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**Local Government Energy Program
Energy Audit Report**

For

***Middletown Township
Administration and Police Building
1 Kings Highway
Middletown, NJ 07748***

Project Number: LGEA41



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INTRODUCTION

On November 23, 2009 and December 8, 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 Administration and Police Building. The building is located at 1 Kings Highway, Middletown, New Jersey 07748, in Monmouth County. The current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

The one-story facility was built in 1961, and underwent a major renovation and restoration in 2001. The building has a total area of 15,706 square feet. The Administration and Police Department houses the Township courthouse, police department, records and other administrative offices. The building is open from 8:00 AM to 4:30 PM Monday through Friday and is occupied by approximately 87 employees, most of which work in shifts.. The police dispatch area is open 24/7.

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/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.

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 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.

EXECUTIVE SUMMARY

This document contains the energy audit report for the Administration and Police Building, located at 1 Kings Highway, Middletown, New Jersey 07748.

Based on the field visits performed by SWA/BSG-PMK staff on November 23, 2009 and December 8, 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, January, 2009 through December, 2009, the facility consumed a total of 704,480 kWh of electricity for a total cost of \$113,730 and 15,604 therms of natural gas, for a total cost of \$19,200.

With electricity and fossil fuel combined, the building consumed 3,964 MMBtus of energy at a total cost of \$132,930.

SWA/BSG-PMK has entered energy information about the Facility 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 244 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.

SWA/BSG-PMK recommends that the Township of Middletown contact 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 \$ 0.011/kWh, which would have equated to \$8,058 for the past 12 months.

Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification through the United States Green Building Council (USGBC). SWA/BSG-PMK encourages the Township of Middletown to continue entering utility data in *Energy Star Portfolio Manager* in order to track whether normalized source energy use over time. The building performance rating could not be determined because this is a mixed-use facility, comprised by non-eligible space types categorized as "Other".

(Refer to Section 1.3 for Energy Star Rating)

Category I Recommendations: Capital Improvement Measures

Replace the current natural gas water heater with an equivalent gas unit. Replacing the water heater is not recommended as an ECM, due to a long payback period.

Category II Recommendations: Operations and Maintenance

Replace the weather stripping for all of the exterior doors.

Review all system operations for the Administrative offices and lower level detective areas. Consider re-balancing the cooling system, to alleviate comfort complaints.

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

At this time, SWA/BSG-PMK highly recommends a total of **6** Energy Conservation Measures (ECMs) for the Police and Administration building that are summarized in the following tables. The total investment cost for this ECM is **\$66,934**. SWA/BSG-PMK estimates a first year savings of **\$12,768** with a simple payback of **5.2 years**. SWA/BSG-PMK estimates that implementing the highly recommended ECMs will reduce the carbon footprint of the building by **91,859 lbs of CO₂**, which is equivalent to removing approximately 7 cars from the roads each year.

There are various incentives that the Township of Middletown could apply for that could also help lower the cost of installing the ECMs. SWA/BSG-PMK recommends that the 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, 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 142.4 kW.

The following table summarizes the proposed Energy Conservation Measures (ECM) and their economic relevance:

ROI: Return on Investment (%)

Assumptions:

Discount rate: 3.2% per DOE FEMP guidelines Electricity rate \$0.16 /kWh
 Energy price escalation rate: 0% per DOE FEMP guidelines Gas rate \$1.23 /therm

Avg. Annual Demand: 0.00202 Area of Building (SF) 15,706

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 Upgrades	Empirical Data	\$19,000	\$3,630	\$15,370	40,323	6.79	0	8.76	\$0	\$6,452	15	\$75,917	2.38	2626%	175%	42%	\$61,650	55,243
2	Vending Machine Occupancy Sensors	Similar Projects	\$750	\$0	\$750	2,415	0.41	0	0.52	\$0	\$386	10	\$3,263	1.94	3350%	335%	51%	\$2,546	3,309
3	Outdoor Air Reset Control	Similar Projects	\$6,000	\$0	\$6,000	0	0.00	1,248	7.95	\$0	\$1,535	10	\$12,965	3.91	1161%	116%	22%	\$7,097	14,605
TOTAL			\$25,750	\$3,630	\$22,120	42,738	7.20	1,248	17.23	\$0.00	\$8,373	-	\$92,145	2.64	-	-	-	\$71,293	73,156

Table 2 - Recommended 5-10 Year Payback ECMs																			
ECM #	ECM description	Source	Est. Installed Cost, \$	Est. Incentives, \$	Net Est. ECM Cost with Incentives, \$	kWh, 1st Yr Savings	kW, Demand Reduction/Mo	Therms, 1st Yr Savings	kBtu/sq ft, 1st Yr Savings	Est. Operating Cost, 1st Yr Savings, \$	Total 1st Yr Savings, \$	Life of Measure, Yrs	Est. Lifetime Energy Cost Savings, \$	Simple Payback, Yrs	Lifetime Return on Investment, %	Annual Return on Investment, %	Internal Rate of Return, %	Net Present Value, \$	CO ₂ Reduced, lbs/yr
4	Upgrade Plumbing Fixtures	Contractor, RS Means CostWorks 2009	\$17,500	\$0	\$17,500	0	0.00	0.00	0.00	\$0	\$2,271	15	\$26,727	7.70	352%	23%	10%	\$9,615	0
5	High-Efficiency Air Conditioners	RS Means CostWorks 2009	\$44,500	\$35,600	\$8,900	9,580	1.61	0.00	2.08	\$0	\$1,533	15	\$18,036	5.81	684%	46%	15%	\$9,398	13,124
TOTAL			\$62,000	\$35,600	\$26,400	9,580	1.61	0	2.08	\$0.00	\$3,804	-	\$44,763	6.94	-	-	-	\$19,013	13,124

Table 3 - 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
6	Install Thermal-Pane Windows	Similar Projects	\$18,414	\$0	\$18,414	251	0.0	447	2.90	\$0.00	\$590	35	\$12,325	31.18	-1%	0%	11%	\$28,759	5,579
TOTAL			\$18,414	\$0	\$18,414	251	0.0	447	2.90	\$0.00	\$590	-	\$12,325	31.18	-	-	-	\$28,759	5,579

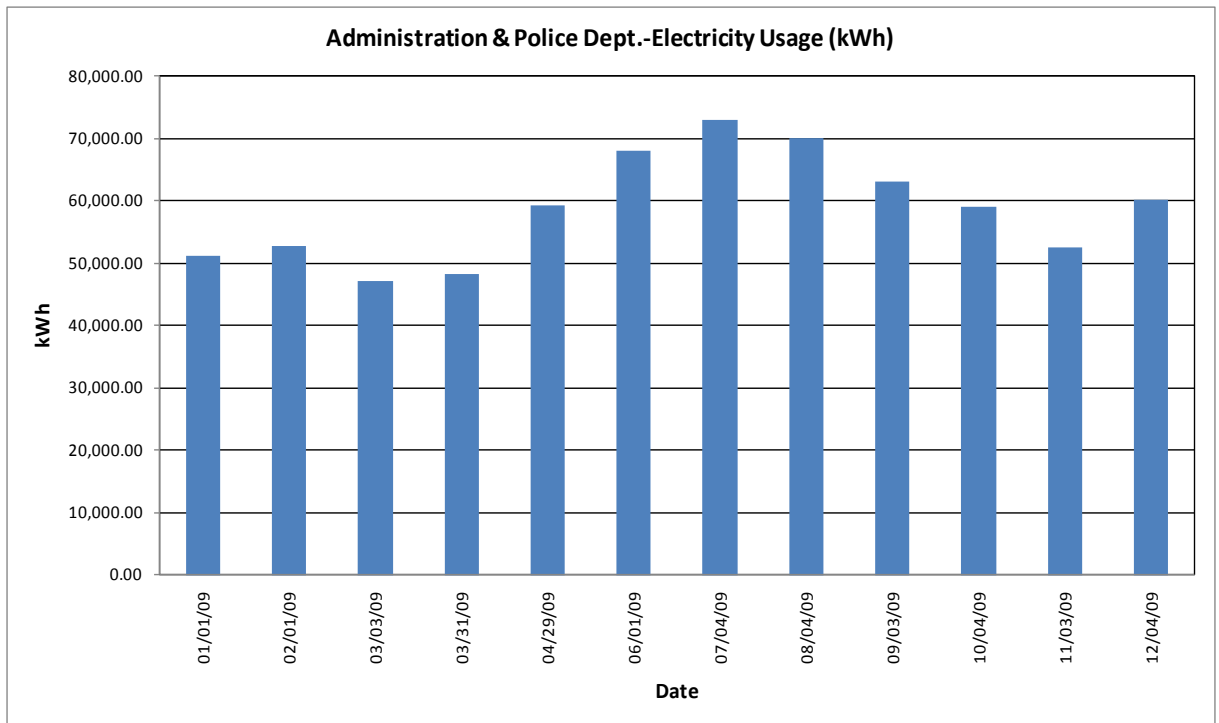
1. HISTORIC ENERGY CONSUMPTION

1.1 Energy Usage and Cost Analysis

SWA/BSG-PMK analyzed utility bills from January, 2009 through December, 2009 that were received from the utility companies supplying the Administration Building & Police Department with electric and natural gas.

