



Steven Winter Associates, Inc.
Architects and Engineers

50 Washington Street
Norwalk, CT 06854
www.swinter.com

Telephone
Facsimile
E-mail:

(203) 8111-0200
(203) 852-0741
swinter@swinter.com

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**Local Government Energy Program
Energy Audit Report**

For

***William T. Hornidge Municipal Complex
1600 Pinewald Road, Beachwood, NJ 08722***

Project Number: LGEA39



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INTRODUCTION

Launched in 2008, the Local Government Energy Audit (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 the additional 25% will also be paid by the program. The Board of Public Utilities (BPU) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

On November 13, 2009, Steven Winter Associates, Inc. (SWA) and PMK Group, Inc., a business unit of Birdsall Services Group (BSG-PMK), performed an energy audit and assessment for the William T. Hornidge Municipal Complex. The building is located at 1600 Pinewald Road, Beachwood, New Jersey 08722, in Ocean County. The current conditions and energy-related information were collected in order to analyze the implementation of energy conservation measures for the building.

The one-story facility, built in 1995, is 14,896 square feet in area. The building includes the borough's police department as well as several municipal departments and offices, including the mayor's office, the borough's court, the tax office, and the construction department, among others. The police station has continuous operation, while the rest of the building operates from 8:00AM-5:00PM, Monday through Friday.

Energy data and building information collected in the field were analyzed to determine the baseline energy performance of each building. Using spreadsheet-based calculation methods, SWA and BSG-PMK estimated the energy and cost savings associated with the installation of each of the recommended energy conservation measures. The findings for the building are summarized in this report.

The goal of this energy audit is to provide sufficient information to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the buildings.

EXECUTIVE SUMMARY

This document contains the energy audit report for the William T. Hornidge Municipal Complex, located at 1600 Pinewald Road, Beachwood, New Jersey 08722.

Based on the field visit performed by SWA and BSG-PMK staff on November 13, 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.

Current conditions

In the most recent full year of data collected, October, 2008 through September, 2009, the Municipal Complex consumed a total of 345,600 kWh of electricity for a total cost of \$56,222, and 9,859 therms of natural gas for a total cost of \$13,853.

With electricity and fossil fuel combined, the building consumed 2,165 MMBtus of energy at a total cost of \$70,075.

BSG-PMK has entered energy information about the Municipal Complex in the US Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. In order to compare commercial buildings equitably, the *Portfolio Manager* ratings convey the consumption of each type of energy in a single common unit. The EPA uses source energy to represent the total amount of raw fuel required to operate the building. The site energy use intensity for the complex is 139 kBtu/sq.ft./year. After energy efficiency improvements are made, future utility bills can be added to the *Portfolio Manager* and the site energy use intensity for a different time period can be compared to the year 2009 baseline to track the changes in energy consumption associated with the energy improvements.

The building performance rating could not be determined because this is a mixed-use facility, comprised by non-eligible space types categorized as "Other".

Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). BSG-PMK encourages the Borough of Beachwood to continue entering utility data in *Energy Star Portfolio Manager* in order to track whether normalized source energy use over time.

(Refer to Section 1.3 for Energy Star Rating)

Category I Recommendations: Capital Improvement Measures

- 1) The water heater has passed its useful life, and should be replaced with a high-efficiency equivalent. Due to the relatively low cost of natural gas this building pays, this measure could not be considered an Energy Conservation Measure due to the high payback period.
- 2) Install a 10-kW system of ground-mounted photovoltaic panels. This system would cost about \$90,000, but would not yield enough energy savings to yield a positive net present value, and therefore cannot be recommended as an ECM.

Category II Recommendations: Operations and Maintenance

- 1) Re-commissioning HVAC systems and Building Automation Controls system including rebalancing and VAV box operational checks.

Category III Recommendations: Energy Conservation Measures - Upgrades with associated energy savings

At this time, PMK-SWA highly recommends a total of three (3) Energy Conservation Measures (ECMs) for the Municipal Complex which are summarized in the following Table 1. The total investment cost for these ECMs, without incentives, is **\$148,168**, and with incentives, is **\$139,551**. SWA estimates a first year savings of **\$9,237** with a simple payback of **15.1 years**. SWA estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the building by **76,237 lbs of CO₂**, which is equivalent to removing approximately 6 cars from the roads each year.

There are various incentives that the Borough of Beachwood could apply for that could also help lower the cost of installing the ECMs. SWA/BSG-PMK recommends that the Borough apply for the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project. A new NJ Clean Power program, Direct Install, could also assist to cover up to 80% of the capital investment. In order to qualify, the facility being upgraded must not have had a peak demand that exceeded 200 kW in any of the preceding 12 months; the highest peak demand for the complex in the previous year was 91.2 kW.

The following 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	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	Lighting Upgrade	Similar Projects	\$1,488	\$270	\$1,218	3,286	0.7	0	0.75	\$0.00	\$535	15	\$6,291	2.28	417%	28%	44%	\$5,164	4,502
	Occupancy Sensors		\$6,580	\$2,335	\$4,245	8,040	1.6	0	1.84	\$0.00	\$1,308	10	\$11,045	3.25	160%	16%	30%	\$11,371	11,015
TOTAL			\$8,068	\$2,605	\$5,463	11,326	2.3	0	2.59	\$0.00	\$1,843	-	\$17,336	2.96	-	-	-	\$16,536	15,517

Table 2 - Recommended Extended-Payback ECMs																			
ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW, Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings, \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO ₂ Reduced, lbs/yr
2	Replace Condensing Units & AHUs	RS Means CostWorks 2009	\$60,000	\$4,600	\$55,400	23,216	4.7	0	5.32	\$0.00	\$3,914	15	\$46,061	14.15	-17%	-1%	1%	-\$8,670	31,805
3	Upgrade Boilers & Pumps and Install OAR	Similar Projects	\$80,000	\$1,313	\$78,688	1,839	0.4	2,256	15.57	\$0.00	\$3,480	35	\$72,643	22.61	-8%	0%	1%	-\$18,086	28,915
TOTAL			\$140,000	\$5,913	\$134,088	25,054	5.1	2,256	20.88	\$0.00	\$7,395	-	\$118,704	18.13	-	-	-	-\$26,757	60,720

ROI: Return on Investment (%)

Assumptions:

Discount rate: 3.2% per DOE FEMP guidelines

Energy price escalation rate: 0% per DOE FEMP guidelines

Electricity rate: \$0.16 \$/kWh (Entire Year)

Gas rate: \$0.17 \$/kWh (Cooling Season Only)

Gas rate: \$1.41 \$/therm (Entire Year)

Area of Building (SF) 14,896

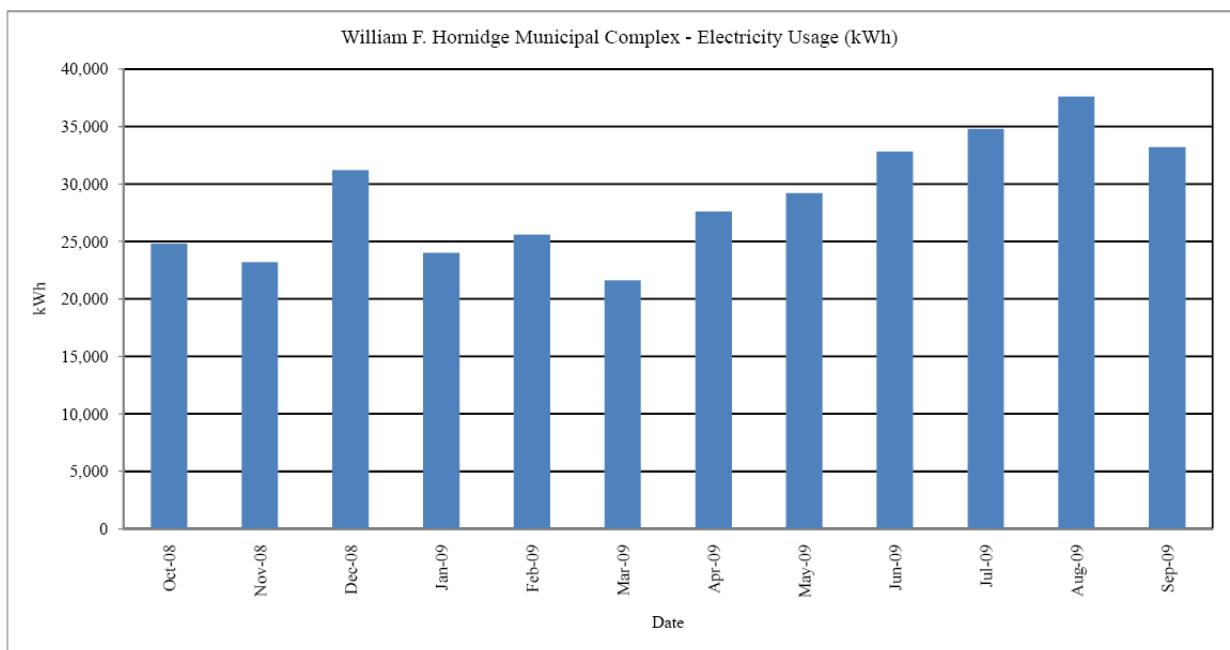
1. HISTORIC ENERGY CONSUMPTION

1.1. Energy usage and cost analysis

BSG-PMK analyzed utility bills from October, 2008 through September, 2009 that were received from the utility companies supplying the Municipal Complex with electric and natural gas.

