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May 5, 2010

Local Government Energy Program
Energy Audit Report

For

Township of Parsippany – Troy Hills

Parsippany – Troy Hills Police Headquarters
3339 Route 46
Parsippany, NJ 07054

Project Number: LGEA26

TABLE OF CONTENTS

INTRODUCTION

As an approved energy consulting firm under the Local Government Energy Audit Program (LGEA), Steven Winter Associates, Inc. (SWA) was selected to perform an energy audit and assessment for the Township of Parsippany – Troy Hills buildings. The audit included a review of the Parsippany – Troy Hills Town Hall, Public Library, Community Center and Tennis Club, Police Headquarters, Parks Forestry and Recreation building, as well as the Water Utilities Office, DPW building, Park Road Booster Station building, Well 21 building, and Sewer Pump station # 4 building. The buildings are located in Parsippany and Lake Hiawatha, NJ. A separate energy audit report is issued for each of the referenced buildings.

This report addresses the Parsippany – Troy Hills Police Headquarters building located at 3339 Route 46, Parsippany, NJ. The current conditions and energy-related information were collected in order to analyze and suggest the implementation of building improvements and energy conservation measures.

The Parsippany - Troy Hills Police Headquarters building, located at 3339 Route 46 was opened in 2005, when work was completed as a new construction building. It consists of approximately 26,000 square feet of conditioned space and is home to both the Parsippany Police Department and Parsippany Municipal Courthouse. In addition to the typical offices and interrogation rooms associated with both a police station and courthouse the building also contains a full service garage bay, armory, locker rooms and exercise rooms. The Police department is open and operated 24 hours per day and the usual full time occupancy is approximately 26 full time officers and police department employees. At night the occupancy is reduced to approximately 3 employees that are on night shift. The Municipal courthouse occupancy is approximately 6 full time municipal employees and is open Monday through Friday from 9:00 AM to 4:00 PM for its collections and violations departments, and Court is in session every Tuesday at 1:00 PM, 6:30 PM and 7:30 PM and Thursdays at 6:30 PM.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Township of Parsippany – Troy Hills to make decisions regarding the implementation of the most appropriate and most cost effective energy conservation measures for the building.

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

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

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Parsippany - Troy Hills Police Headquarters building located at 3339 Route 46, Parsippany, NJ. The building is a two-story building with a total floor area of 26,000 square feet. The building opened in 2005, when work was completed as a new construction building and no additions have been constructed since.

Based on the field visit performed by the SWA staff on October 21st, 2009 and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

Existing conditions

From August 2008 through July 2009, the period of analysis for this audit, the building consumed 603,680 kWh or $98,187 worth of electricity at an approximate rate of $0.163/kWh and 15,108 therms or $20,237 worth of natural gas at an approximate rate of $1.339 per therm. The joint energy consumption for the building, including both electricity and fossil fuel was 3,571 MMBtus of energy that cost a total of $118,424.

SWA has entered energy information about the Police Headquarters and municipal court building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building is not eligible to receive a performance rating since it is classified as a police building. SWA encourages the Township of Parsippany - Troy Hills to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

The Site Energy Use Intensity is 137.7 kBtu/sq ft yr compared to the national average of a Police Headquarters consuming 78 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 3.3 kBtu/sqft yr, with an additional 3.7 kBtu/sq ft yr from the recommended 5-10 year payback ECMs.

Recommendations

Implementing this report's recommendations will reduce use by approximately 7.0 kBtu/ft^2yr, which would decrease the building's energy use intensity to 130.7 kBtu/ft^2yr.

The Police Headquarters is less than 5 years old and therefore most HVAC equipment as well as lighting has been installed according to recent building codes. Equipment was observed in age-appropriate condition and has a majority of the remaining useful lifetime left. SWA observed operating conditions of the building and has provided a scope of work based on those observations. With a building less than 5 years old, preventative maintenance is the single most important recommendation to ensure energy efficient, cost savings as well as maintain tenant comfort.

Based on the assessment of the building, SWA has separated the recommendations into three categories (See Section 4 for more details). These are summarized as follows:

Category I Recommendations: Capital Improvement Measures

- None

Category II Recommendations: Operations and Maintenance

- Program all computers for power save mode
- Perform routine maintenance inspections on exterior walls
- Perform routine maintenance inspections of the roof
- Perform routine maintenance inspections of windows and doors
- Provide water efficient fixtures and controls
- Use Energy Star labeled appliances

Category III Recommendations: Energy Conservation Measures

At this time, SWA highly recommends a total of **3** Energy Conservation Measures (ECMs) for the Police Headquarters that is summarized in the following Table 1. The total investment cost for these ECMs with incentives is **$277**. SWA estimates a first year savings of **$3,555** with a simple payback of **0.1 years**. SWA also recommends **2** ECMs with a 5-10 year payback that is summarized in Table 2 and no End of Life Cycle ECMs.

The implementation of all the recommended ECMs would reduce the building electric usage by 48,953 kWh annually, or 8% of the building's current electric consumption. The implementation of all the recommended ECMs would also reduce natural gas usage by 1,153 therms or 8% of the building's current natural gas consumption. SWA estimates that implementing these ECMs will reduce the carbon footprint of the Police Headquarters by **89,465 lbs of CO_2**, which is equivalent to removing approximately 3 cars from the roads each year or avoiding the need of 165 trees to absorb the annual CO_2 produced. SWA also recommends that Township of Parsippany - Troy Hills contacts third party energy suppliers in order to negotiate a lower electricity rate. Comparing the current electric rate to average utility rates of similar type buildings in New Jersey, it may be possible to save up to $0.013/kWh, which would have equated to $7,848 for the past 12 months.

There are various incentives that Township of Parsippany - Troy Hills could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the Township of Parsippany - Troy Hills 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 80% of the capital investment.

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

The following two 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	Adjust thermostat for Court house area	Similar Projects	30	0	30	19,320	19.3	98	2.9	0	3,280	5	14,935	0.0	49,684.3	9,936.9	10,932.8	14,991	35,668
2	Adjust domestic hot water supply temperature	Similar Projects	30	0	30	0	0.0	67	0.3	0	90	5	409	0.3	1261.7	252.3	298.7	381	739
3	Install 4 new CFL lamps	RS Means, lit search	217	0	217	1,075	0.2	0	0.1	10	185	5	843	1.2	288.7	57.7	81.0	631	1,925
	TOTALS	**-**	**277**	**0**	**277**	**20,935**	**19.5**	**165**	**3.3**	**10**	**3,555**	**-**	**16,187**	**0.1**	**-**	**-**	**-**	**16,003**	**38,332**

Assumptions: Discount Rate: 3.2% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines
Note: A 0.0 electrical demand reduction / month indicates that it is very low / negligible

Table 2 - Recommended 5-10 Year Payback ECMs																			
ECM #	ECM description	Source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	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	Install 10kW PV system	Similar Projects	70,000	10,000	60,000	11,804	10.0	0	1.5	0	8,524	15	100,303	7.0	67.2	4.5	11.4	41,760	21,135
5	Install 57 new Pulse Start Metal Halide fixtures	RSMeans, lit search	41,183	1,425	39,758	16,754	3.5	0	2.2	1,355	4,086	15	48,079	9.7	20.9	1.4	6.0	9,019	29,998
	TOTALS	**-**	**111,183**	**11,425**	**99,758**	**28,558**	**13.5**	**0**	**3.7**	**1,355**	**12,610**	**-**	**148,382**	**7.9**	**-**	**-**	**-**	**50,779**	**51,133**

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

1. HISTORIC ENERGY CONSUMPTION

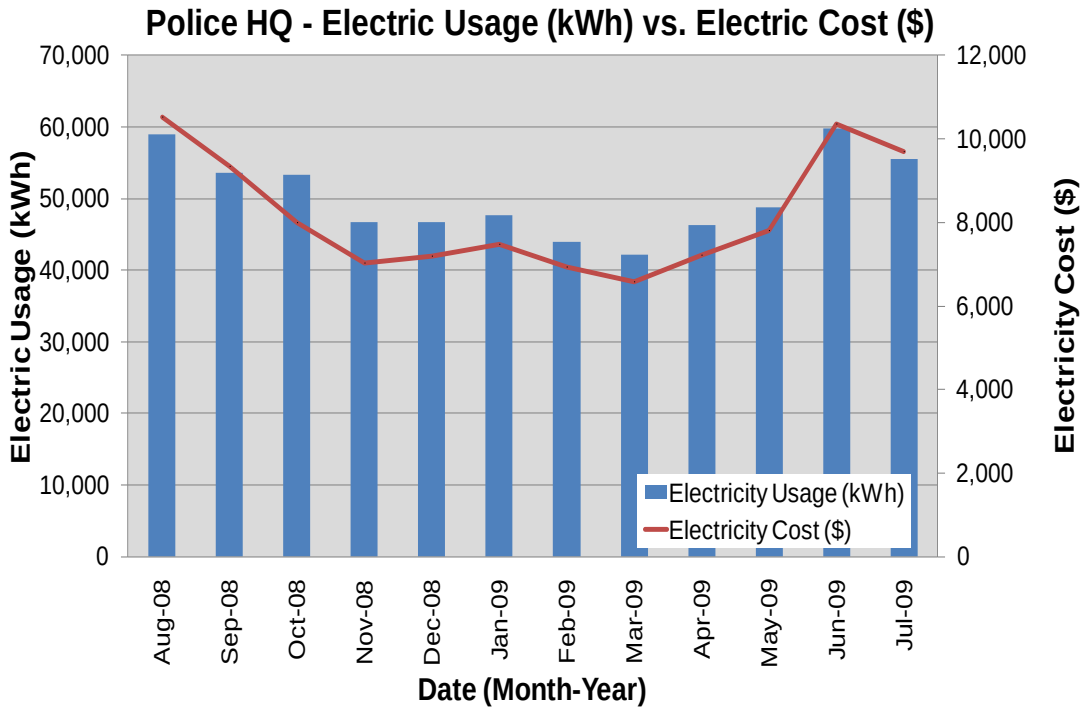
1.1. Energy usage, load profiles and cost analysis

SWA analyzed utility bills from **August 2008 through July 2009**(period of analysis) that were received from the utility companies supplying the Police Headquarters with electric and natural gas.

Electricity - The Police Headquarters buys electricity from JCP&L at **an average rate of $0.163/kWh** based on 12 months of utility bills from August 2008 to July 2009. The Police Headquarters purchased **approximately 603,680 kWh or $98,187 worth of electricity** in the previous year. The Police Headquarters is currently charged for demand (kW) which has been factored into each monthly bill.

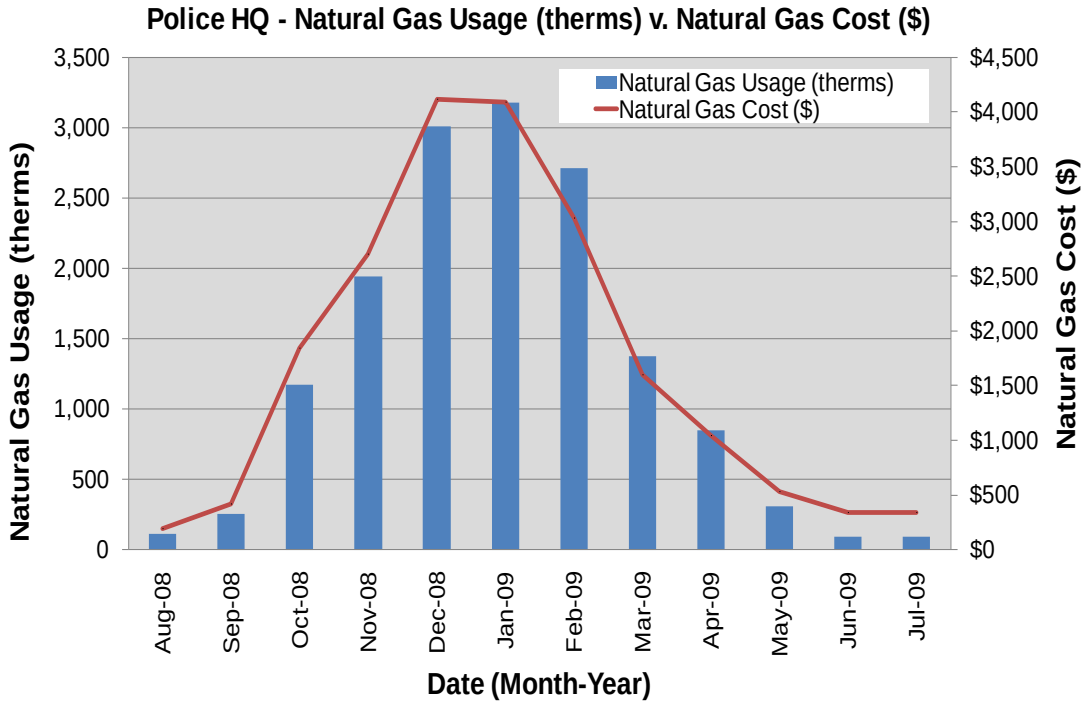
Natural gas - The Police Headquarters is currently served by one meter for natural gas. The Police Headquarters currently buys natural gas from New Jersey Natural Gas (NJNG) at **an average aggregated rate of $1.339/therm** based on 12 months of utility bills for August 2008 to July 2009. The Police Headquarters purchased **approximately 15,108 therms or $20,237 worth of natural gas** in the previous year.

