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January 28th, 2009

Local Government Energy Program
Energy Audit Report

For

Township of Vernon

Municipal Building
21 Church Street
Vernon, NJ 07462

Project Number: LGEA28

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INTRODUCTION

As an approved energy consulting firm under the Local Government Energy Audit Program (LGEA), Steven Winter Associates, Inc. (SWA) was selected to perform an energy audit and assessment for the Township of Vernon.

This report addresses the Municipal building located at 21 Church Street, Vernon, NJ. The current conditions and energy-related information were collected in order to analyze and suggest the implementation of building improvements and energy conservation measures.

The Vernon Municipal building was built in 1975 with an addition in 1992. The building is two stories with a total floor area of 30,000 square feet. The building houses 14 township offices on the second floor as well as a police department and senior center on the first floor. Vernon Township has decided to go with a four day work week, partly for energy savings. Township office areas as well as the Senior Center are operated 4 days per week from 8:30am to 5:15pm. The Police Department is operated 24 hours per day, 7 days per week. During the day, the building contains up to 125 persons at one time.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to Vernon Township to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the 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, 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 (BPU's) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

- Section 1 and section 2 of the report cover a description and analysis of the building existing conditions.
- Section 3 provides a detail inventory of major electrical and mechanical systems in the building.
- Sections 4 through 7 provide a description of our recommendations.
- Appendices include further details and information supporting our recommendations.

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Vernon Township Municipal building located at 21 Church Street, Vernon, NJ. The building is a 2-story building with a total floor area of 30,000 square feet. The original structure was built in 1975 and has undergone one addition in 1992.

Based on the field visits performed by the SWA staff on October 7th, 2009 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.

Existing conditions

From October 2008 through October 2009, the period of analysis for this audit, the building consumed 458,064 kWh or $76,585 worth of electricity at an approximate rate of $0.167/kWh and 17,214 therms or $20,743 worth of natural gas at an approximate rate of $1.21 per therm. The joint energy consumption for the building, including both electricity and fossil fuel, was 3,284 MMBtus of energy that cost a total of $97,328.

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 was ineligible to receive an Energy Star performance rating since the building is a multi-use building. SWA encourages Vernon Township 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 112.1 kBtu/ft^{2}yr compared to the national average of an office building consuming 75 kBtu/ft^{2}yr.

Recommendations

Implementing this report's recommendations will reduce use by approximately 31.8 kBtu/ft^{2}yr, which would decrease the building's energy use intensity to 80.3 kBtu/ft^{2}yr.

Currently, the Municipal building is approximately 34 years old and much of the HVAC equipment is near or past the end of its useful lifetime. As buildings age, maintenance becomes more important. Much of the equipment has failed already such as the chiller or shows signs of major deficiencies such as the heating boilers. SWA recommends that Vernon Township take immediate action to replace the existing heating plant as well as cooling plant. These pieces of equipment are beyond their useful lifetime and do not operate correctly. Properly functioning HVAC equipment is essential to reduced operating costs as well as tenant comfort. The boilers located in the basement are atmospheric gas boilers that use the combustion process to heat the building. One of these boilers was observed to have a excess piece of equipment left on one of the burners which can disrupt the combustion process and cause health and safety issues. In addition to heating equipment, cooling equipment is also an essential portion of building operations. As part of the air-conditioning process, cooling equipment also controls the amount of moisture in the air, not just the temperature of distributed air. Some areas such as the Police Dispatch room and the Senior Center contain cooling equipment that has caused water damage and mold has started to develop. SWA recommends that the cooling equipment is first replaced as recommended to ensure that energy consumption reduced, occupant comfort is increased and air quality is improved. After HVAC equipment is replaced, SWA recommends that Vernon Township implement a preventative maintenance to ensure that all building equipment is maintained properly. The Municipal building currently does not have building staff that are dedicated to maintaining the

HVAC systems within the building. SWA recommends that an outside contractor is hired, preferably one that will perform the recommended retro-commissioning, as part of a preventative maintenance plan. The outside contractor should schedule periodic visits to the building to perform routine maintenance tasks such as change air filters, adjust temperature set points and other regular maintenance items. This hired contractor should become familiar with the building and also have the ability to be responsive if there are any immediate problems. A preventative maintenance plan would have to be negotiated with the contractor directly through Vernon Township. Preventative maintenance will help keep the new equipment in good working order, allowing the building to function efficiently as well as extending the lifetime of each piece of system equipment.

Based on the assessment of the 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

- Remove window AC units/Repair windows
- Replace roof
- Replace skylights

Category II Recommendations: Operations and Maintenance

- Initiate maintenance/service contract
- Re-insulate Domestic Hot Water piping
- Maintain roofs
- Maintain gutters and downspouts
- Provide weather stripping / air sealing
- Repair / seal wall cracks and penetrations
- Provide water efficient fixtures and controls and piping insulation
- Use Energy Star labeled appliances

Category III Recommendations: Energy Conservation Measures

At this time, SWA highly recommends a total of **5** Energy Conservation Measures (ECMs) for the Vernon Municipal building that is summarized in the following Table 1. The total investment cost for this ECM with incentives is **$18,033**. SWA estimates a first year savings of **$7,811** with a simple payback of **2.1 years**. SWA also recommends **4** ECMs with a 5-10 year payback that are summarized in Table 2 and another **7** End of Life Cycle ECMs that are summarized in Table 3.

The implementation of all the recommended ECMs would reduce the building electric usage by 142,407 kWh annually, or 31% of the building's current electric consumption. Natural gas usage would be reduced by 4,659 therms or 27% of the building's current natural gas consumption. SWA estimates that implementing these ECMs will reduce the combined energy usage of the building by 29% and the carbon footprint of the Municipal building by **306,335 lbs of CO_2** annually, which is equivalent to removing approximately 218 cars from the roads each year or avoiding the need of 6,940 trees to absorb the annual CO_2 produced. SWA also recommends that Vernon Township contacts third party energy suppliers in order to negotiate a lower electricity rate. Comparing the current electric rate to average utility rates of similar type buildings in New Jersey, it may be possible to save up to $0.017/kWh, which would have equated to $7,787 for the past 12 months.

There are various incentives that Vernon Township could apply for that could also help lower the cost of installing the ECMs. SWA recommends that Vernon Township 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. A new NJ Clean Power program, Direct Install, to be rolled out soon, could also assist to cover 80% of the capital investment.

In addition to the NJ SmartStart and Direct Install programs, SWA also recommends that Vernon Township apply for the Pay-for-Performance (P4P) program through the New Jersey Office of Clean Energy. The P4P program is aimed at buildings that show potential for saving 15% or greater of annual energy consumption. This comprehensive energy efficiency program provides incentives towards whole-building energy improvements, including incentives for an Energy Reduction Plan, installation of energy saving measures and Post-Construction benchmarking. The program was originally intended for buildings with an average annual peak demand of over 200kW, however the program currently allows local government buildings not receiving Energy Efficiency and Conservation Block Grants to participate. The 2009 deadline for local governments to enter to program is 12/31/2009. More P4P program opportunities may be available in 2010, however funding has not yet been approved.

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

The following three tables summarize the proposed Energy Conservation Measures (ECM) and their economic relevance.

Table 1 - Highly Recommended 0-5 Year Payback ECMs

ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	Total Energy Reduction, % MMBTU	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	Upgrade HW Booster Pump Motors to Premium Efficiency	RSMeans, MotorMaster	1,362	0	1,362	14,439	0.3	0	1.6	1.5	0	2,411	20	35,220	0.6	2485.9	124.3	177.0	34,512	25,853
2	Upgrade 30 incandescent lamps to CFLs	RSMeans	1,522	0	1,522	4,556	0.9	0	0.5	0.4	99	860	5	3,915	1.8	157.3	31.5	48.7	2,416	8,158
3	Install 19 occupancy sensors	RSMeans	4,180	380	3,800	10,125	2.1	0	1.2	1.1	0	1,691	15	19,897	2.2	423.6	28.2	44.3	16,386	18,129
4	Upgrade 21 exterior lighting fixtures	RSMeans	5,194	375	4,819	7,328	1.5	0	0.8	0.5	549	1,773	15	20,860	2.7	332.9	22.2	36.4	16,344	13,121
5	Install 21 photocell sensors on exterior lights	RSMeans	5,775	735	5,040	6,443	1.3	0	0.7	0.7	0	1,076	15	12,661	4.7	151.2	10.1	20.0	7,805	11,536
	TOTALS	-	**18,033**	**1,490**	**16,543**	**42,891**	**6.1**	**0**	**4.9**	**4.2**	**648**	**7,811**	-	**92,553**	**2.1**	-	-	-	**77,463**	**76,796**

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

Note: A 0.0 electrical demand reduction / month indicates that it is very low / negligible

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	Total Energy Reduction, % MMBTU	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
6	Upgrade existing exit signs to LED fixtures	RSMeans	3,798	500	3,298	3,250	0.7	0	0.4	0.3	83	626	15	7,363	5.3	123.3	8.2	17.2	4,172	5,819
7	Install 5kW PV system	RSMeans	35,000	5,000	30,000	5,902	5.0	0	0.7	0.6	0	4,538	15	53,399	6.6	78.0	5.2	12.6	24,174	10,568
8	Upgrade 373 T12 fluorescent fixtures	RSMeans	93,246	11,190	82,056	47,110	9.8	0	5.4	4.9	3,868	11,735	15	138,091	7.0	68.3	4.6	11.5	58,040	84,350
9	Retro-commissioning	Similar Projects	37,500	0	37,500	19,080	0.0	1,472	7.1	6.5	0	4,967	10	41,944	7.5	11.9	1.2	5.5	4,874	50,389
	TOTALS	-	**169,544**	**16,690**	**152,854**	**75,342**	**15.5**	**1,472**	**13.5**	**12.3**	**3,951**	**21,867**	-	**240,797**	**7.0**	-	-	-	**91,260**	**151,126**

	Table 3 - Recommended End of Life Cycle 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	Total Energy Reduction, % MMBTU	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
10	Replace two rooftop exhaust fan motors (total)	RSMeans	678	0	678	142	0.0	0	0.0	.01	15	39	20	565	17.5	-16.6	-0.8	-1.9	-102	254
11	Replace existing 150 kVA transformer	RSMeans	24,213	0	24,213	7,396	1.5	0	0.8	0.7	0	1,235	15	14,534	19.6	-40.0	-2.7	-3.2	-9,468	13,243
12	Heating plant replacement, 2100 MBH (total)	RSMeans	47,850	2,100	45,750	0	0.0	2,746	9.2	7.9	0	3,323	15	39,098	13.8	-14.5	-1.0	1.1	-6,084	30,269
13	Re-insulate attic with min. R-19 insulation	RSMeans	13,650	0	13,650	450	0.1	441	1.5	1.3	0	609	15	7,163	22.4	-47.5	-3.2	-4.7	-6,383	5,667
14	Replace existing 75 kVA transformer	RSMeans	22,458	0	22,458	4,006	0.8	0	0.5	0.4	0	669	15	7,872	33.6	-64.9	0.0	-8.7	-14,471	7,173
15	Replace Split AC system (total)	RSMeans	8,688	0	8,688	1,472	0.0	0	0.2	.1	0	246	15	2,893	35.3	-66.7	-4.4	-9.2	-5,753	2,636
16	Cooling Plant Replacement (total)	RSMeans	104,150	5,616	98,534	10,708	2.1	0	1.2	1.0	0	1,788	15	21,042	55.1	-78.6	-5.2	-13.1	-77,186	19,173
	TOTALS	**-**	**221,687**	**7,716**	**213,971**	**24,174**	**4.5**	**3,187**	**13.4**	**11.4**	**15**	**7,908**	**-**	**93,168**	**27.1**	**-**	**-**	**-**	**-119,448**	**78,414**

Note: For more details on End of Life Cycle ECMs and associated incremental cost for high efficiency equipment and performance see Section 4.

1. HISTORIC ENERGY CONSUMPTION

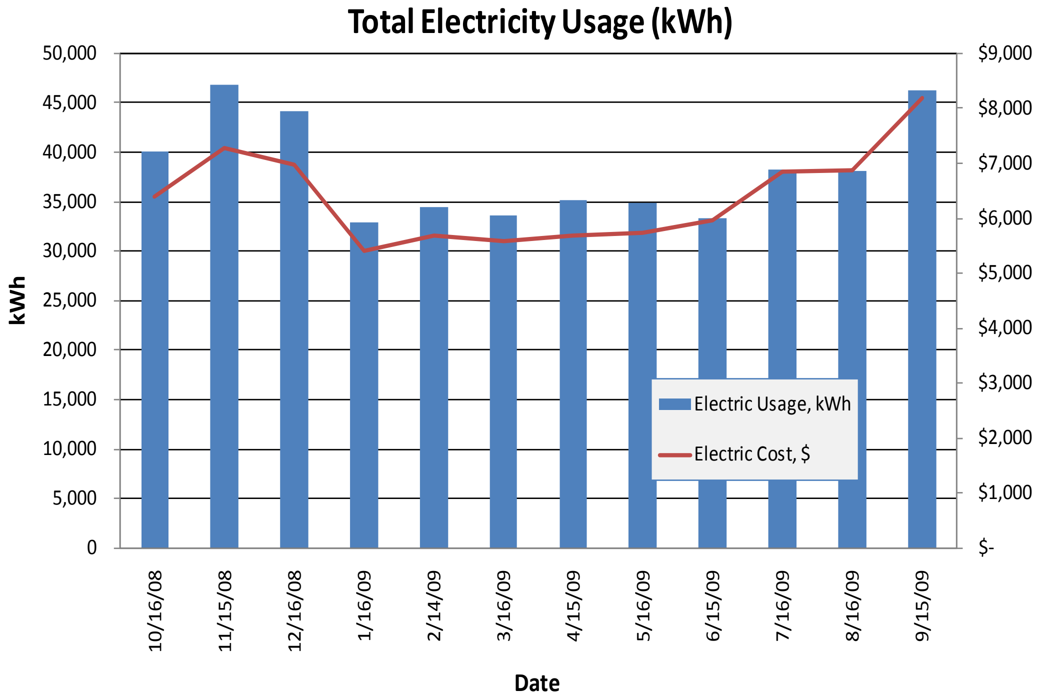
1.1. Energy usage, load profiles and cost analysis

SWA analyzed utility bills from **October 2008 through October 2009** that were received from the utility companies supplying the Municipal building with electric and natural gas.

Electricity - The Municipal building buys electricity from JCP&L at **an average rate of $0.167/kWh** based on 12 months of utility bills from October 2008 to October 2009. There are currently two electric meters for the building; one serving the building and one serving just the exterior lights. The usage and cost from both meters have been combined in order to accurately represent total electric supply and charges. The Municipal building purchased **approximately 458,064 kWh or $76,585 worth of electricity** in the previous year. The Municipal building also saw an average demand of 97.7 kW with a peak demand of 117.0 kW.