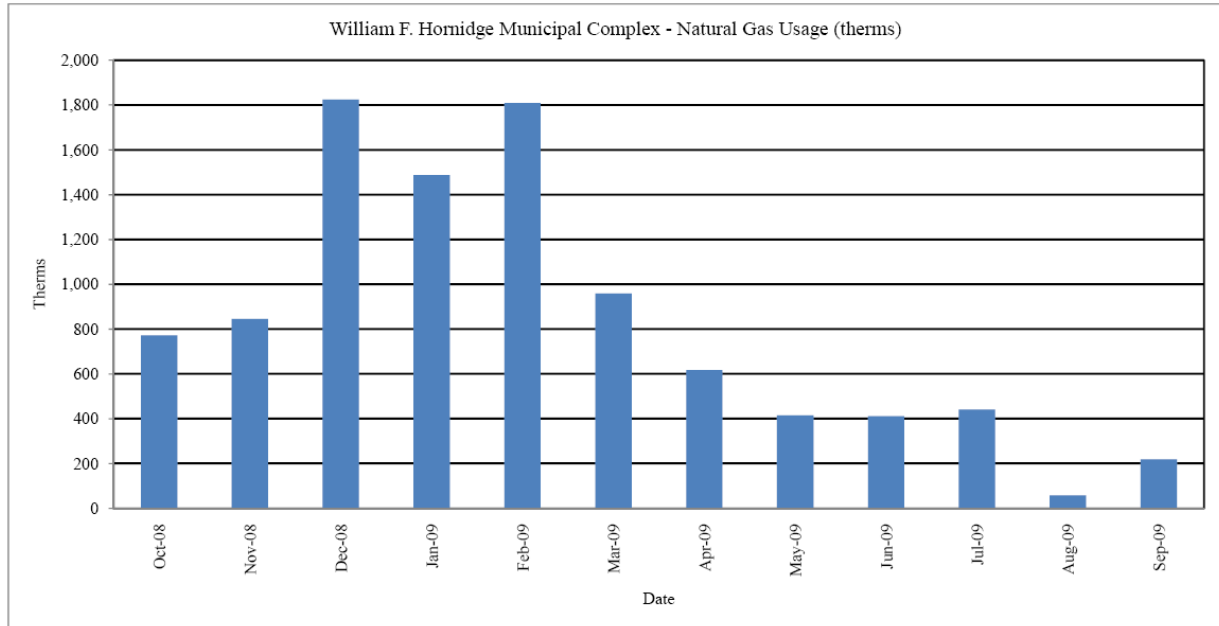
Electricity - The Municipal Complex is currently served by one electric meter and buys electricity from Jersey Central Power & Light at **an average rate of \$0.16/kWh** based on 12 months of utility bills from October, 2008 through September, 2009. The building purchased **345,600 kWh or \$56,222 worth of electricity** during that time span.

The following chart shows electricity usage for the building based on utility bills from October, 2008 through September, 2009:



Natural Gas - The Municipal Complex is currently served by one natural gas meter and receives transmission services from New Jersey Natural Gas and receives supply services from Pepco Energy at **an average aggregated rate of \$1.41/therm** based on 12 months of utility bills from October, 2008 through September, 2009. The unit cost is fairly low, due to minimal gas consumption from May through September. The building purchased **9,859 therms or \$13,853 worth of natural gas** during that time span.

The following chart shows the natural gas consumption for the complex based on natural gas bills for the 12 month period of October, 2008 through September, 2009:



1.2. Utility rate

The Municipal Complex currently purchases electricity from Jersey Central Power & Light for electricity use (kWh) with a separate (kW) demand charge. The complex currently pays an average rate of approximately \$0.16/kWh based on the 12 months of utility bills of October, 2008 through September, 2009.

The Municipal Complex currently purchases natural gas transmission from New Jersey Natural Gas and supply from Pepco Energy at an average aggregated rate of \$1.41/therm based on 12 months of utility bills from October, 2008 through September, 2009.

1.3. Energy benchmarking

The building information and utility data were entered into the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. BSG-PMK and SWA recommend that the Borough maintain the Portfolio Manager account at the link below. As the account is maintained, BSG-PMK and SWA can share with the Borough and allow future data to be added and tracked using the benchmarking tool.

http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager

Username: beachwoodboro

Password: beachwood

Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). BSG-PMK encourages the Borough to continue entering utility data in Energy Star Portfolio Manager in order to track whether normalized source energy use over time.



STATEMENT OF ENERGY PERFORMANCE

Municipal Complex

Building ID: 2005382
For 12-month Period Ending: September 30, 2009¹
Date SEP becomes ineligible: N/A

Date SEP Generated: January 25, 2010

Facility

Municipal Complex
 1600 Pinewald Rd
 Beachwood, NJ 08722

Facility Owner

Borough of Beachwood
 1600 Pinewald Rd
 Beachwood, NJ 08722

Primary Contact for this Facility

Elizabeth Mastropasqua
 1600 Pinewald Rd
 Beachwood, NJ 08722

Year Built: 1995

Gross Floor Area (ft²): 15,600

Energy Performance Rating² (1-100) N/A

Site Energy Use Summary³

Electricity - Grid Purchase(kBtu)	1,179,187
Natural Gas (kBtu) ⁴	985,927
Total Energy (kBtu)	2,165,114

Energy Intensity⁵

Site (kBtu/ft ² /yr)	139
Source (kBtu/ft ² /yr)	319

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	232
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Electric Distribution Utility

FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	50%
Building Type	Other

Meets Industry Standards⁶ for Indoor Environmental Conditions:

Ventilation for Acceptable Indoor Air Quality	N/A
Acceptable Thermal Environmental Conditions	N/A
Adequate Illumination	N/A

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

Certifying Professional

N/A

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 Site Energy Use Intensity is 139 kBtu/ft²yr compared to the national average of 104 kBtu/ft²yr for commercial buildings classified similarly by the Energy Star Portfolio Manager. Implementing this report's recommendations will reduce use by approximately 23.5 kBtu/ft²yr, which when implemented would lower the buildings energy consumption.

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building envelope

2.1.1. Exterior Walls

The exterior wall envelope of the Municipal building is constructed with a brick veneer and EFIS (Exterior Finish Insulation System) near the vestibule. The interior of walls are finished with insulation and gypsum wall board. The exterior walls were found to be in good condition



Brick masonry exterior walls with EFIS near vestibule

2.1.2. Roof

The Municipal Complex has a pitched roof covered with asphalt shingles. No water damage or drainage issues are evident. There is a standing seam metal roof over the police entrance. Both roofs are original and in good condition.



2.1.3. Base

The Municipal Complex building's base is a 4" concrete slab-on grade with a perimeter footing and concrete block or poured concrete stem walls.

2.1.4. Windows

There are (35 qty.) 48" x 72" double paned- vinyl framed windows, as well as (4 qty.) 48" x 36" double pane vinyl framed windows. The windows are original and have do not indicate any evidence of dried caulking or infiltration.



Double Pane Aluminum Framed Windows

2.1.5. Exterior doors

There are two glass doors in the front entrance into the vestibule. These doors are sealed tightly and show no signs of infiltration. There are eight additional insulated hollow metal doors located around the perimeter of the building. All doors were found to be in good condition.



2.1.6. Building air tightness

The Municipal Complex building was built in 1995 and is in very good condition. There were no signs of abnormal air infiltration in this building.

2.2. HVAC Systems

2.2.1 Heating

Heating is provided by two original Slant Fin Caravan model # GG375 gas-fired hot water boilers. The boilers are approximately 80% efficient and have an input capacity of 375 MBH and an output capacity of 300 MBH.

Heat is distributed throughout the building via two hot water circulation pumps (one used as a back-up) in the boiler room, which feed the baseboards; these pumps are rated at 35 GPM, 50 foot head, 1 HP, @ 1,750 RPM.