The following chart shows electricity use versus cost for the Police Headquarters based on utility bills for the 12 month period of August 2008 to July 2009.



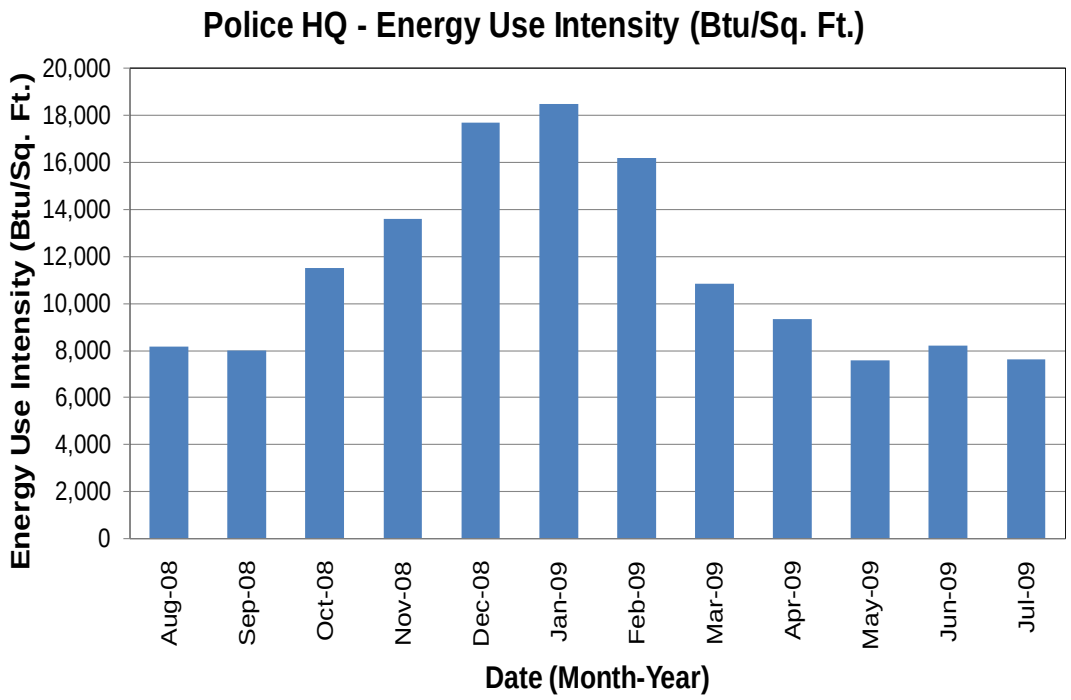
Electricity use follows a trend as expected; peaking during the summer months when air conditioning units are used most and decreases during the winter. The cost of electricity fluctuates as expected with usage.

The following is a chart of the natural gas annual load profile for the building versus natural gas costs, peaking in the coldest months of the year and a chart showing natural gas consumption following the "heating degree days" curve.



In the above chart, the natural gas use follows a heating trend as expected. During the summer it is clear that the natural gas use is very minimal which reflects that heat is not being used and the domestic hot water (DHW) load is minimal.

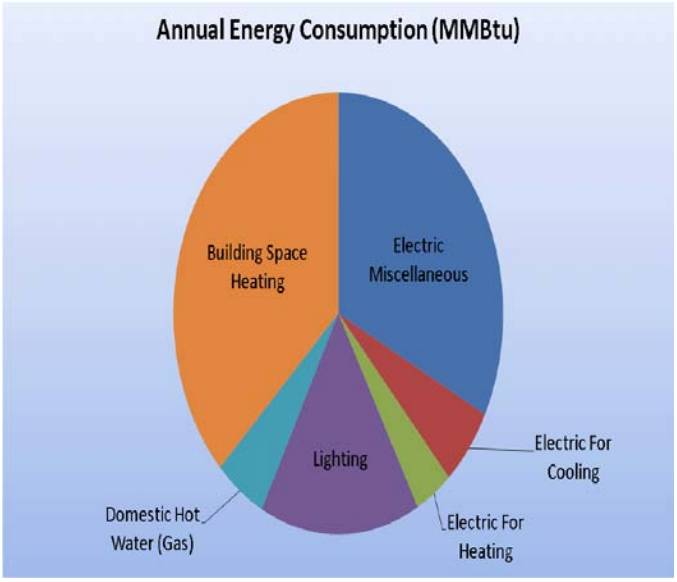
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Police Headquarters based on utility bills for the 12 month period of August 2008 to July 2009.

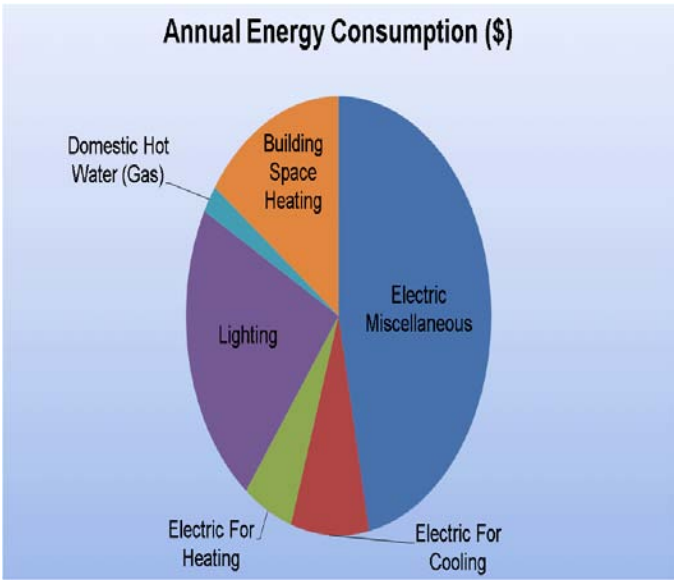


The following table and chart pies show energy use for the Police Headquarters based on utility bills for the 12 month period of August 2008 to July 2009. Note electrical cost at $48/MMBtu of energy is more than 3.5 times as expensive to use as natural gas at $13/MMBtu.

Aug. 2008 - July 2009 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	1,163	33%	$55,433	47%	48
Electric For Cooling	205	6%	$9,771	8%	48
Electric For Heating	132	4%	$6,292	5%	48
Lighting	560	16%	$26,692	23%	48
Domestic Hot Water (Gas)	180	5%	$2,411	2%	13
Building Space Heating	1,331	37%	$17,826	15%	13
Totals	3,571		$118,424	100%	
Total Electric Usage	2,060	58%	$98,187	83%	48
Total Gas Usage	1,511	42%	$20,237	17%	13
Totals	3,571	100%	$118,424	100%	

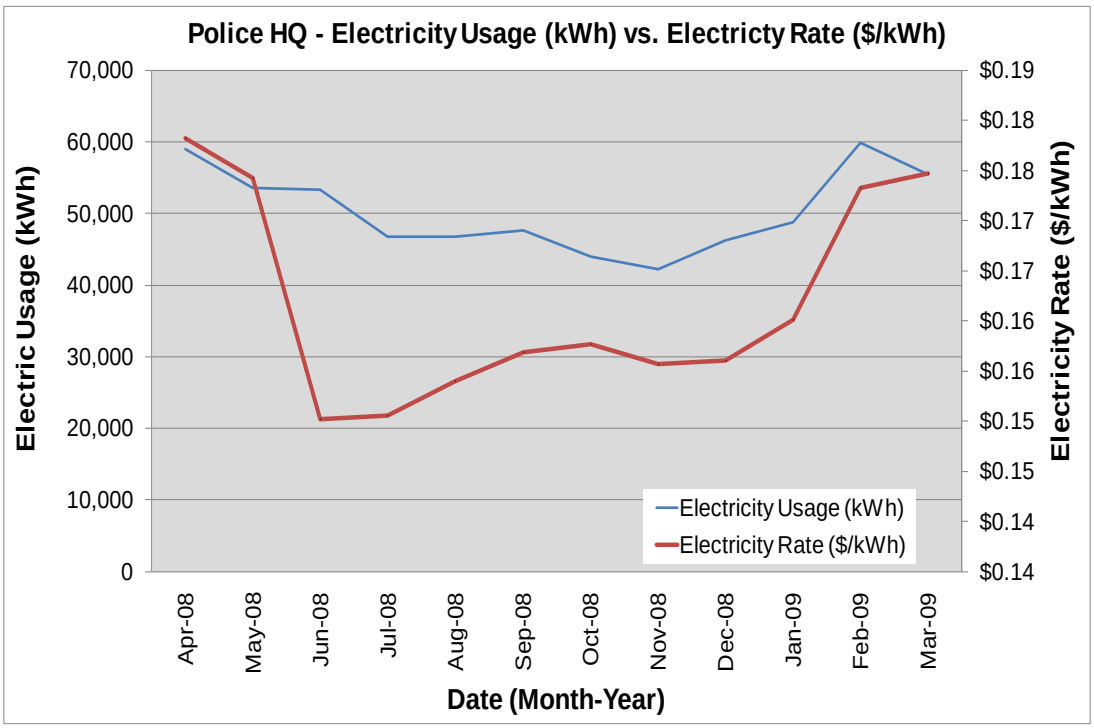
*Electric miscellaneous loads are attributed to plug-load appliances and miscellaneous equipment. For this building miscellaneous equipment showed a large usage due to radio and dispatch equipment, computers and other equipment that is left on 24 hours per day due to the nature of the building as a Police Department.





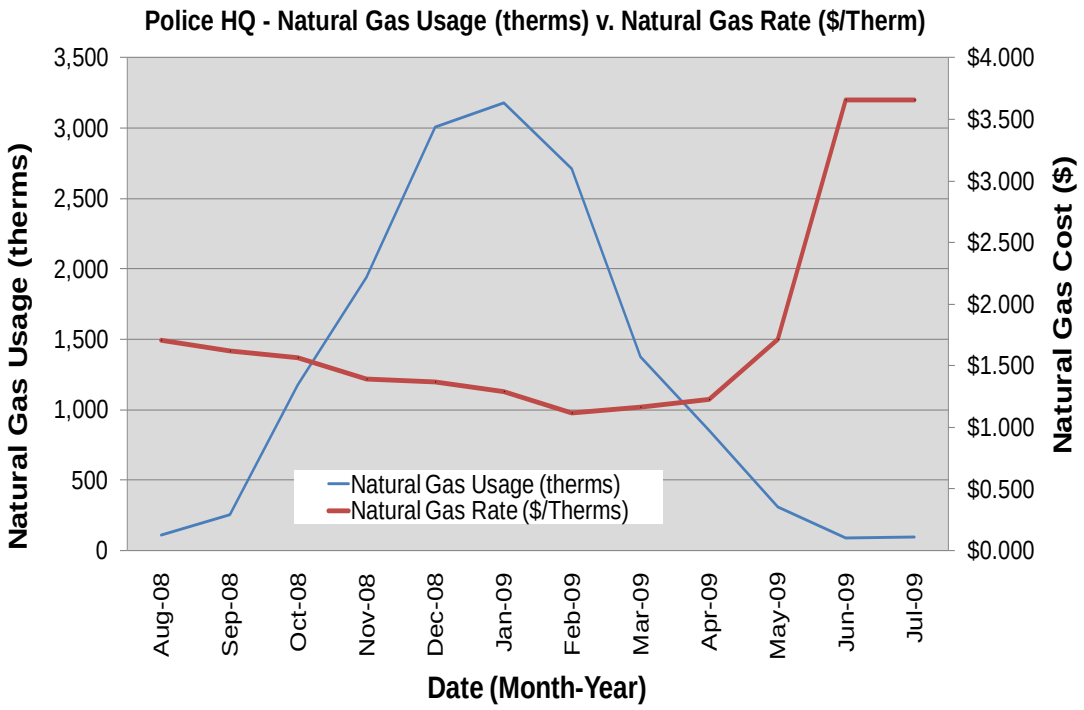
1.2. Utility rate analysis

The Police Headquarters currently purchases electricity from JCP&L at a general service market rate for electricity use (kWh) including a separate (kW) demand charge that is factored into each monthly bill. The Police Headquarters currently pays an average rate of approximately $0.163/kWh based on the 12 months of utility bills of August 2008 to July 2009. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. The electric rate does not show large fluctuations throughout the year except for an anticipated rise in the summer time and small increase in the winter that corresponds to a spike in fuel prices. Based on these observations this appears to be the appropriate rate for the building.