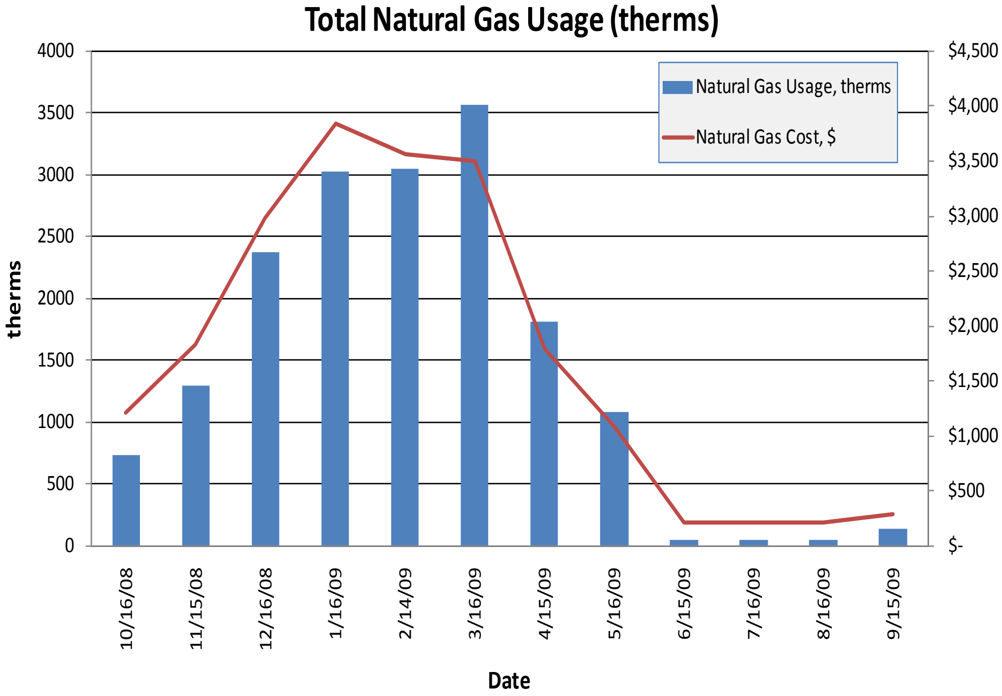
Natural gas - The Municipal building is currently served by one meter for natural gas. The Municipal building currently buys natural gas from Elizabethtown gas at **an average aggregated rate of $1.21/therm** based on 12 months of utility bills for October 2008 to October 2009. The Municipal building purchased **approximately 17,214 therms or $20,743 worth of natural gas** in the previous year.

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



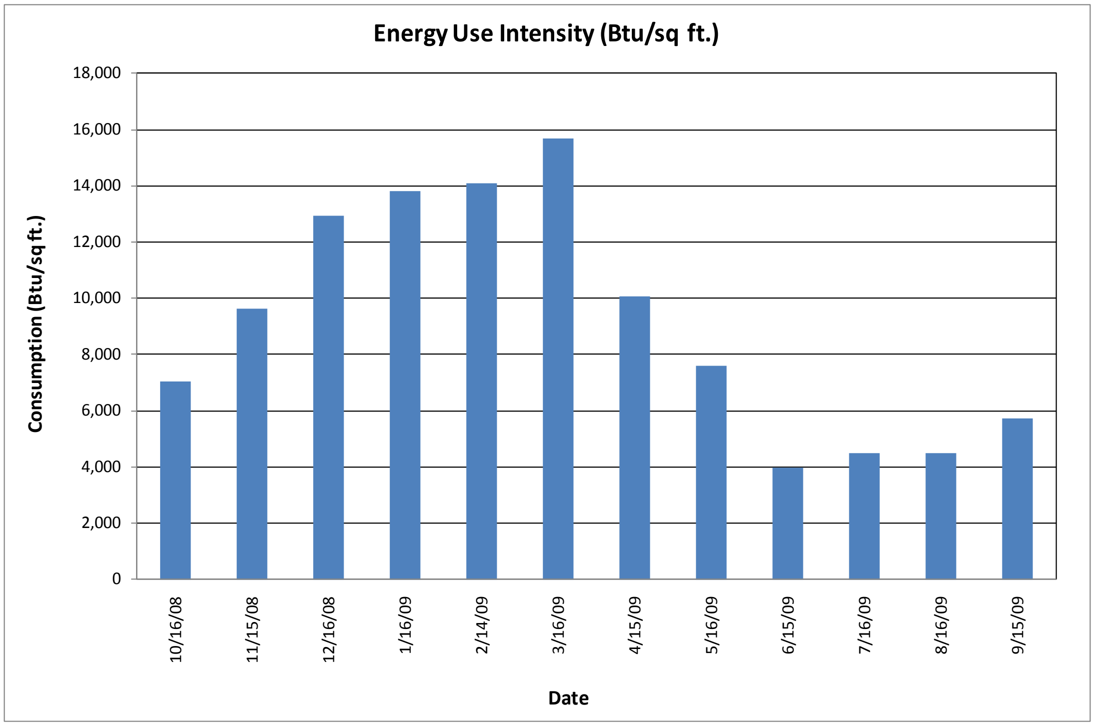
Electricity costs follow a trend as expected, based on the electricity usage. There are no unusually spikes or gaps in electricity data.

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



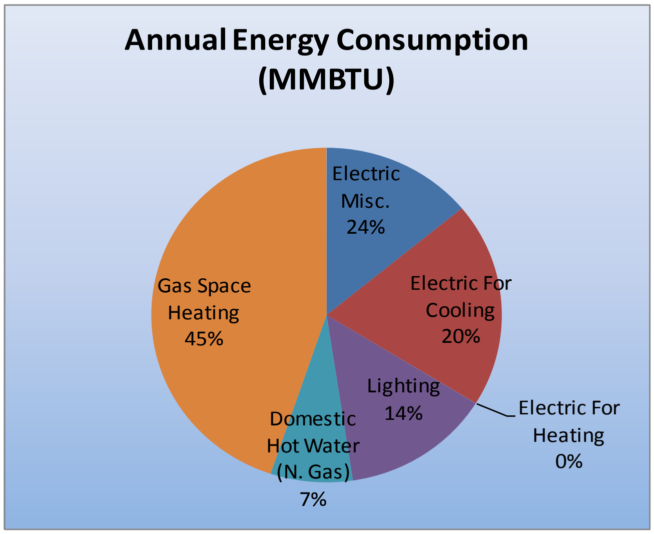
In the above chart, the natural gas use follows a heating trend as expected. During the summer it is clear that the natural gas use is very minimal which reflects that heat is not being used and the domestic hot water (DHW) load is minimal. March 2009 was colder than usually compared to previous years and therefore natural gas usage shows a spike in the chart. In addition, the utility bills may show fluctuations due to actual readings being blended with estimated readings from the utility company.

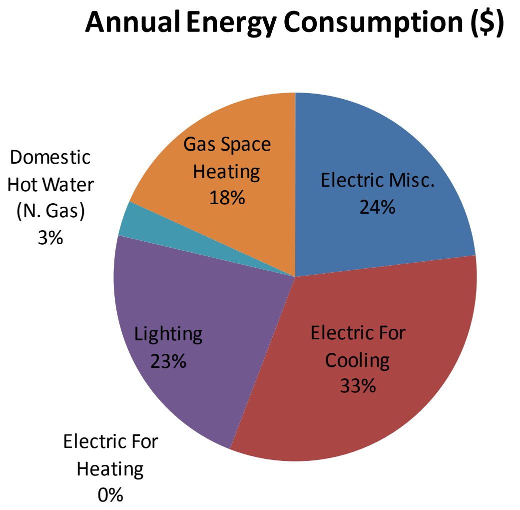
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Municipal building based on utility bills for the 12 month period of October 2008 to October 2009.



The following table and chart pies show estimated energy use for the Municipal building based on utility bills for the 12 month period of October 2008 to October 2009. Note electrical cost at $49.0/MMBtu of energy is more than 4 times as expensive to use as natural gas at $12.1/MMBtu.

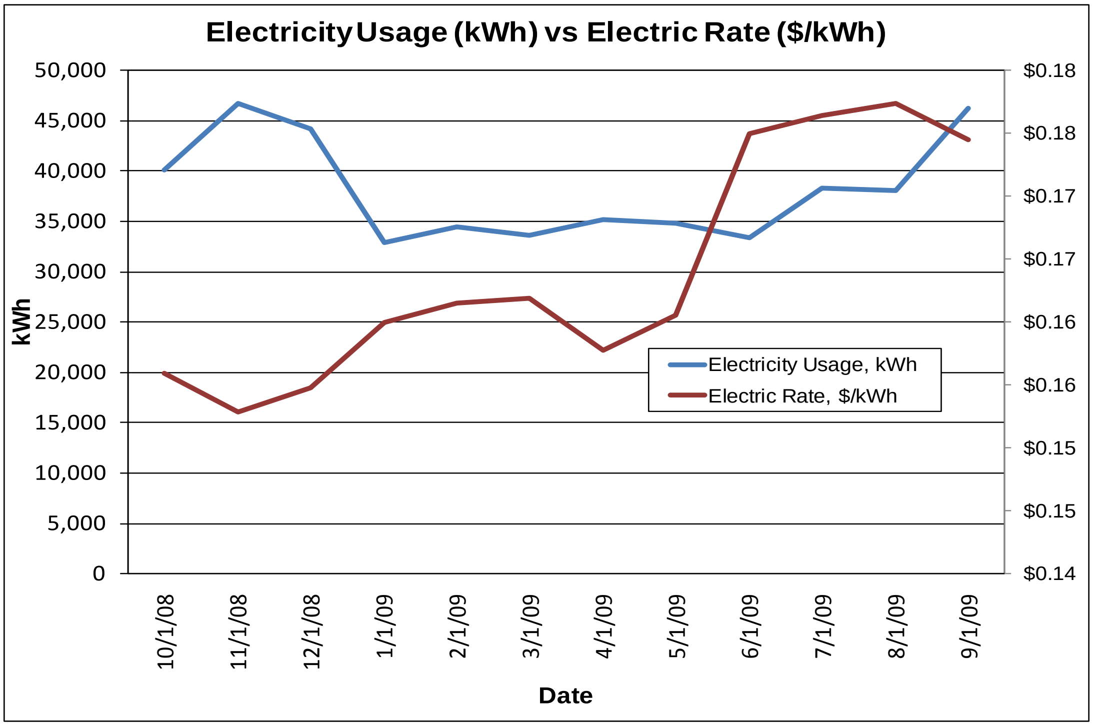
2008 Annual Energy Consumption / Costs					
	MMBtu	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Electric Miscellaneous	460	14%	$22,540	44%	49.0
Electric For Cooling	651	20%	$31,899	17%	49.0
Electric For Heating	0	0%	$0	13%	49.0
Lighting	452	14%	$22,148	6%	49.0
Domestic Hot Water (N. Gas)	249	8%	$3,013	2%	12.1
Gas Space Heating	1472	45%	$17,811	18%	12.1
Totals	3,284	100%	$97,411	100%	-
Total Electric Usage	1563	48%	$76,587	79%	49.0
Total Gas Usage	1721	52%	$20,824	21%	12.1
Totals	3,284	100%	$97,411	100%	-





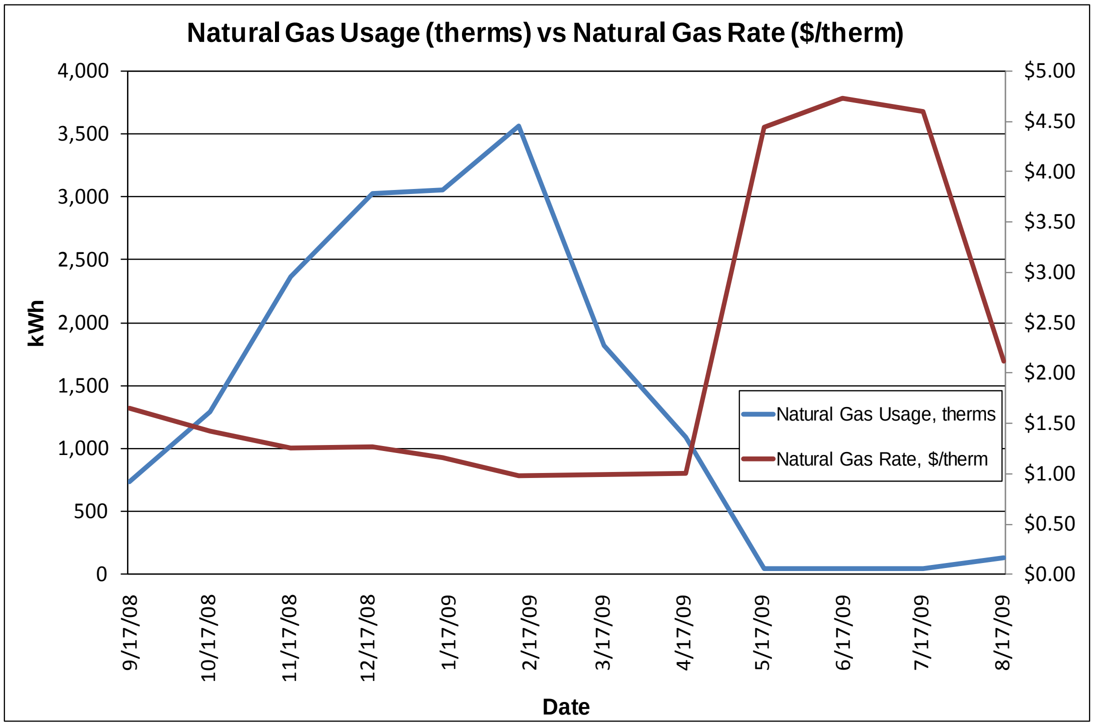
1.2. Utility rate analysis

The Municipal building currently purchases electricity from JCP&L at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Municipal building currently pays an average rate of approximately $0.167/kWh based on the 12 months of utility bills of October 2008 to October 2009. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. The electric rate does show large fluctuations throughout the year, increasing during summer months when the peak demand charge is much higher. Even though there are large fluctuations with the utility rate, the general service rate is the appropriate rate for this size and type of building. It is important to note that demand for this building almost doubles during the summer months. Any Energy Conservation Measure (ECM) that reduces demand will also help to decrease fluctuations in the electricity rate.



The Municipal building currently purchases natural gas supply from the Elizabethtown Gas at a general service market rate for natural gas ($,therms). There is currently only one gas meter that provides natural gas service to the Municipal building. The average aggregated rate (supply and transport) for the meter is approximately $1.21/therm based on 12 months of utility bills for October 2008 to October 2009. The suppliers' general service rate for natural gas charges a market-rate price based on use and the 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 prices increase during the heating months when natural gas is used by the boilers for space heating. The high gas price per therm fluctuations in the summer may be due to high energy costs that occurred in 2008 and low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months.

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. The natural gas rate fluctuates according to the natural gas usage as expected, as more quantity of natural gas is consumed, the natural gas rate decreases per unit.



1.3. Energy benchmarking

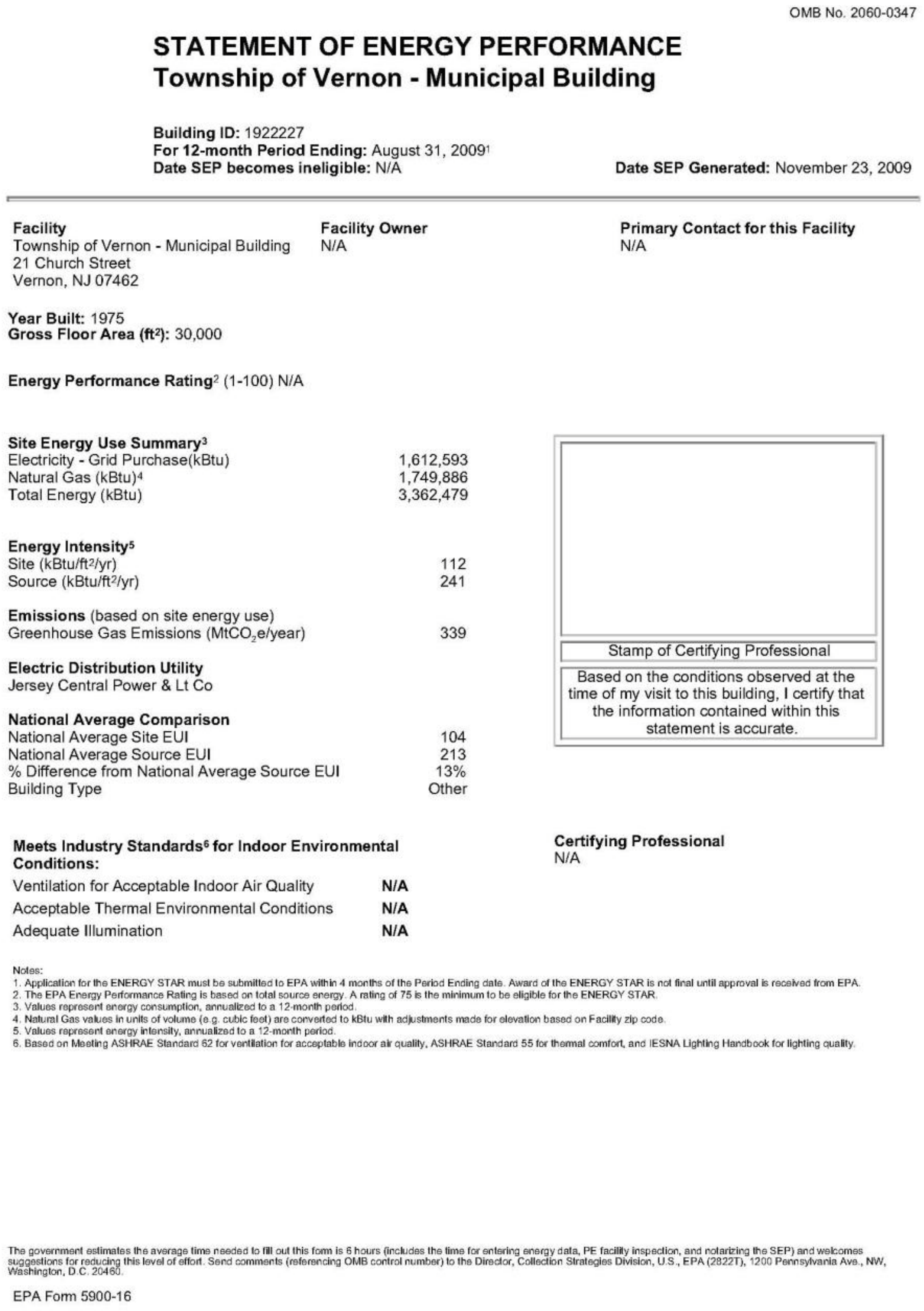
SWA has entered energy information about the Municipal building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building is not eligible to receive a performance rating since it is classified as a multi-use building.

