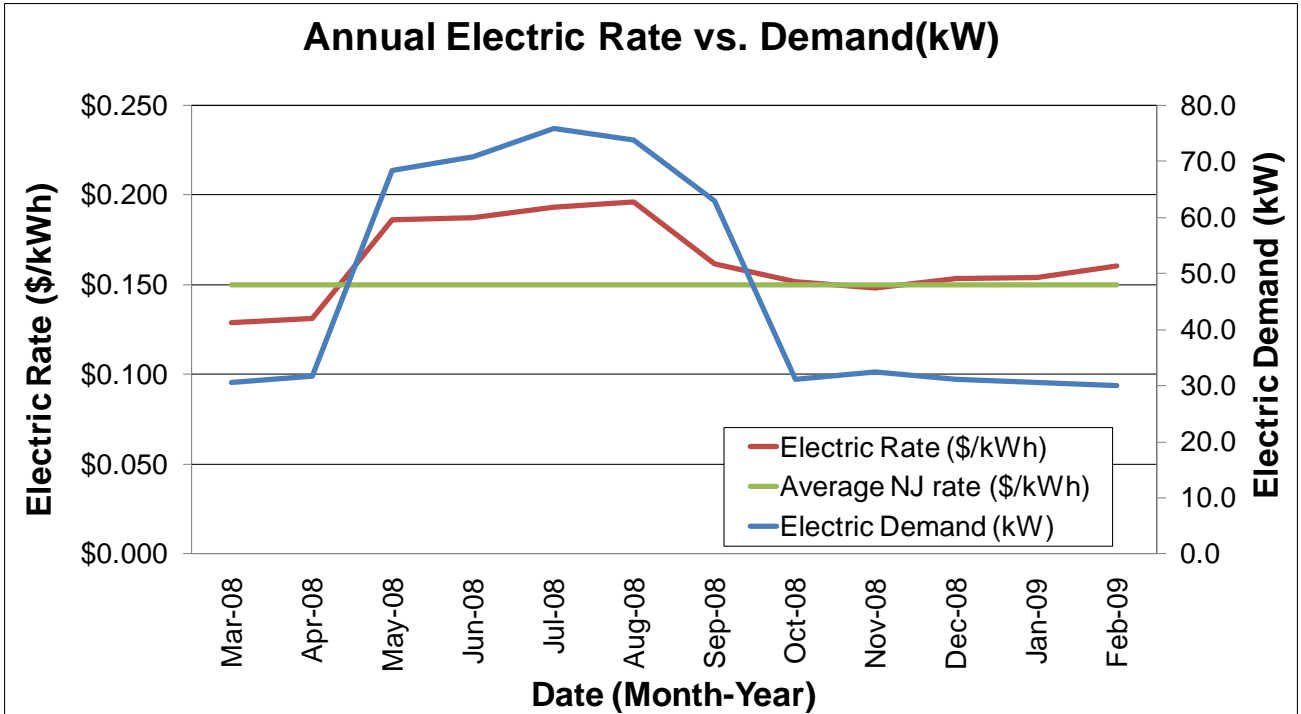
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load profiles

The following charts show annual electric and natural gas load profiles for the Municipal Building:



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 peaks.



The following chart shows the estimated use of natural gas annual load for the building, peaking in the coldest months of the year and another chart showing heating oil fuel consumption following the “heating degree days” curve; the annual fuel oil use has been tailored to follow the HDD curve for an estimated 3,588 therms of annual use for the Municipal building.