The Police Headquarters currently purchases natural gas supply from the NJNG at a general service market rate for natural gas (therms). There is one gas meter that provides natural gas service to the Police Headquarters currently. The average aggregated rate (supply and transport) for the meter is approximately $1.339/therm based on 12 months of utility bills for August 2008 to July 2009. The suppliers' general service rate for natural gas charges a market-rate price based on use and the Police Headquarters billing does not breakdown demand costs for all periods. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the natural gas prices increase during the summer months when natural gas is only used by the hot water boilers. The high gas price per therm fluctuations in the summer may be due to low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months.

Some of the minor unusual utility fluctuations that showed up for a couple of months on the utility bills may be due to adjustments between estimated and actual meter readings.



1.3. Energy benchmarking

SWA has entered energy information about the Police Headquarters and municipal court in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building is not eligible to receive a performance rating since it is classified as a police building. SWA encourages the Township of Parsippany - Troy Hills to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time.

The Site Energy Use Intensity is 137.7 kBtu/sq ft yr compared to the national average of a Police Headquarters consuming 78.0 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 3.3 kBtu/sqft yr, with an additional 3.7 kBtu/sq ft yr from the recommended ECMs.

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

[redacted]

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

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Parsippany - Police HQ and Municipal Court

Building ID: 1959695
For 12-month Period Ending: July 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: March 10, 2010

Facility
Parsippany - Police HQ and Municipal Court
3339 Route 46
Parsippany, NJ 07054

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 2005
Gross Floor Area (ft²): 26,000

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	2,069,992
Natural Gas (kBtu)[4]	1,510,681
Total Energy (kBtu)	3,580,673

Energy Intensity[5]

Site (kBtu/ft²/yr)	138
Source (kBtu/ft²/yr)	327

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	396

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	108%
Building Type	Fire Station/Police Station

Stamp of Certifying Professional

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

Certifying Professional
N/A

Meets Industry Standards[6] **for Indoor Environmental Conditions:**

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

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The Parsippany - Troy Hills Police Headquarters building, located at 3339 Route 46 was opened in 2005, when work was completed as a new construction. It consists of approximately 26,000 square feet of conditioned space and is home to both the Parsippany Police Department and Parsippany Municipal Courthouse. In addition to the typical offices and interrogation rooms associated with both a police station and courthouse the building also contains a full service garage bay, armory, locker rooms and exercise rooms. The Police department is always open and its usual full time occupancy is approximately 26 full time officers and police department employees. At night, the Police Department occupancy is reduced to 3 night shift employees. The municipal courthouse occupancy is approximately 6 full time municipal employees and is open Monday through Friday from 9:00 AM to 4:00 PM for its collections and violations departments, and Court is in session every Tuesday at 1:00 PM, 6:30 PM and 7:30 PM and Thursdays at 6:30 PM.

2.2. Building occupancy profiles

The Police department is always open and its usual full time occupancy is approximately 26 full time officers and police department employees. The municipal courthouse occupancy is approximately 6 full time municipal employees and is open Monday through Friday from 9:00 AM to 4:00 PM for its collections and violations departments, and Court is in session every Tuesday at 1:00 PM, 6:30 PM and 7:30 PM and Thursdays at 6:30 PM.

2.3. Building envelope

2.3.1.Exterior Walls

There are two typical types of exterior walls at the Police Headquarters. Nearly all of the exterior wall is constructed of a 4” red masonry brick face layer with a 1.75” airspace on 15# waterproofing felt over 0.5” thick exterior grade gypsum board on a 6” structural studs with 0.625” interior gypsum board wall. The structural studs are insulated with a 6” layer of batt insulation with a specified value of R-19. However, at the building corners the exterior surface is 4” cast stone with 2.75” airspace on 15# waterproofing felt over 0.5” thick exterior grade gypsum board on 6” structural studs with 0.625 interior gypsum board layer. The structural studs are insulated with a 6” layer of BATT insulation with a specified value of R-19.

Existing Exterior Walls

Overall, exterior and interior wall finishes of the envelope were found to be in age-appropriate, good condition with no major signs of water or air leakage. There were some isolated instances at surface transitions and building corners that are beginning to show signs of cracking and slight water damage. SWA does however; recommend biannual maintenance inspections to inspect the exterior walls with a focus on cracks and pointing of the masonry, degraded caulking, and locating sources of water and air leakage.

Exterior wall cracks and water damage at corners and surface transitions

2.3.2.Roof

The roof of the Police Headquarters is typically a sloped shingle roof with a pitch of 6:12. The exterior surfaces is fiberglass asphalt roofing shingles over 30# roofing felt, with a 0.625" layer of exterior grade plywood to its interior over the wooden roof trusses which have two layers of 6" BATT insulation secured to the truss bottom chord. The specified value of the batt insulation is R-38. Also

installed on the roof are water and ice shields at all eaves, valleys, hips and ridges of the roof. The roof is in good age appropriate condition however, there are some isolated instances where the shingles have been uprooted and where the roof eave show signs of damage.

Example of uprooted roof shingles

Example of damaged roofing eave

Given the age of the building, there are no improvements to the roof assembly or insulation that would provide a significant improvement to the building performance; however, SWA does recommend biannual maintenance inspections with a focus on the drainage, penetrations, flashing and seams of the roof.

2.3.3.Base

The building's base is a 5" concrete slab-on-grade with a 3,000 lb. rating except for the garage bay areas where it is rated for 4,000 lbs and reinforced with 6x6-8/8 welded wire fabric. The slab is installed with a 6 mil vapor barrier layer and layers of 2" thick rigid insulation both horizontally and 2' deep below grade. There were no reported problems with water penetration or moisture; however, some slight cracks were noticed at grade level. This is standard for this type of structure. SWA does not recommend any additional insulation as it would not be cost effective.

2.3.4. Windows

The existing windows of the Police Headquarters are insulated aluminum clad framing units with grid patterns. They are either fixed inoperable dormer units or operable double hung units with dual glazing and thermal breaks. There are also fixed transom units above exterior doors and small window panels installed in some of the exterior doors.

Example of typical installed windows

The windows were observed to be in good age appropriate condition with properly functioning hardware and tight seals. Most windows are accompanied by vertical or venetian blind installations. Installation of new windows would not be economically viable, but as a best practice, SWA recommends that all windows be inspected at least once a year. Any gaps, cracks, or damage to weather-stripping or caulking should be repaired or replaced, as needed, to minimize energy loss around those openings.

2.3.5. Exterior doors

There are three different types of exterior doors at the Police Headquarters as there are insulated tempered paneled wooden exterior doors with small glass window panels, insulated aluminum clad hollow core paneled metal doors, and insulated steel folding sectional overhead garage doors. The exterior doors are in excellent condition and virtually all of the weather-stripping is still intact. If not properly maintained, exterior doors can become major sources of heat loss and infiltration. As a best

practice, SWA recommends checking the weather-stripping of each door on a regular basis and replacing any broken seals immediately. This will help optimize comfort and energy performance.

2.3.6. Building air tightness

Based on a visual inspection and communication with the building staff, the building was observed to be well-sealed and air tight which is consistent with the age and intended use of the building. As a best practice, weather-stripping on doors and windows should be checked every 6 months for deficiencies and replaced as they fail.

2.4. HVAC Systems

The Police Headquarters is served by one main heating plant that provides hot water to air handling units located in the attic. The air handlers also provide cooling using condensers located on the ground outside located around the perimeter of the building. Energy recovery ventilators are also used to pre-condition outside air before it enters the building. The HVAC system of the building is controlled by an Automated Logic BMS system, with each space further being controlled by programmable thermostats. The building is operated 24 hours per day except for the Court room. It was observed that the Court room was not currently setback properly at night when the building is not occupied. SWA recommends that thermostats in the Court Room are adjusted to account for the operational hours of the Court room including times when Court is in session.

2.4.1. Heating

The heating system includes two P-K Thermific gas-fired high-efficiency boilers with a total capacity of 2,000 MBH and a nameplate efficiency of 85%. Originally, the boilers were not designed to alternate, boiler B-2 was used as the main hot water supply. Building staff have recently adjusted the controls to alternate between the two boilers each week to ensure even wear on both boilers and prevent maintenance issues.

The heating system is setup to supply 140°F water to 11 air handlers located in the building attic and return water back to the boiler at 120°F. Four hot water pumps, including two 7.5HP and two 3/4HP pumps are used to distribute hot water to each air handler. Air handlers provide conditioned air to all areas of the building including both the Police Department and attached Court house. In addition to the main heating plant, the attic space also contains 6 energy recovery ventilators that transfer heat from exhaust air to preheat incoming outside air. The building is operated using an Automated Logic BMS system that is controlled by a third-party contractor. In addition to the BMS system, each individual space within the building contains a programmable thermostat.

2.4.2. Cooling

The building uses the above mentioned air handlers to provide cooled air to all parts of the building. Each air handling unit acts as a split air-conditioned system since condensers located on the ground outside of the building are attached to each air handler. Cooling is controlled by the BMS system as well as programmable thermostats located in each space.

2.4.3. Ventilation

As mentioned above, conditioned air is provided to the building by air handlers located in the attic. These air handlers mix outside air with return air from inside the space to provide conditioned air

throughout the building. In addition to the air handlers, energy recovery ventilators also provide ventilation by supplying the building with pre-conditioned air via a heat exchanger with exhaust air.

In addition to the air handling units, there are exhaust fans that help rid the building of stale air and also help induce fresh air into the building. These rooftop exhaust fans were observed to all be working with no major maintenance issues.

2.4.4. Domestic Hot Water

There is one AO Smith Preferred gas-fired water heater with a 100 gallon capacity, 199,990 BTUH input and 228 gal/hr recovery. The domestic hot water heater was observed to be appropriately sized and in good condition. The water heater serves sinks located throughout the Police Headquarters as well as showers. The hot water temperature setpoint was observed to be 140°F. SWA recommends reducing the hot water setpoint to 120°F as an energy saving measure. SWA does not recommend lowering the hot water setpoint to a temperature below 120°F, since a minimum setpoint is required to prevent the formation of Legionella bacteria.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting – The Police Headquarters contains mostly efficient lighting. All lighting in the building uses 2' or 4' T8 fixtures with electronic ballasts or CFL's (Compact Fluorescent Light bulb). Additionally there are also a large amount of controls devices already installed such as dimmers and occupancy sensors. There are also a few halogen and metal halide HID fixtures installed in the building. SWA is recommending replacing these fixtures with CFL's and Pulse Start Metal Halides respectively. See attached lighting schedule in Appendix A for a complete lighting inventory throughout the building and estimated power consumption.

Exit Lights - Exit signs were found to be LED type.

Exterior Lighting - The exterior lighting surveyed during the building audit were found to be mostly 70W, 100W and 150W metal halide fixtures. SWA recommends replacing the metal halides with 45W, 65W and 100W pulse start metal halide lamps respectively.

Parking - The parking lighting surveyed during the building audit were found to be 100W and 150W metal halide fixtures and a high output T8 fixture. SWA recommends replacing the metal halides with 65W and 100W pulse start metal halide lamps.

2.5.2. Appliances

SWA performed a survey of appliances installed at the Parsippany - Troy Hills Police Headquarters building and has determined that it would not be cost-effective to replace any appliances at this time due to the age of the building. Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. For example, Energy Star refrigerators use as little as 315 kWh / yr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Building management should select Energy Star label appliances and equipment when replacing: refrigerators, printers, and computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov.

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions in meeting areas use approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all appliances (i.e. refrigerators, coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off. The Police Headquarters computers are generally programmed for the power save mode, to shut down after a period of time that they have not been used.