Electricity - The Administration Building & Police Department is currently served by one electric meter and receives electricity from Jersey Central Power & Light at **an average rate of \$0.16/kWh** based on 12 months of utility bills from January, 2009 through December, 2009. The building consumed **704,480 kWh or \$113,730 worth of electricity** during that time span.

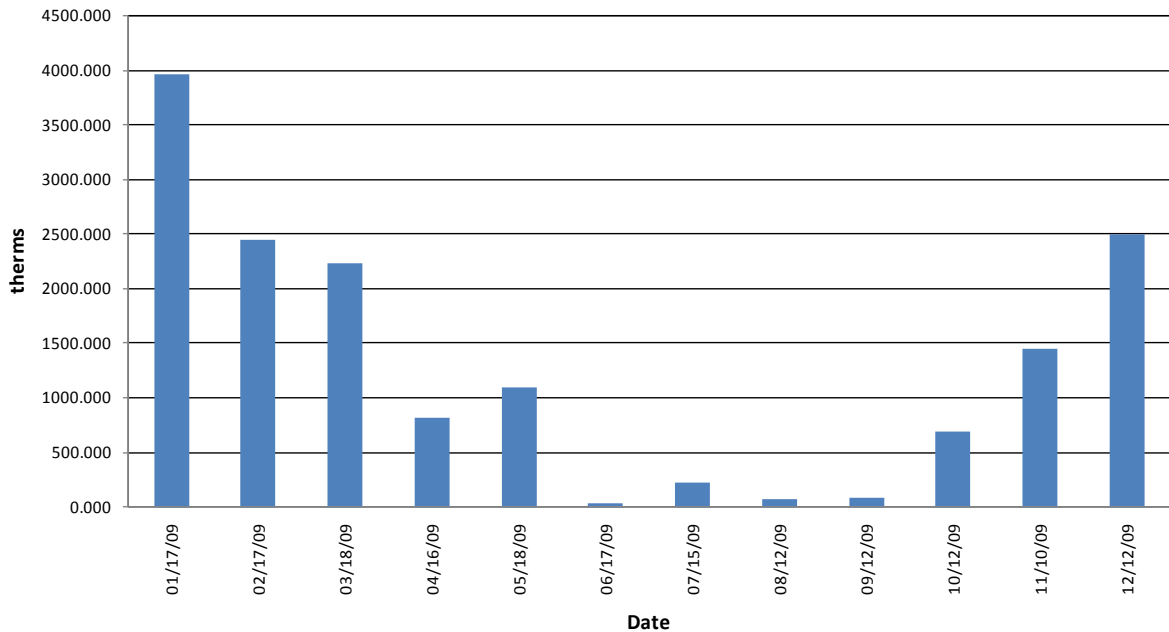
The following chart shows electricity usage for the building based on utility bills from January, 2009 through December, 2009:



Natural Gas - The Administration Building & Police Department is currently served by one natural gas meter and receives gas from New Jersey Natural Gas at **an average rate of \$1.23/therm** based on 12 months of utility bills from January, 2009 through December, 2009. The building consumed **15,604 therms or \$19,200 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 January, 2009 through December, 2009:

Administration & Police Dept.-Natural Gas Usage (therms)



1.2 Utility Rates

The Administration Building & Police Department currently receives 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 from January, 2009 through December, 2009

The Administration Building & Police Department currently receives natural gas supply and transmission from New Jersey Natural Gas at an average aggregated rate of \$1.23/therm based on 12 months of utility bills from January, 2009 through December, 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. SWA/BSG-PMK recommend that the Township maintain the Portfolio Manager account at the link below. As the account is maintained, SWA/BSG-PMK has shared information with the Township to allow future data to be added and tracked using the benchmarking tool. SWA has also shared this information with TRC.

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

Username: middletowntownship

Password:middletown

Buildings achieving an Energy Star rating of 75 are eligible to apply for the Energy Star award and receive the Energy Star plaque to convey superior performance. These ratings also greatly help when applying for Leadership in Energy and Environmental Design (LEED) building certification

through the United States Green Building Council (USGBC). SWA/BSG-PMK encourages the Township to continue entering utility data in Energy Star Portfolio Manager in order to track whether normalized source energy use over time.

The Site Energy Use Intensity is 244 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 22.2 kBtu/ft²yr, which when implemented would lower the buildings energy consumption.



STATEMENT OF ENERGY PERFORMANCE

Administration & Police Building

Building ID: 2062016
 For 12-month Period Ending: November 30, 2009¹
 Date SEP becomes ineligible: N/A

Date SEP Generated: February 17, 2010

Facility
 Administration & Police Building
 1 King's Hwy
 Middletown, NJ 07748

Facility Owner
 Middletown Township
 1 Kings Highway
 Middletown, NJ 07749

Primary Contact for this Facility
 Jason Greenspan
 1 King's Highway
 Middletown, NJ 07737

Year Built: 1921
 Gross Floor Area (ft²): 15,706

Energy Performance Rating² (1-100) N/A

Site Energy Use Summary³

Electricity - Grid Purchase(kBtu)	2,399,237
Natural Gas (kBtu) ⁴	1,431,674
Total Energy (kBtu)	3,830,911

Energy Intensity⁵

Site (kBtu/ft ² /yr)	244
Source (kBtu/ft ² /yr)	606

Emissions (based on site energy use)

Greenhouse Gas Emissions (M ₁ CO ₂ e/year)	442
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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	184%
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 Standards⁶ 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:

- 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.
- 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.
- Values represent energy consumption, annualized to a 12-month period.
- 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.
- Values represent energy intensity, annualized to a 12-month period.
- 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 Administration and Police Department was built in 1961, and underwent a major renovation and restoration in 2001. The building has a total area of 15,706 square feet. The Administration and Police Department houses the Township courthouse, police department, records and other administrative offices.

2.2 Building Occupancy Profiles

The building is open from 8:00 AM to 4:30 PM Monday through Friday and is occupied approximately 87 employees. The police dispatch area is open 24/7.

2.3 Building Envelope

2.3.1 Exterior Walls

The exterior walls are constructed from brick veneer over wood studs with R-11 insulation. The walls are in good condition. The interior of the walls are insulated and finished in gypsum wallboard.



2.3.2 Roof

The roof is constructed from wood joists, plywood, and finished with asphalt shingles. It contains a layer of R-30 insulation in the ceiling joists. The roof is approximately 15 years old and in fair condition with areas of missing or broken shingles.



2.3.3 Base

There is a fully occupied basement on slab in this building.

2.3.4 Windows

There are 15 single-pane wooden-framed windows in the court section of the building. All are in poor condition. All other windows are double-pane with aluminum framing, and are in good condition.



Category III Recommendation-ECM #6: Replace all single-pane windows in the court section of the building with thermal-pane windows.

2.3.5 Exterior doors

The exterior doors are in good condition. The doors are medium style aluminum doors with thermal-pane glass. Category II: Repair and maintenance- Replace the weather stripping for all of the exterior doors.



2.3.6 Building air tightness

There are open louvers located in the attic space as well as several windows that are contributing to significant heat loss.

2.4 HVAC

2.4.1 Heating

Three natural gas hot water boilers provide hot water to multiple zones. The two boilers located in the Admin building feed hot water baseboard for eight zones. The distribution for zones one through eight in order is; Court Clerk's Area, Administration Offices, Court Clerk's office, Administration Area, Main Conference Room, Traffic, Police Computer Room, and the Welfare Office. The Boiler located in the lower mechanical room adjacent to Records provides heating for the court room, and remaining Police and Detective areas. All units were manufactured by Peerless and are in good condition. The administration boiler room contains a 157 MBH unit % efficient with model number EC-04-150-WPCL, boiler room #2 has a 402 MBH unit with model number SC/SCT-07-W/S, and a third boiler room has a 182 MBH unit with model number EC-04-175-WPCL.

Category III Recommendations – ECM #3: Install hot water outdoor air reset control. These 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.

2.4.2 Cooling

There are ten systems utilized for cooling the facility; two are packaged 8 and 10 ton Trane Voyager Dx units located on grade that provide cooling only for the newly renovated Police and Administration areas. The remaining split systems provide cooling to the following areas; A 15 Ton Trane Odyssey feeds the Administration, and Controls area, The Police Computer room is fed by a three ton Sanyo split systems with a secondary three ton Arcoaire split system each with condensers located on grade at the west side of the building. The administration offices are served by a 5 ton York split system with condenser on grade and an attic air handler, Personnel in this area expressed a sense of discomfort with regard to cooling. Police dispatch is cooled by 3 ton York split system with supplemental cooling provided over the dispatch desk by a 2 ton Sanyo split system. The Court Clerk area is fed by a 5 ton split system with condenser on grade. The Court room and adjacent areas are cooled by an on grade 25 ton Trane Chiller and air handler located in the lower level mechanical room. The lower level detective's area is fed by this unit as well and there were complaints of continuous cold air being supplied during the winter months from the overhead diffusers. All systems are controlled individually with programmable thermostats.