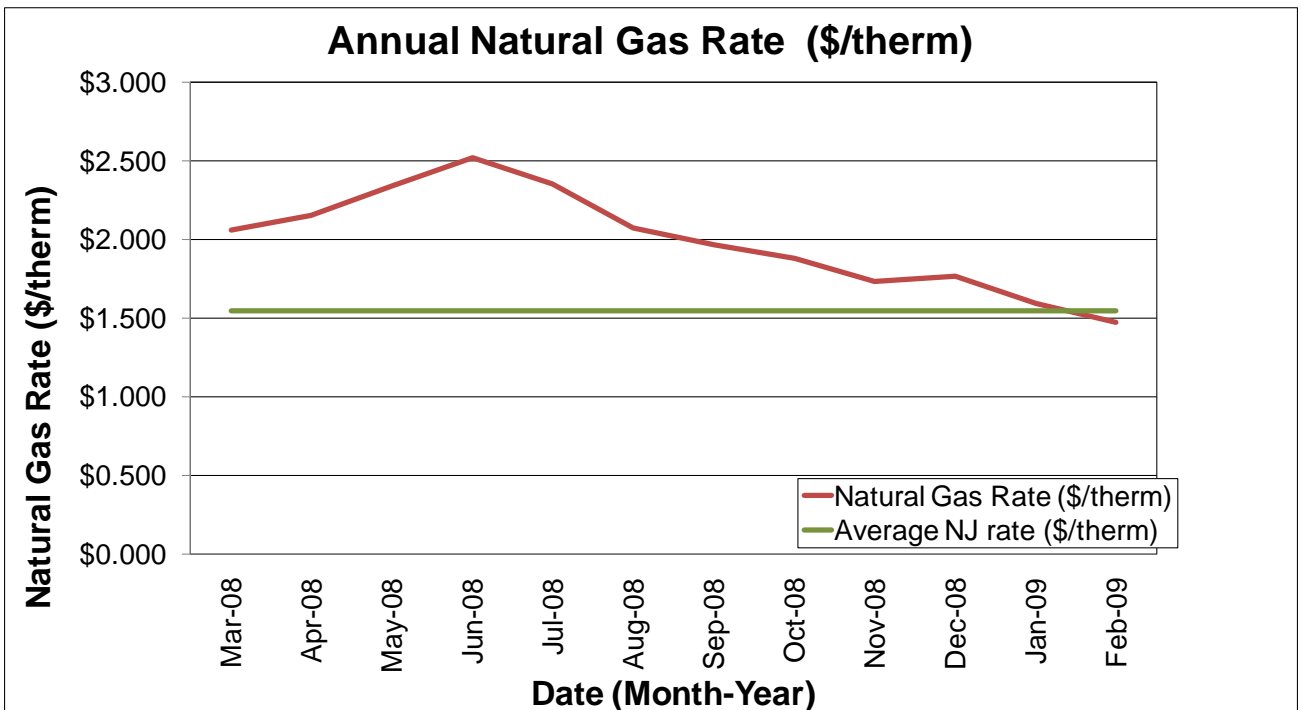
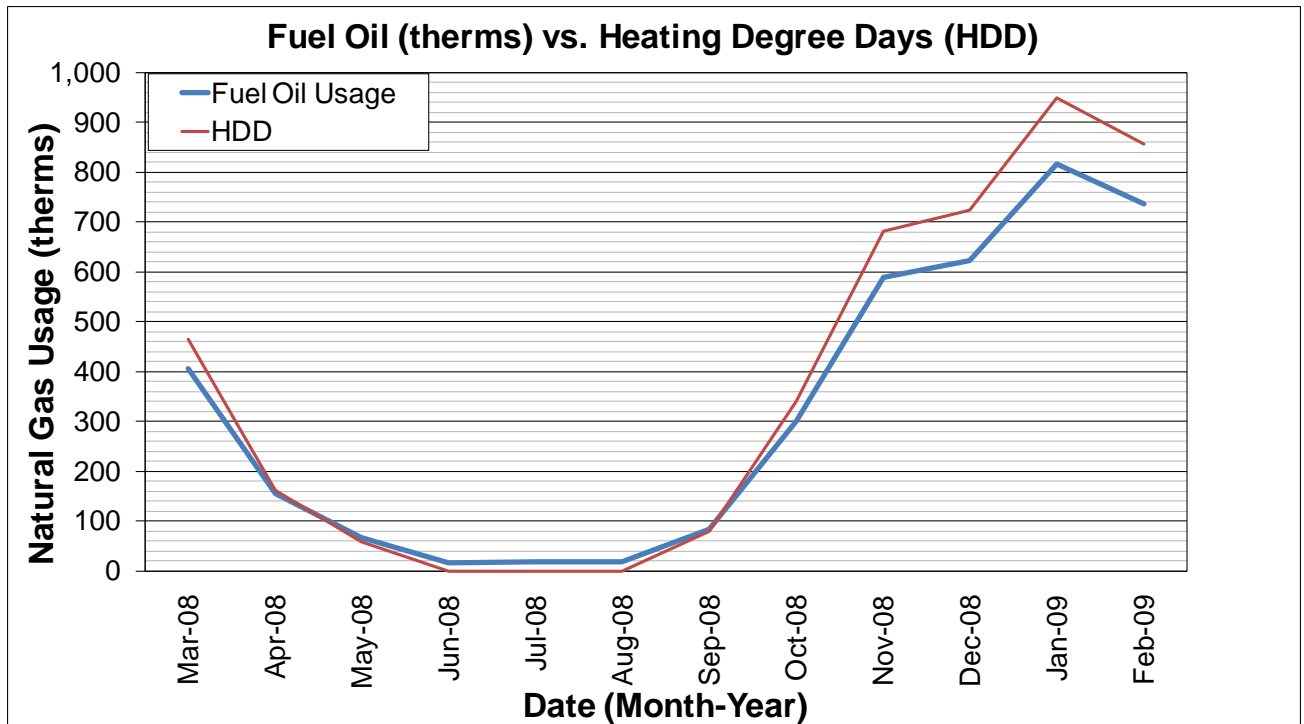