2.5.3.Elevators

The Police Headquarters does not have any installed elevators.

2.5.4.Process and others electrical systems

There are currently no other process or electrical systems present in the building.

3. EQUIPMENT LIST

Inventory

Building System	Description	Physical Location	Make/ Model	Fuel	Space served	Date Installed	Estimated Remaining useful life %
Heating/Cooling	AA-1 Greenheck Energy Recovery Unit, Cooling: 65 WB, 79 DB, Heating: 56.5 DB, 84% Eff, 0.75 HP	Attic	Greenheck, Model #ERV-361TH	Electricity	Same as AHU-1	2005	50%
Heating/Cooling	AA-2 Greenheck Energy Recovery Unit, Cooling: 66 WB, 80 DB, Heating: 52.956.5 DB, 84% Eff, 1.5 HP	Attic	Greenheck, Model #ERV-361S	Electricity	Same as AHU-11	2005	50%
Heating/Cooling	AA-3 Greenheck Energy Recovery Unit, Cooling: 65 WB, 79 DB, Heating: 56.5 DB, 84% Eff, 0.75 HP	Attic	Greenheck, Model #ERV-361S	Electricity	Same as AHU-6	2005	50%
Heating/Cooling	AA-4 Greenheck Air heat exchanger, 0.5 HP, 208V, 1Ph, 5.4Amp, Cooling: 65 WB, 78 DB, Heating: 57.3 DB, 84% Eff	Roof	Greenheck, Model #ERV-251H-20-A-ES intake, Serial #04G06174	Electricity	Same as AHU-10	2005	50%
Heating/Cooling	AA-5 Greenheck Energy Recovery Unit, Cooling: 65 WB, 79 DB, Heating: 50 DB, 84% Eff, 1.0 HP	Attic	Greenheck, Model #ERV-361h	Electricity	Same as AHU-7	2005	50%
Heating/Cooling	AA-6 Greenheck Energy Recovery Unit, Cooling: 65 WB, 79 DB, Heating: 51.7 DB, 84% Eff, 0.5 HP	Attic	Greenheck, Model #ERV-251H	Electricity	Same as AHU-8	2005	50%
Heating/Cooling	AH-1; MagicAire air handling unit, 800 CFM, 0.25 HP, 120V, 24 MBH Cooling, 46.5 MBH Heating	Basement	Magic Aire M#24-BVX	Electricity	Basement, Police Archives	2005	67%
Heating/Cooling	AH-2; MagicAire air handling unit, 0.5HP, 36 MBH Cooling, 58 MBH Heating	Basement	Magic Aire M#36-BVX	Electricity	Basement, Court Archives	2005	67%
Heating/Cooling	AH-3; MagicAire air handling unit, 0.5 HP, 36 MBH Cooling, 58 MBH Heating	Basement	Magic Aire M#36-BVX	Electricity	Basement, FORMER weight room	2005	67%
Heating/Cooling	AH-4; MagicAire air handling unit, 208V, 3Ph, 60 MBH Cooling, 100 MBH Heating	Basement	MagicAire, Model #60-BVX-B, Serial #W040598781	Electricity	Basement, Locker Rooms	2005	67%
Heating/Cooling	AH-5; MagicAire air handling unit, 208V, 3Ph, 120MBH Cooling, 158MBH Heating	Basement	MagicAire, M#90-BHX	Electricity	Unassigned Space, NEW weight room	2005	67%
Heating/Cooling	AHU-1, 91 MBH Cooling, 56 MBH Heating	Attic	Trane LPCAA08	Electricity	1st fl South east rooms, (Rm 145-152)	2005	67%
Heating/Cooling	AHU-2 72.6 MBH Cooling, 85.2 MBH Heating	Attic	Trane LPCAA08	Electricity	1st Fl meeting room & corridor	2005	67%
Heating/Cooling	AHU-3 34.08 MBH Cooling, 19.63 MBH Heating	Attic	Trane LPCAA03	Electricity	1st Fl Police Lobby	2005	67%
Heating/Cooling	AHU-4 27 MBH Cooling, 19.6 MBH Heating	Attic	Trane LPCAA03	Electricity	1st Fl Dispatch & Radio	2005	67%
Heating/Cooling	AHU-5; unit was running with no court in session, 90 MBH Cooling, 71.4 MBH Heating, 208V, 3Ph	Attic	Trane Climate Changer, M#LPCAA08,	Electricity	1st Fl Court Room Admin Area	2005	67%
Heating/Cooling	AHU-6 140 MBH cooling, 126.5 MBH Heating	Attic	Trane LPCAA10	Electricity	1st Fl SW corner rooms, (Rm 161, 162, 167 - 171)	2005	67%
Heating/Cooling	AHU-7; Trane Air Handler, 208V, 3Ph, 94.8 MBH Cooling, 86 MBH Heating	Attic	Trane Climate Changer Model #LPCAA08D2D0RB40, Serial #T04E31083	Electricity	1st Fl Traffic	2005	67%
Heating/Cooling	AHU-8 58.3 MBH cooling, 87.8 MBH Heating	Attic	Trane LPCAA06	Electricity	1st Fl Center SE rooms, (chief deputy, chief office)	2005	67%

Heating/Cooling	AHU-9 93.8 MBH cooling, 93.1 MBH Heating	Attic	Trane LPCAA08	Electricity	1st Fl Center NE rooms, (lieutenant, sargeant)	2005	67%
Heating/Cooling	AHU-10 38.5 MBH cooling, 56.9 MBH Heating	Attic	Trane LPCAA03	Electricity	1st Fl. Booking, Holding & Cell Rms	2005	67%
Heating/Cooling	AHU-11 158.7 MBH cooling, 182.2 MBH Heating	Attic	Trane LPCAA10	Electricity	1st Fl Court Rm	2005	67%
Domestic Hot Water	AO Smith Preferred gas-fired water heater, 199,990 Btuh input, 100 gallon capacity, 228 gal/hr recovery, Water setpoint at 140F	Basement, mechanical room	AO Smith Preferred, Model #BTH 199 970, Serial #MJ03-2697524-970	Natural Gas	All Areas	2005	50%
Controls	Automated Logic BMS system, no model info	Basement, mechanical room	Automated Logic, NA	Electricity	All Areas	2005	67%
Heating	B-1, P-K Thermific gas-fire heating condensing boiler, 1000MBH, 85% Efficiency, Supply 140F, Return 120F	Basement, mechanical room	Patterson Kelley Thermific, Serial #AL06-04-23096	Natural Gas	All Areas	2005	67%
Heating	B-2, P-K Thermific gas-fire heating condensing boiler, 1000MBH, 85% Efficiency, Supply 140F, Return 120F	Basement, mechanical room	Patterson Kelley Thermific, Serial #AL06-04-26095	Natural Gas	All Areas	2005	67%
Cooling	CU-1 Trane - American Standard condensor, R-22, 7.5 Tons, 11SEER	Outside, ground level, left side when facing building	Trane - American Standard, Model #TTA090A300FA, Serial #4223KBXAD	Electricity	AHU-1	2005	67%
Cooling	CU-10 Environmental International Inc (EMI) multi-zone condensing unit, R-22, 3.5Tons, 12SEER	Outside, ground Level, west side of building	EMI, Model #2TTA2042B3000AB, Serial #4204P693F	Electricity	AHU-10	2005	67%
Cooling	CU-11 large Trane - American Standard condensor, Odyssey, R-22, 12.5Tons, SEER 11	Outside, ground level, north west side near courtroom	Trane - American Standard, Odyssey, Model #TTA150B300EA, Serial #4135J51AD	Electricity	AHU-11	2005	67%
Cooling	CU-12, Trane Condenser R-22, 2 Tons, 12 SEER, 208V, 3Ph CU-Trane, XB12 condenser, R-22	Ground Level, Outside, right side when facing entrance	Trane, XB12, Model #2TTB2024A1000AA, Serial #4085R8F4F	Electricity	AH-1	2005	67%
Cooling	CU-13, Trane Condenser R-22, 3 Tons, 12 SEER, 208V, 3Ph	Ground Level, Outside, right side when facing entrance	Trane, Model #2TTA2036A3000AB, Serial #419256A3F	Electricity	AH-2	2005	67%
Cooling	CU-14 small Trane Condenser, R-22. 3 Tons, 12 SEER	Outside, ground level, north west side near courtroom	Trane M#2TTA2036A3000AB, S#41925783F	Electricity	AH-3	2005	
Cooling	CU-15 large Trane Condenser R-22	Outside, ground level, north west side near courtroom	Trane M# 2TTA2060A3000AB, S#35110C43F	Electricity	AH-4	2005	
Cooling	CU-16, Trane Condenser R-22, 7.5Tons, 11 SEER, 208V, 3Ph	Ground Level, Outside, right side when facing entrance	Trane , Model #TTA090A300FA, Serial#42155LTAD	Electricity	AH-5	2005	67%
Cooling	CU-17 Environmental International Inc (EMI) multi-zone condensing unit, R-22	Outside, ground level, left side when facing building	EMI, Model #SHC18DFA000AA0A, Serial #1-04-C-5874-10	Electricity	Courtroom	2005	67%
Cooling	CU-18, Trane Condenser, R-22	Ground Level, Outside, Center Back of Building	Trane, Model #TTA090A300FA, Serial #4222KCAAD	Electricity	Courtroom	2005	67%
Cooling	CU-2, Trane Condenser R-22, 6 Tons, 12 SEER	Outside, ground level, left side when facing building	Trane, Model #2TTA0072A3000AA, Serial #4173WMR2F,	Electricity	AHU-2	2005	67%
Cooling	CU-3, Trane Condenser R-22, 3 Tons, 12 SEER	Outside, ground level, left side when facing building	Trane, Model #2TTA2036A3000AB, Serial #41925WW3F	Electricity	AHU-3	2005	67%
Cooling	CU-4, Trane Condenser, R-22. 3 Tons, 12 SEER	Ground Level, Outside, Center Back of Building	Trane, Model #2TTA2036A3000AB, Serial #41925683F	Electricity	AHU-4	2005	67%
Cooling	CU-5 Trane Condenser, R-227.5 Tons, 11 SEER	Outside, ground level, north west side near courtroom	Trane TTA090A300FA, S# 4222KCAAD		AHU-5	2005	67%
Cooling	CU-6, Trane Odyssey Condenser, R-22, 12.5 Tons, 11 SEER	Ground Level, Outside, Center Back of Building	Trane Odyssey, Model #TTA150B300EA, Serial #413412MAD	Electricity	AHU-6	2005	67%
Cooling	CU-7, Trane Odyssey Condenser, R-22, 7.5 Tons, 11 SEER	Ground Level, Outside, Center Back of Building	Trane Odyssey, Model # TTA090A300FA, Serial# 422263WAD	Electricity	AHU-7	2005	67%

Cooling	CU-8, Trane Condenser R-22, 5Tons, 11 SEER, 208V, 3Ph	Ground Level, Outside, right side when facing entrance	Model # 2TTA2060A3000AB, Serial# 4021TMA3F	Electricity	AHU-8	2005	67%
Cooling	CU-9, Trane Condenser R-22, 7.5 Tons, 12 SEER, 208V, 3Ph	Ground Level, Outside, right side when facing entrance	Model #TTA090A300FA, Serial #42225YHAD	Electricity	AHU-9	2005	67%
Cooling	CU-FUJI1 Attic Condenser #1; Fujitsu Halcyon Inverter, condensing unit, R410A, exhausts in attic, installed after building was open	Attic	Fujitsu, Model #A0U30CLX, Serial #DEN001616	Electricity	Dispatch Area	2005	73%
Cooling	CU-FUJI2 Attic Condenser #2; Fujitsu Condenser,115V, 60Hz, 1Ph, 9700 BTH/hr, R-410, SEER 14.3	Attic	FUJITSU, Model #A009CQ, Serial #BCN011308	Electricity	Dispatch Area	2005	73%
Heating	P-1 Hot Water Pumps B&G, 208V, 3Ph, 7.5 HP, 63% Eff.	Basement, mechanical room	Bell & Gosset, Model #AE45A, Serial #CS3812-01	Electricity	All Areas	2005	50%
Heating	P-2 Hot Water Pumps B&G, 208V, 3Ph, 7.5 HP, 63% Eff	Basement, mechanical room	Bell & Gosset, Model #AE45A, Serial #CS3812-01	Electricity	All Areas	2005	50%
Heating	P-3 Hot Water Pumps B&G, 208V, 3Ph, 3/4 HP, 63% Eff	Basement, mechanical room	Bell & Gosset Series 60	Electricity	All Areas	2005	50%
Heating	P-4 Hot Water Pumps B&G, 208V, 3Ph, 3/4 HP, 63% Eff	Basement, mechanical room	Bell & Gosset, Series 60	Electricity	All Areas	2004	50%

Note: The remaining useful life of a system (in %) is an estimate based on the system date of built and existing conditions derived from visual inspection.

