Steven Winter Associates, Inc.
Building Systems Consultants
www.swinter.com

293 Route 18, Suite 330
East Brunswick, NJ 08816

Telephone (866) 676-1972
Facsimile (203) 852-0741

June 28, 2010

Local Government Energy Program
Energy Audit Final Report

Borough of Park Ridge

Police Department
33 Park Avenue
Park Ridge, NJ 07656

Project Number: LGEA62

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EXECUTIVE SUMMARY

The Borough of Park Ridge Police Department is a single-story building comprising a total conditioned floor area of 8,000 square feet. The original structure was built in 2004, and there have been no major renovations or additions since then. The following chart provides an overview of current energy usage in the building based on the analysis period of January 2009 through January 2010:

Table 1: State of Building—Energy Usage

	Electric Usage, kWh/yr	Gas Usage, therms/yr	Current Annual Cost of Energy, $	Site Energy Use Intensity, kBtu/sq ft yr	Joint Energy Consumption, MMBtu/yr
Current	165,200	1,023	$33,367	81.0	666
Proposed	139,816	1,023	$30,016	70.0	579
Savings	25,384	0	3,351	11.0	87
% Savings	15%	0.0%	10%	14%	13%

SWA has also entered energy information about the Police Department in the U.S. Environmental Protection Agency's (EPA) *ENERGY STAR® Portfolio Manager* energy benchmarking system. This Police Station is comprised of non-eligible ("Other") space type. The resulting score is 81.0kBtu/sqft-yr, which is above the national average comparable building by 3.8%.

Based on the current state of the building and its energy use, SWA recommends implementing various energy conservation measures from the savings detailed in Table 1. The measures are categorized by payback period in Table 2 below:

Table 2: Energy Conservation Measure Recommendations

ECMs	First Year Savings ($)	Simple Payback Period (years)	Initial Investment, $	CO2 Savings, lbs/yr
0-5 Year	1,132	1.4	1,540	13,758
5-10 Year	12,536	7.2	90,000	31,692
>10 year	0		0	0
Total	13,668	6.7	91,540	45,449

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 1 car from the road each year or avoiding the need of 34 trees to absorb the annual CO_2 generated.

Other recommendations to increase building efficiency pertaining to operations and maintenance and capital improvements are listed below:

Further Recommendations:

SWA recommends that the Police Department further explore the following:

- Capital Improvements
  - Install premium motors when replacements are required

- Operations and Maintenance
  - Efflorescence-coated brick and masonry materials need to dry out
  - Thoroughly and evenly insulate space above the ceiling tiles
  - Maintain roof
  - Soot visible on air supply diffusers - equipment air filters must be regularly replaced as per manufacturers recommendations
  - Maintain downspouts and cap flashing
  - Provide weather-stripping/air-sealing
  - Repair/seal wall cracks and penetrations
  - Provide water-efficient fixtures and controls
  - Purchase Energy Star labeled appliances when replacements are needed
  - Use smart power electric strips
  - Create an energy educational program

Financial Incentives and Other Program Opportunities

There are various incentive programs that the Borough of Park Ridge could apply for that could also help lower the cost of installing the ECMs.

Although the Borough of Park Ridge is their own electric provider and does not pay a societal benefit charge, as of April 1, 2010, the Borough's buildings are eligible for NJ Clean Energy Program incentives. The funds for this change are provided by the American Recovery and Reinvestment Act, ARRA. Therefore, applicants are subject to federal ARRA terms and conditions. The Borough of Park Ridge should investigate the procedure to obtain NJ Clean Energy incentives such as Direct Install and Pay for Performance under ARRA conditions. For more information including other programs that are available because the Borough is a regulated gas customer, call 866-NJSMART or visit NJCleanEnergy.com. Please refer to Appendix F for details.

INTRODUCTION

Launched in 2008, the Local Government Energy Audit (LGEA) Program provides subsidized energy audits for municipal and local government-owned facilities, including offices, courtrooms, town halls, police and fire stations, sanitation buildings, transportation structures, schools and community centers. The Program will subsidize up to 100% of the cost of the audit. The Board of Public Utilities (BPUs) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 38-year-old architectural/engineering research and consulting firm, with specialized expertise in green technologies and procedures that improve the safety, performance, and cost effectiveness of buildings. SWA has a long-standing commitment to creating energy-efficient, cost-saving and resource-conserving buildings. As consultants on the built environment, SWA works closely with architects, developers, builders, and local, state, and federal agencies to develop and apply sustainable, 'whole building' strategies in a wide variety of building types: commercial, residential, educational and institutional.

SWA performed an energy audit and assessment for the Police Department at 33 Park Avenue, Park Ridge, NJ. The process of the audit included facility visits on March 10, 2010 and March 24, 2010, benchmarking and energy bills analysis, assessment of existing conditions, energy modeling, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

The goal of this Local Government Energy Audit is to provide sufficient information to the Borough of Park Ridge to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Police Department.