Chart reads Natural Gas and should read oil!



6.2. Tariff analysis

Currently, natural gas and fuel oil are supplied to the Municipal building by PSE&G and Majestic Oil Co, Inc., respectively, and sold to the Township at the prevailing market rate. Typically, the fuel oil prices increase during the heating months when fuel oil is used by the hot water boiler units.

The Municipal Building is direct-metered (via one main meter) 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 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. Typically, the electricity prices increase during the cooling months when electricity is used by air conditioning equipment.

6.3. Energy Procurement strategies

The Municipal building receives natural gas from PSE&G, who supplies the natural gas and transports it. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. Electricity is purchased via one incoming meter directly for the Municipal building without an ESCO. SWA analyzed the utility rate for fuel oil #2, natural gas, and electricity over an extended period. Electric bill analysis shows fluctuations up to 50% over the most recent 12 month period. Some of these fluctuations may have been caused by adjustments between estimated and actual meter readings, others may be due to unusual high and escalating energy costs in 2008. The average estimated NJ commercial utility rates for electric, fuel oil #2, and natural gas are \$0.150/kWh, \$2.19/gallon, and \$1.55/therm respectively. The Municipal Building annual electric cost is \$3,703 higher for electric and \$96 higher for

natural gas when compared to the average estimated NJ commercial rates.

SWA recommends that the Township of Mount Holly further explore opportunities of purchasing electricity from an ESCO in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Municipal building. Appendix B contains a complete list of third party energy suppliers for the Municipal building service area. The Township may want to consider partnering with other municipalities, townships and communities to aggregate a substantial electric and natural gas use for better leveraging in negotiations with their local utility and ESCOs. This sort of activity is happening in many parts of the country and in New Jersey. Also, the Municipal building would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time (without a large capital investment) to shed a minimum of 150 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option.