4. ENERGY CONSERVATION MEASURES

Based on the assessment of the Police Headquarters, SWA has separated the investment opportunities into three recommended categories:

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

Category I Recommendations: Capital Improvements

- Due to the age of the building, there are no recommended Capital Improvements at this time.

Category II Recommendations: Operations and Maintenance

- Program all computers for power save mode – Based on field observations, the computers at the building were typically programmed for power save mode in order to reduce electricity consumption. Some computers may not be programmed correctly or as efficiently as possible. SWA recommends that all computers are programmed to shut down with the exception of the hard drive when left inactive. One new power strip product called, "Smart strips" are now commercially available that shut down a computer's components with the help of an occupancy sensors. Smart strips can be purchased for approximately $100.

- Perform routine maintenance inspections on exterior walls – SWA recommends that biannual inspections of the exterior walls are conducted as part of a preventative maintenance schedule. SWA observed some isolated instances at surface transitions and building corners that were starting to show signs of cracking and slight water damage. At this time, there are no major concerns with the exterior walls that should be addressed. Any weaknesses in the building structure that could allow either water or thermal presentation should be addressed immediately. Properly maintaining the exterior walls will ensure that the vapor barrier as well as insulation levels are not compromised.

- Perform routine maintenance inspections of the roof – SWA recommends that biannual inspections of the roof are conducted as part of a preventative maintenance schedule. Some sections of the roof showed signs that shingles were beginning to uproot. At this time, there are no major concerns with the roofing material that should be addressed. Properly maintaining the roof will ensure that the vapor barrier as well as insulation levels are not compromised.

- Perform routine maintenance inspections of windows and doors– SWA recommends that biannual inspections of each window are conducted as part of a preventative maintenance schedule. The windows and doors appeared to be in excellent condition and are not in need of upgrading at this time. Typically, weather-stripping around windows and doors begin to show wear and tear over time. SWA recommends that weather-stripping is repaired or replaced as soon as soon as signs of deterioration are observed. Correcting weather-stripping issues prevent energy cost losses and comfort complaints.

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

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

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	Adjust thermostat for Court house area
2	Adjust domestic hot water supply temperature
3	Install 4 new CFL lamps
	Description of Recommended 5-10 Year Payback ECMs
4	Install 10kW PV system
5	Install 57 new Pulse Start Metal Halide fixtures

ECM#1: *Adjust thermostat for Court house area*

Description:

The Police Headquarters building is currently operated 24 hours per day with the exception of the Court area. Based on field observations as well as maintenance staff interviews, the thermostats located in the Court house do not properly setback the air handling units that serve the Court house area. SWA recommends adjusting the thermostats, and setting the air handler into standby mode, to account for the exact schedule that the Court house is operated.

Installation cost:

Estimated installed cost: $30
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
1	Adjust thermostat for Court house area	Similar Projects	30	0	30	19,320	19.3	98	2.9	0	3,280	5	14,935	0.0	49,684.3	9,936.9	10,932.8	14,991	35,668

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. It was assumed that the previously, HVAC systems were allowed to operate for 24 hours per day. Calculations are based on operating hours of 9am-4pm on Mondays, Wednesday and Fridays and 9am-9pm on Tuesdays and Thursdays. A minimal labor cost of $30 is assumed for maintenance staff to adjust thermostat.

Rebates / financial incentives:
There are currently no incentives for this measure at this time.

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#2: *Adjust domestic hot water supply temperature*

Description:

The Police Headquarters currently contains an AO Smith Preferred hot water tank with 100 gallon capacity to meet the domestic hot water needs of the entire building. SWA observed that the domestic hot water supply temperature was set for 140°F. The higher the supply temperature, the more energy required to maintain that temperature in the hot water tank. In addition to energy savings, 140°F water has a much higher potential to cause scalding. SWA recommends that the hot water tank is adjusted to provide temperature at 120°F, to reduce energy consumption and also help reduce the risk of scalding. A minimum temperature of 120°F is recommended to prevent the formation of Legionella bacteria in the water.

Installation cost:
Estimated installed cost: $30
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	Adjust domestic hot water supply temperature	Similar Projects	30	0	30	0	0.0	67	0.3	0	90	5	409	0.3	1261.7	252.3	298.7	381	739

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. Calculations were based on reducing supply temperature from 140°F to 120°F. A minimal labor cost of $30 is assumed for maintenance staff to adjust hot water temperature settings.

Rebates / financial incentives:
There are currently no incentives for this measure at this time.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#3: *Install 4 new CFL lamps*

Description:

The Police Department building is less than 5 years old and therefore contains mostly updated and efficient lighting. The building currently contains four 100W halogen bulbs located in the Lobby 140 room. SWA recommends that these screw-type halogen bulbs are replaced with 33W CFL screw-type bulbs. In addition, there will be operating cost savings associated with each bulb since CFLs have a longer rated lifetime than halogen bulbs. See Appendix A for complete lighting schedule and analysis.

Installation cost:

Estimated installed cost: $217
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
3	Install 4 new CFL lamps	RS Means, lit search	217	0	217	1,075	0.2	0	0.1	10	185	5	843	1.2	288.7	57.7	81.0	631	1,925

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operation cost savings based on avoided bulb replacement when upgrading to lighting that consists of longer rated burn hours.

Rebates / financial incentives:
There are currently no incentives for this measure at this time.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#4: *Install 10kW PV system*

Description:

Currently, the Police Headquarters does not use any renewable energy systems. Renewable energy systems such as photovoltaic panels, can be mounted on the building roofs, and can offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. SWA presents below the economics, and recommends at this time that Township of Parsippany - Troy Hills further review installing a 10kW PV system to offset electrical demand and reduce the annual net electric consumption for the building, and review guaranteed incentives from NJ rebates to justify the investment. The Police Headquarters is not eligible for a 30% federal tax credit. Instead, Township of Parsippany - Troy Hills may consider applying for a grant and / or engage a PV generator / leaser who would install the PV system and then sell the power at a reduced rate. JCP&L provides the ability to buy SRECs at $600 / MWh or best market offer.

There are a few locations for a 10kW PV installation on the building roofs and away from shade. The size of the system was determined using the amount of roof surface area as a limiting factor. A PV system could be installed on a portion of the sloped roof that faces South or West. The recommended system would fit on either the roof above the garage areas or on the roof located above the Court house that faces towards the Water Department building. A commercial multi-crystalline 123 watt panel (17.2 volts, 7.16 amps) has 10.7 square feet of surface area (11.51 watts per square foot). A 10kW system needs approximately 82 panels which would take up 870 square feet. The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the community.

Installation cost:

Estimated installed cost: $60,000
Source of cost estimate: Similar projects

Economics (with incentives):

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
4	Install 10 kW PV System	Similar Projects	70,000	10,000	60,000	11,804	10.0	0	1.5	0	8,524	15	100,303	7.0	67.2	4.5	11.4	41,760	21,135

Assumptions: SWA estimated the cost and savings of the system based on past PV projects. SWA projected physical dimensions based on a typical Polycrystalline Solar Panel (123 Watts, model #ND-123UJF). PV systems are sized based on Watts and physical dimensions for an array will differ with the efficiency of a given solar panel (W/sq ft).

Rebates/financial incentives:
NJ Clean Energy - Renewable Energy Incentive Program, Incentive based on $1.00 / watt Solar PV application. Incentive amount for this application is $10,000.

http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program

NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. $6,600 has been incorporated in the above costs; however it requires proof of performance, application approval and negotiations with the utility.

Options for funding ECM:
This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#5: *Install 57 new Pulse Start Metal Halide fixtures*

Description:

The Police Department currently contains 57 inefficient Probe-start metal halide light fixtures used for general exterior lighting as well as to illuminate the parking lot. These existing probe-start metal halide fixtures varied in size and consisted of 70W, 100W or 150W models. Installing new pulse-start metal halides allows the existing light fixtures to use 1/3 less wattage. In addition, pulse start metal halides provide a better quality light for safety and also require less bulb replacements since the quality of light does not degrade over time. See Appendix A for complete lighting schedule and analysis.

Installation cost:

Estimated installed cost: $39,758
Source of cost estimate: RS *Means; Published and established costs*

Economics:

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime energy cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
5	Install 57 new Pulse Start Metal Halide fixtures	RS Means, lit search	41,183	1,425	39,758	16,754	3.5	0	2.2	1,355	4,086	15	48,079	9.7	20.9	1.4	6.0	9,019	29,998

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operation cost savings based on avoided bulb replacement when upgrading to lighting that consists of longer rated burn hours.

Rebates / financial incentives:
NJ Clean Energy Prescriptive Lighting – Metal Halide with pulse start ($25 per fixture)
Maximum incentive amount is $1,425.

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There are not currently any existing renewable energy systems.

5.2. Wind

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

5.3. Solar Photovoltaic

Pleases see the above recommended ECM #4.

5.4. Solar Thermal Collectors

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

5.5. Combined Heat and Power

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

5.6. Geothermal

Geothermal is not applicable for this building because current HVAC equipment is new.

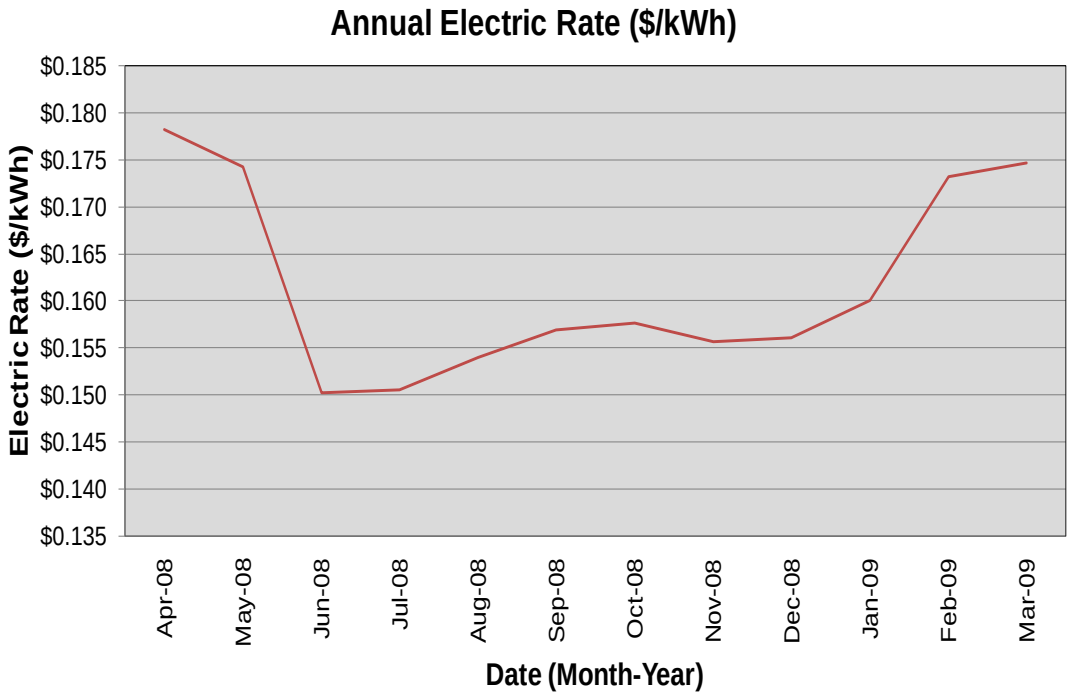
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