The Site Energy Use Intensity is 112.1 kBtu/sq ft yr compared to the national average of an Office building consuming 75 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 4.9 kBtu/sqft yr, with an additional 13.5 kBtu/sq ft yr from the recommended ECMs and 13.4 kBtu/sq ft yr from the recommended End of Life Cycle ECMs.

Per the LGEA program requirements, SWA has assisted Vernon Township to create an *Energy Star Portfolio Manager* account and has shared the Municipal building facility information to allow future data to be added and tracked using the benchmarking tool. SWA is sharing this Portfolio Manager Site information with TRC Energy Services. As per requirements, the account information is provided below:

[redacted]

Also, below is a performance rating that is generated based on historical energy consumption from the Portfolio Manager Benchmarking tool.



OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Township of Vernon - Municipal Building

Building ID: 1922227
For 12-month Period Ending: August 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: November 23, 2009

Facility
Township of Vernon - Municipal Building
21 Church Street
Vernon, NJ 07462

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1975
Gross Floor Area (ft^2): 30,000

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	1,612,593
Natural Gas (kBtu)[4]	1,749,886
Total Energy (kBtu)	3,362,479
Energy Intensity[5]	
Site ($kBtu/ft^2/yr$)	112
Source ($kBtu/ft^2/yr$)	241
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	339
Electric Distribution Utility	
Jersey Central Power & Lt Co	
National Average Comparison	
National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	13%
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.

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**

Certifying Professional
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.

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 welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The Municipal building was built around 1975. The structure is two stories tall with a total floor area of approximately 30,000 square feet. The first floor is structured as a full walk out basement. The first floor area is below grade and houses the Police Department as well as the Senior Center which contains a kitchen. The second floor is at grade level and houses the Planning office, Building Department offices, Tax Assessor, Township Manager, Planning/Zoning and various other administrative offices as well as a court room.

2.2. Building occupancy profiles

The Municipal building operates on a four-day work week from 7:30am to 5:15pm. There is peak occupancy of approximately 125 persons throughout the week. The Police Department, located on the first floor, operates 24 hours per day, 7 days per week.

2.3. Building envelope

2.3.1.Exterior Walls

The exterior envelope consists of a textured cement block façade with stucco finishes around the window areas of the building. The exterior walls of the 1992 section of the building contain 6” of fiberglass batt insulation. The walls that make up the exterior for the original portion of the building do not contain any insulation.

There are signs of water damage to walls around the building due to clogged gutters. On the day of the audit there were leaves that completely clogged the gutters, allowing water to build up and also drip down the side of the exterior wall. In addition to water running down the exterior walls, water is allowed to drip from the gutter and splash on the base of the wall. SWA recommends that gutters are cleaned on a monthly basis, or whenever debris is noticed in the gutters/downspouts. Proper maintenance will prevent water from backing up and will allow rainwater and melted snow to be diverted away from the building.

The chillers located behind the building are beyond their useful life and therefore window air-conditioning units have been installed throughout the building to provide comfort. These window units are installed for the warm months only. The existing windows are horizontal slide windows that are slid to the open position during the warmer months to allow a window air conditioning unit to be mounted directly on the interior of the frame. The window units are installed using a piece of painted OSB board drilled into the window frame to block of the remaining portion of the open window. OSB board does not provide a thermal break to protect the expensive conditioned air inside the building, nor does it protect against water such as rain and humidity. The way that the window units are mounted, most of the units were observed to not be leveled properly in the window frame. When window AC units are mounted they should only have a slight tilt towards the exterior surface. Window AC units produce condensate as a by-product that needs to evaporate by spreading out on the flat condensate drain pan inside of the unit. When the AC unit is mounted at to much of an angel, condensate is allowed to drip out of the pan and down the wall that the window unit is mounted on. Below shows a picture of condensate allowed to drip out of the AC unit and damage the exterior wall. SWA recommends that if any window AC units are used for this building, that they are mounted using a level to ensure that condensate is allowed to drip into the condensate pan at a slight angle away from the building but not so far that water drips behind the unit and causes water damage to the exterior side of the building.

In addition to water damage, there are also several penetrations across the entire envelope of the building. These penetrations are in the form of holes or cracks in the outer wall that have the potential for allowing cold air as well as water to penetrate the shell of the building causing further damage. SWA recommends that Vernon Township repairs these penetrations so that the exterior surface provides a consistent thermal and vapor barrier across the entire building.

2.3.2. Roof

The roof consists of two large sections of flat roof consisting of a black, asphalt built-up roof surface, met in the middle with a small section of peaked roof that contains brown asphalt shingles. The entire flat roof surface was replaced 5 years ago but has had water problems ever since. Building staff mentioned that the contractors hired to do the roof replacement did not do a good job and members of the town DPW department later had to seal the roof in places with tar. When facing the building, the left side of the roof appears to have less of an angle to allow for water damage than the right side. On the day of the audit, standing water was seen pooling on the left section of flat roof. In addition to problems with the roof replacement, building staff mentioned that ice dams form along the roof lines and DPW workers are asked to chop it off. When DPW workers chop off ice, it is noted that the roof has been damaged before allowing water leakage to occur which required repair to the roof in places. The fact that ice is allowed to dam and build up on the roof, indicates the rising heat from the building is allowed to leak through the roof surface in some areas, allowing snow to melt and then freeze into ice.

The plenum located between the second floor ceiling and the roof showed signs of damaged insulation. The R-30 insulation that was inspected in the plenum was moved around and not covering the top-side of the ceiling properly. Many of these batts of insulation have been tossed aside when the plenum was accessed for maintenance and never replaced properly. Some of these insulation batts were positioned with the vapor barrier facing the wrong way. There were also many bays situated between the trusses that were missing insulation. In addition to missing insulation or insulation that has been replaced incorrectly, insulation that has been compressed no longer has the same R-value. SWA recommends that any defective insulation batts are removed from the plenum and new insulation is added where applicable. In colder climates, such as Northern New Jersey, the vapor barrier (paper-side) of the insulation should face the interior side of the building. An even layer of insulation can also prevent excess heat from rising through the roof surface, melting snow and causing ice dams. The integrity of the roof surface should be maintained properly to prevent water from penetrating the roof surface. There are some installation flaws that have been repaired but routine maintenance will prevent further damage. Energy savings alone will not justify replacing the roof surface. In the future, when the roof is replaced, SWA recommends installing a reflective, light-colored Energy Star roof surface that forms an impenetrable vapor barrier as well as reflect solar radiation away from the roof surface.

2.3.3. Base

The building’s base is 4” concrete slab below grade with a perimeter footing and concrete block stem walls. There were no observed or reported problems with water penetration or moisture. The building code in 1975 would not have required insulation at either the perimeter of the foundation walls or under the slab. The benefits of installing slab perimeter insulation would not justify the expense and disruption of excavating around the entire building. If excavation is ever require for other reasons, consideration should be given to installing a minimum of 2 inches of rigid foam board insulation at that time.

2.3.4. Windows

The building contains mostly horizontal sliding windows with aluminum frame. Each of these windows contains two panels; one that is allowed to slide horizontally and one that is fixed. The windows contain double-glazed glass with no effective low-e coating. The windows are in poor condition and some of the weather-stripping is in deteriorating condition. Windows contain three components that are important to the energy efficiency of the building; glass panes, frames that hold the panes in place and weather-stripping that provides a seal between the window panes and frame. For the existing windows, the glass is double-paned glass which is good but does not contain an effective low-emissivity (low-e) coating. The low-e coating helps reflect solar radiation from penetrating through the glass and increasing the heat load within the building. The aluminum window frames are un-insulated and create a “thermal bridge” that allows heat to transfer into the building during warm months and allows heat to escape during cold months. In addition to a lack of insulation, window AC units are installed into some of the windows. Each AC unit is secured to the window frame by inserting multiple screws to hold the window in place. Every hole that exists in the frame adds to the risk of heat transfer across the frame as well as the possibility of water penetrating into the frame. Energy savings alone will not justify the cost of replacing windows. SWA recommends that window replacement is considered as a capital improvement plan to help seal the building both from a water standpoint as well as an energy standpoint. Holes in the window frame can also allow water to penetrate the window frame and cause rusting and rotting from the inside out.

As a best practice, SWA recommends that all windows be inspected at least once a year. Any gaps, cracks, or damage to weather-stripping or caulking should be repaired or replaced, as needed, to minimize energy loss around those openings. Building staff should also verify that windows open and close properly and repair, as needed. The two pictures below show the current condition of many of the windows inside of the building. The first picture shows a damaged frame that once held a window AC; the second picture shows a window with an AC unit currently installed using plywood and screws.

The roof contains one skylight that is no longer sealed properly. The roof inspection revealed that the skylight has several cracks that are not sealed properly as well as air spaces along the outside edge of the glass. SWA recommends that this skylight is replaced with a similar skylight, containing a low-e surface, and sealed properly to prevent cold air and moisture from penetrating the roof surface. Below are pictures showing areas of the skylight, where the seal has been compromised.

2.3.5.Exterior doors

The exterior entry/egress doors are in varying condition. Most doors no longer have weather-stripping intact. One metal door in the back of the building no longer provides a seal between the door and the frame. Water has visibly penetrated the frame, rusting out sections and exposing the building to water damage and a potential for frost damage. SWA recommends that all doors are weather-stripped and the metal door located behind the building is replaced. As part of the door replacement, the entire frame should be replaced and sealed properly to the exterior walls. SWA recommends that once weather-stripping is installed, that it be inspected every 6 months at a minimum. Whenever weather-stripping begins to deteriorate, it should be replaced/repaired immediately. Cracks around the exterior of doors can allow expensive, conditioned air to leak outside of the building as well as allow water and frost to penetrate the building during the winter.

2.3.6.Building air tightness

Based on a visual inspection, the building was observed to contain several major penetrations to the shell that can allow expensive, conditioned air escape out of the building. SWA recommends that appropriate steps are taken to ensure that these trouble spots are taken care of. The noted spots of penetration include; piping penetrations on backside of building from chiller unit, bent/damaged window frames from previously installed window AC units, weather-stripping around exterior doors and windows, a cracked skylight, a broken steel door and other damages to the exterior surface of the building.

2.4. HVAC Systems

The building is served by a number of air-handling units located in ceiling plenums and mechanical rooms throughout the building. These air-handling units contain a hot water coil served by the hot water boiler as well as a chilled water coil served by the four chillers located behind the building. Three of the four chillers were decommissioned 3 years ago as they began to fail. The fourth chiller struggled through the last cooling season and has finally been decommissioned this year. As the chillers have failed, window and standalone AC units have been installed throughout the building.

In general, much of the terminal equipment was performing adequately. Many of the diffuser grills located in the ceilings showed signs of dust and debris building up on the grill. This can be a sign that air is not being filtered properly before it is distributed throughout the building. Currently, there is no maintenance contract for the HVAC equipment in the building and lack of maintenance is starting to show in the condition of the equipment. Two of the air-handling units have been decommissioned due to water leaks and the split-system condenser located in the Police Dispatch room shows signs of mold forming around the diffuser.

2.4.1.Heating

The heating system includes a central heating plan that feeds hot water through air-handlers throughout the building. The heating plant consists of 5 sections of Hydrotherm Multitemp boilers with a total output capacity of 1,638 MBH and a nominal thermal efficiency of 78%. The atmospheric boilers consume natural gas for space heating. The heating plant is approximately 31 years old and is in poor condition. Almost all of the thermostats and aqua stats located on the units are broken and no longer give accurate read-outs. The aqua stats that worked and measured supply hot water temperature were set for 200ºF, which is 20ºF higher than design. One section of boiler contains a piece of metal, assumed to be a cover for another piece of equipment that was laid over the burner. It was apparent from the high temperature marks on the piece of metal, that it was careless laid on top of the burner at least a year ago and has been heated up and cooled down over and over again. Not only does this piece of metal prevent the burners from firing efficiently, it can also become a safety hazard since it prevents gas from being ignited over a small portion of the burner. Originally, there were thermostats located in most rooms to control temperature. These thermostats have been disconnected and two thermostats have been installed on the second floor of the building; one unit located in office space and the other unit located in the courtroom. These thermostats are programmable but do not properly operate the HVAC equipment since they do not accurately represent the heating load of the building. Poor thermostat locations can cause energy as well as comfort issues by not operating the boiler and chiller precisely. It is also unclear whether the control system has been adjusted for the 4 day work week that has been instituted for the building in the past year. There is a newer BMS system that has been installed recently to control the HVAC system but is no longer operated by anyone. When this control system was installed, there was an HVAC service contract in place that monitored energy usage and adjusted boiler settings appropriately. The BMS is most likely not adjusting heating and cooling according to outside air and also does not setback at night properly. SWA recommends that the entire heating plant is replaced with a similar sized combustion boiler plant made up of two modular units, which are much safer and efficient to operate. Sealed combustion boilers can reach efficiencies up to 85%. Condensing boilers were considered however, due to the high installation cost associated with more expensive boilers combined with the cost of lining the existing flue with stainless steel and adding new piping, condensing boilers have been ruled out. SWA also assumes based on similar projects that return hot water temperatures will not be low enough to take full advantage of the condensing boilers. The boilers should be connected to the BMS properly in order to modulate the boilers and control the entire HVAC system properly. SWA also recommends that a minimum of 4 thermostats are controlled to better control temperature distribution throughout the building.

At the main heating plant, there are three 2HP hot water pumps that circulate hot water throughout the building to different air-handler units. On the day of the audit, the heating season had not begun yet however; Pump #1 was left on running. Building maintenance staff mentioned that these pumps were never shut off after the last heating season and have been running ever since. Not properly shutting down HVAC equipment after a heating season will cause unnecessary wear on different components. Pump #1 appeared to be running dry which can quickly damage a motor in addition to wasting unnecessary electricity and increasing the heat load in the mechanical room. SWA recommends that all of the hot water pump motors are properly shut off after the heating season to prevent unnecessary energy usage. This pump motor has been left on 24 hours per day for almost an entire year, which wastes energy as well as decreases the efficiency and lifetime of that motor.