7. METHOD OF ANALYSIS

7.1. Assumptions and tools

Energy modeling tool: Established / standard industry assumptions, E-Quest
Cost estimates: RS Means 2009 (Facilities Maintenance & Repair Cost Data)
RS Means 2009 (Building Construction Cost Data)
RS Means 2009 (Mechanical Cost Data)
Published 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	Bsmt	Boiler Rm	Recessed Ceiling Mounted	M	4T12	3	2	40	Sw	24	365	12	276	2,418	T8	Recessed Ceiling Mounted	4T8	E	OS	3	2	32	18	365	5	207	1360	604	453	1058
2	Bsmt	Hallway	Recessed Wall Mounted	M	4T12	3	2	40	Sw	16	365	12	276	1,612	T8	Recessed Wall Mounted	4T8	E	MS	3	2	32	12	365	5	207	907	403	302	705
3	Bsmt	Hallway	Recessed Wall Mounted	M	2T12	2	1	20	Sw	16	365	6	52	304	T8	Recessed Wall Mounted	2T8	E	MS	2	1	17	12	365	2	38	166	82	55	137
4	Bsmt	Storage Rm	Recessed Wall Mounted	M	4T12	1	2	40	Sw	2	365	12	92	67	T8	Recessed Wall Mounted	4T8	E	Sw	1	2	32	2	365	5	69	50	17	0	17
5	Bsmt	Interview room	Recessed	S	Inc	4	1	90	Sw	8	365	0	360	1,051	CFL	Recessed	CFL	S	Sw	4	1	30	8	365	0	120	350	701	0	701
6	Bsmt	Office	Recessed Parabolic	M	4T12	8	2	40	Sw	24	365	12	736	6,447	T8	Recessed Parabolic	4T8	E	OS	8	2	32	18	365	5	552	3627	1612	1209	2821
7	Bsmt	Office	Recessed Parabolic	M	4T12	3	1	40	Sw	24	365	12	156	1,367	T8	Recessed Parabolic	4T8	E	OS	3	1	32	18	365	5	111	729	394	243	637
8	Bsmt	Armory	Recessed	S	CFL	1	2	34	Sw	2	365	0	68	50	N/A	Recessed	CFL	S	Sw	1	2	34	2	365	0	68	50	0	0	0
9	Bsmt	Evidence room	Recessed	S	CFL	4	1	15	Sw	2	365	0	60	44	N/A	Recessed	CFL	S	Sw	4	1	15	2	365	0	60	44	0	0	0
10	Bsmt	Jail Cell	Ceiling Mounted	S	CFL	3	1	23	Sw	24	365	0	69	604	N/A	Ceiling Mounted	CFL	S	Sw	3	1	23	24	365	0	69	604	0	0	0
11	Bsmt	Hallway	Wall Mounted	M	4T12	8	2	40	Sw	24	365	12	736	6,447	T8	Wall Mounted	4T8	E	MS	8	2	32	18	365	5	552	3627	1612	1209	2821
12	Bsmt	Processing	Ceiling Mounted	M	4T12	2	2	40	Sw	24	365	12	184	1,612	T8	Ceiling Mounted	4T8	E	MS	2	2	32	18	365	5	138	907	403	302	705
13	Bsmt	Processing 2	Ceiling Mounted	M	4T12	2	2	40	Sw	24	365	12	184	1,612	T8	Ceiling Mounted	4T8	E	MS	2	2	32	18	365	5	138	907	403	302	705
14	Bsmt	Elevator Mech. Rm	Ceiling Mounted	M	Inc	2	1	60	Sw	2	365	0	120	88	CFL	Ceiling Mounted	CFL	M	Sw	2	1	20	2	365	0	40	29	58	0	58
15	Bsmt	Corridor	Ceiling Mounted	M	4T12	1	2	40	Sw	12	365	12	92	403	T8	Ceiling Mounted	4T8	E	MS	1	2	32	9	365	5	69	227	101	76	176
16	Bsmt	Corridor	Ceiling Mounted	M	4T12	1	2	40	Sw	24	365	12	92	806	T8	Ceiling Mounted	4T8	E	MS	1	2	32	18	365	5	69	453	201	151	353