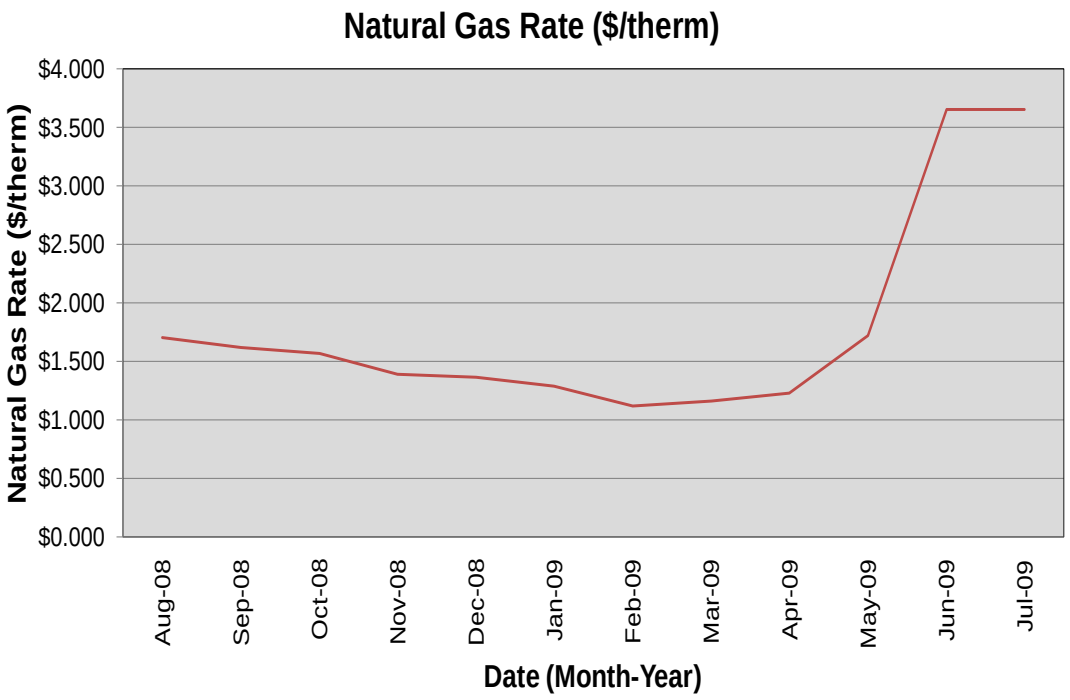
6.1. Energy Purchasing

The Police Headquarters receives natural gas via one incoming meter. New Jersey Natural Gas supplies gas to the building. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. Electricity is also purchased via one incoming meter directly for the Police Headquarters from JCP&L without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations of 16% over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 69% over the most recent 12 month period. The high gas price per therm fluctuations in the summer may be due to low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months.

Currently, New Jersey commercial buildings of similar type pay $0.150/kWh for electricity and $1.55/therm for natural gas. Currently, the electricity rate for Police Headquarters is $.163/kWh, which means there is a potential cost savings of $7,848 per year. The current natural gas rate for the Police Headquarters is $1.339/therm which is better than the average natural gas cost. A large cost savings potential for electricity exists, however this involves contacting third party suppliers and negotiating

utility rates. SWA recommends that Township of Parsippany - Troy Hills further explore opportunities of purchasing electricity from third party energy suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Police Headquarters. Appendix B contains a complete list of third party energy suppliers for the Township of Parsippany - Troy Hills service area. Township of Parsippany - Troy Hills may want to consider partnering with other school districts, municipalities, townships and communities to aggregate a substantial electric and natural gas use for better leveraging in negotiations with ESCOs and of improving the pricing structures. This sort of activity is happening in many parts of the country and in New Jersey.





6.2. Energy Procurement strategies

Also, the Police Headquarters would not be eligible for enrollment in a Demand Response Program, because there isn't the capability at this time to shed a minimum of 150 kW electric demand when requested by the utility during peak demand periods, which is the typical threshold for considering this option.

7. METHOD OF ANALYSIS

7.1. Assumptions and tools

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

7.2. Disclaimer

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

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

Appendix A: Lighting Study of Parsippany - Troy Hills Police Headquarters

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	B	Office - Police Archives 3	Parabolic	E	4'T8	9	2	32	OS	9	365	6	630	2,070	N/A	Parabolic	4'T8	E	OS	9	2	32	9	365	6	630	2070	0	0	0
2	B	Storage Rm 0	Parabolic	E	4'T8	1	2	32	S	2	365	6	70	51	N/A	Parabolic	4'T8	E	S	1	2	32	2	365	6	70	51	0	0	0
3	B	Mechanical Rm 9	Parabolic	E	4'T8	6	2	32	OS	2	365	6	420	307	N/A	Parabolic	4'T8	E	OS	6	2	32	2	365	6	420	307	0	0	0
4	B	Mechanical Rm 7	Parabolic	E	4'T8	1	2	32	OS	2	365	6	70	51	N/A	Parabolic	4'T8	E	OS	1	2	32	2	365	6	70	51	0	0	0
5	B	Ambulance Day Room 4	Recessed	E	4'T8	2	3	32	OS	24	365	10	212	1,857	N/A	Recessed	4'T8	E	OS	2	3	32	24	365	10	212	1857	0	0	0
6	B	Office-PBA Office 5	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
7	B	Office - BOA Office 4	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
8	B	Men's Locker Room 10	Recessed	E	4'T8	9	2	32	OS	8	365	6	630	1,840	N/A	Recessed	4'T8	E	OS	9	2	32	8	365	6	630	1840	0	0	0
9	B	Men's Locker Room 10	2'U-shape	E	2'T8	8	2	18	OS	8	365	5	328	958	N/A	2'U-shape	2'T8	E	OS	8	2	18	8	365	5	328	958	0	0	0
10	B	Men's Locker Room 10	2'U-shape	E	2'T8	3	2	18	OS	8	365	5	123	359	N/A	2'U-shape	2'T8	E	OS	3	2	18	8	365	5	123	359	0	0	0
11	B	Office - Court Archives 1	Parabolic	E	4'T8	5	2	32	OS	9	365	6	350	1,150	N/A	Parabolic	4'T8	E	OS	5	2	32	9	365	6	350	1150	0	0	0
12	B	Storage Rm 2	Parabolic	E	4'T8	5	2	32	OS	2	365	6	350	256	N/A	Parabolic	4'T8	E	OS	5	2	32	2	365	6	350	256	0	0	0
13	B	Women's Locker Room 14	Recessed	E	4'T8	2	2	32	OS	8	365	6	140	409	N/A	Recessed	4'T8	E	OS	2	2	32	8	365	6	140	409	0	0	0
14	B	Women's Locker Room 14	2'U-shape	E	2'T8	1	2	18	OS	8	365	5	41	120	N/A	2'U-shape	2'T8	E	OS	1	2	18	8	365	5	41	120	0	0	0
15	B	Bathroom Women 13	2'U-shape	E	2'T8	2	2	18	OS	9	365	5	82	269	N/A	2'U-shape	2'T8	E	OS	2	2	18	9	365	5	82	269	0	0	0
16	B	Bathroom Women 13	Recessed	E	CFL	1	1	13	OS	9	365	0	13	43	N/A	Recessed	CFL	E	OS	1	1	13	9	365	0	13	43	0	0	0
17	B	Bathroom Men 12	Recessed	E	CFL	4	1	13	OS	9	365	0	52	171	N/A	Recessed	CFL	E	OS	4	1	13	9	365	0	52	171	0	0	0
18	B	Bathroom Men 12	2'U-shape	E	2'T8	2	1	18	OS	9	365	4	44	145	N/A	2'U-shape	2'T8	E	OS	2	1	18	9	365	4	44	145	0	0	0
19	B	Bathroom Men 12	Recessed	E	4'T8	1	1	32	OS	9	365	3	35	115	N/A	Recessed	4'T8	E	OS	1	1	32	9	365	3	35	115	0	0	0
20	B	Staircase 12	Parabolic	E	4'T8	1	2	32	S	16	365	6	70	409	N/A	Parabolic	4'T8	E	S	1	2	32	16	365	6	70	409	0	0	0
21	B	Staircase 17	Parabolic	E	4'T8	1	2	32	S	16	365	6	70	409	N/A	Parabolic	4'T8	E	S	1	2	32	16	365	6	70	409	0	0	0
22	B	Hallway 11	2'U-shape	E	2'T8	11	2	18	OS	16	365	5	451	2,634	N/A	2'U-shape	2'T8	E	OS	11	2	18	16	365	5	451	2634	0	0	0
23	B	Hallway 11	Screw-in	N	CFL	3	1	13	S	16	365	0	39	228	N/A	Screw-in	CFL	N	S	3	1	13	16	365	0	39	228	0	0	0
24	B	Storage Rm 2	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
25	B	Exercise Rm 18	2'U-shape	E	2'T8	9	2	18	OS	8	365	5	369	1,077	N/A	2'U-shape	2'T8	E	OS	9	2	18	8	365	5	369	1077	0	0	0
26	B	Storage Rm 18	Parabolic	E	4'T8	1	1	32	OS	2	365	3	35	26	N/A	Parabolic	4'T8	E	OS	1	1	32	2	365	3	35	26	0	0	0
27	B	Storage Rm 18	Parabolic	E	4'T8	1	1	32	OS	2	365	3	35	26	N/A	Parabolic	4'T8	E	OS	1	1	32	2	365	3	35	26	0	0	0
28	1	Closet 144	Screw-in	N	CFL	2	2	13	OS	2	365	0	52	38	N/A	Screw-in	CFL	N	OS	2	2	13	2	365	0	52	38	0	0	0
29	1	Meeting Rm 143	Screw-in	N	CFL	9	2	13	D	8	365	0	234	683	N/A	Screw-in	CFL	N	D	9	2	13	8	365	0	234	683	0	0	0
30	1	Meeting Rm 143	2'U-shape	E	2'T8	9	2	18	D	8	365	5	369	1,077	N/A	2'U-shape	2'T8	E	D	9	2	18	8	365	5	369	1077	0	0	0
31	1	Office - Lieutenant 145	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
32	1	Office - Commander 147	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
33	1	Computer Lab 150	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
34	1	Office - Lieutenant 151	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
35	1	Planning 149	Recessed	E	4'T8	11	3	32	OS	8	365	10	1,166	3,405	N/A	Recessed	4'T8	E	OS	11	3	32	8	365	10	1166	3405	0	0	0
36	1	Office Area - Support Services 146	Recessed	E	4'T8	10	3	32	OS	9	365	10	1,060	3,482	N/A	Recessed	4'T8	E	OS	10	3	32	9	365	10	1060	3482	0	0	0
37	1	Office - Repo 152	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
38	1	Closet 142	Screw-in	N	CFL	1	2	13	OS	2	365	0	26	19	N/A	Screw-in	CFL	N	OS	1	2	13	2	365	0	26	19	0	0	0
39	1	Office Area - Support Services 146	2'U-shape	E	2'T8	4	2	18	OS	9	365	5	164	539	N/A	2'U-shape	2'T8	E	OS	4	2	18	9	365	5	164	539	0	0	0
40	1	Office - Finger Printing 141	2'U-shape	E	2'T8	1	2	18	OS	9	365	5	41	135	N/A	2'U-shape	2'T8	E	OS	1	2	18	9	365	5	41	135	0	0	0
41	1	Office - Finger Printing 141	Recessed	E	8'T8	1	2	59	OS	9	365	13	131	430	N/A	Recessed	8'T8	E	OS	1	2	59	9	365	13	131	430	0	0	0
42	1	Lobby 140	Screw-in	N	CFL	4	2	13	S	8	365	0	104	304	N/A	Screw-in	CFL	N	S	4	2	13	8	365	0	104	304	0	0	0
43	1	Lobby 140	Parabolic	E	4'T8	9	2	32	S	8	365	6	630	1,840	N/A	Parabolic	4'T8	E	S	9	2	32	8	365	6	630	1840	0	0	0
44	1	Lobby 140	HID	N	Hal	4	1	100	S	8	365	25	500	1,460	CFL	Screw-in	CFL	N	S	4	1	33	8	365	0	132	385	1075	0	1075
45	1	Lobby 156	Recessed	E	4'T8	7	3	32	S	8	365	10	742	2,167	N/A	Recessed	4'T8	E	S	7	3	32	8	365	10	742	2167	0	0	0
46	1	Office - Witness Room 139	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
47	1	Office - Dispatch 138	Recessed	E	4'T8	6	3	32	OS	9	365	10	636	2,089	N/A	Recessed	4'T8	E	OS	6	3	32	9	365	10	636	2089	0	0	0
48	1	Office - Dispatch 138	2'U-shape	E	2'T8	2	2	18	OS	9	365	5	82	269	N/A	2'U-shape	2'T8	E	OS	2	2	18	9	365	5	82	269	0	0	0