Category II Recommendations – Operations & Maintenance: Review over all system operations for the Administrative offices and lower level detective areas. Consider re-balancing the cooling system, to alleviate comfort complaints.

Category III Recommendations – ECM #5: Replace existing split systems with higher efficient units.

2.4.3 Ventilation

Ventilation is provided by exhaust fans, two package air conditioners, and natural ventilation through doors, louvers, and windows.

2.4.4 Domestic Hot Water

Domestic hot water is provided by a model 21V50-6, 50-gallon, 60 MBH Rheem unit located in the lower boiler room, the heater is passed its useful life and should be replaced.

Category I Recommendation – Capital Investments: Replace the current natural gas water heater with an equivalent gas unit. Replacing the water heater is not recommended as an ECM, due to a long payback period.

2.5 Electrical Systems

2.5.1 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 \$6,451.68 based on the current \$0.16/kWh and the current occupancy schedule. Implementation of this ECM will cost approximately \$19,000. Currently the Board of Public Utilities (BPU) would offer an estimated rebate of \$3,630.00, yielding a net cost of \$15,370.00 for this project. With a yearly savings of \$6,451.68 the payback on this ECM would about 2.4 years.

Category III Recommendation - ECM #1: Recommend upgrading all T-12 lighting fixtures with magnetic ballasts to T-8 fixtures with electronic ballasts, as well as various other lighting upgrades outlined in Appendix A. Lighting sensors are already installed in certain areas of the building.

2.5.2 Appliances and Process

In this building, there were seventy-eight computers, four microwaves, eight refrigerators and three vending machines.

Category III Recommendation – ECM #2: Install occupancy sensors in the vending machines to turn off the lights when the machines are not being used.

2.5.3 Elevators

There is one 2 stop hydraulic Dover elevator located off the newly renovate lobby. The cab and mechanical equipment are all new and in good condition.

2.5.4 Other Electrical Systems

The facility has a 230kW Kohler Diesel Generator that supplies back-up power.

3. EQUIPMENT LIST

Building System	Description	Location	Model #	Fuel	Space Served	Estimated Remaining Useful Life %
Cooling	Unit #9: Split-system condensing unit, 25 tons,	Outside, adj. to courtroom	Trane M# RAUCC25EBU1-3A0DF	Electric	Town Hall - Court Room	60%
Cooling	Unit #8: 5-ton split-system condensing unit	Outside, west end	York M# H1DA060S25A	Electric	Town Hall - Court Clerk	60%
	Air-handler	Attic				60%
Cooling/ Heating	Unit #1: 7-ton packaged DX unit	Outside	Trane Voyager M# TCH086C300BC	Electric	Police & Detecives	40%
Cooling/ Heating	Unit #2: 10-ton packaged DX unit	Outside	Trane Voyager M# TCH121C300AA	Electric	Police & Detecives	40%
Cooling	Split-system condensing unit, 2 tons	Outside	Sanyo M# SAP241C	Electric	Dispatch	75%
	Air-handler	Ceiling	Sanyo M# SAP241R			75%
Cooling	Unit #5: Split-system condensing unit, 3 tons	Outside	Sanyo M# CL3632A	Electric	Police Dept. Computer Room	75%
	Air-handler	Wall-mounted	Sanyo M# CL3632R			75%
Cooling	Unit #7: Split-system condensing unit, 3 tons	Outside	York M# H2DA036S25A	Electric	Police Dept. - Dispatch	60%
	Air-handler	Attic				60%

Cooling	Unit #6: Split-system condensing unit, 5 tons	Outside	York M# H1RD060S25B	Electric	Administration	60%
	Air-handler	Attic				60%
Cooling	Unit #4: 3-ton condensing unit	Outside	Arcoaire M# HAC036AKA1	Electric	Police Dept.	60%
	Air-handler	Attic	Label not accessible			60%
Cooling	Unit #3: Split-system condensing unit, 15 tons	Outside	Trane Odyssey M# TTA180C300DA	Electric	Administration Controls	27%
	Air-handler	Attic	Not accessible			27%
Emergency Power	Back-up Generator	On grade East side of building	230 Kw Kohler Deisel Generator	Deisel	Police Department	60%
Heating	Unit #1: Hot water boiler, 157 MBH, 80% efficient	Admin. boiler room	Peerless M# EC-04-150-WPCL	Natural Gas	Admin, downstairs, traffic	80%
Heating	Unit #2: Hot water boiler, 182 MBH, 80% efficient	"Boiler room"	Peerless M# EC-04-175-WPCL	Natural Gas	Admin Building	80%
Heating	Hot water boiler, 402 MBH, 80% efficient	Boiler Room #2 (downstairs by records)	Peerless M# SC/SCT-07-W/S	Natural Gas	Court Room /detective areas	80%
Domestic Hot Water	50 gallon, 60 MBH domestic water heater	Boiler room #2	Rheem M# 21V50-6	Natural Gas	Entire building	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 Administration & Police, SWA/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

Replace the current natural gas water heater with an equivalent gas unit. Replacing the water heater is not recommended as an ECM, due to a long payback period.

Category II Recommendations: Operations and Maintenance

Replace the weather stripping for all of the exterior doors.

Review over all system operations for the Administrative offices and lower level detective areas. Consider re-balancing the cooling system, to alleviate comfort complaints.

Category III Recommendations: Energy Conservation Measures

Summary Table

ECM #	Description
1	Lighting Upgrades
2	Vending Miser
3	Outdoor Air Reset Control
4	Upgrade Plumbing Fixtures
5	High-Efficiency Air-Conditioners
6	Install Thermal-Pane Windows

ECM#1: Lighting Upgrades

Description:

Lighting at the Administration Building & Police Department consists primarily of T-12 fluorescent lamps with magnetic ballasts, incandescent lamps and T-8 fluorescent lamps and electronic ballasts. Lighting sensors are already installed in certain areas. It is recommended that all T-12 fixtures with magnetic ballasts be retrofit with T-8 lamps and electronic ballasts and the incandescent lamps be replaced with compact fluorescents. The building exterior was lit with compact fluorescent lamps. The exterior lighting also consisted of H.I.D. pole mounted fixtures in the parking lot. 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.

Recommended lighting upgrades are detailed in Appendix A.

Installation cost:

Summary	Lighting (Only)	Sensors (Only)	Complete Lighting Upgrade
Cost	\$19,000.00	\$0.00	\$19,000.00
Rebate	\$3,630.00	\$0.00	\$3,630.00
Net Cost	\$15,370.00	\$0.00	\$15,370.00
Savings (kWh)	40,323	0	40,323
Savings (\$)	\$6,451.68	\$0.00	\$6,451.68
Payback	2.4		2.4

Variables:		Assumptions:	
\$0.16	Avg. Electric Rate (\$/kWh)	25%	Occupancy Sensor Savings (Avg)
	Avg. Demand Rate (\$/kW)	40%	Occupancy Sensor Savings(> Avg)
8760	Operating Hours/Year		
24	Operating Hours/Work Day		

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	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 Upgrades	Empirical Data	\$19,000	\$3,630	\$15,370	40,323	6.79	0	8.76	\$0	\$6,452	15	\$75,917	2.38	2626%	175%	42%	\$61,650	55,243

Assumptions:

The electric cost used in this ECM was \$0.16/kWh, which was the Police and Administration building’s average rate for the 12-month period ranging from January, 2009 through December, 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:

This ECM may be eligible for incentives through New Jersey’s Direct Install Program, which can incentivize up to 80% of the total installation cost, which we estimate to be \$3,630 for this measure. Please note that these incentive levels are estimates based on SWA’s expected project cost and assumption of project eligibility. Actual incentive levels and project eligibility can only be determined through an Energy Assessment performed by a Direct Install Contractor.

ECM#2: Vending Miser

Description:

The average vending machine consumes 4,025 kWh of energy per year, most of which can be attributed to lighting and cooling, which run 24 hours-per-day. Installing occupancy sensors on Parks and Recreation building's three vending machines would activate the power to the vending machines when in use, and deactivate the power if the vending machines have not been used for more than 15 minutes. Vending machine lighting would remain off until the adjacent area is occupied again. The refrigeration unit will be shut down for a maximum two hours, in order to maintain a desirable temperature for the product.

Installation cost: \$250 each, \$750 total

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
2	Vending Machine Occupancy Sensors	Similar Projects	\$750	\$0	\$750	2,415	0.41	0	0.52	\$0	\$386	10	\$3,263	1.94	3350%	335%	51%	\$2,546	3,309

Assumptions:

The electric cost used in this ECM was \$0.16/kWh, which was the Police and Administration building's average rate for the 12-month period ranging from October 8th, 2008 through October 12th, 2009. The average vending machine consumes 4,025 kWh per year. Energy savings for a vending machine in high-occupancy (over 100 hours per week) areas is about 20%.