There are also two cabinet hot-water heaters and two unit heaters. The cabinet heaters are rated at 430 CFM, 21.2 MBH, @ 11 GPM, with a 0.1 HP blower. The unit heaters are rated at 500 CFM, 15 MBH, @ 8 GPM.

The heating and cooling systems are controlled by a building automation system. There have been complaints that suggest a temperature imbalance. The control system may not be functioning properly.

Category I Recommendation: Capital Improvements- Follow-up with the service contact at Advanced Building Controls to determine how the complaints are handled, and schedule re-commissioning of the control system. The building automation system should be re-commissioned to verify that it is working properly, and to correct any temperature imbalances within the building.

Category III Recommendation: ECM #3 – Upgrade the current boilers to two high-efficiency condensing boilers, upgrade the circulation pumps and motors to premium-efficiency units, and install outside air reset control.

2.2.2 Cooling

Cooling is provided by three Carrier condensing units. CU-1 is a 20-ton unit, with model # 38AKS024 and an Energy Efficiency Ratio (EER) of 9.4. CU-2 and CU-3 are 15-ton units, with model # 38AE016 and an EER of 9.4. All three units were installed in 1995. CU-1, CU-2 and CU-3 serve air handlers AH-1, AH-2 and AH-3, respectively.

AH-1 serves VAV boxes in the county clerk's office, clerk's office, copy room, training room, treasury office, and the Tax & Water Department's office. It has a supply CFM rating of 7,100 with 1,280 CFM of outside air, and is rated at 241 MBH cooling capacity.

AH-2 serves VAV boxes in the lobby, detective's office, squad room, communications room, Lieutenant's office, Sergeant's office, and Chief's office. It has a supply CFM ratings of 5,100 with 900 CFM of outside air, and is rated at 171 MBH cooling capacity.

AH-3 serves VAV boxes in the lobby, court, council room, judge's office, and violations office. It has a supply CFM ratings of 4,400 with 1,800 CFM of outside air, and is rated at 190 MBH cooling capacity.

Category III Recommendation: ECM #2 – Replace all condensing units to newer units that use Puron refrigerant, rather than R-22 refrigerant, and a higher EER rating. The air-handlers should also be replaced with units that are compatible with the new type of refrigerant.

2.2.3 Ventilation

Ventilation is provided by six wall-mounted fans in the attic. The fans were found to be in good condition

2.2.4 Domestic Hot Water

Water is heated by a gas-fired 50-gallon AO Smith water heater, located in the boiler room. The unit has surpassed its useful life.

Category I Recommendation #3 – Replace the current water heater with a high-efficiency equivalent.

2.3. Electrical systems

2.3.1. Lighting

A complete inventory of all interior, exterior, and exit sign light fixtures were examined and documented in Appendix A of this report including an estimated total lighting power consumption. Our initial findings indicate that performing a detailed lighting upgrade per the recommendations in Appendix A will result in an annual savings of \$ 1,826.38 based on the current \$0.16/kWh and the current occupancy schedule. Implementation of this ECM will cost approximately \$8,068. Currently the Board of Public Utilities (BPU) would offer an estimated Rebate of \$2,605 yielding a net cost of \$5,463 for this project. With a yearly savings of \$1,826.38 the payback on this ECM would be just about 3 years.

The facility is lit primarily with energy efficient T-8 fixtures with electric ballasts as well as compact fluorescent fixtures. A few T-12 fixtures with magnetic ballasts and incandescent fixture remain in place with little occupancy. All exit signs are lit by ultra-efficient light-emitting diodes (LEDs).

Category III Recommendation: ECM #1 – Retrofit all remaining T-12 fixtures with T-8's and replace all incandescent lamps with compact fluorescents. Also, Install occupancy sensors in all rooms with a high potential for savings.

Lighting inventory w/recommended lighting upgrades are detailed in Appendix A.

2.3.2. Appliances and process

The facility has miscellaneous appliances throughout, which include: thirty-seven computers, five televisions, four coffee makers, three microwaves, one mini-fridge, one regular refrigerator, and one toaster oven.

2.3.3. Elevators

There are no elevators at this facility.

2.3.4. Other electrical systems

There are no other major mechanical systems at this facility.

3. EQUIPMENT LIST

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating	2 Slant Fin hot water boilers, 375 MBH input, 300 MBH output	Boiler room	Slant Fin M# GG 375	Natural Gas	Entire Building	1995	40%
Heating	2 hot water circulation pumps (1 main, 1 backup); 35 GPM, 50' head, 1hp, 1,750 RPM	Boiler room	Taco (model # not accessible)	Electric	Boilers	1995	25%
Heating	2 cabinet heaters: 430 CFM; 1,050 RPM; 21.2 MBH; 11 GPM; 0.1 HP	Ceilings of entrances	Vulcan M# RC 1200/04	Natural Gas	Ceilings of entrances	1995	25%
Heating	Cabinet heater, no specs	Hallway, Police Station	Qmark (no model #)	Natural Gas	Hallway, Police Station	1995	25%
Heating	Unit heater: 500 CFM; 1,550 RPM; 15 MBH; 8 GPM	Attic	Sterling QV M# HS 118A	Natural Gas	Attic	1995	25%
Heating	Unit heater: 500 CFM; 1,550 RPM; 15 MBH; 8 GPM	Boiler room	Sterling QV M# HS 118A	Natural Gas	Boiler room	1995	25%
Cooling	CU-1: 20-ton condensing unit, 9.4 EER	Outside building	Carrier M# 38AKS024	Electric	AHU-1	1995	0%
	AHU-1: Supply - 7,100 CFM; outside, 1,280 CFM; 970 RPM; 7.5 HP; 241 MBH cooling coil	Attic	Carrier M# 39NXH092	Electric	Tax & Water Depts.	1995	25%
Cooling	CU-2: 15-ton condensing units, 9.4 EER	Outside building	Carrier M# 38AE016	Electric	AHU-2	1995	0%
	AHU-2: Supply - 5,100 CFM; outside - 900 CFM; 1,430 RPM; 7.5 HP; 171 MBH cooling coil	Attic	Carrier M# 39NXH112	Electric	Police Dept.	1995	25%
Cooling	CU-3: 15-ton condensing units, 9.4 EER	Outside building	Carrier M# 38AE016	Electric	AHU-3	1995	0%
	AHU-3: Supply - 4,400 CFM; outside - 1,800 CFM; 1,410 RPM; 5 HP; 181 MBH cooling coil; 190 MBH heating coil	Attic	Carrier M# 39NXH117	Electric	Courtroom	1995	25%
Cooling/ Vent.	23 VAV boxes	Entire building	Unknown	Electric	Entire building	1995	25%
Vent.	Through-the-wall fan	Attic	No nameplate	Electric	Attic	1995	0%
Domestic Hot Water	Water heater; 50 gallons, 50 MBH, 45.5 gal/hr	Boiler room	AO Smith M# BT 65 930A	Natural Gas	Entire Building	1995	0%

Note: The remaining useful life of a system (in %) is the relationship between the system manufactured and / or installed date and the standard life expectancy of similar equipment based on ASHRAE (2003), ASHRAE Handbook: HVAC Applications, Chapter 36.

4. ENERGY CONSERVATION MEASURES

Based on the assessment of the Municipal Complex, BSG-PMK 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 Improvement Measures

- 1) Follow-up with the service contact at Advanced Building Controls to determine how the complaints are handled, and schedule re-commissioning of the control system. The building automation system should be re-commissioned to verify that it is working properly, and to correct any temperature imbalances within the building.
- 2) As part of the re-commissioning, balance the variable air volume (VAV) boxes.
- 3) The water heater has passed its useful life, and should be replaced with a high-efficiency equivalent. Due to the relatively low cost of natural gas this building pays, this measure could not be considered an Energy Conservation Measure due to the high payback period of 22 years.
- 4) Install a 10-kW system of ground-mounted photovoltaic panels. This system would cost about \$90,000, but would not yield enough energy savings to yield a positive net present value, and therefore cannot be recommended as an ECM.

Category II Recommendations: Operations and Maintenance

- 1) Re-commissioning HVAC systems and Building Automation Controls system including rebalancing and VAV box operational checks.