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
49	1	Garage 155	HID	N	MH	5	1	250	S	9	365	63	1,565	5,141	PSMH	HID	PSMH	N	S	5	1	165	9	365	36	1005	3301	1840	0	1840
50	1	Garage 155	Screw-in	N	CFL	3	2	13	S	9	365	0	78	256	N/A	Screw-in	CFL	N	S	3	2	13	9	365	0	78	256	0	0	0
51	1	Garage 155	Parabolic	E	4'T8	5	2	32	S	9	365	6	350	1,150	N/A	Parabolic	4'T8	E	S	5	2	32	9	365	6	350	1150	0	0	0
52	1	Emerg. Gen. Room 157	Parabolic	E	4'T8	2	2	32	OS	2	365	6	140	102	N/A	Parabolic	4'T8	E	OS	2	2	32	2	365	6	140	102	0	0	0
53	1	Bathroom 159	Recessed	E	4'T8	1	3	32	OS	9	365	10	106	348	N/A	Recessed	4'T8	E	OS	1	3	32	9	365	10	106	348	0	0	0
54	1	Office - Mechanics 158	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
55	1	Hallway 184	Recessed	E	4'T8	13	3	32	OS	16	365	10	1,378	8,048	N/A	Recessed	4'T8	E	OS	13	3	32	16	365	10	1378	8048	0	0	0
56	1	Office - Internal Affairs 162	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
57	1	Cafeteria 164	Recessed	E	4'T8	8	3	32	OS	8	365	10	848	2,476	N/A	Recessed	4'T8	E	OS	8	3	32	8	365	10	848	2476	0	0	0
58	1	Storage Rm 167	Recessed	E	4'T8	12	3	32	OS	2	365	10	1,272	929	N/A	Recessed	4'T8	E	OS	12	3	32	2	365	10	1272	929	0	0	0
59	1	Storage Rm 171	Recessed	E	4'T8	8	3	32	S	2	365	10	848	619	N/A	Recessed	4'T8	E	S	8	3	32	2	365	10	848	619	0	0	0
60	1	Office - Quarter Master 165	Recessed	E	4'T8	2	3	32	S	9	365	10	212	696	N/A	Recessed	4'T8	E	S	2	3	32	9	365	10	212	696	0	0	0
61	1	Storage Rm 201	Parabolic	E	4'T8	2	2	32	OS	2	365	6	140	102	N/A	Parabolic	4'T8	E	OS	2	2	32	2	365	6	140	102	0	0	0
62	1	Bathroom 160	2'U-shape	E	2'T8	1	2	18	OS	9	365	5	41	135	N/A	2'U-shape	2'T8	E	OS	1	2	18	9	365	5	41	135	0	0	0
63	1	Closet 166	Screw-in	N	CFL	1	2	13	OS	2	365	0	26	19	N/A	Screw-in	CFL	N	OS	1	2	13	2	365	0	26	19	0	0	0
64	1	Closet 165	Screw-in	N	CFL	1	2	13	OS	2	365	0	26	19	N/A	Screw-in	CFL	N	OS	1	2	13	2	365	0	26	19	0	0	0
65	1	Office - Report Room 170	Recessed	E	4'T8	1	3	32	OS	9	365	10	106	348	N/A	Recessed	4'T8	E	OS	1	3	32	9	365	10	106	348	0	0	0
66	1	Hallway 131	Recessed	E	4'T8	3	3	32	OS	16	365	10	318	1,857	N/A	Recessed	4'T8	E	OS	3	3	32	16	365	10	318	1857	0	0	0
67	1	Vestibule 163	Recessed	E	4'T8	1	3	32	OS	16	365	10	106	619	N/A	Recessed	4'T8	E	OS	1	3	32	16	365	10	106	619	0	0	0
68	1	Vestibule 172	Recessed	E	4'T8	1	3	32	OS	16	365	10	106	619	N/A	Recessed	4'T8	E	OS	1	3	32	16	365	10	106	619	0	0	0
69	1	Hallway 131	Recessed	E	4'T8	3	3	32	S	16	365	10	318	1,857	N/A	Recessed	4'T8	E	S	3	3	32	16	365	10	318	1857	0	0	0
70	1	Office 175	Recessed	E	4'T8	3	3	32	OS	9	365	10	318	1,045	N/A	Recessed	4'T8	E	OS	3	3	32	9	365	10	318	1045	0	0	0
71	1	Office - Lieutenatn 177	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
72	1	Office - Commander 178	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
73	1	Office - Traffic 180	Recessed	E	4'T8	4	3	32	OS	9	365	10	424	1,393	N/A	Recessed	4'T8	E	OS	4	3	32	9	365	10	424	1393	0	0	0
74	1	Office - Records 181	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
75	1	Bathroom Men 182	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
76	1	Closet 179	Recessed	E	4'T8	1	3	32	OS	9	365	10	106	348	N/A	Recessed	4'T8	E	OS	1	3	32	9	365	10	106	348	0	0	0
77	1	Closet 176	Recessed	E	4'T8	8	3	32	OS	9	365	10	848	2,786	N/A	Recessed	4'T8	E	OS	8	3	32	9	365	10	848	2786	0	0	0
78	1	Office - Patrol 176	2'U-shape	E	2'T8	1	2	18	OS	9	365	5	41	135	N/A	2'U-shape	2'T8	E	OS	1	2	18	9	365	5	41	135	0	0	0
79	1	Bathroom Women 183	Recessed	E	4'T8	1	3	32	OS	9	365	10	106	348	N/A	Recessed	4'T8	E	OS	1	3	32	9	365	10	106	348	0	0	0
80	1	Office - Ineterview 186	Recessed	E	4'T8	1	3	32	OS	9	365	10	106	348	N/A	Recessed	4'T8	E	OS	1	3	32	9	365	10	106	348	0	0	0
81	1	Office - Ineterview 188	Recessed	E	4'T8	1	3	32	OS	9	365	10	106	348	N/A	Recessed	4'T8	E	OS	1	3	32	9	365	10	106	348	0	0	0
82	1	Office - dwi 187	Recessed	E	4'T8	1	3	32	OS	9	365	10	106	348	N/A	Recessed	4'T8	E	OS	1	3	32	9	365	10	106	348	0	0	0
83	1	Office - Spec. Ops. 115	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
84	1	Office - Sargeants 114	Recessed	E	4'T8	3	3	32	OS	9	365	10	318	1,045	N/A	Recessed	4'T8	E	OS	3	3	32	9	365	10	318	1045	0	0	0
85	1	Office - Lieutenant 113	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
86	1	Office - Cheifs 125	Recessed	E	4'T8	4	3	32	OS	9	365	10	424	1,393	N/A	Recessed	4'T8	E	OS	4	3	32	9	365	10	424	1393	0	0	0
87	1	Office - Deptuty Chief 135	Recessed	E	4'T8	4	3	32	OS	9	365	10	424	1,393	N/A	Recessed	4'T8	E	OS	4	3	32	9	365	10	424	1393	0	0	0
88	1	Office - Admin 133	Recessed	E	4'T8	4	3	32	OS	9	365	10	424	1,393	N/A	Recessed	4'T8	E	OS	4	3	32	9	365	10	424	1393	0	0	0
89	1	Staircase 98	Recessed	E	4'T8	2	3	32	OS	16	365	10	212	1,238	N/A	Recessed	4'T8	E	OS	2	3	32	16	365	10	212	1238	0	0	0
90	1	Office - Adult Investigation 116	Recessed	E	4'T8	18	3	32	OS	9	365	10	1,908	6,268	N/A	Recessed	4'T8	E	OS	18	3	32	9	365	10	1908	6268	0	0	0
91	1	Bathroom Women	2'U-shape	E	2'T8	1	2	18	OS	9	365	5	41	135	N/A	2'U-shape	2'T8	E	OS	1	2	18	9	365	5	41	135	0	0	0
92	1	Bathroom Men	2'U-shape	E	2'T8	1	2	18	OS	9	365	5	41	135	N/A	2'U-shape	2'T8	E	OS	1	2	18	9	365	5	41	135	0	0	0
93	1	Office - Admin 133	2'U-shape	E	2'T8	2	2	18	OS	9	365	5	82	269	N/A	2'U-shape	2'T8	E	OS	2	2	18	9	365	5	82	269	0	0	0
94	1	Meeting Rm 129	2'U-shape	E	2'T8	9	2	18	OS	8	365	5	369	1,077	N/A	2'U-shape	2'T8	E	OS	9	2	18	8	365	5	369	1077	0	0	0
95	1	Office - Adult Investigation 116	2'U-shape	E	2'T8	1	2	18	OS	9	365	5	41	135	N/A	2'U-shape	2'T8	E	OS	1	2	18	9	365	5	41	135	0	0	0
96	1	Storage Rm 124	Parabolic	E	4'T8	1	1	32	OS	2	365	3	35	26	N/A	Parabolic	4'T8	E	OS	1	1	32	2	365	3	35	26	0	0	0