17	Bsmt	Office Area	Ceiling Mounted	M	4T12	6	2	40	Sw	24	365	12	552	4,836	T8	Ceiling Mounted	4T8	E	OS	6	2	32	18	365	5	414	2720	1209	907	2116
18	Bsmt	Storage Rm	Ceiling Mounted	M	Inc	1	1	60	Sw	2	365	0	60	44	CFL	Ceiling Mounted	CFL	M	Sw	1	1	20	2	365	0	20	15	29	0	29
19	Bsmt	Records	Ceiling Mounted	M	4T12	1	2	40	Sw	8	365	12	92	269	T8	Ceiling Mounted	4T8	E	OS	1	2	32	6	365	5	69	151	67	50	118
20	Bsmt	Records	Ceiling Mounted	M	4T12	10	4	40	Sw	8	365	12	1,720	5,022	T8	Ceiling Mounted	4T8	E	OS	10	4	32	6	365	5	1330	2913	1139	971	2110
21	Bsmt	Records hallway	Recessed Parabolic	M	4T12	1	4	40	Sw	8	365	12	172	502	T8	Recessed Parabolic	4T8	E	MS	1	4	32	6	365	5	133	291	114	97	211
22	Bsmt	Victim witness m	Recessed Parabolic	M	4T12	2	2	40	Sw	8	365	12	184	537	T8	Recessed Parabolic	4T8	E	MS	2	2	32	6	365	5	138	302	134	101	235
23	Bsmt	Entrance	Recessed Parabolic	M	4T12	4	1	40	Sw	8	365	12	208	607	T8	Recessed Parabolic	4T8	E	MS	4	1	32	6	365	5	148	324	175	108	283
24	Bsmt	Entrance	Recessed Parabolic	M	4T12	1	4	40	Sw	8	365	12	172	502	T8	Recessed Parabolic	4T8	E	MS	1	4	32	6	365	5	133	291	114	97	211
25	Bsmt	Bathroom Women	Recessed Parabolic	M	4T12	1	1	40	Sw	9	365	12	52	171	T8	Recessed Parabolic	4T8	E	OS	1	1	32	7	365	5	37	91	49	30	80
26	Bsmt	Bathroom Men	Recessed Parabolic	M	4T12	1	1	40	Sw	9	365	12	52	171	T8	Recessed Parabolic	4T8	E	OS	1	1	32	7	365	5	37	91	49	30	80
27	Bsmt	Bathroom Men	Recessed Parabolic	M	4T12	1	1	40	Sw	9	365	12	52	171	T8	Recessed Parabolic	4T8	E	OS	1	1	32	7	365	5	37	91	49	30	80
28	Bsmt	Locker Room Men	Recessed Parabolic	M	4T12	5	2	40	Sw	9	365	12	460	1,511	T8	Recessed Parabolic	4T8	E	OS	5	2	32	7	365	5	345	850	378	283	661
29	Bsmt	Locker Room Women	Recessed Parabolic	M	4T12	3	2	40	Sw	9	365	12	276	907	T8	Recessed Parabolic	4T8	E	OS	3	2	32	7	365	5	207	510	227	170	397
30	2	Hallway	Recessed Parabolic	M	4T12	8	2	40	Sw	16	365	12	736	4,298	T8	Recessed Parabolic	4T8	E	MS	8	2	32	12	365	5	552	2418	1075	806	1880
31	2	Attic	Ceiling Mounted	S	Inc	2	1	60	Sw	16	365	0	120	701	CFL	Ceiling Mounted	CFL	S	OS	2	1	20	12	365	0	40	175	467	58	526
32	2	Office	Recessed Parabolic	M	4T12	2	2	40	Sw	9	365	12	184	604	T8	Recessed Parabolic	4T8	E	OS	2	2	32	7	365	5	138	340	151	113	264
33	2	Hallway	Recessed Parabolic	M	4T12	3	2	40	Sw	16	365	12	276	1,612	T8	Recessed Parabolic	4T8	E	MS	3	2	32	12	365	5	207	907	403	302	705
34	2	Conference rm	Recessed Parabolic	M	4T12	2	2	40	Sw	16	365	12	184	1,075	T8	Recessed Parabolic	4T8	E	OS	2	2	32	12	365	5	138	604	269	201	470
35	2	Office	Recessed Parabolic	M	4T12	2	2	40	Sw	9	365	12	184	604	T8	Recessed Parabolic	4T8	E	OS	2	2	32	7	365	5	138	340	151	113	264