In addition to the heating plant, there are also several heating distribution issues for the building. Two of the air-handling units, located in the back of the Senior Center are currently not running. Building maintenance disconnected these air-handling units when the chiller caused piping to freeze, thaw and then overflow the condensate pans, causing water damage inside of the building. These units have not been serviced properly and brought back online yet. De-commissioning these units not only affects air-conditioning but also effects the distribution of warm air. These units are responsible for helping bring fresh air into the building as well as distribute air throughout the interior spaces. The de-commissioned units did not appear to have major damage, with the exception of some piping connections. SWA recommends that water damage around these units is properly taken care of and each unit is repaired and put back into operating order.

2.4.2.Cooling

The building is designed to be cooled by four electric, air-cooled liquid chillers. These chillers are located behind the building and use R-22 refrigerant to chill liquid that passes through a piping system throughout the building. Throughout the building, air-handling units that provide heat and fresh air also provide cooled air using chilled water coils. Three years ago, three of these chillers were decommissioned due to operating problems. The units had outlived their useful lifetime and instead of replacing the chillers, the Town decided to continue use with one working chiller and supplement cooling with window AC units. The fourth chiller struggled to provide cooling over the past year and has recently been decommissioned. The chillers have been de-commissioned because they were not capable of keeping up with the current cooling capacity and were causing problems with maintenance. Based on age and observed deterioration of this equipment, this equipment is no longer functional and is beyond the useful life of its design intent.

The building was designed to use air-handlers equipped with hot water as well as chilled water coils. Since the chillers have been de-commissioned, equipment is not being used as designed and thus affecting the efficiency of the overall system. Window AC units are used for the primary cooling system now, which is not effective on the system level. Window units may help with comfort issues in specific spots but ultimately is ineffective at cooling the building volume as a whole. SWA recommends that the chiller plant is replaced, the entire HVAC system is re-commissioned and a service contract is instituted for routine maintenance. A combination hot water/chilled water system is a complex system that requires a knowledgeable technician to service in order to achieve proper care and maintenance. SWA recommends that Vernon Township enter into a service contract with a local provider that will be able to respond quickly to problems with the HVAC system as well as provide routine maintenance. The current system has failed due to lack of maintenance. A service technician will also be able to adjust set points properly on a seasonal basis in order to optimize the controls of the system. Using the intended system for the Municipal building is ideal since all of the piping has already been installed. In addition, the air-handling units as well as the controls system are newer and are equipped to handle both heating and cooling. Addressing the HVAC system as a whole will help to remedy comfort issues as well as reduce energy consumption on a daily basis.

The air-handling units located throughout the building appear to be in good operating condition and do not need to be replaced at this time. There has been a lack of maintenance to these units, that although is minor has caused many problems. Two of the air-handling units have been de-commissioned due to condensate pan leaks. When the chiller system began malfunctioning, some of the chilled water coils in the air-handling units froze, thawed and caused an overflow in the condensate drain pan. When this excess water filled the condensate pan, debris became lodged in the hole meant for drainage within the drain pan. This hole became clogged and caused the drain pans to overflow and leak onto the ceiling. According to maintenance staff, these units were de-commissioned immediately and were never fixed properly. Upon observation, SWA has determined that these units in fact are still in good condition and just need to be maintained. Additionally, almost every filter observed in the air-handling units have not been replaced since the previous service contracted was terminated. These filters are deteriorating and also clogged. Clogged filters do not allow air to pass through them as designed, so air is forced around the filter and dirty, dusty air is allowed to enter the building ductwork. There are signs of excessive dust and grime in the ductwork in addition to a build up of dirty on the terminal diffuser grills. SWA recommends that a maintenance contract is enacted with a local company to address the entire system as a whole. This maintenance contract should include seasonal inspection. Building staff should be trained to replace filters and perform other routine maintenance items on a routine maintenance schedule.

In addition to the central chilled water system, the Police Department uses a split AC system to provide cooling to the Radio Dispatch room. The Radio Dispatch room contains radio equipment, television monitors, servers and other equipment that provide a lot of waste heat. A split AC system is a common approach to address this area-specific, heat load. A split AC system consists of a condenser outside connected to an evaporator inside. This system uses R-22 refrigerant to cool as well as condition the air. This system is responsible for removing excess heat and moisture from the air. Mold was observed forming around the evaporator, located in the ceiling of the Radio Dispatch room. This mold is a result of equipment not being maintained properly. It is clear that the filter on this unit has not been changed in a long time and has become completely clogged. Warm, moist air is allowed to bypass the filter, building up around the edges of the diffuser located on the evaporator. This moist air has saturated the ceiling tiles, allowing mold to grow. In this case, lack of maintenance has shortened the lifetime of the condenser, can shorten the lifetime of the radio dispatch equipment by not removing excess heat and moisture and has also posed a potential health risk by allowing mold to form. This split AC system was installed in 1991 and is beyond its useful life. SWA recommends replacing the split AC system and also replacing nearby ceiling tiles and insulation that may have been subject to mold growth. Building staff informed SWA that the mold that has been observed has been tested as part of an Indoor Air Quality (IAQ) test and was deemed not harmful. SWA strongly recommends that any mold contamination is removed properly. The split AC system should be incorporated into the service contract recommended above. Building staff should be trained to replace filters and provide other routine maintenance. Building staff should also be trained to identify mold. When mold is identified, an IAQ professional should be contacted immediately to address issues causing the mold and for proper removal.

2.4.3. Ventilation

As mentioned above, a majority of the building is provided conditioned air from air-handling units that contain a heating coil as well as a cooling coil. These units also help bring fresh air into the building and properly mix fresh air with stale return air. Two of the air-handling units are currently not operating which causes a disruption in design airflow for the building. In addition to fresh air entering the building via air-handling units, exhaust fans remove stale air which helps induce fresh air into the building. All of the exhaust fans appear to be in good working order with the exception of the kitchen exhaust fan. Building maintenance staff informed SWA that the exhaust fan for the kitchen has not been working for awhile. The kitchen is located in the Senior Center and recently occupants have complained of excess heat building up near the kitchen area. Upon inspection, it appears that the kitchen exhaust fan needs a belt replacement. Kitchen exhaust fans not only help mitigate heat from the kitchen area but are also intended to remove combustion by-products from the natural gas ranges as well as odors and other particles in the kitchen air such as grease. Avoiding maintenance with kitchen exhaust fans not only wastes energy but also can become a safety hazard by not mitigating stale air and combustion by-products. SWA recommends that Vernon Township address this problem immediately and perform maintenance on the kitchen exhaust fan.

The building has a number of rooftop exhaust fans, and it is assumed that at least two fans are at the end of their operating life. These fans are in good cosmetic condition, however could benefit from motor replacement. SWA recommends that the motors for these two fans are replaced with newer, more efficient motors as well as having new belts installed.

2.4.4.Domestic Hot Water

There is one (1) AO Smith Preferred hot water heater with 76,000 Btuh input, 72.8 gallons/hour recovery and a storage capacity of 74 gallons. This gas-fired, domestic hot water heater is the atmospheric type. This unit was set to supply water at 118ºF, which is appropriate for the building. There is an estimated 40% remaining useful lifetime on this hot water heater. When this unit no longer has useful life, SWA recommends switching to a natural gas-fired, sealed combustion hot water heater for safety and also for a higher efficiency rating. None of the hot water pipes connected directly to the unit contained insulation. SWA recommends insulating these hot water pipes, approximately 20 linear feet, in order to prevent heat from escaping hot water before it is distributed throughout the building.

It is not cost-effective to replace the existing water heating equipment with higher efficiency equipment at this time. However, higher efficiency water heating equipment will save energy and should be strongly considered upon replacement of the existing equipment. Energy saving appliances bearing the ENERGY STAR label should be selected to ensure efficient performance. Incentives may be available to offset any added costs for the installed equipment.

More efficient water-consuming fixtures and appliances save both energy and money through reduced energy consumption for water heating, as well as decreased water and sewer bills. SWA recommends that the aerators in all sinks are retrofitted with low-flow aerators that constrict the volume of water allowed to flow out of the faucets during the time it takes to wash hands, wash dishes, etc. SWA recommends installing 0.5gpm aerators on all faucets in the building. Building staff can easily install faucet aerators and/or low-flow fixtures to reduce hot water consumption. In addition, routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy.

2.5. Electrical systems

2.5.1.Lighting

Interior Lighting – The Municipal building currently consists of mostly inefficient T12 fluorescent fixtures with magnetic ballasts. Based on measurements of lighting levels for each space, there are not any vastly over-lit areas. There are 373 T12 fixtures that should be upgraded to T8 fixtures with electronic ballasts. Typically upgrading a T12 fixture with magnetic ballasts to a T8 fixture with electronic ballasts will result in a 30% power savings. There are also 30 incandescent bulbs found in fixtures. All of the interior fixtures are controlled by switches inside of each specific room. Occupancy sensors have been evaluated for each space and are recommend for areas throughout the building that see sporadic use and could benefit from reducing the amount of time that lights are left on. Installing occupancy sensors would not be justified by energy savings alone. SWA recommends replacement of all T12 fluorescent lighting with magnetic ballasts to T8 fluorescent lighting with electronic ballasts. SWA also recommends that all incandescent bulbs are replaced with compact fluorescents. See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

Exit Lights – There were 25 fluorescent exit signs surveyed throughout the entire building. Fluorescent exit signs use approximately 15W of continuous power compared to 5W LED exit signs. In addition, LED bulbs have a much higher lifetime in relation to fluorescent bulbs, which provides savings associated with bulb replacement over the lifetime of the measure.

Exterior Lighting - The exterior lighting surveyed during the building audit were found to be a mix of probe-start metal halide and incandescent fixtures. SWA recommends the replacement of all probe-start metal halide fixtures with pulse-start metal halide technology. Pulse-start metal halides provide a better quality of light, light quality is not degraded over time and the bulb lifetime is much longer resulting in maintenance savings. SWA recommends that exterior incandescent lights are replaced with reflective compact fluorescent lights. Exterior lighting is controlled by timers and switches. During the audit, many of the exterior lights were left on due to timers being set incorrectly and failure to switch off the lights by hand during the day. Many of the exterior lights have been burnt out from being left on 24/7. SWA recommends installing photocells for each light to ensure that they are only used when light levels are low enough to trigger the photocell.

2.5.2.Appliances

Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. For example, Energy Star refrigerators use as little as 315 kWh / yr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Building management should select Energy Star label appliances and equipment when replacing: refrigerators, printers, computers, copy machines, etc. More information can be found in the “Products” section of the Energy Star website at: http://www.energystar.gov. Also, 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. The building contains one cold-type vending machine located in the break room that contains a lit-up display. The lights for this display remain lit for 24 hours per day, 7 days per week. SWA recommends installing a Vending-miser device that acts as an occupancy sensor for the display lights within the vending machine. A Vending-miser device will allow the display lights to shut off for a portion of the day, as well as nights and weekends when no motion is detected.

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions in meeting areas use approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all appliances (i.e. fridges, coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off. The Building name building computers are generally 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 Municipal building contains one hydraulic elevator. This elevator was installed in 1991 and seems to have been maintained properly. According to building staff, this elevator is rarely used and therefore shut off most of the time.

2.5.4.Process and others electrical systems

There are currently two transformers; one 75 kVA and one 150 kVA located in the Police Department electrical room to handle all incoming electricity to the building. These transformers step down electricity coming from the utility company to a voltage that is used by the building. These transformers are at least 20 years old and are beginning to show signs of aging. These units currently vibrate and produce a humming sound, which can be signs that performance is being affected. In 2007, Federal guidelines mandated that all new transformers conform to higher efficiency standards. As such, new transformers are capable of handling the same electric load at a much higher efficiency. SWA recommends that these transformers are replaced with newer, efficient models. These two transformers handle of the electricity that is used by the building and therefore, small efficiency gains can equate to high cost and power savings. SWA recommends that these transformers are replaced based on their age and potential savings due to high electricity usage for this building.

3. EQUIPMENT LIST

Inventory

Building System	Description	Physical Location	Make/ Model	Fuel	Space served	Estimated Remaining useful life %
Controls	Johnson Metasys controls for HVAC system	Boiler room in Police Department area	Johnson Metasys, Model #NA	Electricity	All areas	60%
Controls	Hydrotherm electronic modular boiler control	Boiler room in Police Department area	Hydrotherm, Model S	Electricity	All areas	60%
Heating	Five (5) sections of Hydrotherm Multitemp boilers, atmospheric natural gas, 2100 Mbtuh input, 1638 Mbtuh output, 78% nominal efficiency, 1/1/78, no nameplate info, model # taken from drawings	Boiler room in Police Department area	Hydrotherm Multitemp, Model #MR2100B/MC2/ES8	Natural Gas	All areas	0%
Heating	P-1,2,3: Three (3) Hot water circulation pumps, Marathon electric motors, 2 HP, 1740 RPM, 3 pumps stacked on top of eachother, top pump (Pump #1) has been running 24/7 dry because it was never turned off after last heating season, pressure gage is broken on P-1	Boiler room in Police Department area	Marathon Electric motors, Model #3VL145TTDR5TTDR5TTDR5352AB, Cat. #M309	Electricity	All areas	10%
Heating/Cooling	AHU-L1; Carrier air-handling unit, 48 MBH cooling, 48 MBH heating, 1,600 CFM, 1991	Lower Level	Carrier, Model #42BH-3, Serial #NA	Electricity	Lower Level	20%
Heating/Cooling	AHU-L2; Carrier air-handling unit, 60 MBH cooling, 60 MBH heating, 2,000 CFM, 1991	Lower Level	Carrier, Model #42BH-4, Serial #NA	Electricity	Lower Level	20%
Heating/Cooling	AHU-L3; Carrier Weathermaker air-handling unit with Johnson Controls, 180 MBH cooling, 180 MBH heating, 6,000 CFM, 1991	Lower Level, right side of Senior Center when facing Police Department	Carrier Weathermaker, Model #39LF1153AB1136L, Serial #5090T14347	Electricity	Lower Level, Senior Center	20%
Heating/Cooling	AHU-L4; Carrier Weathermaker air-handling unit with Johnson Controls, 180 MBH cooling, 180 MBH heating, 6,000 CFM, 1991	Lower Level, left side of Senior Center when facing Police Department	Carrier Weathermaker, Unit #39LF1153AB1136-R, Serial #5090514341	Electricity	Lower Level, Senior Center	20%
Heating/Cooling	AHU-L5; Carrier air-handling unit, 60 MBH cooling, 60 MBH heating, 2,000 CFM, 1991	Lower Level	Carrier, Model #42BH-4, Serial #NA	Electricity	Lower Level	20%
Heating/Cooling	AHU-L6; Carrier air-handling unit, 90 MBH cooling, 90 MBH heating, 3,000 CFM, 1991	Lower Level	Carrier, Model #42BH-5, Serial #NA	Electricity	Lower Level	20%
Heating/Cooling	AHU-L7; Carrier air-handling unit, 60 MBH cooling, 60 MBH heating, 2,000 CFM, 1991	Lower Level	Carrier, Model #42BH-4, Serial #NA	Electricity	Lower Level	20%
Heating/Cooling	AHU-M1; Carrier air-handling unit, 48 MBH cooling, 48 MBH heating, 1,600 CFM, 1991	Main Floor	Carrier, Model #42BH-3, Serial #NA	Electricity	Main Floor	20%
Heating/Cooling	AHU-M2; Carrier air-handling unit, 60 MBH cooling, 60 MBH heating, 2,000 CFM, 1991	Main Floor	Carrier, Model #42BH-4, Serial #NA	Electricity	Main Floor	20%
Heating/Cooling	AHU-M3; Carrier air-handling unit, 60 MBH cooling, 60 MBH heating, 2,000 CFM, 1991	Main Floor	Carrier, Model #42BH-4, Serial #NA	Electricity	Main Floor	20%
Heating/Cooling	AHU-M4; Carrier air-handling unit, 90 MBH cooling, 60 MBH heating, 3,000 CFM, 1991	Main Floor	Carrier, Model #42BH-5, Serial #NA	Electricity	Main Floor	20%
Heating/Cooling	AHU-M5; Carrier air-handling unit, 240 MBH cooling, 240 MBH heating, 8,000 CFM, older unit	Main Floor	Carrier, Model #NA, Serial #NA	Electricity	Main Floor	10%
Heating/Cooling	AHU-M6; Carrier air-handling unit, 60 MBH heating, 60 MBH cooling, 2,000 CFM, older unit	Main Floor	Carrier, Model #NA, Serial #NA	Electricity	Main Floor	10%