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
97	1	Office - Commanders 117	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
98	1	Office - Juv. Sgt. 118	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
99	1	Office - Counselor 121	Recessed	E	4'T8	2	3	32	OS	9	365	10	212	696	N/A	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	0	0
100	1	Office - Juv. Invest. 122	Recessed	E	4'T8	6	3	32	OS	9	365	10	636	2,089	N/A	Recessed	4'T8	E	OS	6	3	32	9	365	10	636	2089	0	0	0
101	1	Staircase	Recessed	E	4'T8	5	3	32	OS	16	365	10	530	3,095	N/A	Recessed	4'T8	E	OS	5	3	32	16	365	10	530	3095	0	0	0
102	1	Vestibule 199	Recessed	E	4'T8	1	3	32	OS	16	365	10	106	619	N/A	Recessed	4'T8	E	OS	1	3	32	16	365	10	106	619	0	0	0
103	1	Office - Booking 197	Recessed	E	4'T8	5	3	32	OS	9	365	10	530	1,741	N/A	Recessed	4'T8	E	OS	5	3	32	9	365	10	530	1741	0	0	0
104	1	Jail Cell 196	Recessed	E	4'T8	1	2	32	S	24	365	6	70	613	N/A	Recessed	4'T8	E	S	1	2	32	24	365	6	70	613	0	0	0
105	1	Jail Cell 194	Recessed	E	4'T8	2	2	32	S	24	365	6	140	1,226	N/A	Recessed	4'T8	E	S	2	2	32	24	365	6	140	1226	0	0	0
106	1	sally port 190	Recessed	E	4'T8	8	2	32	S	8	365	6	560	1,635	N/A	Recessed	4'T8	E	S	8	2	32	8	365	6	560	1635	0	0	0
107	1	Bathroom Men 111	Recessed	E	4'T8	2	3	32	OS	9	261	10	212	498	N/A	Recessed	4'T8	E	OS	2	3	32	9	261	10	212	498	0	0	0
108	1	Bathroom Women 112	Recessed	E	4'T8	2	3	32	OS	9	261	10	212	498	N/A	Recessed	4'T8	E	OS	2	3	32	9	261	10	212	498	0	0	0
109	1	Bathroom Women 112	Parabolic	E	4'T8	1	2	32	OS	9	261	6	70	164	N/A	Parabolic	4'T8	E	OS	1	2	32	9	261	6	70	164	0	0	0
110	1	Bathroom Men 111	Parabolic	E	4'T8	1	2	32	OS	9	261	6	70	164	N/A	Parabolic	4'T8	E	OS	1	2	32	9	261	6	70	164	0	0	0
111	1	Lobby 101	2'U-shape	E	2'T8	6	3	18	OS	8	261	6	360	752	N/A	2'U-shape	2'T8	E	OS	6	3	18	8	261	6	360	752	0	0	0
112	1	Vestibule 100	2'U-shape	E	2'T8	2	3	18	OS	16	261	6	120	501	N/A	2'U-shape	2'T8	E	OS	2	3	18	16	261	6	120	501	0	0	0
113	1	Court Room 102	2'U-shape	E	2'T8	23	3	18	OS	8	261	6	1,380	2,881	N/A	2'U-shape	2'T8	E	OS	23	3	18	8	261	6	1380	2881	0	0	0
114	1	Court Room 102	Recessed	N	CFL	28	2	13	OS	8	261	0	728	1,520	N/A	Recessed	CFL	N	OS	28	2	13	8	261	0	728	1520	0	0	0
115	1	Court Room 102	Screw-in	N	CFL	4	1	100	OS	8	261	0	400	835	N/A	Screw-in	CFL	N	OS	4	1	100	8	261	0	400	835	0	0	0
116	1	Office - Lawyers 110	Recessed	E	4'T8	2	3	32	OS	9	261	10	212	498	N/A	Recessed	4'T8	E	OS	2	3	32	9	261	10	212	498	0	0	0
117	1	Office - Lawyers 106	Recessed	E	4'T8	2	3	32	OS	9	261	10	212	498	N/A	Recessed	4'T8	E	OS	2	3	32	9	261	10	212	498	0	0	0
118	1	Office - Court Administration 107	Recessed	E	4'T8	2	3	32	OS	9	261	10	212	498	N/A	Recessed	4'T8	E	OS	2	3	32	9	261	10	212	498	0	0	0
119	1	Office - Judges Chamber 103	Recessed	E	4'T8	2	3	32	OS	9	261	10	212	498	N/A	Recessed	4'T8	E	OS	2	3	32	9	261	10	212	498	0	0	0
120	1	Office - Copy Room 105	Recessed	E	4'T8	1	3	32	OS	9	261	10	106	249	N/A	Recessed	4'T8	E	OS	1	3	32	9	261	10	106	249	0	0	0
121	1	Bathroom 104	Recessed	E	4'T8	1	3	32	OS	9	261	10	106	249	N/A	Recessed	4'T8	E	OS	1	3	32	9	261	10	106	249	0	0	0
122	1	Office - Court Admin 109	Recessed	E	4'T8	13	3	32	OS	9	261	10	1,378	3,237	N/A	Recessed	4'T8	E	OS	13	3	32	9	261	10	1378	3237	0	0	0
123	1	Office - Court Admin 109	2'U-shape	E	2'T8	9	2	18	OS	9	261	5	369	867	N/A	2'U-shape	2'T8	E	OS	9	2	18	9	261	5	369	867	0	0	0
124	1	Meeting Rm 143	Exit Sign	N	LED	2	1	5	N	24	365	1	12	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
125	1	Office Area - Support Services 146	Exit Sign	N	LED	3	1	5	N	24	365	1	18	158	N/A	Exit Sign	LED	N	N	3	1	5	24	365	1	18	158	0	0	0
126	1	Garage E155	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
127	1	Lobby E156	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
128	1	Vestibule E163	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
129	1	Hallway E184	Exit Sign	N	LED	3	1	5	N	24	365	1	18	158	N/A	Exit Sign	LED	N	N	3	1	5	24	365	1	18	158	0	0	0
130	1	Hallway E131	Exit Sign	N	LED	3	1	5	N	24	365	1	18	158	N/A	Exit Sign	LED	N	N	3	1	5	24	365	1	18	158	0	0	0
131	1	Vestibule E100	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
132	1	Court Room E102	Exit Sign	N	LED	3	1	5	N	24	365	1	18	158	N/A	Exit Sign	LED	N	N	3	1	5	24	365	1	18	158	0	0	0
133	1	Office - Judges Chamber E103	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
134	1	Office - Court Admin E109	Exit Sign	N	LED	2	1	5	N	24	365	1	12	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
135	Ext	Exterior	Exterior	N	MH	4	1	150	T	12	365	38	752	3,294	PSMH	Exterior	PSMH	N	T	4	1	100	12	365	22	488	2137	1156	0	1156
136	Ext	Exterior	Exterior	N	CFL	8	1	13	T	12	365	0	104	456	N/A	Exterior	CFL	N	T	8	1	13	12	365	0	104	456	0	0	0
137	Ext	Exterior	Exterior	N	MH	4	1	100	T	12	365	25	500	2,190	PSMH	Exterior	PSMH	N	T	4	1	65	12	365	14	316	1384	806	0	806
138	Ext	Exterior	Exterior	N	MH	2	1	70	T	12	365	18	176	771	PSMH	Exterior	PSMH	N	T	2	1	45	12	365	10	110	482	289	0	289
139	Ext	Exterior	Exterior	N	MH	2	1	150	T	12	365	38	376	1,647	PSMH	Exterior	PSMH	N	T	2	1	100	12	365	22	244	1069	578	0	578
140	Ext	Parking	Exterior	N	MH	37	1	150	T	12	365	38	6,956	30,467	PSMH	Exterior	PSMH	N	T	37	1	100	12	365	22	4514	19771	10696	0	10696
141	Ext	Parking	Exterior	N	MH	1	2	150	T	12	365	76	376	1,647	PSMH	Exterior	PSMH	N	T	1	2	100	12	365	43	243	1064	583	0	583
142	Ext	Parking	Exterior	N	MH	2	2	100	T	12	365	50	500	2,190	PSMH	Exterior	PSMH	N	T	2	2	65	12	365	28	316	1384	806	0	806
143	Ext	Parking	Exterior	N	4'T8	4	3	32	T	12	365	10	424	1,857	N/A	Exterior	4'T8	N	T	4	3	32	12	365	10	424	1857	0	0	0
Totals:						**566**	**323**	**4,743**				**1,264**	**48,315**	**164,192**						**566**	**323**	**4,296**			**1,090**	**43,982**	**146,364**	**17,828**	**0**	

Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space

TO USERS: ONCE ALL ROOMS ARE ADDED, DELETE ROWS NOT USED. MAKE SURE TO DELETE ENTIRE ROW, DO NOT SHIFT CELLS!

Appendix B: Third Party Energy Suppliers (ESCOs)

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

Third Party Electric Suppliers for JCPL Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for NJNG Service Territory	Telephone & Web Site
Cooperative Industries	(800) 628-9427
412-420 Washington Avenue	www.cooperativenet.com
Belleville, NJ 07109	
Direct Energy Services, LLC	(866) 547-2722
120 Wood Avenue, Suite 611	www.directenergy.com
Iselin, NJ 08830	
Gateway Energy Services Corp.	(800) 805-8586
44 Whispering Pines Lane	www.gesc.com
Lakewood, NJ 08701	
UGI Energy Services, Inc.	(856) 273-9995
704 East Main Street, Suite 1	www.ugienergyservices.com
Moorestown, NJ 08057	
Hess Corporation	(800) 437-7872
1 Hess Plaza	www.hess.com
Woodbridge, NJ 07095	
Intelligent Energy	(800) 724-1880
2050 Center Avenue, Suite 500	www.intelligentenergy.org
Fort Lee, NJ 07024	
Metromedia Energy, Inc.	(877) 750-7046
6 Industrial Way	www.metromediaenergy.com
Eatontown, NJ 07724	
MxEnergy, Inc.	(800) 375-1277
510 Thornall Street, Suite 270	www.mxenergy.com
Edison, NJ 08837	
NATGASCO (Mitchell Supreme)	(800) 840-4427
532 Freeman Street	www.natgasco.com
Orange, NJ 07050	
NJ Gas & Electric	(866) 568-0290
1 Bridge Plaza, Fl. 2	www.NewJerseyGasElectric.com
Fort Lee, NJ 07024	
Pepco Energy Services, Inc.	(800) 363-7499
112 Main Street	www.pepco-services.com
Lebanon, NJ 08833	
PPL EnergyPlus, LLC	(800) 281-2000
811 Church Road	www.pplenergyplus.com
Cherry Hill, NJ 08002	
South Jersey Energy Company	(800) 756-3749
One South Jersey Plaza, Route 54	www.southjerseyenergy.com
Folsom, NJ 08037	
Sprague Energy Corp.	(800) 225-1560
12 Ridge Road	www.spragueenergy.com
Chatham Township, NJ 07928	
Woodruff Energy	(800) 557-1121
73 Water Street	www.woodruffenergy.com
Bridgeton, NJ 08302	

Appendix C: Glossary and Method of Calculations

Glossary of ECM Terms

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Net ECM Cost: The net ECM cost is the cost experienced by the customer, which is typically the total cost (materials + labor) of installing the measure minus any available incentives. Both the total cost and the incentive amounts are expressed in the summary for each ECM.

Annual Energy Cost Savings (AECS): This value is determined by the audit firm based on the calculated energy savings (kWh or Therm) of each ECM and the calculated energy costs of the building.

Lifetime Energy Cost Savings (LECS): This measure estimates the energy cost savings over the lifetime of the ECM. It can be a simple estimation based on fixed energy costs. If desired, this value can factor in an annual increase in energy costs as long as the source is provided.

Simple Payback: This is a simple measure that displays how long the ECM will take to break-even based on the annual energy and maintenance savings of the measure.

ECM Lifetime: This is included with each ECM so that the owner can see how long the ECM will be in place and whether or not it will exceed the simple payback period. Additional guidance for calculating ECM lifetimes can be found below. This value can come from manufacturer's rated lifetime or warranty, the ASHRAE rated lifetime, or any other valid source.

Operating Cost Savings (OCS): This calculation is an annual operating savings for the ECM. It is the difference in the operating, maintenance, and / or equipment replacement costs of the existing case versus the ECM. In the case where an ECM lifetime will be longer than the existing measures (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

Return on Investment (ROI): The ROI is expresses the percentage return of the investment based on the lifetime cost savings of the ECM. This value can be included as an annual or lifetime value, or both.

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

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

Calculation References

ECM = Energy Conservation Measure
AOCS = Annual Operating Cost Savings
AECS = Annual Energy Cost Savings
LOCS = Lifetime Operating Cost Savings
LECS = Lifetime Energy Cost Savings
NPV = Net Present Value
IRR = Internal Rate of Return
DR = Discount Rate

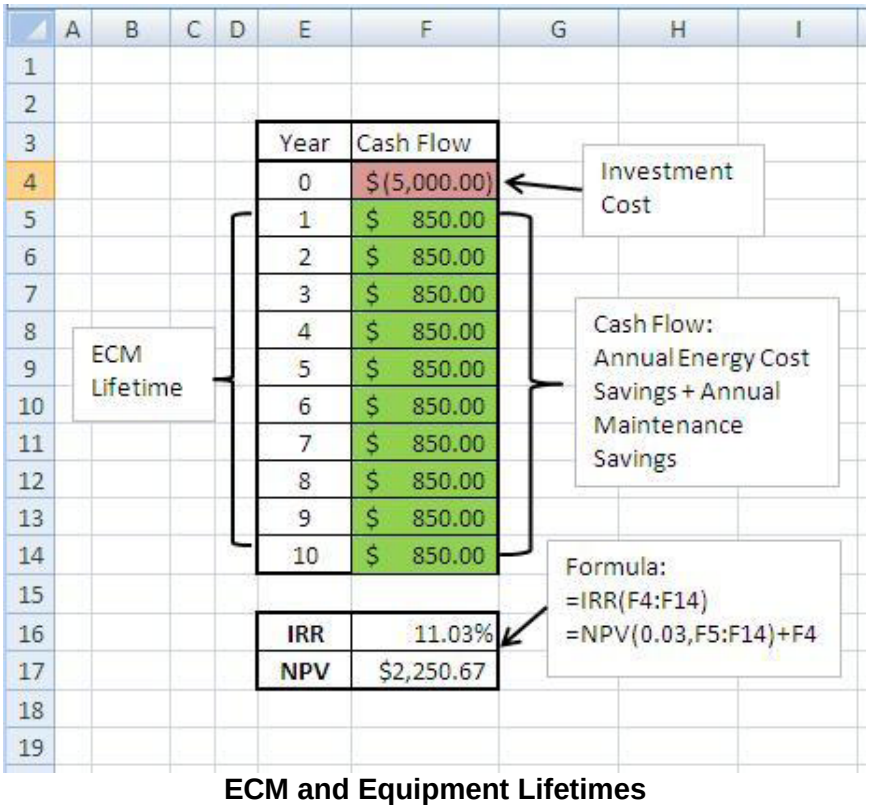
Net ECM Cost = Total ECM Cost – Incentive
LECS = AECS X ECM Lifetime
AOCS = LOCS / ECM Lifetime

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

Simple Payback = Net ECM Cost / (AECS + AOCS)
Lifetime ROI = (LECS + LOCS – Net ECM Cost) / Net ECM Cost
Annual ROI = (Lifetime ROI / Lifetime) = (AECS + OCS) / Net ECM Cost – 1 / Lifetime
It is easiest to calculate the NPV and IRR using a spreadsheet program like Excel.

Excel NPV and IRR Calculation

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



ECM and Equipment Lifetimes

Determining a lifetime for equipment and ECM's can sometimes be difficult. The following table contains a list of lifetimes that the NJCEP uses in its commercial and industrial programs. Other valid sources are also used to determine lifetimes, such as the DOE, ASHRAE, or the manufacturer's warranty.
Lighting is typically the most difficult lifetime to calculate because the fixture, ballast, and bulb can all have different lifetimes. Essentially the ECM analysis will have different operating cost savings (avoided equipment replacement) depending on which lifetime is used.

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

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

NJCEP C & I Lifetimes

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