36	2	File rm	Recessed Parabolic	E	3 U-Sha	1	2	32	Sw	9	365	5	69	227	C	Recessed Parabolic	U-Sha	E	OS	1	2	32	7	365	5	69	170	0	57	57
37	2	File rm	Ceiling Mounted	S	Inc	2	1	60	Sw	2	365	0	120	88	CFL	Ceiling Mounted	CFL	S	Sw	2	1	20	2	365	0	40	29	58	0	58
38	2	Kitchen	Ceiling Mounted	S	Inc	1	1	60	Sw	9	365	0	60	197	CFL	Ceiling Mounted	CFL	S	Sw	1	1	20	9	365	0	20	66	131	0	131
39	2	Bathroom Men	Ceiling Mounted	M	4T12	1	1	40	Sw	9	365	12	52	171	T8	Ceiling Mounted	4T8	E	OS	1	1	32	7	365	5	37	91	49	30	80
40	2	Bathroom Women	Ceiling Mounted	M	4T12	1	1	40	Sw	9	365	12	52	171	T8	Ceiling Mounted	4T8	E	OS	1	1	32	7	365	5	37	91	49	30	80
41	2	Tax Collector	Ceiling Mounted	M	4T12	9	2	40	Sw	9	365	12	828	2,720	T8	Ceiling Mounted	4T8	E	OS	9	2	32	7	365	5	621	1530	680	510	1190
42	2	Finance	Ceiling Mounted	M	4T12	2	2	40	Sw	9	365	12	184	604	T8	Ceiling Mounted	4T8	E	OS	2	2	32	7	365	5	138	340	151	113	264
43	2	Finance office	Ceiling Mounted	M	4T12	2	2	40	Sw	9	365	12	184	604	T8	Ceiling Mounted	4T8	E	OS	2	2	32	7	365	5	138	340	151	113	264
44	2	Finance office	Ceiling Mounted	M	4T12	2	2	40	Sw	9	365	12	184	604	T8	Ceiling Mounted	4T8	E	OS	2	2	32	7	365	5	138	340	151	113	264
45	2	Administration	Ceiling Mounted	M	4T12	11	2	40	Sw	9	365	12	1,012	3,324	T8	Ceiling Mounted	4T8	E	OS	11	2	32	7	365	5	759	1870	831	623	1454
46	2	Administration office	Ceiling Mounted	S	Inc	2	1	60	Sw	9	365	0	120	394	CFL	Ceiling Mounted	CFL	S	OS	2	1	20	7	365	0	40	99	263	33	296
47	2	Administration office	Recessed	E	4T8	1	1	32	Sw	9	365	5	37	122	N/A	Recessed	4T8	E	Sw	1	1	32	9	365	5	37	122	0	0	0
48	2	stairwell	Wall Mounted	M	4T12	5	1	40	Sw	9	365	12	260	854	T8	Wall Mounted	4T8	E	OS	5	1	32	7	365	5	185	456	246	152	398
49	2	stairwell	Wall Mounted	M	2T12	1	1	20	Sw	9	365	6	26	85	T8	Wall Mounted	2T8	E	Sw	1	1	17	9	365	2	19	62	23	0	23
50	2	entry	Ceiling Suspended	S	Inc	1	12	60	Sw	9	365	0	720	2,365	CFL	Ceiling Suspended	CFL	S	OS	1	12	20	7	365	0	240	591	177	197	1774
51	1	Courthouse	Recessed Parabolic	M	4T12	24	3	40	Sw	9	365	12	3,168	10,407	T8	Recessed Parabolic	4T8	E	OS	24	3	32	7	365	5	2424	5972	2444	1991	4435
52	1	Courthouse meeting rm	Recessed Parabolic	M	4T12	3	3	40	Sw	9	365	12	396	1,301	T8	Recessed Parabolic	4T8	E	OS	3	3	32	7	365	5	303	747	306	249	554
53	1	Courthouse meeting rm 2	Recessed Parabolic	M	4T12	4	2	40	Sw	9	365	12	368	1,209	T8	Recessed Parabolic	4T8	E	OS	4	2	32	7	365	5	276	680	302	227	529
54	1	Court Room	Exit Sign	S	Inc	1	1	40	N	24	365	0	40	350	LEDex	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	302	0	302
5																														