Category III Recommendations: Energy Conservation Measures

Summary table

ECM #	Description
1	Lighting Upgrade & Sensor Installations
2	Replace Condensing Units & Air Handlers
3	Upgrade Boilers & Pumps and Install OAR

ECM#1: Lighting Upgrade & Sensor Installations

Description:

Lighting at the Beachwood Municipal Building consists primarily of energy efficient T-8 fluorescent lamps with electronic ballasts. There are also a number of energy efficient compact fluorescent lamps in the lobby and hallways. Standard T-12 fixtures were found in areas with typically low occupancy and the same with a few incandescent. It is recommended that all remaining T-12 fixtures with magnetic ballasts be retrofit with T-8 lamps and electronic ballasts. Lighting replacement generally yields a very good payback, due to the fact that most lighting usage in commercial buildings is fairly high and the installation is relatively inexpensive.

Also in the building are a few 75-watt incandescent lamps. It is recommended that these be replaced with compact fluorescents. Compact fluorescents of only 26 watts are needed to produce equivalent light levels.

Lighting sensors are another way to save energy in commercial buildings. Rooms where the lights stay on in spaces that are typically unoccupied are prime candidates. These sensors turn the lights on when the room is occupied and off when it is not. This can lead to a reduction in energy use on controlled fixtures by 50% or more. In this facility, lighting sensors were recommended in offices, work rooms, and locker rooms.

Recommended lighting upgrades are detailed in Appendix A.

Installation cost:

Estimated installed cost: Lighting: \$1,488; Sensors: \$6,580; Total: \$8,068
 Rebates/incentives: Lighting: \$270; Sensors: \$2,335; Total: \$2,605
 Net cost, with incentives: Lighting: \$1,218; Sensors: \$4,245; **Total: \$5,463**
 Source of cost estimate: Empirical Data

Economics (without incentives):

ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kWh 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, \$	CO2 Reduced, lbs/yr
1	Lighting Upgrade	Similar Projects	\$1,488	\$270	\$1,218	3,286	0.7	0	0.75	\$0.00	\$535	15	\$6,291	2.28	417%	28%	44%	\$5,164	4,502
	Occupancy Sensors		\$6,580	\$2,335	\$4,245	8,040	1.6	0	1.84	\$0.00	\$1,308	10	\$11,045	3.25	160%	16%	30%	\$11,371	11,015

Assumptions:

The electric cost used in this ECM was \$0.16/kWh, which was the Municipal Complex's average rate for the 12-month period ranging from October 1, 2008 through September 30, 2009. The replacements for each lighting fixture, the costs to replace or retrofit each one, and the rebates and wattages for each fixture are located in Appendix A.

Rebates/financial incentives:

The New Jersey SmartStart rebate for upgrading lighting fixtures to T-8 lamps ranges from \$10 to \$20 per fixture. The total rebate this ECM qualifies for is \$2,605.

ECM#2: Replace Condensing Units & AHUs

Description:

The facility is cooled by three Carrier two 15-ton condensing units, and one 20-ton unit. These units have reached the end of their useful lives, and more energy-efficient models are now on the market. These newer models use Puron refrigerant, a more efficient fluid than the current refrigerant, R-22. It is recommended that the current units be replaced with units that have higher Energy Efficiency Ratios (EERs), preferable of 10 or higher. The air handlers that these condensing units serve must also be changed, to units that are compatible with Puron refrigerant.

Installation cost:

	Equipment	Labor	Total
CU-1 (20-tons)	\$10,000	\$6,250	\$16,250
AHU-1	\$5,500	\$3,250	\$8,750
CU-2 (15 tons)	\$7,250	\$4,000	\$11,250
AHU-2	\$4,000	\$2,250	\$6,250
CU-3	\$7,250	\$4,000	\$11,250
AHU-3	\$4,000	\$2,250	\$6,250
Total	\$38,000	\$22,000	\$60,000

Source of cost estimate: RS Means CostWorks 2009

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, \$	CO2 Reduced, lbs/yr
2	Replace Condensing Units & AHUs	RS Means CostWorks 2009	\$60,000	\$4,600	\$55,400	23,216	4.7	0	5.32	\$0.00	\$3,914.40	15	\$46,061	14.15	-17%	-1%	1%	-\$8,670	31,805

Assumptions:

Using the facility's electricity bills from October 1st, 2008 through September 30th, 2009, it was determined that the cost of electricity during the cooling season (May through September) is currently \$0.17/kWh. EER (Energy Efficiency Ratio, or the ratio of cooling capacity to electric consumption) values for the new units are 10 for the 15-ton units and 11 for the 20-ton unit. The current units had EERs of 9.4 at the time of their installation, and their age and condition indicates a decrease of their EERs of 20%, to around 7. 864 cooling degree-days and a 0.4% dry-bulb temperature of 91°F were used for

calculations; this data was provided by the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE). The desired indoor temperature during the cooling season was assumed to be 72°F.

The following equation, the degree-day equation for cooling systems, was used to calculate the electric consumptions of the current and proposed air-conditioners:

$$\frac{\text{Capacity} \times \text{Degree-Days} \times 24 \frac{\text{hours}}{\text{day}}}{1,000 \times \text{EER} \times (\text{Temp}_{\text{outdoor}} - \text{Temp}_{\text{indoor}})} = \text{Electric Consumption (in kWh)}$$

Using this formula, it was calculated that the current cooling system consumed 92,882 kWh of electricity last year, and the proposed system would consume 63,370 kWh.

However, from May through September, there was a noticeable spike in electric consumption. This is due to cooling. The average electric consumption from October through April is the electric due to lighting, computers, etc., and a rise in temperature will not cause this amount to change. This spike in electric consumption accounted for an extra 73,065 kWh of electricity to be used from May through September – this would be the actual consumption used for cooling, and it is 79% of the 92,882 kWh that was calculated earlier; therefore, the proposed system would actually consume 79% of the 63,370 kWh that was calculated, or 49,849 kWh. This value was used in our ECM evaluation.

Rebates/financial incentives:

This ECM is eligible for New Jersey’s SmartStart rebate, which pays up to \$92 per ton for unitary air-conditioning systems, or \$4,600 for this ECM.

ECM#3: Upgrade Boilers & Pumps and Install Outdoor Air Reset Control

Description:

Heating is provided to the Municipal Complex by two 375 MBH, hot water Slant Fin boilers, which are fueled by natural gas. These boilers are only 15 years old and have 40% of their useful lives remaining, but much more efficient models are now available. The current unit was 80% efficient at the time of its purchase, and due to its age, can be estimated to be around 70% now. It is recommended that these units, along with their pumps, be replaced with 95% efficient units; it is also recommended to install outdoor air reset control, which would save an additional 8%. Outside air reset controllers reduce the maximum boiler water temperature depending on the outside air temperature; for instance, if the outside air temperature is 0°F, the boiler temperature will be 180°F, but if the outside air temperature is 40°F, the boiler temperature will only need to be 130°F.

Installation cost:

Estimated installed cost: \$80,000
 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, \$	CO2 Reduced, lbs/yr
3	Upgrade Boilers & Pumps and Install OAR	Similar Projects	\$80,000	\$1,313	\$78,688	1,839	0.4	2,256	15.57	\$0.00	\$3,480.19	35	\$72,643	22.61	-8%	0%	1%	-\$18,086	28,915

Assumptions:

The cost per therm of natural gas that was used, taken from twelve months of the Municipal Complex’s energy bills, was \$1.41. During the calendar year of October, 2008 through September, 2009, the Municipal Complex consumed 9,859 therms of natural gas. Using the cumulative heating capacity of every heating unit in the building, the boilers accounted for 94% of this combined heating load (the only other gas-consuming unit being the water heater), and therefore can be assumed to account for 94% of the 9,859 therms of natural gas consumed, or 9,243 therms. The annual savings by the new system was the annual fuel consumption, multiplied by the difference between the efficiencies of the new and old systems. An additional 8% of the annual fuel consumption was added to the savings, representing the energy saved by the outdoor air reset control.

Rebates/financial incentives:

This ECM is eligible for New Jersey’s SmartStart rebate, which pays \$1.75 per MBH for boilers this size, or \$1,313 for this ECM.

BSG-PMK/SWA has reviewed several funding options for the purposes of subsidizing the costs for installing the energy conservation measures noted within this report.

Although funding options are constantly changing and updating this project may benefit from enrolling in a number of alternative programs such as the; The NJ SmartStart program with Technical Assistance, alternate funding by applying for financing and competitive grants through the United States Department of Energy as well as local utility incentive programs in an effort to offset a portion of the cost of ECM implementation.

The Smart Start program offers reimbursement incentives for various equipment purchases, and lighting incentives. The benefits and requirements of this program can be found at:

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

Financial assistance is also available through the United States Department of Energy in the form of; Grants, Cooperative Research and development agreements, small business innovation research, and Loan Guarantee Programs. Further information for these programs is available at:

http://www1.eere.energy.gov/financing/types_assistance.html

Local Utility incentives such as a Direct Install Program, offer incentives that can provide up to 80% subsidy of the cost to install particular ECM's. As each utility company has different guidelines and incentives it is important to contact your local utility authority for eligibility in these programs.