Heating/Cooling	AHU-M7; Carrier air-handling unit, 60 MBH heating, 60 MBH cooling, 2,000 CFM, 1991	Main Floor	Carrier, Model #42BH-4, Serial #NA	Electricity	Main Floor	20%
Heating/Cooling	AHU-M8; Carrier air-handling unit, 90 MBH heating, 90 MBH cooling, 3,000 CFM, 1991	Main Floor	Carrier, Model #42BH-5, Serial #NA	Electricity	Main Floor	20%
Heating/Cooling	AHU-M9; Carrier air-handling unit, 60 MBH heating, 60 MBH cooling, 2,000 CFM, 1991	Main Floor	Carrier, Model #42BH-4, Serial #NA	Electricity	Main Floor	20%
Cooling	Chiller #1: Carrier Air-cooled chiller, 94 kW/27 tons cooling capacity, R-22, unit has been de-commissioned (2008)	Behind building	Carrier, Model #30GT-030---600--, Serial #1990F16099	Electricity	All areas	0%
Cooling	Chiller #2: Carrier Air-cooled chiller, 94 kW/27 tons cooling capacity, R-22, unit has been de-commissioned (2006)	Behind building	Carrier, Model #30GT-030---600--, Serial #0391F48993	Electricity	All areas	0%
Cooling	Chiller #3: Carrier Air-cooled chiller, 94 kW/27 tons cooling capacity, R-22, unit has been de-commissioned (2006)	Behind building	Carrier, Model #30GT-030---600--, Serial #0792F86430	Electricity	All areas	0%
Cooling	Chiller #4: Carrier Air-cooled chiller, 94 kW/27 tons cooling capacity, R-22, unit has been de-commissioned (2006)	Behind building	Carrier, Model #30GT-030---600--, Serial #3690F33786	Electricity	All areas	0%
Cooling	Two (2) window AC units, 10,000 Btu cooling capacity, R-22, nameplates missing, installed 2005	Finance office windows	NA	Electricity	Finance Office	80%
Cooling	Two (2) window AC units, 10,000 Btu cooling capacity, R-22, nameplates missing, used to cool court room all year long, installed 2005	Court room windows	NA	Electricity	Court Room	80%
Cooling	One (1) window AC unit, 5,500 Btu cooling capacity, R-22, nameplates missing, installed 2005	Court Clerk's windows	NA	Electricity	Court Clerk's Office	80%
Cooling	Hitachi UZUQ AC split system condenser, 5/1992, R-22	Right side exterior, when facing building	Hitachi UZUQ, Model #RAS-24AQ, Production #U4Y99696	Electricity	Police Dispatch	15%
Cooling	Hitachi UZUQ AC split system evaporator, 5/1992, R-22, mold on outside of unit, filters clogged and need to be replaced	Ceiling of Police Dispatch room	Hitachi UZUQ, Model #RPC-24AQ	Electricity	Roll Call Room	50%
Cooling	DeLonghi floor AC unit, R-22 refrigerant, nameplate missing	Roll Call room in Police Department area	DeLonghi, Model #PAC L90	Electricity	Roll Call Room	50%
Ventilation	Loren Cook exhaust fan, 1.5 HP, 4/1991	Flat section of roof; back of left section	Loren Cook, Model #180R8B, Job #855 S29 116900	Electricity	Municipal building	0%
Ventilation	Loren Cook exhaust fan, 1/3 HP, 4/1991	Flat section of roof; back right of left section	Loren Cook, Model #150C10D, Job #855 S29 116900	Electricity	Municipal building	0%
Domestic Hot Water	AO Smith Preferred hot water heater, atmospheric natural gas, 72.8 gal/hr recovery, 74 gallon capacity, 76,000 Btuh input, 118F supply, missing insulation on piping	Boiler room in Police Department area	AO Smith Preferred, Model #80 110, Serial #MK01-1250762-110	Natural Gas	All areas	40%
Lighting	See details appendix A	-	-	-	-	-
Generator	Cummins power generator, 660 gallons of diesel storage	-	-	-	-	95%
Transformer	Westinghouse Dry-Type, 3 phase transformer, Class AA, 3 ph, 60 Hz, 75 kVA, 5.5% impedance, hot to the touch	Electrical room in Police Department area	Westinghouse DT-3, Style #V48M28T75F, Serial #78K174	Electricity	All areas	10%
Transformer	GE Dry-Type, 3 phase transformer, Nema Class AA, 3.5% Impedance, 150 kVA	Electrical room in Police Department area	GE, Model #9T23Q3576	Electricity	All areas	95%
Controls	Hydrotherm electronic modular boiler control	Boiler room in Police Department area	Hydrotherm, Model S	Electricity	All areas	60%
Elevator	Dover Elevator system, 460V, 20HP, 2/6/1991	Elevator machine room in back of Senior Center	Dover, Model #M590AF3, Serial #20D661	Electricity	All areas	60%

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

- Remove window AC units/Repair windows – Once the original central cooling system is replaced, all of the window AC units should be removed. Any holes/damage to the existing windows resulting from the window AC units should be replaced. Some windows may require replacement. Window replacement should be investigated once all AC units are removed and all possible repairs completed.

- Replace roof - The entire roof at the Municipal building was replaced 5 years ago and was not installed correctly. Immediately after installation, there were reported water leaks. In addition, the North-West flat roof section has sloped slightly less than the South-East side, allowing water to sit.

- Replace skylights – the skylights in the building showed signs of aging and small cracks. SWA recommends that these be investigate further. There were no reported water leaks; however the skylights do show signs of deterioration.

Category II Recommendations: Operations and Maintenance

- Initiate maintenance/service contract – A major problem with Vernon Township is the lack of dedicated maintenance staff to building systems. SWA recommends that Vernon Township invest in an annual service contract with a local firm that will perform preventative maintenance at least twice per year as well as service all equipment when installed. A majority of problems relating to HVAC equipment and systems could have been prevented with routine preventative maintenance. SWA observed that maintenance issues were left unattended for long periods of time because of a lack of properly trained maintenance staff. Central heating and cooling systems can be complex and related maintenance issues should be addressed by a trained professional. Retro-commissioning, which is essentially the first procedure for entering into a maintenance/service contract is recommended as an ECM. As an additional cost, SWA estimates that an annual maintenance contract should be approximately $5,000. A service contract will have to be drafted and put out to bid. The Town should expect the service contractor to visit the site approximately once per month as part of a preventative maintenance program. In addition, the contractor should be called when there are any problems. The contract price will not include additional parts or labor.

- Re-insulate Domestic Hot Water piping – Hot water piping that leaves from the domestic hot water heater and supplies the rest of the building is currently not insulated. SWA recommends that building maintenance staff properly insulate these pipes to prevent heat from being lost through piping before domestic hot water is allowed to circulate the building.

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

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

- Provide weather stripping / air sealing - SWA observed that exterior door weather-stripping in places was beginning to deteriorate. Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected and any missing or deteriorated caulking should be re-caulked to provide an unbroken seal around the window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.

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

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

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

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	Upgrade Hot Water Booster Pump Motors to Premium Efficiency
2	Upgrade 30 incandescent lamps to CFLs
3	Install 19 occupancy sensors
4	Upgrade 21 exterior lighting fixtures
5	Install 21 photocell sensors on exterior lights
	Description of Recommended 5-10 Year Payback ECMs
6	Upgrade existing exit signs to LED fixtures
7	Install 5 kW PV system
8	Upgrade 373 T12 fluorescent fixtures
9	Retro-commissioning
	Description of Recommended End of Life Cycle ECMs
10	Replace two rooftop exhaust fan motors
11	Replace existing 150 kVA transformer
12	Heating Plant Replacement, 2100 MBH
13	Re-insulate attic with min. R-19 batt insulation
14	Replace existing 75 kVA transformer
15	Replace Split AC system
16	Cooling Plant Replacement

ECM#1: *Upgrade Hot Water Booster Pump Motors to Premium Efficiency*

Description:

The current hot water heating system contains three pumps that each contain one Marathon Electric 2 HP motor. These Marathon Electric motors are standard motors with an efficiency of 80.5%. In addition to standard efficiency, Pump Motor #1 is currently not controlled and operates 24 hours per day, 365 days per year. The motors are configured to be manually shut off during the heating season and Pump Motor #1 was never manually disconnected. On the day of the site visit, the building was still operating in cooling mode but Pump Motor #1, responsible for heating only was observed to be operating. The motor was extremely hot to the touch, which further strengthened the assumption that the motor had been left running. In addition, building maintenance staff confirmed that the motor had not been shut off since the previous heating season. SWA assumes that Pump motor #2 and Pump motor #3 were both shut off properly at the end of the previous heating season and are used only during operational hours during the heating season.

Installation cost:

Estimated installed cost: $1,362
Source of cost estimate: RS *Means; Published and established costs, MotorMaster v4.0*

Economics:

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	Upgrade HW Booster Pump Motors to Premium Efficiency	RSMeans, MotorMaster	1,362	0	1,362	14,439	0.3	0	1.6	0	2,411	20	35,220	0.6	2485.9	124.3	177.0	34,512	25,853

Assumptions: Pump Motor #1 is assumed to operate 8,760 hours per year which is reduced to 1,217 hours per year. Pump Motors #2, 3 are assumed to operate 1,217 hours per year based on building operations heating schedule. MotorMaster v4.0 was used to calculate electrical use savings, demand savings as well as generate an installed cost per motor. Existing motors have an efficiency of 80.5%. Calculations are based on upgrading equivalent premium efficiency motors with efficiency of 86.5%.

Rebates / financial incentives:
There are currently no incentives for this measure 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: *Upgrade 30 incandescent lamps to CFLs*

Description:

The Vernon Municipal building currently contains 30 incandescent lamps located in various rooms throughout the buildings. SWA recommends that all 30 of these incandescent lamps are upgraded to screw-type CFLs. A complete lighting schedule has been attached in Appendix A of this report.

Installation cost:

Estimated installed cost: $1,522
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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	Upgrade 30 incandescent lamps to CFLs	RSMeans	1,522	0	1,522	4,556	0.9	0	0.5	99	860	5	3,915	1.8	157.3	31.5	48.7	2,416	8,158

Assumptions: Operational hours are assumed based on field observations and interviews with maintenance staff.

Rebates / financial incentives:

There are currently no incentives for this measure 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#3: *Install 19 occupancy sensors*

Description:

The Vernon Municipal building currently contains many smaller rooms that are used sporadically throughout the day. A majority of these rooms such as the Police locker rooms, closets, mechanical/electrical rooms and bathrooms can benefit by installing an occupancy sensor. It is important that these occupancy sensors are installed in an ideal location, where they can sense any slight motion in the room. Installing occupancy sensors in corners, too close too doorways or at an incorrect height will not allow the sensor to detect motion easily. Each sensor has a delay timer setting that should be adjusted for each room. This delay timer controls how long it will take a light to shut off via the sensor after no motion is detected. It is important that the delay settings are set correct to prevent lights from constantly shutting off when the room is still in use and also to minimize the amount of time that lights are allowed to remain on after all occupants have left a room. SWA recommends installing a total of 19 occupancy sensors throughout the Vernon Municipal building. A complete lighting schedule including occupancy sensors has been attached in Appendix A of this report. Savings for sensors are shown by adjusting the runtime hours of applicable light fixtures.

Installation cost:

Estimated installed cost: $3,800
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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	Install 19 occupancy sensors	RSMeans	4,180	380	3,800	10,125	2.1	0	1.2	0	1,691	15	19,897	2.2	423.6	28.2	44.3	16,386	18,129

Assumptions: Operational hours are assumed based on field observations and interviews with maintenance staff. Existing runtime hours are estimated based on interviews with maintenance staff as well as building occupants.

Rebates / financial incentives:

NJ Clean Energy Lighting Controls – Wall mounted occupancy sensors ($20 per control)

Maximum incentive amount is $380.

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: *Upgrade 21 exterior lighting fixtures*

Description:

The Vernon Municipal building currently contains 21 exterior lights that are older and consume an unnecessary amount of power. These light fixtures consist of a mix of probe-start metal halides and incandescent flood lamps. SWA recommends upgrading each probe-start metal halide to pulse-start metal halides and incandescent flood lamps to CFL reflective flood lamps. A complete lighting schedule has been attached in Appendix A of this report.

Installation cost:

Estimated installed cost: $4,819
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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
4	Upgrade 21 exterior lighting fixtures	RSMeans	5,194	375	4,819	7,328	1.5	0	0.8	549	1,773	15	20,860	2.7	332.9	22.2	36.4	16,344	13,121

Assumptions: Operational hours are assumed based on field observations and interviews with maintenance staff.

Rebates / financial incentives:

NJ Clean Energy Prescriptive Lighting – Metal halide w/pulse start ($25 per fixture)
Maximum incentive amount is $375.

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 21 photocell sensors on exterior lights*

Description:

The Vernon Municipal building currently contains 21 exterior lights that are older and consume an unnecessary amount of power. These light fixtures are currently controlled manually by switches located in the electrical room of the Police Department. SWA observed that all of the switches for these exterior lights were observed to be in the on position. Most of the light fixtures on the front of the building had burnt out bulbs. These bulbs have not been replaced by maintenance staff and have most likely burnt out sooner than the life of the bulb since they have been left on 24 hours per day. SWA recommends installing photocells for each light fixture in order to assure that lights are shut off during the day. Photocells will also help extend the life of each bulb by reducing the run time per day. Vernon Township should consult with a lighting contractor when moving forward with this ECM to investigate the possibility wiring multiple fixtures per sensor in order to reduce the installed cost of the photocell sensors. A complete lighting schedule has been attached in Appendix A of this report.

Installation cost:

Estimated installed cost: $5,040
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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
5	Install 21 photocell sensors on exterior lights	RSMeans	5,775	735	5,040	6,443	1.3	0	0.7	0	1,076	15	12,661	4.7	151.2	10.1	20.0	7,805	11,536

Assumptions: Operational hours are assumed based on field observations and interviews with maintenance staff. Existing runtime hours are estimated at 24 hours per day and are assumed to be reduced to 12 hours per day.

Rebates / financial incentives:

NJ Clean Energy Lighting Controls – Remote mounted occupancy sensors ($35 per control)

Maximum incentive amount is $735.

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: *Upgrade existing exit signs to LED fixtures*

Description:

The Vernon Municipal building currently contains twenty-five 20W fluorescent exit signs. SWA recommends upgrading each of these exit signs with newer 5W LED exit signs. A complete lighting schedule has been attached in Appendix A of this report.

Installation cost:

Estimated installed cost: $3,298
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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
6	Upgrade existing exit signs to LED fixtures	RSMeans	3,798	500	3,298	3,250	0.7	0	0.4	83	626	15	7,363	5.3	123.3	8.2	17.2	4,172	5,819

Assumptions: All assumptions are based on field observations by SWA staff.

Rebates / financial incentives:
NJ Clean Energy Prescriptive Lighting – LED Exit Signs ($10/$20 per fixture)
Maximum incentive amount is $500.

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#7: *Install 5 kW PV system*

Description:

Currently, the Vernon Municipal building does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels, can be mounted on the building roof, 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 used 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 Vernon Township further review installing a 5kW 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 Municipal building is not eligible for a 30% federal tax credit. Instead, Vernon Township 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. JCP&L provides the ability to buy SRECs at $600/MWh or best market offer.

There are a few locations for a 5kW PV installation on the building roof and away from the shade. 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 5kW system needs approximately 41 panels which would take up 435 square feet. The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the community.