Rebates/financial incentives:

No rebates or incentives for vending machine occupancy sensors could be found.

ECM#3: Hot Water Outdoor Air Reset Control

Description:

The Police and Administration building is heated by three hot water gas boilers. The boilers are in good condition, but can be made even more efficient by installing outside air reset control. Boilers are designed to provide water to radiators or hot water coils at a constant temperature, usually 180°F. This can cause the system to provide too much heat to the space it was designed to heat, which wastes energy and increases energy bills. 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: \$2,000 for each system, \$6,000 total
 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	Outdoor Air Reset Control	Similar Projects	\$6,000	\$0	\$6,000	0	0.00	1,248	7.95	\$0	\$1,535	10	\$12,965	3.91	1161%	116%	22%	\$7,097	14,605

Assumptions:

Outside air reset controllers typically save between 8% and 15% of the annual heating consumption; to be conservative, the lower end of this range, 8%, will be used. In 2009, the Police and Administration building consumed 15,603 therms at a rate of \$1.23 per therm.

Rebates/financial incentives:

No rebates for outside air reset control are available.

ECM#4: Upgrade Plumbing Fixtures

Description:

In the Police and Administration restrooms, there were a total of 5 toilets, 4 urinals, and 11 sinks that should be upgraded to units that use less water per use. The current toilets are rated at 3.5 gal/flush, the current urinals are rated at 3 gal/flush, and the current sinks are rated at 2.5 gal/min. Low-flow sinks and toilets are available at 1.5 gal/min for sinks and 1.6 gal/flush for toilets, and waterless urinals are also available.

Installation cost: Low-flow (1.6 gpf) toilets: \$1,700 each
 Waterless urinals: \$600 each
 Low-flow (1.5 gpm) sinks: \$600 each

Source of cost estimate: Contractor, 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, \$	CO ₂ Reduced, lbs/yr
4	Upgrade Plumbing Fixtures	Contractor, RS Means CostWorks 2009	\$17,500	\$0	\$17,500	0	0.00	0.00	0.00	\$0	\$2,271	15	\$26,727	7.70	352%	23%	10%	\$9,615	0

Assumptions:

The cost per gallon of water is typically \$0.01/gal. All toilets and urinals are estimated to be used twice per hour, and it was assumed that there is one 30-second use of a sink for each use of a toilet or urinal.

Rebates/financial incentives:

No rebates or incentives for plumbing fixtures could be found.

ECM#5: High-Efficiency Air-Conditioners

Description:

The Police and Administration building and is cooled by ten air-conditioning systems. Three units, two DX packaged units and a 15-ton split-system condensing unit, are nearing the end of their useful lives and are in poor condition. It is recommended that these units be replaced with units that have high Energy Efficiency Ratios (EERs).

Installation cost:

Estimated installed cost: Replacement for 7-ton Trane packaged DX unit: \$11,000
 Replacement for 10-ton Trane packaged DX unit: \$13,500
 Replacement for 15-ton Trane split-system condensing unit and its air-handler: \$20,000
 Total: \$44,500

Source of cost estimate: Similar projects, 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, \$	CO ₂ Reduced, lbs/yr
5	High-Efficiency Air-Conditioners	RS Means CostWorks 2009	\$44,500	\$35,600	\$8,900	9,580	1.61	0.00	2.08	\$0	\$1,533	15	\$18,036	5.81	684%	46%	15%	\$9,398	13,124

Assumptions:

The cost per kWh of electricity is \$0.16, taken from 12 months of the Police and Administration building’s electric bills. There are ten cooling units in the building, therefore the electric consumption is divided between these units. First, the total amount of electricity used for cooling must be separated from the electric bills. In 2009, the building consumed 704,480 kWh of electricity. In the months of April through October, the electric consumption was higher than it was in the other six months; this can be attributed to cooling. Therefore, the difference between the electric consumptions in the six months cooling was used (392,320 kWh) and the six months where cooling was not used (312,160 kWh) would be the amount of electricity used for cooling in this 12-month period (80,160 kWh). An accurate way to divide the electric consumption between the units is to add the cooling capacities of all ten units, and make the percentage of the total electric consumption that each unit consumed proportional to the percentage of the cumulative cooling capacities that each unit represents (units 1, 2, and 3 are the units recommended for an upgrade):

Unit #	Description	Tons	% of Total	kWh
1	Trane Packaged DX	7	8.97%	7,194
2	Trane Packaged DX	10	12.82%	10,277
3	Trane Split-System	15	19.23%	15,415
4	Arcoaire Cond. Unit	3	3.85%	3,083
5	Sanyo Split-System	3	3.85%	3,083
6	York Split-System	5	6.41%	5,138
7	York Split-System	3	3.85%	3,083
8	York Split-System	5	6.41%	5,138
9	Trane Split-System	25	32.05%	25,692
10	Sanyo Split-System	2	2.56%	2,055

The EER of the packaged DX units, due to their age and condition, should be decreased from 10 to 9, and the split-system, from 10 to 8. New packaged DX units have EERs up to 13, and the new split-systems have EERs of 11. The cooling savings were calculated by the following series of equations:

Current Electric Input: 7-ton packaged DX, 7,194 kWh; 10-ton packaged DX, 10,277; 15-ton split-system, 15,415 kWh

$$\text{Current/Proposed Cooling Output (BTU)} = \text{Current Electric Input (kWh)} \times \text{SEER} \left(\frac{\text{BTU}}{\text{Wh}} \right) \times \frac{1,000 \text{ Wh}}{\text{kWh}}$$

$$\text{Proposed Electric Input (kWh)} = \frac{\text{Proposed Cooling Output (BTU)}}{\text{SEER} \left(\frac{\text{BTU}}{\text{Wh}} \right) \times \frac{1,000 \text{ Wh}}{\text{kWh}}}$$

$$\text{Savings (kWh)} = \text{Current Electric Input (kWh)} - \text{Proposed Electric Input (kWh)}$$

The cooling savings for upgrading the units are as follows:

Unit #	Description	Cooling		EER		Current Input/Output		Proposed Input/Output		Savings	
		Tons	% of Total	Current	Proposed	kWh (in)	BTU (out)	kWh (in)	BTU (out)	kWh	\$
1	Trane Packaged DX	7	8.97%	9	13	7,194	64,744,615	4,980	64,744,615	2,213	\$354.16
2	Trane Packaged DX	10	12.82%	9	13	10,277	92,492,308	7,115	92,492,308	3,162	\$505.94
3	Trane Split-System	15	19.23%	8	11	15,415	123,323,077	11,211	123,323,077	4,204	\$672.67

Rebates/financial incentives:

This ECM may be eligible for incentives through New Jersey's Direct Install Program, which can incentivize up to 80% of the total installation cost, which we estimate to be \$35,600 for this measure. Please note that these incentive levels are estimates based on SWA's expected project cost and assumption of project eligibility. Actual incentive levels and project eligibility can only be determined through an Energy Assessment performed by a Direct Install Contractor.

ECM#6: Install Thermal-Pane Windows

Description:

The windows at the Police and Administration building not replaced during the 2001 renovation have passed their useful life of 35 years. They are single-pane, non-thermal windows that do not provide much thermal resistance. In addition, the current units allow excess infiltration. Replacing the windows with double-pane units with aluminum framing and thermal breaks will prevent heat from escaping in the winter and entering in the summer, therefore reducing the amount the heating and cooling systems need to work, saving energy and adding longevity to the lives of the systems.

Installation cost:

Estimated installed cost: \$18,414 at \$62 per square-foot
 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
6	Install Thermal-Pane Windows	Similar Projects	\$18,414	\$0	\$18,414	251	0.0	447	2.90	\$0.00	\$590	35	\$12,325	31.18	-1%	0%	11%	\$28,759	5,579

Assumptions:

The area of the windows that are recommended to be replaced is 297 square feet. The electric cost used, taken from 12 months of the Police and Administration’s energy bills, is \$0.16 per kWh. The cost of natural gas is \$1.23/therm. The cost of installation, using several similar projects as a guideline, was determined assuming \$62 per square-foot of windows. The current windows are single-pane, and have a thermal resistance (R-value) of 0.90, equivalent to an overall heat transfer coefficient (U-factor) of 1.11. The proposed windows have an R-value of 3.8 and a U-factor of 0.26. The efficiency of the current heating system is 80%. The mean SEER (Seasonal Energy Efficiency Ratio) for the current air conditioning units is approximately 12. The assumed indoor temperature in the cooling season is 72°F, and for the heating season, 68°F. The building is in use 72 hours per week. The calculations were performed using a heat transfer analysis, with 5°F bin temperature data for Newark, NJ. The first step in calculating the savings is to multiply the annual hourly occurrences for each 5°F bin by the difference between that temperature and the desired indoor temperature (bin temperatures above 72°F were considered to be the cooling season, and below were considered to be a heating season), and sum all of these values for heating and cooling. The unit for these two values will be hrs.×°F, and shall be represented as (t×ΔT), with *t* representing time and *ΔT* representing the temperature difference. Current and proposed heat loss were calculated using the following equations:

$$U \times \text{Area} \times (t \times \Delta T)_{\text{cool}} = \text{Annual heat loss, cooling (in BTU)}$$

$$U \times \text{Area} \times (t \times \Delta T)_{\text{heat}} = \text{Annual heat loss, heating (in BTU)}$$

The energy savings, in BTUs, were calculated using the difference between the current and proposed heat losses, for heating and cooling. Electric and natural gas savings were calculated using the following equations:

$$\frac{(\text{Cost of Electric}) \times (\text{Energy Savings})_{\text{cool}}}{\text{EER} \times 1,000} \times \frac{\text{Weekly Hours of Operation}}{24 \times 7} = \text{Cooling Savings}$$

$$\frac{(\text{Cost of Electric}) \times (\text{Energy Savings})_{\text{heat}}}{3,412 \frac{\text{BTU}}{\text{kWh}} \times (\text{Efficiency})_{\text{heating system}}} \times \frac{\text{Weekly Hours of Operation}}{24 \times 7} = \text{Heating Savings}$$

Rebates/financial incentives:

No rebates or incentives for window upgrades could be found.