Additional funding may also be found through the following funding methods:

- Energy Savings Improvement Program (ESIP) – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements.
- Municipal Bonds – Municipal bonds are a bond issued by a city or other local government, or their agencies. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.
- Power Purchase Agreement – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as “power purchase agreements.” These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system.

BSG-PMK/SWA recommends the Owner review the use of the above-listed funding options in addition to utilizing their standard method of financing for facilities upgrades in order to fund the proposed energy conservation measures.

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There are currently no existing renewable energy systems.

5.2. Solar Photovoltaic

As a result of our study, the grounds of the Municipal Complex building have been identified as conducive for the application of a Photovoltaic (PV) system.

A PV system with a design capacity of 10 kW was selected. The total annual generating capacity of the system is 12,544 kWh as estimated using PV WATTS calculator provided by the Department of Energy (DOE), National Renewable Energy Laboratory (NREL).



AC Energy
&
Cost Savings



Station Identification		Results			
City:	Atlantic_City	Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
State:	New_Jersey				
Latitude:	39.45° N	1	3.50	865	138.40
Longitude:	74.57° W	2	4.12	914	146.24
Elevation:	20 m	3	4.77	1123	179.68
PV System Specifications		4	5.30	1170	187.20
DC Rating:	10.0 kW	5	5.57	1246	199.36
DC to AC Derate Factor:	0.770	6	5.65	1175	188.00
AC Rating:	7.7 kW	7	5.70	1209	193.44
Array Type:	Fixed Tilt	8	5.50	1176	188.16
Array Tilt:	35.0°	9	5.24	1109	177.44
Array Azimuth:	180.0°	10	4.54	1019	163.04
Energy Specifications		11	3.49	798	127.68
Cost of Electricity:	16.0 ¢/kWh	12	3.07	740	118.40
		Year	4.71	12544	2007.04

This proposed PV system would include 50 flat, crystalline PV modules installed on pole mounts on the front and side lawn. The system is based on commonly used 200 Watt PV modules, and one (1) inverter for conversion to AC power.

The proposed system would generate approximately, 3 percent of the electric power consumed annually by the Municipal Complex building. It is noted this system would supplement the utility power supply since PV electricity production is based on weather and the system size is limited to 3 percent. The estimated cost of construction would be approximately \$100,000 for this system. The approximate annual savings would be \$7,776, which would make the approximate payback 11.6 years

<i>PV System –Beachwood Municipal Complex</i>		
	Savings	Cost
Estimated Cost Of Construction		\$100,000
REIP Incentive		-\$10,000
Township Investment		\$90,000
First Year Electric Energy Savings	\$2,007	
Estimated Annual SREC Revenue	\$6,272	
Annual Maintenance		\$500
First Year Savings	\$7,776	
Simple Payback Analysis	Approximately 11.6 Years	

5.3. Solar Thermal Collectors

Solar thermal collectors are not cost effective for this project and are not recommended due to the low amount of domestic hot water use throughout the building.

5.4. Combined Heat and Power

CHP is not applicable to this project because of the HVAC system type and limited domestic hot water usage.

5.5. Geothermal

Geothermal is not applicable to this project because of the age of the building and amount of space needed for the installation of the system.

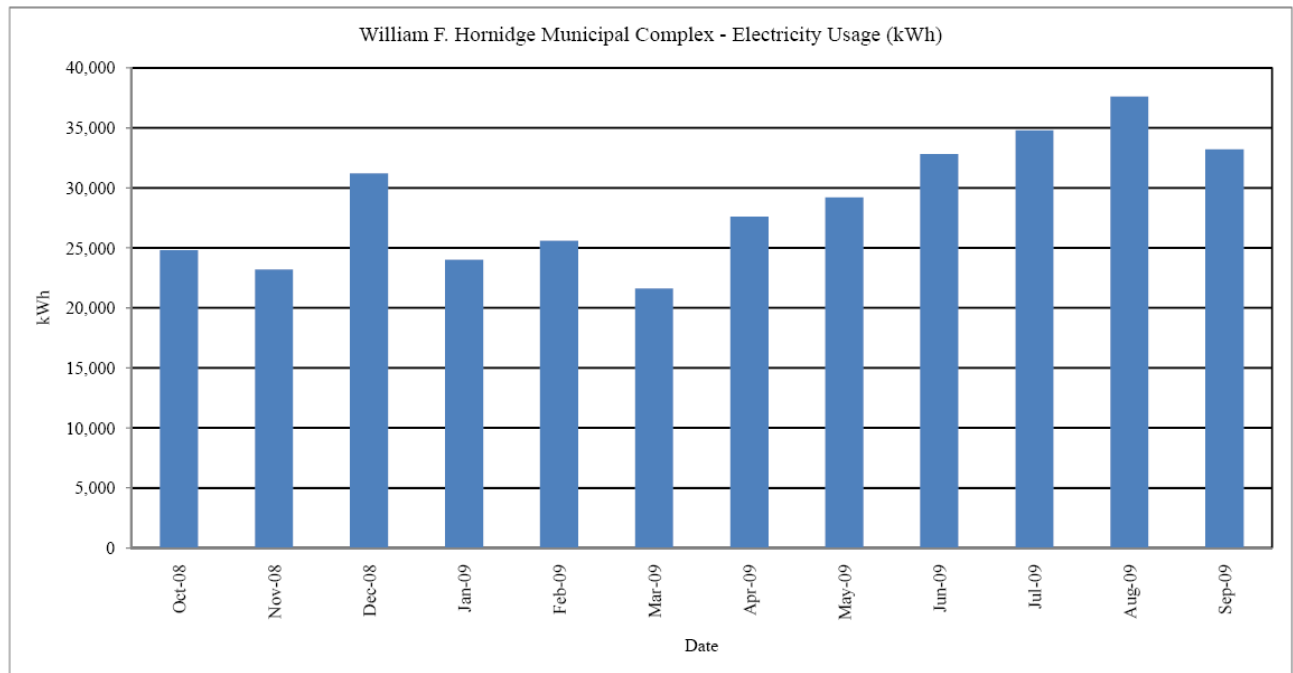
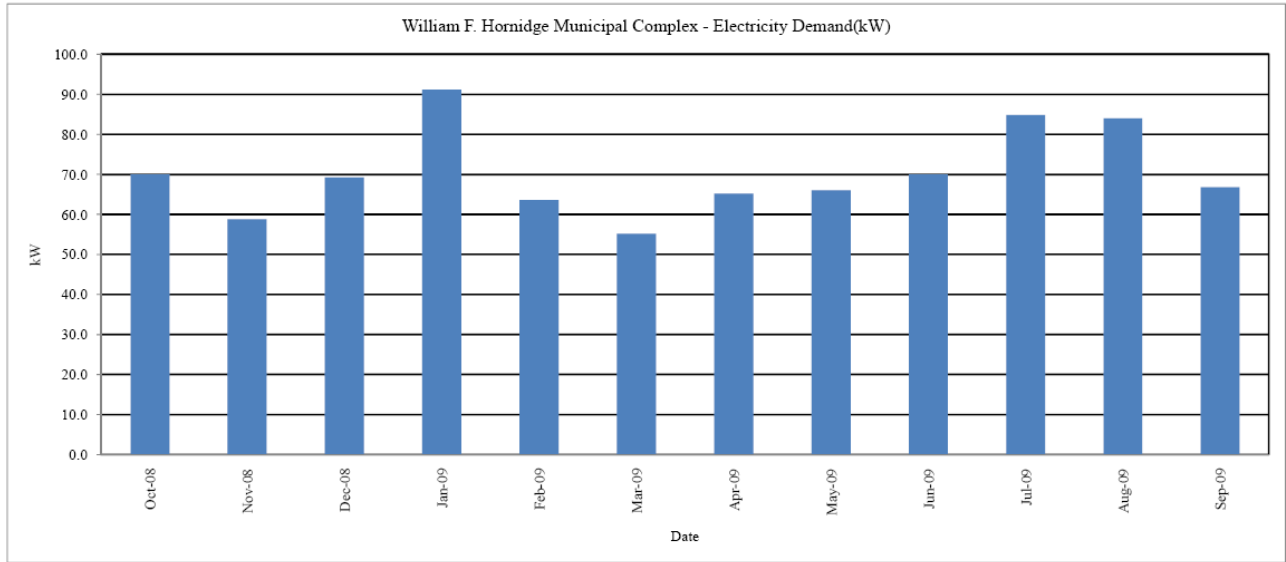
5.6. Wind