Installation cost:

Estimated installed cost: $30,000
Source of cost estimate: Similar Projects

Economics:

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	Install 5kW PV system	RSMeans	35,000	5,000	30,000	5,902	5.0	0	0.7	0	4,538	15	53,399	6.6	78.0	5.2	12.6	24,174	10,568

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.
Maximum incentive amount is $5,000.

NJ Clean Energy Solar Renewable Energy Certificate Program -Each time a solar electric system generates 1000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The building must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. $3,600 per year has been incorporated in the above savings; 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#8: *Upgrade 373 T12 fixtures*

Description:

The Vernon Municipal building currently contains 373 inefficient T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacing each one of these T12 fixtures with equivalent T8 fluorescent fixtures with electronic ballasts. Typically, T8 fluorescent fixtures with electronic ballasts use 30% less energy than equivalent T12 fixtures with magnetic ballasts. In addition, there will be operating cost savings associated with each bulb since T8 fixtures with electronic ballasts have a longer rated lifetime than T12 fixtures with magnetic ballasts. See Appendix A for complete lighting schedule and analysis.

Installation cost:

Estimated installed cost: $82,056
Source of cost estimate: RS *Means; Published and established costs*, *NJ Clean Energy Program*

Economics (Some of the options considered 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	Upgrade 373 T12 fluorescent fixtures	RSMeans	93,246	11,190	82,056	47,110	9.8	0	5.4	3,868	11,735	15	138,091	7.0	68.3	4.6	11.5	58,040	84,350

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

Rebates/financial incentives:
NJ Clean Energy Prescriptive Lighting – T-5 and T8 lamps with electronic ballast in existing facilities ($10-30 per fixture, depending on quantity of lamps)
Maximum incentive amount is $11,190.

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#9: *Retro-Commissioning*

Description:

Retro-commissioning is a process that seeks to improve how building equipment and systems function together. Depending on the age of the building, retro-commissioning can often resolve problems that occurred during design or construction and/or address problems that have developed throughout the building's life. Owners often undertake retro-commissioning to optimize building systems, reduce operating costs, and address comfort complaints from building occupants.

Since the HVAC systems at the Vernon Municipal building not functioning properly, SWA recommends undertaking retro-commissioning to optimize system operation as a follow-up to the completion of upgrades. Both the heating plant and cooling plant equipment are past their useful lifetimes, SWA recommends first addressing any equipment replacements and then undergoing retro-commissioning to improve the building on a system level. Vernon Municipal building shows many operational problems with terminal units, distribution and central plant equipment and therefore should undergo equipment replacement followed by retro-commissioning. Retro-commissioning should also include "tuning up" each system to the actual operational loads and requirements of the building.

Installation cost:

Estimated installed cost: $37,500
Source of cost estimate: Similar Projects

Economics:

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
9	Retro-commissioning	Similar Projects	37,500	0	37,500	19,080	0.0	1,472	7.1	0	4,967	10	41,944	7.5	11.9	1.2	5.5	4,874	50,389

Assumptions: Since the utility bills have some accounting fluctuations, it is difficult to determine the amount of energy used for heating and cooling the Vernon Municipal building. Based on experience with similar buildings, SWA estimated the heating and cooling energy consumption based on billing analysis, inventory and energy modeling. Typical savings for retro-commissioning range from 5-20%, as a percentage of the total space conditioning consumption. SWA assumed a 10% savings on estimated heating and cooling usage only. Estimated costs for retro-commissioning range from $0.50-$2.00 per square foot. SWA assumed $1.25

Rebates / financial incentives:

There are currently no incentives for this measure 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#10: *Replace two rooftop exhaust fan motors*

Description:

The Vernon Municipal building is equipped with different rooftop exhaust fans to help mitigate stale air from the building. Two of these rooftop exhaust fans are at the end of their lifetime and should be addressed. These rooftop fans appeared to be in good cosmetic condition. Instead of replacing the entire fan, SWA recommends replacing the motors inside of each exhaust fan with newer, more efficient motors. As the motors are being replaced, maintenance staff should make sure to also re-adjust the drive belts or replace as needed.

Installation cost:

Estimated installed cost: $24,213
Source of cost estimate: RS *Means; Published and established costs, MotorMaster v4.0*

Economics:

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
10a	Replace two rooftop exhaust fan motors (in kind)	RSMeans	444	0	444	102	0.0	0	0.0	15	32	20	468	13.9	5.4	0.3	3.8	33	183
10b	Replace two rooftop exhaust fan motors (incremental)	RSMeans	234	0	234	40	0.0	0	0.0	15	22	20	317	10.8	35.3	1.8	6.8	89	72
10	**Replace two rooftop exhaust fan motors (total**	**RSMeans**	**678**	**0**	**678**	**142**	**0.0**	**0**	**0.0**	**15**	**39**	**20**	**565**	**17.5**	**-16.6**	**-0.8**	**1.3**	**-102**	**254**

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. Savings are calculated based on the current efficiency of 79.3% and the efficiency performance of a new, high efficiency model (source DOE/EERE) with efficiency 86.5%. For comparisons of in-kind replacement costs, an efficiency of 84.4% has been used.

Rebates / financial incentives:

There are currently no incentives for this measure 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#11: *Replace existing 150 kVA transformer*

Description:

The Vernon Municipal building is equipped with two distribution transformers; sizes 75 kVA and 150 kVA. SWA recommends replacing both transformers. ECM #9 details replacing the 150 kVA transformer. The recommended measure consists of disconnecting and removing the existing distribution transformer and installing a new unit compliant with DOE's latest standards of high efficiency transformers. The design should include load calculations and sizing of the new system in order to achieve the best possible efficiency for this application.

Installation cost:

Estimated installed cost: $24,213
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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
11	Replace existing 150 kVA transformer	RSMeans	24,213	0	24,213	7,396	1.5	0	0.8	0	1,235	15	14,534	19.6	-40.0	-2.7	-3.2	-9,468	13,243

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. Savings are calculated based on the current efficiency of 96.7% and the efficiency performance of a new, high efficiency model (source DOE/EERE) with efficiency 99.1% sized to the existing capacity. While this assumption is conservative, re-sizing the equipment could lead to achieving further savings.

Rebates / financial incentives:

There are currently no incentives for this measure 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#12: *Heating Plant Replacement, 2100 MBH*

Description:

The existing boiler set-up is beyond its expected service life and should be replaced to avoid catastrophic failure. An upgrade to sealed combustion 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 sealed combustion boilers should have a guaranteed minimum thermal efficiency of 85% at the worse 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. The boiler should have compact design for easy retrofit installation.

Installation cost:

Estimated installed cost: $45,750
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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
12a	Heating plant replacement, 2100 MBH (in-kind)	RSMeans	42,850	2,100	40,750	0	0.0	954	3.2	0	1,154	15	13,583	35.3	-66.7	-4.4	-9.2	-26,970	10,516
12b	Incremental cost to replace boilers with equivalent sized sealed combustion boilers	RSMeans	5,000	0	5,000	0	0.0	1,792	6.0	0	2,168	15	25,515	2.3	410.3	27.4	43.2	20,885	19,753

12	**Heating Plant Replacement , 2100 MBH (total)**	**RSMeans**	**47,850**	**2,100**	**45,750**	**0**	**0.0**	**2,746**	**9.2**	**0**	**3,323**	**15**	**39,098**	**13.8**	**-14.5**	**-1.0**	**1.1**	**-6,084**	**30,269**

Assumptions: SWA assumed savings based on existing nameplate efficiency of 75% and a retrofit nameplate efficiency of 85%. In-kind replacement costs and savings are based on a system with a nameplate efficiency of 80%. All calculations were performed using site observation, billing analysis as well as energy modeling.

Rebates / financial incentives:

NJ Clean Energy Natural Gas Heating – Gas-fired boilers >1,500 MBH <4,000 MBH ($1.00 per MBH)
Maximum incentive amount is $2,100.

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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#13: *Re-insulate attic with min. R-19 batt insulation.*

Description:

On the day of the site visit, SWA observed that most of the batt insulation located directly above the ceiling in the ceiling plenum was moved around or damaged. Maintenance staff also commented on the amount of ice build-up that the roof sees every year. SWA recommends replacing the existing insulation with a minimum of R-19 batt insulation. The batts should be positioned so that the vapor barrier is facing down towards the interior of the building. In order to form a proper thermal barrier, the insulation batts should be laid in place, without compressing the insulation. It is important that no gaps exist between insulation batts. Once the new insulation is installed, if the plenum is accessed and any insulation is disturbed, it should be re-set back into place exactly as installed.

Installation cost:

Estimated installed cost: $13,650
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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
13	Re-insulate attic with min. R-19 insulation	RSMeans	13,650	0	13,650	450	0.1	441	1.5	0	609	15	7,163	22.4	-47.5	-3.2	-4.7	-6,383	5,667

Assumptions: SWA assumes that the existing insulation has an effective resistance value of R-11. This measure assumes that the existing insulation will be completely removed and replaced with new R-19 batts. Assumptions are based on field observations, billing analysis and energy modeling.

Rebates / financial incentives:

There are currently no incentives for this measure 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#14: *Replace existing 75 kVA transformer*

Description:

The Vernon Municipal building is equipped with two distribution transformers; sizes 75 kVA and 150 kVA. SWA recommends replacing both transformers. ECM #12 details replacing the 75 kVA transformer. The recommended measure consists of disconnecting and removing the existing distribution transformer and installing a new unit compliant with DOE's latest standards of high efficiency transformers. The design should include load calculations and sizing of the new system in order to achieve the best possible efficiency for this application.

Installation cost:

Estimated installed cost: $22,458
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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
14	Replace existing 75 kVA transformer	RSMeans	22,458	0	22,458	4,006	0.8	0	0.5	0	669	15	7,872	33.6	-64.9	0.0	-8.7	-14,471	7,173

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. Savings are calculated based on the current efficiency of 96.5% and the efficiency performance of a new, high efficiency model (source DOE/EERE) with efficiency 99.1% sized to the existing capacity. While this assumption is conservative, re-sizing the equipment could lead to achieving further savings.

Rebates / financial incentives:

There are currently no incentives for this measure 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#15: *Replace Split AC System*

Description:

The Police Dispatch area located on the lower level of the Vernon Municipal building uses a split AC system to provide cooling to the Radio Dispatch room. The Radio Dispatch room contains radio equipment, television monitors, servers and other equipment that provide a high amount of waste heat. This split AC system uses R-22 refrigerant to cool as well as condition the air within the Police Dispatch room.

SWA observed that this split AC system has reached the end of it's lifetime. Filters are not changed on a regular basis for this unit and mold was observed growing around the diffuser of the unit. When filters are not changed on a regular basis, they become clogged and do not remove contaminants out of the air properly. Mold is forming on the ceiling tiles around the unit due to moist air being forced around the unit instead of through the filter. SWA recommends replacing this unit with a higher efficiency unit, preferably with a SEER value of 13.0 or greater.

Installation cost:

Estimated installed cost: $8,688
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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
15a	Replace Split AC system (in-kind)	RSMeans	7,555	0	7,555	638	0.0	0	0.1	0	107	15	1,254	70.9	-83.4	-5.6	-15.1	-6,283	1,142
15b	Replace with higher efficiency Split AC system (incremental)	RSMeans	1,133	0	1,133	834	0.0	0	0.1	0	139	15	1,639	8.1	44.6	3.0	8.8	530	1,493

15	**Replace Split AC system (total)**	**RSMeans**	**8,688**	**0**	**8,688**	**1,472**	**0.0**	**0**	**0.2**	**0**	**246**	**15**	**2,893**	**35.3**	**-66.7**	**-4.4**	**-9.2**	**-5,754**	**2,636**

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. The original system was estimated to have a SEER value of 8.5. Costs and savings calculations are based on a 9.0 SEER value for an in-kind replacement and a 13.0 SEER value for an upgraded efficiency unit.

Rebates / financial incentives:

There are currently no incentives for this measure 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#16: *Cooling Plant Replacement*

Description:

The Vernon Municipal building was originally designed to be fully conditioned using a central heating plant as well as a central cooling plant. The original cooling plant consists of four 27 ton air-cooled chillers located on cement pads behind the building. As the chillers reached the end of their useful lifetime, they began to fail and were de-commissioned as they failed instead of being repaired. Three years ago, 3 of the chillers were completely de-commissioned and window AC units were installed to provide area-specific cooling for the building. In the most recent cooling season, the fourth chiller was finally de-commissioned as it had problems keeping up with the cooling load.

Most of the existing piping located within the building was observed to be in good condition and can be re-used. The entire cooling plant is sized at 108 tons which based on preliminary observations may be over-sized for the building. SWA recommends that the hired installer perform a load calculation to determine if re-sizing the chillers would be appropriate. Replacing the chiller system will provide adequate comfort for the building and will perform as designed to provide cooling via the installed air handling units. When the cooling plant is replaced, window units should be removed and any window weather-stripping defects should be repaired immediately.

SWA recommends an air-cooled chiller similar to the Smardt brand chiller that integrates a Turbocor oil-free compressor. The incremental cost of this chiller is shown in the financial table below.

Installation cost:

Estimated installed cost: $98,534
Source of cost estimate: RS *Means; Published and established costs*

Economics:

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
16a	Cooling Plant Replacement	RSMeans	98,786	5,616	93,170	3,894	2.1	0	0.4	0	650	15	7,652	143.3	-91.8	-6.1	-20.3	-85,407	6,972

16b	Incremental cost to install Smardt chiller	RSMeans	5,364	0	5,364	6,814	0.0	0	0.8	0	1,138	15	13,390	4.7	149.6	10.0	19.8	8,221	12,200
16	**Cooling Plant Replacement (total)**	**RSMeans**	**104,150**	**5,616**	**98,534**	**10,708**	**2.1**	**0**	**1.2**	**0**	**1,788**	**15**	**21,042**	**55.1**	**-78.6**	**-5.2**	**-13.1**	**-77,186**	**12,200**

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis. Costs and savings calculations are based on existing window AC units with a SEER value of 8.5, in-kind replacement has a SEER value of 9.0 and a installing a new Smardt chiller would have an efficiency of .7 kW/ton.

Rebates / financial incentives:
NJ Clean Energy Electric Chillers – Air-cooled chillers ($8-$52 per ton)
Maximum incentive amount is $5,616.

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 are currently no existing renewable energy systems installed.

5.2. Wind

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

Pleases see the above recommended ECM#6.

5.4. Solar Thermal Collectors

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

CHP is not applicable for this building because of the existing HVAC system and insufficient domestic hot water use.

5.6. Geothermal

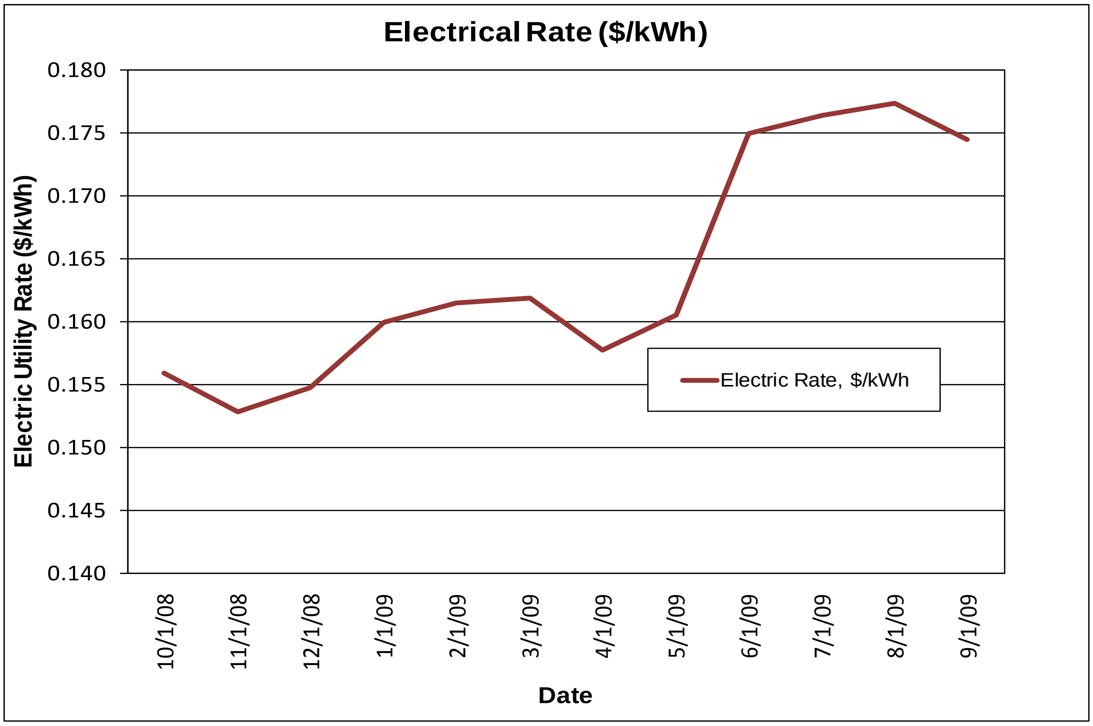
Geothermal is not applicable for this building because it would not be cost effective considering the high installation costs and load profiles of the building.