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1 Existing Systems

There are currently no existing renewable energy systems.

5.2 Solar Photovoltaic

Photovoltaic (PV) technology would not be cost beneficial to this project since there is such a high cost of installation and small area of viable space available that faces south.

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 it would require modifications to the existing heat distribution system, which would not be cost effective.

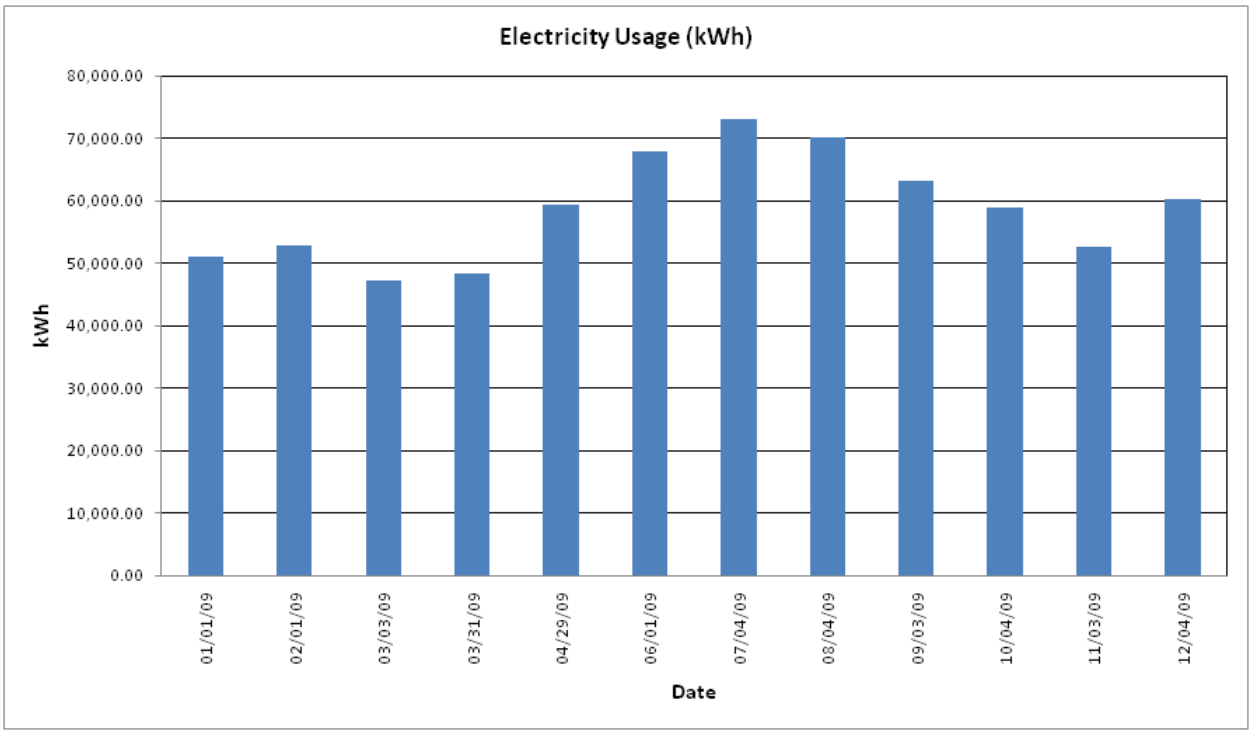
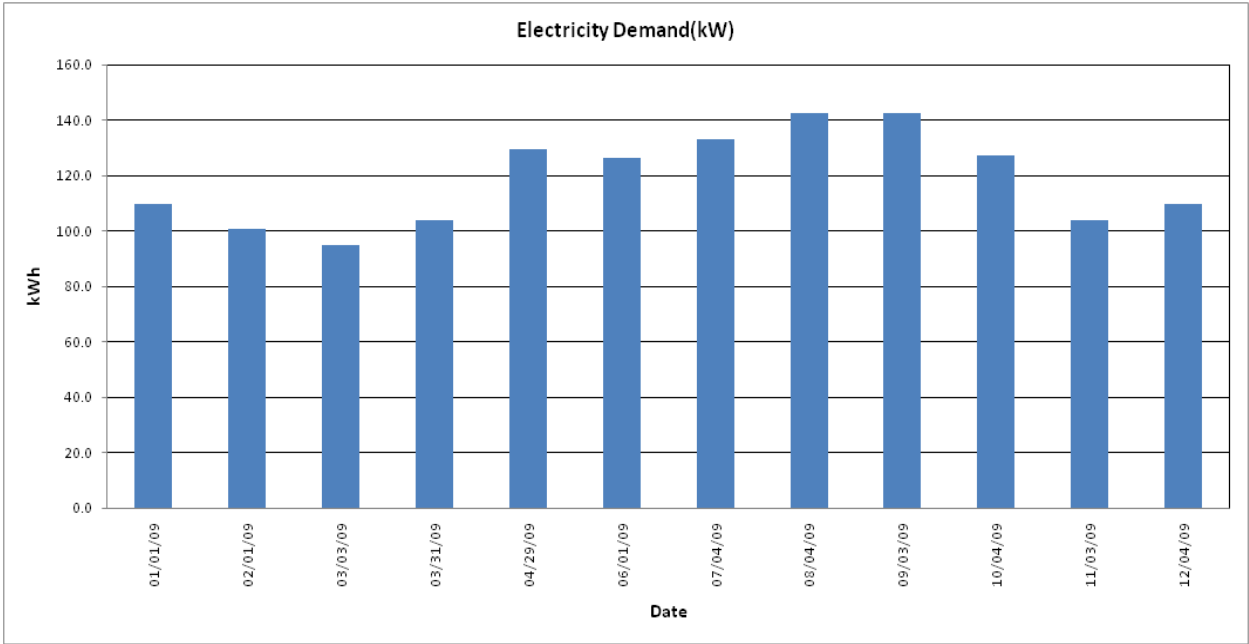
5.6 Wind

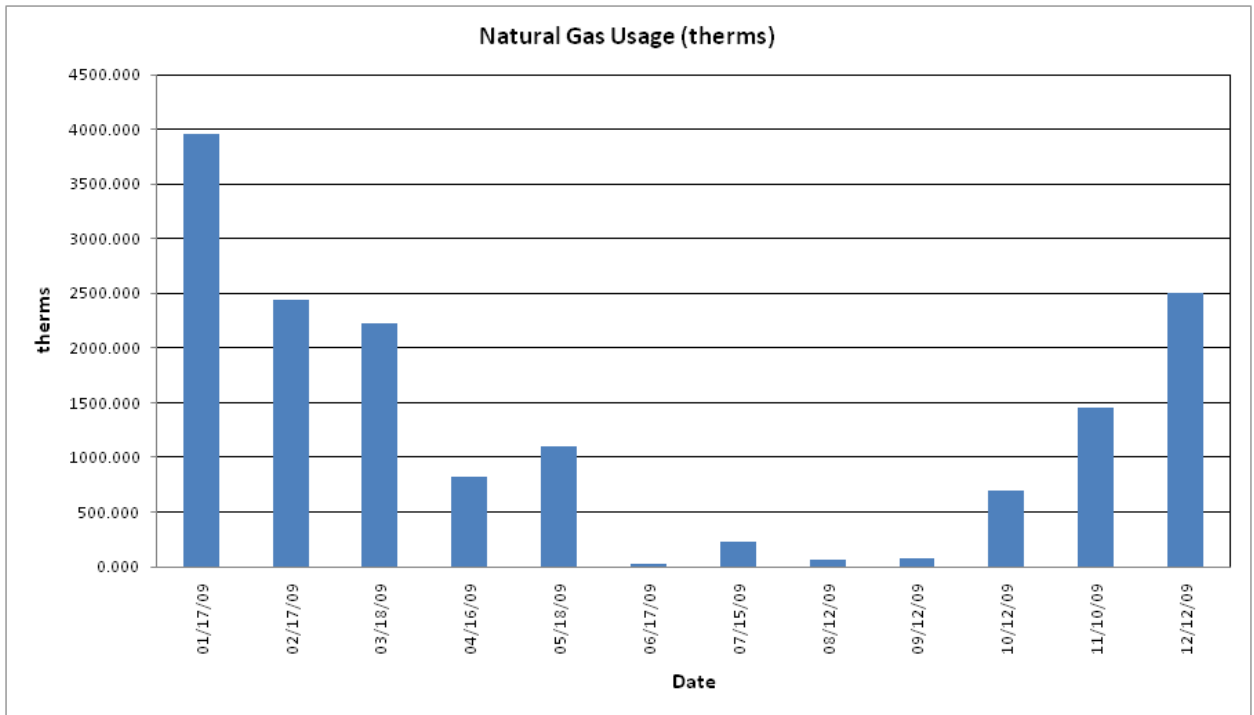
Wind power production is not appropriate for this location because required land is not available for the wind turbine. Also, the available wind energy resource is very low.