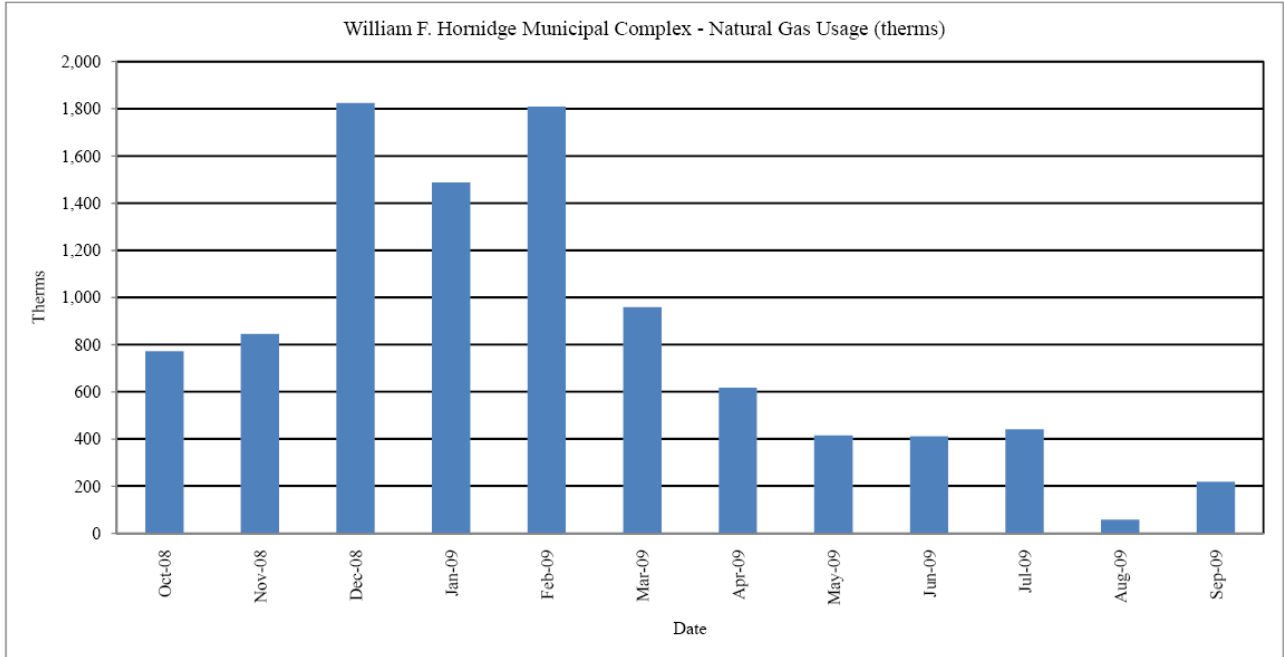
Wind power production is not appropriate for this location because required land is not available for the wind turbine. Also, the available wind energy resource is very low.

6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load profiles

The average electrical peak demand for the Municipal Complex during previous year was 70.4 kW and the maximum peak demand was 91.2 kW. The electric and gas load profiles for this project are presented in the following charts. The first chart shows the electric demand (in kW) for the previous 12 months and the other two charts show electric (in kWh) and gas usage (in therms), respectively.



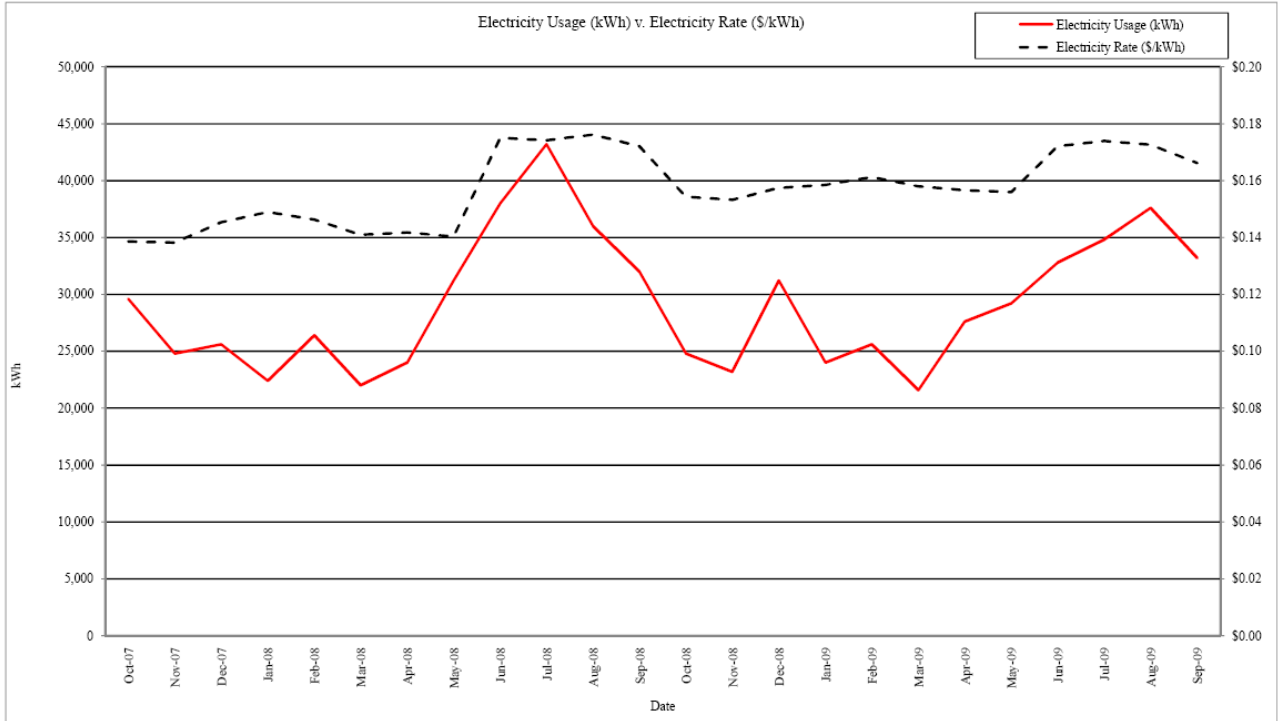


6.2. Energy Procurement strategies

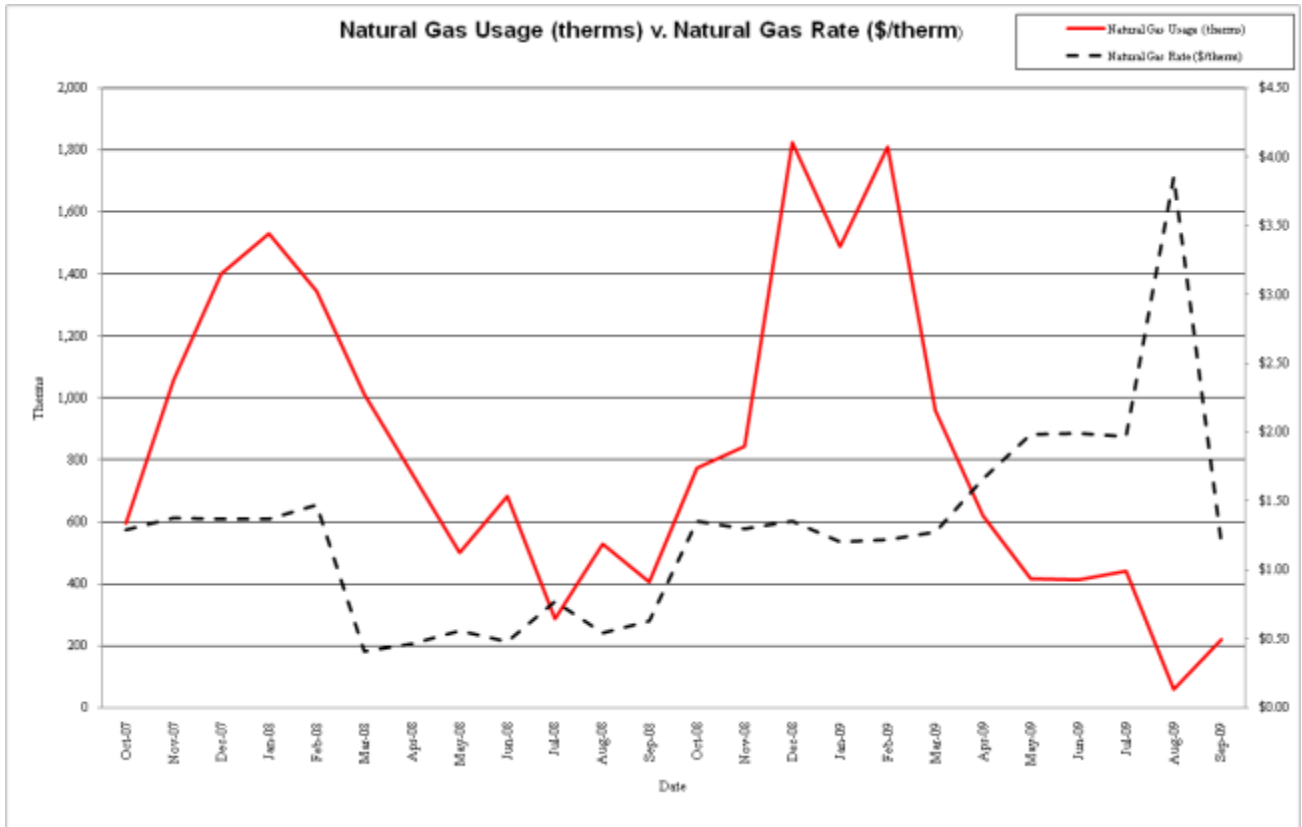
Billing analysis shows price fluctuations of over 20% over the course of the year for the building electrical and natural gas accounts. Customers that have a large variation in monthly billing rates can often reduce the costs associated with energy procurement by selecting a third party energy supplier. Contact the NJ Energy Choice Program for further information on Energy Services Companies (ESCOs) that can act as third party energy suppliers. Purchasing electricity from an ESCO can reduce electric rate fluctuation and ultimately reduce the annual cost of energy for the school.