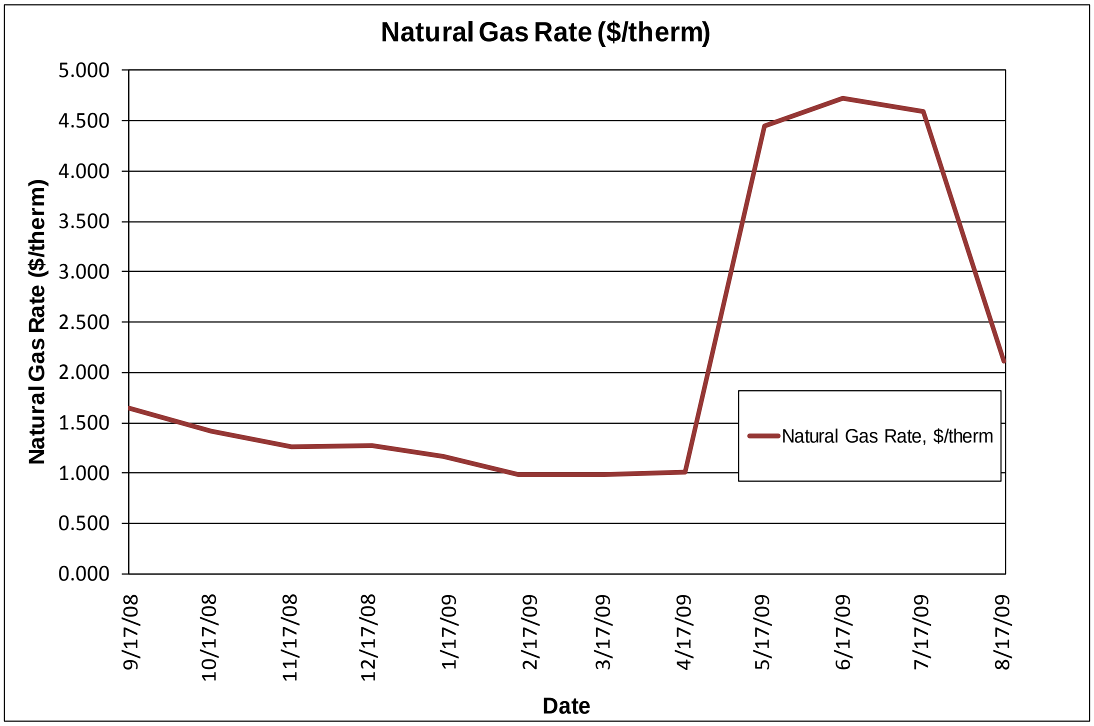
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Energy Purchasing

The Municipal building receives natural gas via one incoming meter. Elizabethtown gas supplies gas to the building. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. Electricity is also purchased via one incoming meter directly for the Municipal building from JCP&L without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations of 17% over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 79% 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.

Currently, New Jersey commercial buildings of similar type pay $0.150/kWh for electricity and $1.55/therm for natural gas. Currently, the electricity rate for the Municipal building is $.167/kWh, which means there is a potential cost savings of $7,787 per year. The current natural gas rate for the Municipal building is $1.21/therm which is better than the average natural gas cost. A large cost savings potential for electricity exists, however this involves contacting third party suppliers and negotiating utility rates. SWA recommends that the Vernon Township further explore opportunities of purchasing electricity from third party energy suppliers 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 Vernon Township service area. Vernon Township 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.





6.2. Energy Procurement strategies

Also, the Municipal building would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time to shed a minimum of 150 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option. Demand Response could be an option in the future when the Vernon Township may install a large enough back-up emergency generator.

7. METHOD OF ANALYSIS

7.1. Assumptions and tools

Energy modeling tool:	Established / standard industry assumptions, DOE 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	Operational Days per	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	Operational Days per	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	GF	Hallway	Parabolic	M	4'T12	2	2	40	D	24	365	24	184	1,822	T8	Parabolic	4'T8	E	D	2	2	32	24.0	365	6	134	1,226	596	0	596
2	GF	Hallway	Exit Sign	N	Inc. Exit	1	2	20	N	24	365	0	40	350	LEDex	Exit Sign	LED	N	N	1	1	5	24.0	365	1	6	53	298	0	298
3	GF	Boiler Rm	Parabolic	M	4'T12	2	2	40	S	2	365	24	184	152	T8	Parabolic	4'T8	E	S	2	2	32	2.0	365	6	134	102	50	0	50
4	GF	Hallway	Parabolic	M	4'T12	2	2	40	S	24	365	24	184	1,822	T8	Parabolic	4'T8	E	S	2	2	32	24.0	365	6	134	1,226	596	0	596
5	GF	Processing	Parabolic	M	4'T12	4	4	40	S	8	365	40	680	2,336	T8	Parabolic	4'T8	E	S	4	4	32	8.0	365	13	525	1,647	689	0	689
6	GF	Cells	Parabolic	M	4'T12	3	2	40	S	24	365	24	264	2,733	T8	Parabolic	4'T8	E	S	3	2	32	24.0	365	6	198	1,840	894	0	894
7	GF	Cells	Parabolic	M	4'T12	1	2	40	S	24	365	24	104	911	T8	Parabolic	4'T8	E	S	1	2	32	24.0	365	6	70	613	298	0	298
8	GF	Sally port	Parabolic	M	4'T12	2	2	40	N	24	365	24	184	1,822	T8	Parabolic	4'T8	E	N	2	2	32	24.0	365	6	134	1,226	596	0	596
9	GF	Sally port	HID	N	MH	2	1	150	N	24	365	38	338	3,294	PSMH	HID	PSMH	N	N	2	1	100	24.0	365	22	222	2,137	1,156	0	1,156
10	GF	Sally port	Exit Sign	N	Fl.	1	1	20	N	24	365	0	20	175	LEDex	Exit Sign	LED	N	N	1	1	5	24.0	365	1	6	53	123	0	123
11	GF	Interrogation	Parabolic	M	4'T12	2	4	40	S	8	365	40	360	1,168	T8	Parabolic	4'T8	E	S	2	4	32	8.0	365	13	269	823	345	0	345
12	GF	Interview rm	Parabolic	M	4'T12	2	4	40	S	8	365	40	360	1,168	T8	Parabolic	4'T8	E	S	2	4	32	8.0	365	13	269	823	345	0	345
13	GF	Office 33	Parabolic	M	4'T12	2	4	40	S	8	365	40	360	1,168	T8	Parabolic	4'T8	E	S	2	4	32	8.0	365	13	269	823	345	0	345
14	GF	Hallway	Parabolic	M	4'T12	2	2	40	S	24	365	24	184	1,822	T8	Parabolic	4'T8	E	S	2	2	32	24.0	365	6	134	1,226	596	0	596
15	GF	Armory 32	Parabolic	M	4'T12	2	4	40	S	2	365	40	360	292	T8	Parabolic	4'T8	E	S	2	4	32	2.0	365	13	269	206	86	0	86
16	GF	Electrical rm	Screw-in	N	CFL	2	1	25	S	2	365	0	50	37	N/A	Screw-in	CFL	N	S	2	1	25	2.0	365	0	50	37	0	0	0
17	GF	Interview rm 30	Parabolic	M	4'T12	2	2	40	S	8	365	24	184	607	T8	Parabolic	4'T8	E	S	2	2	32	8.0	365	6	134	409	199	0	199
18	GF	Locker rm	Parabolic	M	4'T12	5	4	40	S	12	365	40	840	4,380	T8	Parabolic	4'T8	E	OS	5	4	32	9.0	365	13	653	2,316	1,292	772	2,064
19	GF	Locker rm	Parabolic	M	4'T12	1	2	40	S	12	365	24	104	456	T8	Parabolic	4'T8	E	S	1	2	32	12.0	365	6	70	307	149	0	149
20	GF	Locker rm	Parabolic	M	2'T12	1	2	20	S	12	365	16	56	245	T8	Parabolic	2'T8	E	S	1	2	17	12.0	365	3	37	162	83	0	83
21	GF	Office 23	Parabolic	M	4'T12	2	4	40	S	8	365	40	360	1,168	T8	Parabolic	4'T8	E	S	2	4	32	8.0	365	13	269	823	345	0	345
22	GF	Bathroom Men	Parabolic	M	2'T12	1	1	20	S	4	365	8	28	41	T8	Parabolic	2'T8	E	S	1	1	17	4.0	365	2	19	28	13	0	13
23	GF	Bathroom Men	Screw-in	N	Inc	1	1	40	S	4	365	0	40	58	CFL	Screw-in	CFL	N	S	1	1	15	4.0	365	0	15	22	37	0	37
24	GF	Office 21	Parabolic	M	4'T12	4	4	40	S	8	365	40	680	2,336	T8	Parabolic	4'T8	E	S	4	4	32	8.0	365	13	525	1,647	689	0	689
25	GF	Office	Parabolic	M	2'T12	3	1	20	S	8	365	8	68	245	T8	Parabolic	2'T8	E	S	3	1	17	8.0	365	2	53	166	79	0	79
26	GF	Office 14	Parabolic	M	4'T12	4	4	40	S	8	365	40	680	2,336	T8	Parabolic	4'T8	E	S	4	4	32	8.0	365	13	525	1,647	689	0	689
27	GF	Communications	Parabolic	M	4'T12	2	2	40	S	24	365	24	184	1,822	T8	Parabolic	4'T8	E	S	2	2	32	24.0	365	6	134	1,226	596	0	596
28	GF	Communications	Screw-in	N	Inc	1	1	75	S	24	365	0	75	657	CFL	Screw-in	CFL	N	S	1	1	25	24.0	365	0	25	219	438	0	438
29	GF	Electrical panel rm	Parabolic	M	4'T12	2	2	40	S	2	365	24	184	152	T8	Parabolic	4'T8	E	S	2	2	32	2.0	365	6	134	102	50	0	50
30	GF	Evidence rm	Parabolic	M	4'T12	1	2	40	S	8	365	24	104	304	T8	Parabolic	4'T8	E	S	1	2	32	8.0	365	6	70	204	99	0	99
31	GF	Hallway	Parabolic	M	4'T12	6	2	40	S	24	365	24	504	5,466	T8	Parabolic	4'T8	E	S	6	2	32	24.0	365	6	390	3,679	1,787	0	1,787
32	GF	Hallway	Exit Sign	N	Fl.	2	1	20	N	24	365	2	42	385	LEDex	Exit Sign	LED	N	N	2	1	5	24.0	365	1	11	105	280	0	280
33	GF	Lunch Rm	Parabolic	M	4'T12	2	2	40	S	8	365	24	184	607	T8	Parabolic	4'T8	E	S	2	2	32	8.0	365	6	134	409	199	0	199
34	GF	Bathroom Women	Parabolic	M	4'T12	1	2	40	S	4	365	24	104	152	T8	Parabolic	4'T8	E	S	1	2	32	4.0	365	6	70	102	50	0	50
35	GF	Bathroom Women	Screw-in	N	Inc	1	1	40	S	4	365	0	40	58	CFL	Screw-in	CFL	N	S	1	1	15	4.0	365	0	15	22	37	0	37
36	GF	Office 7	Parabolic	M	4'T12	2	4	40	S	8	365	40	360	1,168	T8	Parabolic	4'T8	E	S	2	4	32	8.0	365	13	269	823	345	0	345
37	GF	Office 11	Parabolic	M	4'T12	1	4	40	S	8	365	40	200	584	T8	Parabolic	4'T8	E	S	1	4	32	8.0	365	13	141	412	172	0	172
38	GF	Chiefs office 1	Parabolic	M	4'T12	2	4	40	S	8	365	40	360	1,168	T8	Parabolic	4'T8	E	S	2	4	32	8.0	365	13	269	823	345	0	345