6. ENERGY PURCHASING AND PROCUREMENT

6.1 Load Profiles

The average electrical peak demand for the facility during previous year was 118.6 kW and the maximum peak demand was 142.4 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.



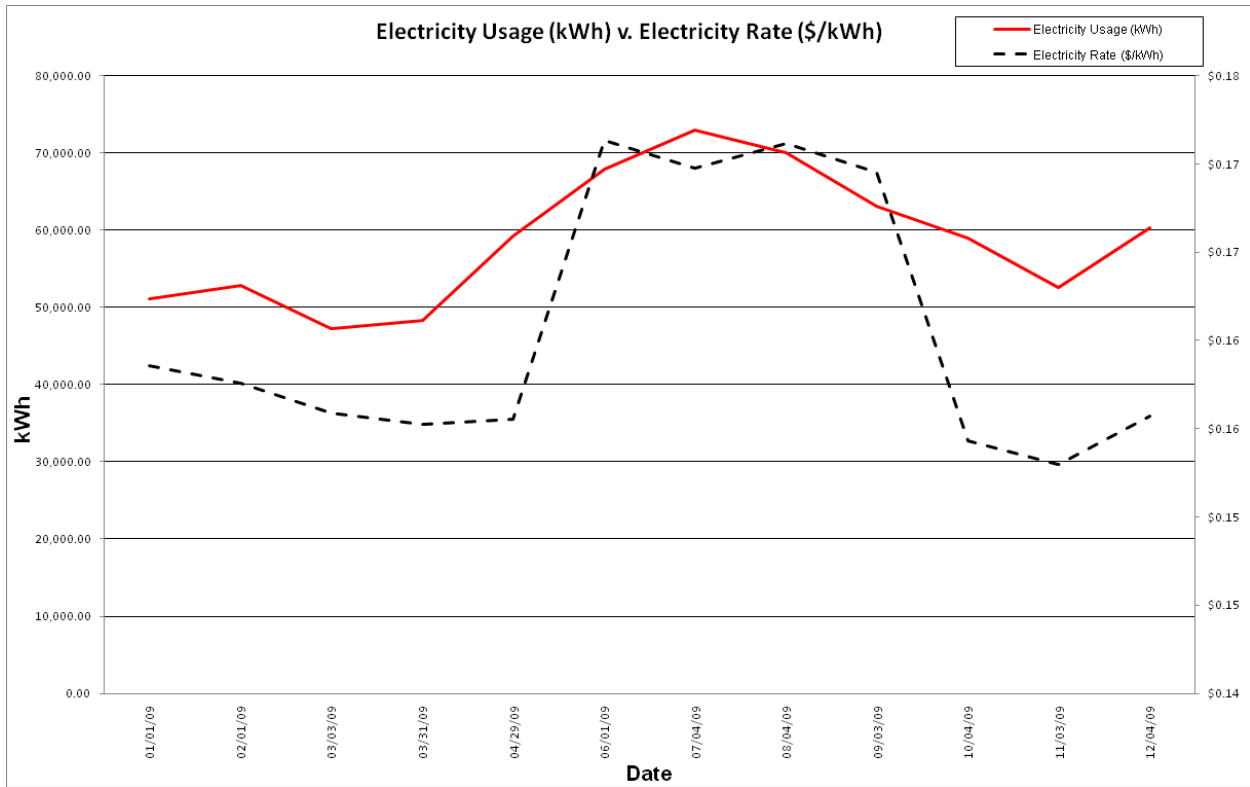


6.2 Energy Procurement Strategies

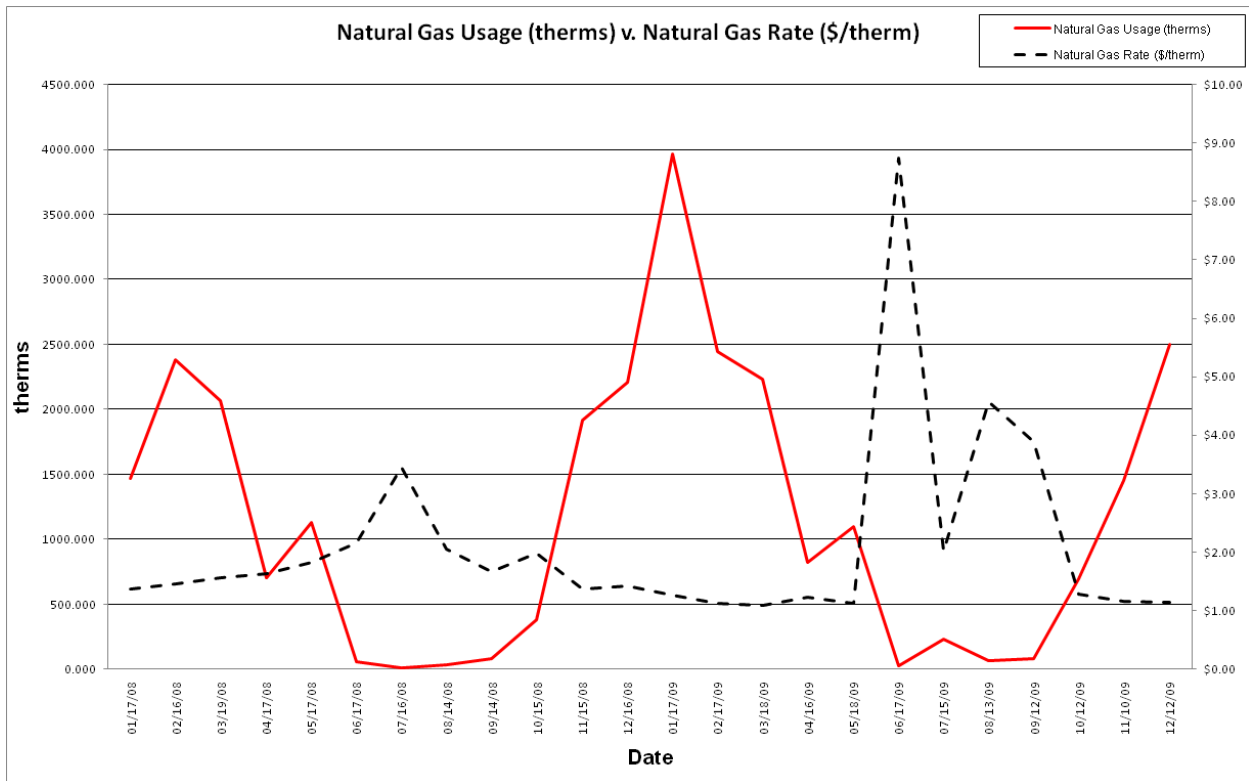
Billing analysis shows price fluctuations of over 20% over the course of the year for the building’s electrical and natural gas accounts. This may be reflective of the utility tariffs under which the building owner secures its’ energy supply. These tariffs often include seasonally adjusted demand charges, or seasonally adjusted usage charges which reflect the markets for the underlying energy commodity. For example a utility often has tariffs which charge more for electricity in the summer when demand for capacity is high and, the marginal producer of electricity is a higher cost generator who otherwise would not be running in the winter, or shoulder seasons.

Buildings which have a large variation in monthly billing rates can often reduce the costs associated with energy procurement by selecting a third party energy supplier who can provide them with fixed pricing over the course of a contract term as well as attain purchasing economies which may not be available on a utilities default tariff (basic generation service in the case of electric and basic gas service in the case of natural gas).

SWA/BSG-PMK recommends that the Township of Middletown contact 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 \$ 0.011/kWh, which would have equated to \$8,058 for the past 12 months. Contact the NJ Energy Choice Program for further information on companies that can act as third party (non-utility) energy suppliers. Purchasing energy from a third party supplier can reduce price fluctuations and can ultimately reduce the annual cost of energy for the facility. Appendix B contains a complete list of third party energy suppliers.