Using an average of \$0.15/kWh the Beachwood Municipal Complex could save approximately \$4,382 on their electric bills. The Borough already purchases natural gas from a third party supplier for \$1.41/therm which is lower than the average rate of \$1.55/therm.

Appendix B contains a complete list of third party energy suppliers.



Electricity prices reflect electricity usage



Natural gas prices fluctuate as expected with usage

7. METHOD OF ANALYSIS

7.1. Assumptions and tools

Energy modeling tool: established / standard industry assumptions, E-Quest
Cost estimates: RS Means 2009 (Facilities Maintenance & Repair Cost Data)
RS Means 2009 (Building Construction Cost Data)
RS Means 2009 (Mechanical Cost Data)
Published and established specialized equipment material and labor costs
Cost estimates also based on utility bill analysis and prior experience with similar projects

7.2. Disclaimer

This engineering audit was prepared using the most current and accurate fuel consumption data available for the site. The estimates that it projects are intended to help guide the owner toward best energy choices. The costs and savings are subject to fluctuations in weather, variations in quality of maintenance, changes in prices of fuel, materials, and labor, and other factors. Although we cannot guarantee savings or costs, we suggest that you use this report for economic analysis of the building and as a means to estimate future cash flow.

THE RECOMMENDATIONS PRESENTED IN THIS REPORT ARE BASED ON THE RESULTS OF ANALYSIS, INSPECTION, AND PERFORMANCE TESTING OF A SAMPLE OF COMPONENTS OF THE BUILDING SITE. ALTHOUGH CODE-RELATED ISSUES MAY BE NOTED, SWA STAFF HAVE NOT COMPLETED A COMPREHENSIVE EVALUATION FOR CODE-COMPLIANCE OR HEALTH AND SAFETY ISSUES. THE OWNER(S) AND MANAGER(S) OF THE BUILDING(S) CONTAINED IN THIS REPORT ARE REMINDED THAT ANY IMPROVEMENTS SUGGESTED IN THIS SCOPE OF WORK MUST BE PERFORMED IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS THAT APPLY TO SAID WORK. PARTICULAR ATTENTION MUST BE PAID TO ANY WORK WHICH INVOLVES HEATING AND AIR MOVEMENT SYSTEMS, AND ANY WORK WHICH WILL INVOLVE THE DISTURBANCE OF PRODUCTS CONTAINING MOLD, ASBESTOS, OR LEAD.

LIGHTING ANALYSIS

Borough of Beachwood
Municipal Building
1600 Pinwald Road



Upgrade Code	Upgrade Description	Existing		Proposed		Lighting		
		Fixture	Watts	Fixture	Watts	Total # of Upgrades	Cost per Upgrade (\$)	SmartStart Rebate per Upgrade
1	2x4 Fixture, (3) 32W T8 w/Elec. Ballasts	3L4' T8/ELEC	89	No Upgrade	89	143	\$0.00	\$0.00
2	Incandescent Fixture w/ 60W Lamp / Replace with 26W CF	60W Inc	60	26W CF	26	2	\$8.00	\$0.00
3	High Pressure Sodium Lamp w/ 100W Lamp / Replace with 44W CF	100W HPS/BALLAST	130	44W CF	44	2	\$26.00	\$0.00
4	LED Exit Sign	LED	2	No Upgrade	2	5	\$0.00	\$0.00
5	Compact Fluorescent Fixture with 26W Lamp	26W CF	26	No Upgrade	26	54	\$0.00	\$0.00
6	2x4 Fixture, (2) 34W T12 w/Elec. Ballasts / Retrofit with (2) 28W Lamps and Elec. Ballast	2L4' EE/STD	80	2L4' T8/ELEC	61	18	\$75.00	\$15.00
7	Incandescent Fixture w/ 75W Lamp / Replace 26W CF	75W Inc	75	26W CF	26	7	\$10.00	\$0.00
8								
9								
10								

Variables:

\$0.1627	Avg. Electric Rate (\$/kWh)
	Avg. Demand Rate (\$/kW)
2080	Operating Hours/Year
8	Operating Hours/Work Day

Assumptions:

25%	Occupancy Sensor Savings (Avg)
40%	Occupancy Sensor Savings (>Avg)

Notes:

Seq. #	Upgrade Code	Room/Area	Hrs/Work Day	Hrs/Year	Existing			Proposed			kW Reduction	Lighting			Occupancy Sensors (ONLY)				SmartStart Rebate		Lighting & Occupancy Sensors							
					Fixture	Qty.	Watts	Foot Candles	Fixture	Qty.		Watts	Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	Lighting	Sensors	Energy Savings, kWh	Post-Rebate Cost (\$)	Savings (\$)	Payback (yrs)		
TOTALS																												
					16486				15561	0.925	3286	\$1,488.00	\$534.62	2.8	8040	\$6,580.00	\$1,308.12	5.0	\$270	\$2,335	11225	\$5,463.00	\$1,826.38	3.0				
1	2	Front Entrance	9	2340	60W Inc	2	120		26W CF	2	52	0.068	159	\$16.00	\$25.89	0.6			0	\$0	\$0.00		\$0	\$0	159	\$16.00	\$25.89	0.6
2	3	Lobby, Hallway	9	2340	100W HPS/BALL	2	260		44W CF	2	88	0.172	402	\$52.00	\$65.48	0.8			0	\$0	\$0.00		\$0	\$0	402	\$52.00	\$65.48	0.8
3	5		9	2340	26W CF	34	884		No Upgrade	34	884	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
4	4		24	8760	LED	2	4		No Upgrade	2	4	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
5	6	Mechanical Room	5	1300	2L4' EE/STD	2	160		2L4' T8/ELEC	2	122	0.038	49	\$150.00	\$8.04	18.7			0	\$0	\$0.00		\$30	\$0	49	\$120.00	\$8.04	14.9
6	5	Rear Entrance	9	2340	26W CF	2	52		No Upgrade	2	52	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
7	1	Restroom	9	2340	3L4' T8/ELEC	1	89		No Upgrade	1	89	0	0	\$0.00	\$0.00		OSR	1	52	\$260	\$8.47	30.7	\$0	\$35	52	\$225.00	\$8.47	26.6
8	1	Restroom	9	2340	3L4' T8/ELEC	1	89		No Upgrade	1	89	0	0	\$0.00	\$0.00		OSR	1	52	\$260	\$8.47	30.7	\$0	\$35	52	\$225.00	\$8.47	26.6
9	1	Stairway	12	3120	3L4' T8/ELEC	1	89		No Upgrade	1	89	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
10	6	Attic	12	3120	2L4' EE/STD	6	480		2L4' T8/ELEC	6	366	0.114	356	\$450.00	\$57.87	7.8			0	\$0	\$0.00		\$90	\$0	356	\$360.00	\$57.87	6.2
11	7	Room w/ AHU-1	12	3120	75W Inc	2	150		26W CF	2	52	0.098	306	\$20.00	\$49.75	0.4			0	\$0	\$0.00		\$0	\$0	306	\$20.00	\$49.75	0.4
12	7	Room w/ AHU-2	12	3120	75W Inc	3	225		26W CF	3	78	0.147	459	\$30.00	\$74.62	0.4			0	\$0	\$0.00		\$0	\$0	459	\$30.00	\$74.62	0.4
13	7	Room w/ AHU-3	12	3120	75W Inc	2	150		26W CF	2	52	0.098	306	\$20.00	\$49.75	0.4			0	\$0	\$0.00		\$0	\$0	306	\$20.00	\$49.75	0.4
14	1	Storage room	3	780	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
15	1	Office	9	2340	3L4' T8/ELEC	18	1602		No Upgrade	18	1602	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
16	1	Mail/copy	9	2340	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00		OSW	1	104	\$200	\$16.94	11.8	\$0	\$20	104	\$180.00	\$16.94	10.6
17	1	Rm 106 File	9	2340	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00		OSW	1	104	\$200	\$16.94	11.8	\$0	\$20	104	\$180.00	\$16.94	10.6
18	1	Rm 105 Vault	9	2340	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
19	1	Rm 112 Finance Officer Office	9	2340	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00		OSR	1	208	\$260	\$33.88	7.7	\$0	\$140	208	\$120.00	\$33.88	3.5
20	1	Rm 113 Municipal Clerk's Office	9	2340	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00		OSR	1	208	\$260	\$33.88	7.7	\$0	\$140	208	\$120.00	\$33.88	3.5
21	1	Rm 110 Council Office	9	2340	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00		OSR	1	104	\$260	\$16.94	15.3	\$0	\$70	104	\$190.00	\$16.94	11.2
22	4	Exit sign	9	2340	LED	1	2		No Upgrade	1	2	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
23	1	Rm 114 Mayors Office	9	2340	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00		OSR	1	104	\$260	\$16.94	15.3	\$0	\$70	104	\$190.00	\$16.94	11.2
24	5	Hallway	9	2340	26W CF	3	78		No Upgrade	3	78	0	0	\$0.00	\$0.00		OSR	1	46	\$260	\$7.42	35.0	\$0	\$105	46	\$155.00	\$7.42	20.9
25	5	Hallway	9	2340	26W CF	10	260		No Upgrade	10	260	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
26	1	Rm 115 Administrator office	9	2340	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00		OSR	1	208	\$260	\$33.88	7.7	\$0	\$140	208	\$120.00	\$33.88	3.5
27	1	Rm 116 Lounge	9	2340	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00		OSW	1	104	\$200	\$16.94	11.8	\$0	\$20	104	\$180.00	\$16.94	10.6