39	GF	Chiefs office 13	Parabolic	M	4'T12	2	4	40	S	8	365	40	360	1,168	T8	Parabolic	4'T8	E	S	2	4	32	8.0	365	13	269	823	345	0	345
40	GF	Office	Parabolic	M	4'T12	2	4	40	S	8	365	40	360	1,168	T8	Parabolic	4'T8	E	S	2	4	32	8.0	365	13	269	823	345	0	345
41	GF	Dispatch	Parabolic	M	4'T12	3	4	40	S	24	365	40	520	5,256	T8	Parabolic	4'T8	E	S	3	4	32	24.0	365	13	397	3,705	1,551	0	1,551
42	GF	Hallway	Parabolic	M	4'T12	2	2	40	S	24	365	24	184	1,822	T8	Parabolic	4'T8	E	S	2	2	32	24.0	365	6	134	1,226	596	0	596
43	GF	Hallway	Parabolic	M	4'T12	1	1	40	S	24	365	16	56	491	T8	Parabolic	4'T8	E	S	1	1	32	24.0	365	3	35	307	184	0	184
44	GF	Hallway	Exit Sign	N	Fl.	1	1	20	N	24	365	0	20	175	LEDex	Exit Sign	LED	N	N	1	1	5	24.0	365	1	6	53	123	0	123
45	GF	Office 6	Parabolic	M	4'T12	5	4	40	S	8	365	40	840	2,920	T8	Parabolic	4'T8	E	S	5	4	32	8.0	365	13	653	2,059	861	0	861
46	GF	Lobby	Parabolic	M	4'T12	3	4	40	S	24	365	40	520	5,256	T8	Parabolic	4'T8	E	S	3	4	32	24.0	365	13	397	3,705	1,551	0	1,551
47	GF	Lobby	Exit Sign	N	Fl.	1	1	20	N	24	365	0	20	175	LEDex	Exit Sign	LED	N	N	1	1	5	24.0	365	1	6	53	123	0	123
48	GF	Bathroom Women	Parabolic	M	2'T12	1	2	20	S	4	365	16	56	82	T8	Parabolic	2'T8	E	S	1	2	17	4.0	365	3	37	54	28	0	28
49	GF	Bathroom Men	Parabolic	M	2'T12	1	2	20	S	4	365	16	56	82	T8	Parabolic	2'T8	E	S	1	2	17	4.0	365	3	37	54	28	0	28
50	GF	Hallway	Parabolic	M	4'T12	2	2	40	S	24	365	24	184	1,822	T8	Parabolic	4'T8	E	S	2	2	32	24.0	365	6	134	1,226	596	0	596
51	GF	Hallway	Exit Sign	N	Fl.	1	1	20	N	24	365	0	20	175	LEDex	Exit Sign	LED	N	N	1	1	5	24.0	365	1	6	53	123	0	123
52	GF	Hallway	Parabolic	M	4'T12	2	2	40	S	24	365	24	184	1,822	T8	Parabolic	4'T8	E	S	2	2	32	24.0	365	6	134	1,226	596	0	596
53	GF	Meeting Rm	Parabolic	M	4'T12	28	4	40	S	10	208	40	4,520	11,648	T8	Parabolic	4'T8	E	OS	28	4	32	7.5	208	13	3,597	6,159	3,436	2,053	5,489
54	GF	File rm	Parabolic	M	4'T12	2	2	40	S	10	208	24	184	433	T8	Parabolic	4'T8	E	S	2	2	32	10.0	208	6	134	291	141	0	141
55	GF	Compressor rm	Parabolic	M	4'T12	1	2	40	S	2	208	24	104	43	T8	Parabolic	4'T8	E	S	1	2	32	2.0	208	6	70	29	14	0	14
56	GF	Oxygen rm	Parabolic	M	4'T12	1	2	40	S	2	208	24	104	43	T8	Parabolic	4'T8	E	S	1	2	32	2.0	208	6	70	29	14	0	14
57	GF	Meeting Rm	4' U-Shape	M	4'T12	14	2	40	S	10	208	12	1,132	2,679	T8	4' U-shape	4'T8	E	OS	14	2	32	7.5	208	8	904	1,572	582	524	1,107
58	GF	Meeting Rm	Exit Sign	N	Fl.	3	1	20	N	10	365	0	60	219	LEDex	Exit Sign	LED	N	N	3	1	5	10.0	365	1	16	66	153	0	153
59	GF	Sprinkler rm	Parabolic	M	4'T12	2	2	40	S	2	208	24	184	87	T8	Parabolic	4'T8	E	S	2	2	32	2.0	208	6	134	58	28	0	28
60	GF	Furnace rm	Parabolic	M	4'T12	2	2	40	S	2	208	24	184	87	T8	Parabolic	4'T8	E	S	2	2	32	2.0	208	6	134	58	28	0	28
61	GF	Lobby	Parabolic	M	4'T12	12	4	40	S	10	208	40	1,960	4,992	T8	Parabolic	4'T8	E	S	12	4	32	10.0	208	13	1,549	3,519	1,473	0	1,473
62	GF	Lobby	Exit Sign	N	Fl.	2	1	20	N	24	365	0	40	350	LEDex	Exit Sign	LED	N	N	2	1	5	24.0	365	1	11	105	245	0	245
63	GF	Entrance	Exit Sign	N	Fl.	2	1	20	N	24	365	0	40	350	LEDex	Exit Sign	LED	N	N	2	1	5	24.0	365	1	11	105	245	0	245
64	GF	Entrance	HID	N	MH	3	1	70	S	10	208	18	228	549	PSMH	HID	PSMH	N	S	3	1	45	10.0	208	10	145	343	206	0	206
65	GF	Meeting Rm near entrance	Parabolic	M	4'T12	6	4	40	S	10	208	40	1,000	2,496	T8	Parabolic	4'T8	E	OS	6	4	32	7.5	208	13	781	1,320	736	440	1,176
66	GF	Bathroom Women	Parabolic	M	4'T12	2	4	40	S	2	208	40	360	166	T8	Parabolic	4'T8	E	S	2	4	32	2.0	208	13	269	117	49	0	49
67	GF	Bathroom Women	Parabolic	M	4'T12	2	2	40	S	2	208	24	184	87	T8	Parabolic	4'T8	E	S	2	2	32	2.0	208	6	134	58	28	0	28
68	GF	Bathroom Men	Parabolic	M	4'T12	2	2	40	S	2	208	24	184	87	T8	Parabolic	4'T8	E	S	2	2	32	2.0	208	6	134	58	28	0	28
69	GF	Bathroom Men	Parabolic	M	4'T12	4	2	40	S	2	208	24	344	173	T8	Parabolic	4'T8	E	S	4	2	32	2.0	208	6	262	116	57	0	57
70	GF	Janitor's Closet	Parabolic	M	4'T12	1	4	40	S	2	208	40	200	83	T8	Parabolic	4'T8	E	S	1	4	32	2.0	208	13	141	59	25	0	25
71	GF	Office Area	Parabolic	M	4'T12	1	4	40	S	10	208	40	200	416	T8	Parabolic	4'T8	E	S	1	4	32	10.0	208	13	141	293	123	0	123
72	GF	Office	4' U-Shape	M	4'T12	3	2	40	S	10	208	12	252	574	T8	4' U-shape	4'T8	E	S	3	2	32	10.0	208	8	200	449	125	0	125
73	GF	Meeting Rm small	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
74	GF	Kitchen	Parabolic	M	4'T12	5	4	40	S	10	208	40	840	2,080	T8	Parabolic	4'T8	E	OS	5	4	32	7.5	208	13	653	1,100	614	367	980
75	S	Staircase	Screw-in	N	Inc	16	1	40	S	10	208	0	640	1,331	CFL	Screw-in	CFL	N	S	16	1	15	10.0	208	0	240	499	832	0	832
76	2	Hallway	Parabolic	M	4'T12	10	2	40	S	10	208	24	824	2,163	T8	Parabolic	4'T8	E	S	10	2	32	10.0	208	6	646	1,456	707	0	707
77	2	Hallway	Exit Sign	N	Fl.	3	1	20	N	24	365	0	60	526	LEDex	Exit Sign	LED	N	N	3	1	5	24.0	365	1	16	158	368	0	368
78	2	Bathroom Women	Parabolic	M	4'T12	1	4	40	S	2	208	40	200	83	T8	Parabolic	4'T8	E	S	1	4	32	2.0	208	13	141	59	25	0	25
79	2	Bathroom Women	Parabolic	M	4'T12	2	2	40	S	2	208	24	184	87	T8	Parabolic	4'T8	E	S	2	2	32	2.0	208	6	134	58	28	0	28
80	2	Bathroom Men	Parabolic	M	4'T12	2	2	40	S	2	208	24	184	87	T8	Parabolic	4'T8	E	S	2	2	32	2.0	208	6	134	58	28	0	28
81	2	Bathroom Men	Parabolic	M	4'T12	1	4	40	S	2	208	40	200	83	T8	Parabolic	4'T8	E	S	1	4	32	2.0	208	13	141	59	25	0	25
82	2	Bathroom Men	Parabolic	M	4'T12	1	2	40	S	2	208	24	104	43	T8	Parabolic	4'T8	E	S	1	2	32	2.0	208	6	70	29	14	0	14
83	2	Bathroom Women	Parabolic	M	4'T12	1	2	40	S	2	208	24	104	43	T8	Parabolic	4'T8	E	S	1	2	32	2.0	208	6	70	29	14	0	14
84	2	Purchasing recreation	Parabolic	M	4'T12	11	4	40	S	10	208	40	1,800	4,576	T8	Parabolic	4'T8	E	S	11	4	32	10.0	208	13	1,421	3,226	1,350	0	1,350
85	2	Purchasing recreation office	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
86	2	Purchasing office	Parabolic	M	4'T12	3	4	40	S	10	208	40	520	1,248	T8	Parabolic	4'T8	E	S	3	4	32	10.0	208	13	397	880	368	0	368
87	2	Purchasing office files	Parabolic	M	4'T12	4	4	40	S	10	208	40	680	1,664	T8	Parabolic	4'T8	E	S	4	4	32	10.0	208	13	525	1,173	491	0	491
88	2	Health clinic	Parabolic	M	4'T12	7	4	40	S	10	208	40	1,160	2,912	T8	Parabolic	4'T8	E	S	7	4	32	10.0	208	13	909	2,053	859	0	859

89	2	Health clinic bath	Parabolic	M	2'T12	1	1	20	S	10	208	8	28	58	T8	Parabolic	2'T8	E	S	1	1	17	10.0	208	2	19	40	19	0	19
90	2	Court rm	Parabolic	M	4'T12	24	4	40	S	10	208	40	3,880	9,984	T8	Parabolic	4'T8	E	S	24	4	32	10.0	208	13	3,085	7,039	2,945	0	2,945
91	2	Electrical rm	Parabolic	M	4'T12	1	1	40	S	2	208	16	56	23	T8	Parabolic	4'T8	E	S	1	1	32	2.0	208	3	35	15	9	0	9
92	2	Court rm	Exit Sign	N	Inc. Exit	4	2	20	N	24	208	0	160	799	LEDex	Exit Sign	LED	N	N	4	1	5	24.0	208	1	21	120	679	0	679
93	2	Court rm	Exit Sign	N	Fl.	2	1	20	N	24	365	0	40	350	LEDex	Exit Sign	LED	N	N	2	1	5	24.0	365	1	11	105	245	0	245
94	2	Lunch Rm	Parabolic	M	4'T12	3	4	40	S	10	208	40	520	1,248	T8	Parabolic	4'T8	E	OS	3	4	32	7.5	208	13	397	660	368	220	588
95	2	Planning Zoning	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
96	2	Planning Zoning	Parabolic	M	4'T12	8	4	40	S	10	208	40	1,320	3,328	T8	Parabolic	4'T8	E	OS	8	4	32	7.5	208	13	1,037	1,760	982	587	1,568
97	2	Planning Zoning	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
98	2	Building dept	Parabolic	M	4'T12	8	4	40	S	10	208	40	1,320	3,328	T8	Parabolic	4'T8	E	OS	8	4	32	7.5	208	13	1,037	1,760	982	587	1,568
99	2	Building dept	4' U-Shape	M	4'T12	3	2	40	S	10	208	12	252	574	T8	4' U-shape	4'T8	E	S	3	2	32	10.0	208	8	200	449	125	0	125
100	2	Building dept	Parabolic	M	4'T12	3	4	40	S	10	208	40	520	1,248	T8	Parabolic	4'T8	E	OS	3	4	32	7.5	208	13	397	660	368	220	588
101	2	Tax collector	Parabolic	M	4'T12	6	4	40	S	10	208	40	1,000	2,496	T8	Parabolic	4'T8	E	OS	6	4	32	7.5	208	13	781	1,320	736	440	1,176
102	2	Tax collector file rm	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
103	2	Tax collector file rm	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
104	2	Tax collector	4' U-Shape	M	4'T12	1	2	40	S	10	208	12	92	191	T8	4' U-shape	4'T8	E	S	1	2	32	10.0	208	8	72	150	42	0	42
105	2	Tax assessor	Parabolic	M	4'T12	10	4	40	S	10	208	40	1,640	4,160	T8	Parabolic	4'T8	E	OS	10	4	32	7.5	208	13	1,293	2,200	1,227	733	1,960
106	2	Hallway front	Parabolic	M	4'T12	14	2	40	S	10	208	24	1,144	3,028	T8	Parabolic	4'T8	E	OS	14	2	32	7.5	208	6	902	1,529	990	510	1,500
107	2	Fire prevention	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
108	2	Entrance	Screw-in	N	CFL	9	1	20	S	10	208	0	180	374	N/A	Screw-in	CFL	N	S	9	1	20	10.0	208	0	180	374	0	0	0
109	2	Entrance	Exit Sign	N	Fl.	2	1	20	N	24	365	0	40	350	LEDex	Exit Sign	LED	N	N	2	1	5	24.0	365	1	11	105	245	0	245
110	2	Finance	Parabolic	M	4'T12	6	4	40	S	10	208	40	1,000	2,496	T8	Parabolic	4'T8	E	OS	6	4	32	7.5	208	13	781	1,320	736	440	1,176
111	2	Bathroom Men	Parabolic	M	4'T12	1	2	40	S	10	208	24	104	216	T8	Parabolic	4'T8	E	S	1	2	32	10.0	208	6	70	146	71	0	71
112	2	Bathroom Women	Parabolic	M	4'T12	1	2	40	S	10	208	24	104	216	T8	Parabolic	4'T8	E	S	1	2	32	10.0	208	6	70	146	71	0	71
113	2	Bathroom Women	Screw-in	N	Inc	1	1	40	S	10	208	0	40	83	CFL	Screw-in	CFL	N	S	1	1	15	10.0	208	0	15	31	52	0	52
114	2	Bathroom Men	Screw-in	N	Inc	1	1	40	S	10	208	0	40	83	CFL	Screw-in	CFL	N	S	1	1	15	10.0	208	0	15	31	52	0	52
115	2	Bathroom Women	Screw-in	N	Inc	1	1	40	S	10	208	0	40	83	CFL	Screw-in	CFL	N	S	1	1	15	10.0	208	0	15	31	52	0	52
116	2	Office	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
117	2	Personnel	Parabolic	M	4'T12	4	4	40	S	10	208	40	680	1,664	T8	Parabolic	4'T8	E	OS	4	4	32	7.5	208	13	525	880	491	293	784
118	2	Personnel	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
119	2	Conference rm	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
120	2	Hallway exit	Parabolic	M	4'T12	1	2	40	S	10	208	24	104	216	T8	Parabolic	4'T8	E	S	1	2	32	10.0	208	6	70	146	71	0	71
121	2	Township clerk	Parabolic	M	4'T12	6	4	40	S	10	208	40	1,000	2,496	T8	Parabolic	4'T8	E	OS	6	4	32	7.5	208	13	781	1,320	736	440	1,176
122	2	Township clerk	Parabolic	M	4'T12	4	4	40	S	10	208	40	680	1,664	T8	Parabolic	4'T8	E	OS	4	4	32	7.5	208	13	525	880	491	293	784
123	2	Township manager	Parabolic	M	4'T12	8	4	40	S	10	208	40	1,320	3,328	T8	Parabolic	4'T8	E	OS	8	4	32	7.5	208	13	1,037	1,760	982	587	1,568
124	2	Township Mgr. Off.	Parabolic	M	4'T12	1	2	40	S	10	208	24	104	216	T8	Parabolic	4'T8	E	S	1	2	32	10.0	208	6	70	146	71	0	71
125	2	Township Mgr. Off.	Parabolic	M	4'T12	4	4	40	S	10	208	40	680	1,664	T8	Parabolic	4'T8	E	OS	4	4	32	7.5	208	13	525	880	491	293	784
126	2	Township Mgr. Off.	Screw-in	N	Inc	2	1	60	S	10	208	0	120	250	CFL	Screw-in	CFL	N	S	2	1	20	10.0	208	0	40	83	166	0	166
127	2	Township Mgr. Off.	Parabolic	M	4'T12	2	4	40	S	10	208	40	360	832	T8	Parabolic	4'T8	E	S	2	4	32	10.0	208	13	269	587	245	0	245
128	2	Township Mgr. Off.	Parabolic	M	4'T12	1	2	40	S	10	208	24	104	216	T8	Parabolic	4'T8	E	S	1	2	32	10.0	208	6	70	146	71	0	71
129	2	Court clerk	Parabolic	M	4'T12	9	2	40	S	10	208	24	744	1,947	T8	Parabolic	4'T8	E	OS	9	2	32	7.5	208	6	582	983	636	328	964
130	Ext	Exterior	Exterior	N	MH	4	1	100	T	24	365	25	425	4,380	PSMH	Exterior	PSMH	N	PC	4	1	65	12.0	365	14	274	1,384	1,612	1,384	2,996
131	Ext	Exterior	Exterior	N	MH	2	1	250	T	24	365	63	563	5,484	PSMH	Exterior	PSMH	N	PC	2	1	175	12.0	365	38	388	1,866	1,752	1,866	3,618
132	Ext	Exterior	Exterior	N	Inc	2	1	100	S	24	365	0	200	1,752	CFL	Exterior	CFL	N	PC	2	1	35	12.0	365	0	70	307	1,139	307	1,445
133	Ext	Exterior	Exterior	N	Inc	2	1	75	S	24	365	0	150	1,314	CFL	Exterior	CFL	N	PC	2	1	25	12.0	365	0	50	219	876	219	1,095
134	Ext	Exterior	Exterior	N	MH	9	1	75	T	24	365	19	694	7,411	PSMH	Exterior	PSMH	N	PC	9	1	50	12.0	365	11	461	2,405	2,602	2,405	5,006
135	Ext	Exterior	Exterior	N	Inc	2	2	40	S	24	365	0	160	1,402	CFL	Exterior	CFL	N	PC	2	2	15	12.0	365	0	60	263	876	263	1,139
Totals:						459	345	5,580				3,389	56,789	189,646						459	343	1,420				42,564	110,834	22,615	12,413	35,028
Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space																														

Appendix B: Third Party Energy Suppliers (ESCOs)

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

Third Party Electric Suppliers for JCPL Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.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
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 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
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
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 Elizabethtown Gas Co. 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
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
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.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
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
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com