Electricity prices generally reflect electricity usage



Natural gas prices and usage levels fluctuate over the course of the year

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, BSG-PMK AND 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

Middletown Township
Administration and Police
1 Kings Highway



Upgrade Code	Upgrade Description	Existing		Proposed		Lighting		
		Fixture	Watts	Fixture	Watts	Total # of Upgrades	Cost per Upgrade (\$)	SmartStart Rebate per Upgrade
1	Incandescent Exit Sign / Retrofit with LEDs	15W EXIT	15	LED	2	20	\$40.00	\$10.00
2	(3) 4' 34W T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	3L4' EE/STD	130	3L4' T8/ELEC	89	112	\$80.00	\$15.00
3	(2) 34W T12 U-Tube Lamps, Magnetic Ballast / Retrofit with T8 U-Tube Lamps, Electronic Ballast	2L22" STD/STD	94	2L22"	62	10	\$60.00	\$15.00
4	(2) 4' 32W T8 Lamps, Electronic Ballast / No Upgrade	2L4' T8/ELEC	61	No Upgrade	61	29	\$0.00	\$0.00
5	(2) 6' T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	1L6' T12/STD/STD	105	2L4' T8/ELEC	61	1	\$300.00	\$25.00
6	(4) 4' 34W T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	4L4' EE/STD	160	4L4' T8/ELEC	110	64	\$90.00	\$15.00
7	75W Incandescent Lamp / Replace with a 26W Compact Fluorescent	75W INCANDESCENT	75	26W CF/SI	28	12	\$10.00	\$0.00
8	250W Metal Halide Fixture / No Upgrade	250W MH/BALLAST	286	No Upgrade	286	8	\$0.00	\$0.00
9	13W Compact Fluorescent Downlights	13W CF/HW	15	No Upgrade	15	40	\$0.00	\$0.00
10	(2) 4' 34W T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	2L4' EE/STD	80	2L4' T8/ELEC	61	28	\$60.00	\$15.00
11	(1) 4' 34W T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	1L4' EE/STD	50	1L4' T8/ELEC	31	1	\$50.00	\$15.00
12	60W Incandescent Lamp / Replace with 13W Compact Fluorescent	60W INCANDESCENT	60	13W CF/SI	15	1	\$10.00	\$0.00
13	(2) 4' 32W T8 U-Tube Lamps, Electronic Ballast / No Upgrade	2L22"	62	No Upgrade	62	1	\$0.00	\$0.00
14	(2) 8' T12 Lamps, Magnetic Ballasts / Retrofit with T8 Lamps, Electronic Ballast	2L8' EE/STD	138	2L8' T8/ELEC	118	12	\$60.00	\$15.00
15	(3) 4' 32W T8 Lamps, Electronic Ballast / No Upgrade	3L4' T8/ELEC	89	No Upgrade	89	56	\$0.00	\$0.00
16	(4) 4' 32W T8 Lamps, Electronic Ballast / No Upgrade	4L4' T8/ELEC	110	No Upgrade	110	2	\$0.00	\$0.00
17	LED Exit Sign	LED	2	No Upgrade	2	4	\$0.00	\$0.00
18	Metal Halide / No Upgrade	MH		No Upgrade		2	\$0.00	\$0.00
19						0	\$0.00	\$0.00
20						0	\$0.00	\$0.00

Summary

	Lighting (Only)	Sensors (Only)	Complete Lighting Upgrade
Cost	\$19,000.00	\$0.00	\$19,000.00
Rebate	\$3,630.00	\$0.00	\$3,630.00
Net Cost	\$15,370.00	\$0.00	\$15,370.00
Savings (kWh)	40,323	0	40,323
Savings (\$)	\$6,451.68	\$0.00	\$6,451.68
Payback	2.4		2.4

Variables:

\$0.16	Avg. Electric Rate (\$/kWh)
	Avg. Demand Rate (\$/kW)
8760	Operating Hours/Year
24	Operating Hours/Work Day

Assumptions:

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

Notes:

Seq. #	Upgrade Code	Room/Area	Hrs/Week Day	Hrs/Year	Existing			Proposed			kW Reduction	Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	Controls		Energy Savings, kWh	Cost (\$)	Savings (\$)	Payback (yrs)	SmartStart Rebate		Energy Savings, kWh	Post-Retire Cost (\$)	Savings (\$)	Payback (yrs)
					Fixture	Qty.	Watts	Foot Candles	Fixture	Qty.						Watts	Type					Qty.	Lighting				
Totals:					40962																	\$3,630.00	\$0.00	40323	\$15,370.00	\$6,451.68	2.4
1	1	Hallway	24	8760	15W EXIT	2	30	LED	2	4	0.026	228	\$80.00	\$36.44	2.2		0	\$0.00	\$0.00		\$20.00	\$0.00	228	\$60.00	\$36.44	1.6	
2	2	Hallway	24	8760	3L4' EE/STD	3	390	3L4' TB/ELEC	3	267	0.123	1077	\$240.00	\$172.40	1.4		0	\$0.00	\$0.00		\$45.00	\$0.00	1077	\$195.00	\$172.40	1.1	
3	3	Hallway	24	8760	2L22" STD/STD	1	94	2L22"	1	62	0.032	280	\$60.00	\$44.95	1.3		0	\$0.00	\$0.00		\$15.00	\$0.00	280	\$45.00	\$44.95	1.0	
4	4	Women's Room	12	4380	2L4' TB/ELEC	3	183	No Upgrade	3	183	0	0	\$0.00	\$0.00	0		0	\$0.00	\$0.00		\$0.00	\$0.00	0	\$0.00	\$0.00	0	
5	2	Conference Room	6	2190	3L4' EE/STD	8	1040	3L4' TB/ELEC	8	712	0.328	718	\$640.00	\$114.93	5.6		0	\$0.00	\$0.00		\$120.00	\$0.00	718	\$520.00	\$114.93	4.5	
6	5	Men's Room	12	4380	1L6' T12/STD/STD	1	105	2L4' TB/ELEC	1	61	0.044	193	\$300.00	\$30.84	9.7		0	\$0.00	\$0.00		\$25.00	\$0.00	193	\$275.00	\$30.84	8.9	
7	4	Men's Room	12	4380	2L4' TB/ELEC	1	61	No Upgrade	1	61	0	0	\$0.00	\$0.00	0		0	\$0.00	\$0.00		\$0.00	\$0.00	0	\$0.00	\$0.00	0	
8	9	Men's Room	12	4380	13W CF/HW	1	15	No Upgrade	1	15	0	0	\$0.00	\$0.00	0		0	\$0.00	\$0.00		\$0.00	\$0.00	0	\$0.00	\$0.00	0	
9	2	Hallway Entrance	24	8760	3L4' TB/ELEC	2	260	3L4' TB/ELEC	2	178	0.082	718	\$180.00	\$114.93	1.4		0	\$0.00	\$0.00		\$30.00	\$0.00	718	\$130.00	\$114.93	1.1	
10	2	Mayor's Office General Area	8	2920	3L4' EE/STD	2	260	3L4' TB/ELEC	2	178	0.082	239	\$160.00	\$38.31	4.2		0	\$0.00	\$0.00		\$30.00	\$0.00	239	\$130.00	\$38.31	3.4	
11	6	Public Info Office	8	2920	4L4' EE/STD	2	320	4L4' TB/ELEC	2	220	0.1	292	\$180.00	\$46.72	3.9		0	\$0.00	\$0.00		\$30.00	\$0.00	292	\$150.00	\$46.72	3.2	
12	6	Mayor's Office	8	2920	4L4' EE/STD	2	320	4L4' TB/ELEC	2	220	0.1	292	\$180.00	\$46.72	3.9		0	\$0.00	\$0.00		\$30.00	\$0.00	292	\$150.00	\$46.72	3.2	
13	6	EED Office	8	2920	4L4' EE/STD	1	160	4L4' TB/ELEC	1	110	0.05	146	\$90.00	\$23.36	3.9		0	\$0.00	\$0.00		\$15.00	\$0.00	146	\$75.00	\$23.36	3.2	
14		Admin Offices																									
15	2	General Office	24	8760	3L4' EE/STD	1	130	3L4' TB/ELEC	1	89	0.041	359	\$80.00	\$57.47	1.4		0	\$0.00	\$0.00		\$15.00	\$0.00	359	\$65.00	\$57.47	1.1	
16	2	General Office	8	2920	3L4' EE/STD	12	1560	3L4' TB/ELEC	12	1068	0.492	1437	\$960.00	\$229.86	4.2		0	\$0.00	\$0.00		\$180.00	\$0.00	1437	\$780.00	\$229.86	3.4	
17	2	Conference Room	8	2920	3L4' EE/STD	2	260	3L4' TB/ELEC	2	178	0.082	239	\$160.00	\$38.31	4.2		0	\$0.00	\$0.00		\$30.00	\$0.00	239	\$130.00	\$38.31	3.4	
18	2	Township Clerk	8	2920	3L4' EE/STD	3	390	3L4' TB/ELEC	3	267	0.123	359	\$240.00	\$57.47	4.2		0	\$0.00	\$0.00		\$45.00	\$0.00	359	\$195.00	\$57.47	3.4	
19	2	Hallway	24	8760	3L4' EE/STD	2	260	3L4' TB/ELEC	2	178	0.082	718	\$180.00	\$114.93	1.4		0	\$0.00	\$0.00		\$30.00	\$0.00	718	\$130.00	\$114.93	1.1	
20	2	A&E Offices	8	2920	3L4' EE/STD	11	1430	3L4' TB/ELEC	11	979	0.451	1317	\$880.00	\$210.71	4.2		0	\$0.00	\$0.00		\$165.00	\$0.00	1317	\$715.00	\$210.71	3.4	
21	2	Asst. Admin.	8	2920	3L4' EE/STD	3	390	3L4' TB/ELEC	3	267	0.123	359	\$240.00	\$57.47	4.2		0	\$0.00	\$0.00		\$45.00	\$0.00	359	\$195.00	\$57.47	3.4	
22	2	Administrator	8	2920	3L4' EE/STD	4	520	3L4' TB/ELEC	4	356	0.164	479	\$320.00	\$76.62	4.2		0	\$0.00	\$0.00		\$60.00	\$0.00	479	\$260.00	\$76.62	3.4	
23	2	Office Room	8	2920	3L4' EE/STD	4	520	3L4' TB/ELEC	4	356	0.164	479	\$320.00	\$76.62	4.2		0	\$0.00	\$0.00		\$60.00	\$0.00	479	\$260.00	\$76.62	3.4	
24	1	Basement	8	2920	15W EXIT	1	15	LED	1	2	0.013	38	\$40.00	\$6.07	6.6		0	\$0.00	\$0.00		\$10.00	\$0.00	38	\$30.00	\$6.07	4.9	
25	6	Traffic Office	8	2920	4L4' EE/STD	4	640	4L4' TB/ELEC	4	440	0.2	584	\$360.00	\$93.44	3.9		0	\$0.00	\$0.00		\$60.00	\$0.00	584	\$300.00	\$93.44	3.2	
26	6	Office	8	2920	4L4' EE/STD	4	640	4L4' TB/ELEC	4	440	0.2	584	\$360.00	\$93.44	3.9		0	\$0.00	\$0.00		\$60.00	\$0.00	584	\$300.00	\$93.44	3.2	
27	6	Office	8	2920	4L4' EE/STD	1	160	4L4' TB/ELEC	1	110	0.05	146	\$90.00	\$23.36	3.9		0	\$0.00	\$0.00		\$15.00	\$0.00	146	\$75.00	\$23.36	3.2	
28	14	Office	8	2920	2L8' EE/STD	1	138	2L8' TB/ELEC	1	118	0.02	58	\$60.00	\$9.34	6.4		0	\$0.00	\$0.00		\$15.00	\$0.00	58	\$45.00	\$9.34	4.8	
29	6	Lobby	24	8760	4L4' EE/STD	3	480	4L4' TB/ELEC	3	330	0.15	1314	\$270.00	\$210.24	1.3		0	\$0.00	\$0.00		\$45.00	\$0.00	1314	\$225.00	\$210.24	1.1	
30	1	Corridor	24	8760	15W EXIT	2	30	LED	2	4	0.026	228	\$80.00	\$36.44	2.2		0	\$0.00	\$0.00		\$20.00	\$0.00	228	\$60.00	\$36.44	1.6	
31	14	Corridor	24	8760	2L8' EE/STD	6	828	2L8' TB/ELEC	6	708	0.12	1051	\$360.00	\$168.19	2.1		0	\$0.00	\$0.00		\$60.00	\$0.00	1051	\$270.00	\$168.19	1.6	
32	6	Mail Room	8	2920	4L4' EE/STD	1	160	4L4' TB/ELEC	1	110	0.05	146	\$90.00	\$23.36	3.9		0	\$0.00	\$0.00		\$15.00	\$0.00	146	\$75.00	\$23.36	3.2	
33	6	Kitchen	8	2920	4L4' EE/STD	2	320	4L4' TB/ELEC	2	220	0.1	292	\$180.00	\$46.72	3.9		0	\$0.00	\$0.00		\$30.00	\$0.00	292	\$150.00	\$46.72	3.2	
34	6	Storage	1	365	4L4' EE/STD	2	320	4L4' TB/ELEC	2	220	0.1	37	\$180.00	\$5.84	30.8		0	\$0.00	\$0.00		\$30.00	\$0.00	37	\$150.00	\$5.84	25.7	
35	1	Hall	24	8760	15W EXIT	11	165	LED	11	22	0.143	1253	\$440.00	\$200.43	2.2		0	\$0.00	\$0.00		\$110.00	\$0.00	1253	\$330.00	\$200.43	1.5	
36	6	Computer Room	8	2920	4L4' EE/STD	4	640	4L4' TB/ELEC	4	440	0.2	584	\$360.00	\$93.44	3.9		0	\$0.00	\$0.00		\$60.00	\$0.00	584	\$300.00	\$93.44	3.2	
37	6	Computer Room	8	2920	4L4' EE/STD	5	800	4L4' TB/ELEC	5	550	0.25	730	\$450.00	\$116.80	3.9		0	\$0.00	\$0.00		\$75.00	\$0.00	730	\$375.00	\$116.80	3.2	
38	7	Closet	0.5	182.5	75W INCANDESCENCE	1	75	26W CF/SI	1	28	0.047	9	\$10.00	\$1.37	7.3		0	\$0.00	\$0.00		\$0.00	\$0.00	9	\$10.00	\$1.37	7.3	
39	6	Maintenance Room	6	2190	4L4' EE/STD	2	320	4L4' TB/ELEC	2	220	0.1	219	\$180.00	\$36.04	5.1		0	\$0.00	\$0.00		\$30.00	\$0.00	219	\$150.00	\$36.04	4.3	
40	6	Office	8	2920	4L4' EE/STD	2	320	4L4' TB/ELEC	2	220	0.1	292	\$180.00	\$46.72	3.9		0	\$0.00	\$0.00		\$30.00	\$0.00	292	\$150.00	\$46.72	3.2	
41	7	Telephone	0.5	182.5	75W INCANDESCENCE	1	75	26W CF/SI	1	28	0.047	9	\$10.00	\$1.37	7.3		0	\$0.00	\$0.00		\$0.00	\$0.00	9	\$10.00	\$1.37	7.3	
42	10	Boiler Room	4	1460	2L4' EE/STD	2	160	2L4' TB/ELEC	2	122	0.038	55	\$120.00	\$8.88	13.5		0	\$0.00	\$0.00		\$30.00	\$0.00	55	\$90.00	\$8.88	10.1	
43	10	Hall	24	8760	2L4' EE/STD	8	640	2L4' TB/ELEC	8	488	0.152	1332	\$480.00	\$213.04	2.3		0	\$0.00	\$0.00		\$120.00	\$0.00	1332	\$360.00	\$213.04	1.7	
44		Police & Court																									
45	4	Electric Closet	0.5	182.5	2L4' TB/ELEC	1	61	No Upgrade	1	61	0	0	\$0.00	\$0.00	0		0	\$0.00	\$0.00		\$0.00	\$0.00	0	\$0.00	\$0.00	0	
46	8	Courtroom	6	2190	250W MH/BALLAST	8	2268	No Upgrade	8	2268	0	0	\$0.00	\$0.00	0		0	\$0.00	\$0.00		\$0.00	\$0.00	0	\$0.00	\$0.00	0	
47	9	Courtroom	6	2190	13W CF/HW	10	150	No Upgrade	10	150	0	0	\$0.00	\$0.00	0		0	\$0.00	\$0.00		\$0.00	\$0.00	0	\$0.00	\$0.00	0	
48	1	Courtroom	6	2190	15W EXIT	2	30	LED	2	4	0.026	57	\$80.00	\$9.11	8												

Appendix B: Third Party Energy Suppliers (ESCOs)

Supplier	Telephone & Web Site
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009 Attn: Brian Vayda	877-977-2636 bvayda@americanpowernet.com www.americanpowernet.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
ConEdison Solutions Cherry Tree Corporate Center 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	212-538-3124 www.creditsuisse.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07962	(800) 977-0500 Supply chain website www.firstenergycorp.com/supplierregistration www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	1-877-569-2841 www.glacialenergy.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 070956	(800) 437-7872 Tom Miller www.hess.com
Integrus Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	1-877-763-9977 Dole Janssen: 920-617-6029 Charles Kuntz: 614-844-4324 www.integrusenergy.com

Supplier	Telephone & Web Site
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	(866) 769-3799 www.libertypowercorp.com
Palmco Power NJ, LLC One Greentree Centre 10000 Lincoln Drive East, Suite 201 Marlton, NJ 08053	(877) 726-5862 www.PalmcoEnergy.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) ENERGY-9 (363-7499) www.pepco-services.com
PPL Energy Plan, LLC 811 Church Road Cherry Hill, NJ 08002	800-281-2000 www.pplenergyplus.com
Sempra Energy Solutions The Mac-Cali Building 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 732-596-6400-Tony Buck www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 Gary Bean gbean@sjindustries.com www.southjerseyenergy.com

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