Seq. #	Upgrade Code	Room/Area	Hrs/Work Day	Hrs/Year	Existing				Proposed			KW Reduction	Lighting				Controls		Occupancy Sensors (ONLY)				Lighting & Occupancy Sensors					
					Fixture	Qty.	Watts	Foot Candles	Fixture	Qty.	Watts		Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	Type	Qty.	Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	SmartStart Rebate		Energy Savings, kWh	Post-Rebate Cost (\$)	Savings (\$)	Payback (yrs)
																							Lighting	Sensors				
28	6	Restroom	7	1820	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	35	\$75.00	\$5.63	13.3	OSR	1	36	\$260	\$5.92	43.9	\$15	\$35	62	\$285.00	\$10.14	28.1
29	6	Restroom	7	1820	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	35	\$75.00	\$5.63	13.3	OSR	1	36	\$260	\$5.92	43.9	\$15	\$35	62	\$285.00	\$10.14	28.1
30	1	Room 103 Tax Assesor Office	9	2340	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
31	5		9	2340	26W CF	1	26		No Upgrade	1	26	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
32	1	Rm 141 OEM Coordinator office	9	2340	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00		OSR	1	208	\$260	\$33.88	7.7	\$0	\$140	208	\$120.00	\$33.88	3.5
33	1	Rm 118 Bldg Dept.	9	2340	3L4' T8/ELEC	6	534		No Upgrade	6	534	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
34	6	Janitor Closet	3	780	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	15	\$75.00	\$2.41	31.1			0	\$0	\$0.00		\$15	\$0	15	\$60.00	\$2.41	24.9
35	1	Rm 135 Court Administrator	9	2340	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
36	1	Back Office	9	2340	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00		OSR	1	104	\$260	\$16.94	15.3	\$0	\$70	104	\$190.00	\$16.94	11.2
37	1	Code enforcement	9	2340	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00		OSR	1	104	\$260	\$16.94	15.3	\$0	\$70	104	\$190.00	\$16.94	11.2
38	1	Fire Prevention	9	2340	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
39	1	Violations	9	2340	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
40	1	Closet/Copy	5	1300	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00		OSR	1	58	\$260	\$9.41	27.6	\$0	\$70	58	\$190.00	\$9.41	20.2
41	1	Court Room	9	2340	3L4' T8/ELEC	25	2225		No Upgrade	25	2225	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
42		Police																										
43	1	Hallway	24	8760	3L4' T8/ELEC	3	267		No Upgrade	3	267	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
44	1	Rm 155 Office	24	8760	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00		OSR	1	780	\$260	\$126.85	2.0	\$0	\$140	780	\$120.00	\$126.85	0.9
45	1	Rm 154 Office	24	8760	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00		OSR	1	780	\$260	\$126.85	2.0	\$0	\$140	780	\$120.00	\$126.85	0.9
46	1	Rm 153 Office	24	8760	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00		OSR	1	780	\$260	\$126.85	2.0	\$0	\$140	780	\$120.00	\$126.85	0.9
47	1	Rm 152 Office	24	8760	3L4' T8/ELEC	6	534		No Upgrade	6	534	0	0	\$0.00	\$0.00		OSR	1	1169	\$260	\$190.27	1.4	\$0	\$210	1,169	\$50.00	\$190.27	0.3
48	1	Rm 151 Office	24	8760	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00		OSR	1	780	\$260	\$126.85	2.0	\$0	\$140	780	\$120.00	\$126.85	0.9
49	1	Storage room	3	780	3L4' T8/ELEC	1	89		No Upgrade	1	89	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
50	1	Rm 144 Office	24	8760	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00		OSR	1	780	\$260	\$126.85	2.0	\$0	\$140	780	\$120.00	\$126.85	0.9
51	6	Restroom	24	8760	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	166	\$75.00	\$27.08	2.8	OSR	1	175	\$260	\$28.51	9.1	\$15	\$35	300	\$285.00	\$48.81	5.8
52	6	Restroom	24	8760	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	166	\$75.00	\$27.08	2.8	OSR	1	175	\$260	\$28.51	9.1	\$15	\$35	300	\$285.00	\$48.81	5.8
53	1	Rm 140 Squad Room	24	8760	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00		OSR	1	780	\$260	\$126.85	2.0	\$0	\$140	780	\$120.00	\$126.85	0.9
54	1	Rm 139 Interrogation	9	2340	3L4' T8/ELEC	2	178		No Upgrade	2	178	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
55	4	hallway	24	8760	LED	2	4		No Upgrade	2	4	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
56	1	Storage room	3	780	3L4' T8/ELEC	1	89		No Upgrade	1	89	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
57	1	Reception	24	8760	3L4' T8/ELEC	4	356		No Upgrade	4	356	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	
58	6	Jail	24	8760	2L4' EE/STD	3	240		2L4' T8/ELEC	3	183	0.057	499	\$225.00	\$81.24	2.8			0	\$0	\$0.00		\$45	\$0	499	\$180.00	\$81.24	2.2
59	6	Cell 1	24	8760	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	166	\$75.00	\$27.08	2.8			0	\$0	\$0.00		\$15	\$0	166	\$60.00	\$27.08	2.2
60	6	Cell 2	24	8760	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	166	\$75.00	\$27.08	2.8			0	\$0	\$0.00		\$15	\$0	166	\$60.00	\$27.08	2.2
61	5	Garage	24	8760	26W CF	4	104		No Upgrade	4	104	0	0	\$0.00	\$0.00				0	\$0	\$0.00		\$0	\$0	0	\$0.00	\$0.00	

Appendix B: Third Party Energy Suppliers (ESCOs)

Third Party Electric Suppliers for PSEG Service Territory	Telephone & Web Site	Third Party Gas Suppliers for Elizabethtown Gas Co. Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com	Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com	Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com	Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com	UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugieneryservices.com
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com	Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com	Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com	Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com	Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com	Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com	MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com	NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Integrus Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrusenergy.com	Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com	PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com	South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com	Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com	Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com		
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com		
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com		
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com		
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com		
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugieneryservices.com		

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