Proposed Lighting Summary Table			
Total Surface Area (SF)	11,351		
Average Power Cost (\$/kWh)	0.1690		
Exterior Lighting	Existing	Proposed	Savings
Exterior Annual Consumption (kWh)	705	705	0
Exterior Power (watts)	161	161	0
Total Interior Lighting	Existing	Proposed	Savings
Annual Consumption (kWh)	100,482	55,559	44,922
Lighting Power (watts)	21,806	15,793	6,014
Lighting Power Density (watts/SF)	1.92	1.39	0.53
Estimated Cost of Fixture Replacement (\$)	24,413		
Estimated Cost of Controls Improvements (\$)	11,000		
Total Consumption Cost Savings (\$)	9,590		

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

Appendix B: Third Party Energy Suppliers (ESCOs)

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

Third Party Electric Suppliers for PSEG Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(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
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
IntegrYS Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 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 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.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 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Dominion Retail, Inc. 395 Highway 170, Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Hudson Energy Services, LLC 545 Route 17 South Ridgewood, NJ 07450	(877) 483-7669 www.hudsonenergyservices.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002	(877) 797-8786 www.systrumenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	(800) 646-6457 www.stuyfuel.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

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 expressed as the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

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

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

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

Calculation References

Term	Definition
ECM	Energy Conservation Measure
AOCS	Annual Operating Cost Savings
AECS	Annual Energy Cost Savings
LOCS*	Lifetime Operating Cost Savings

LECS	Lifetime Energy Cost Savings
LCS	Lifetime Cost Savings
NPV	Net Present Value
IRR	Internal Rate of Return
DR	Discount Rate
Net ECM Cost	Total ECM Cost – Incentive
LECS	AECS X ECM Lifetime
AOCS	LOCS / ECM Lifetime
LCS	LOCS+LECS
Simple Payback	Net ECM Cost / (AECS + AOCS)
Lifetime ROI	(LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI	(Lifetime ROI / Lifetime) = [(AECS + OCS) / Net ECM Cost – (1 / Lifetime)]

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

Excel NPV and IRR Calculation

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

	A	B	C	D	E	F	G	H	I
1									
2									
3									
4					Year	Cash Flow			
5					0	\$ (5,000.00)		Investment Cost	
6					1	\$ 850.00		Cash Flow: Annual Energy Cost Savings + Annual Maintenance Savings	
7					2	\$ 850.00			
8					3	\$ 850.00			
9					4	\$ 850.00			
10					5	\$ 850.00			
11					6	\$ 850.00			
12					7	\$ 850.00			
13					8	\$ 850.00			
14					9	\$ 850.00			
15					10	\$ 850.00			
16					IRR	11.03%		Formula: =IRR(F4:F14) =NPV(0.03,F5:F14)+F4	
17					NPV	\$2,250.67			

Solar PV ECM Calculation

There are several components to the calculation:

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

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

ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.

Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

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

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

New Jersey Clean Energy Program Commercial & Industrial Lifetimes

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