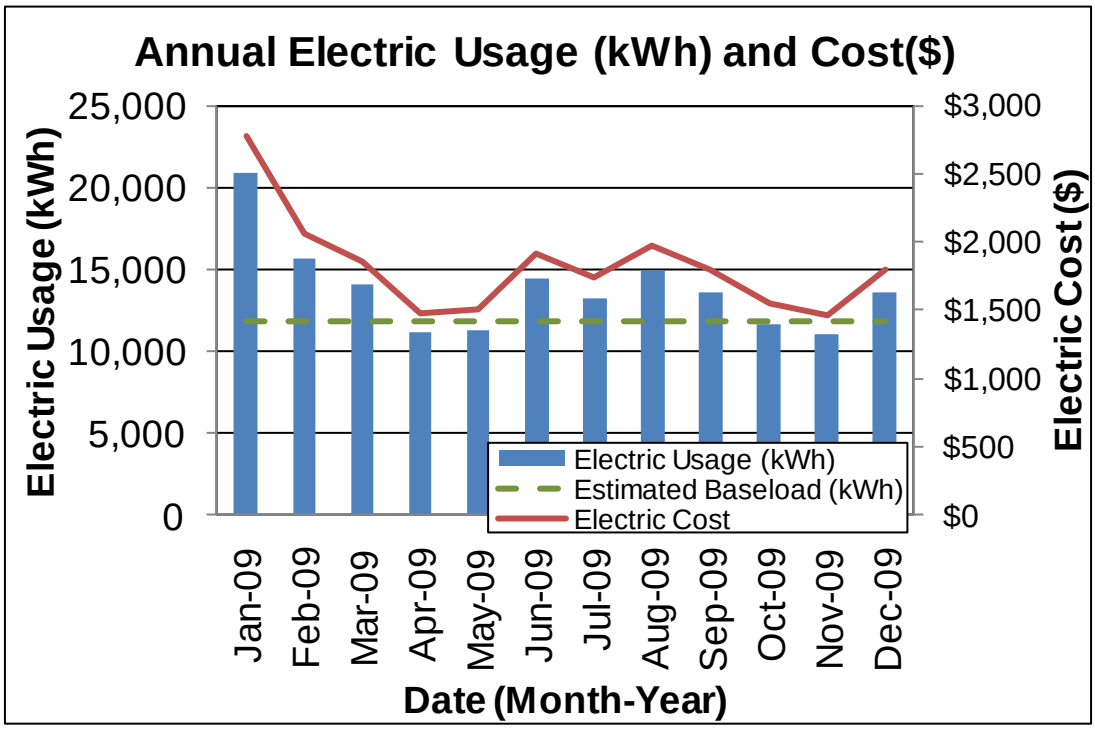
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from January 2008 through January 2010 that were received from the utility companies supplying the Police Department with electric and natural gas. A 12 month period of analysis from January 2009 through January 2010 was used for all calculations and for purposes of benchmarking the building.

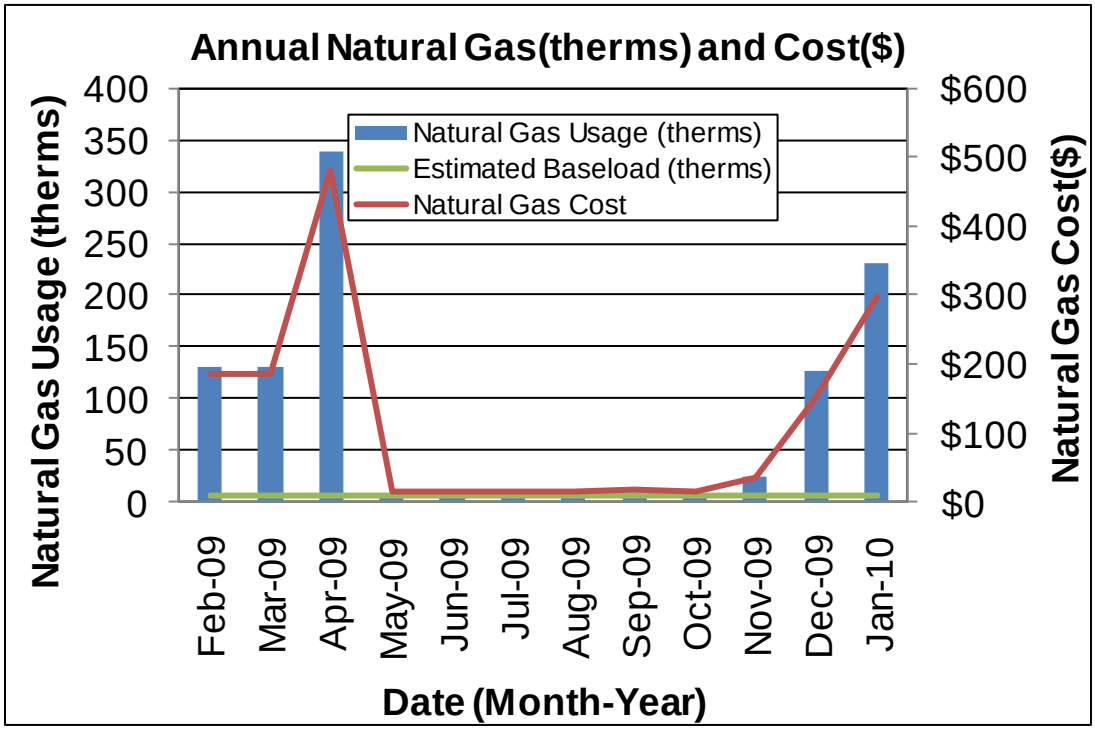
Electricity - The Police Department is currently served by one electric meter. The Police Department currently buys electricity from Park Ridge Electric at **an average aggregated rate of $0.132/kWh**. The Police Department purchased **approximately 165,200 kWh, or $21,877 worth of electricity,** in the previous year. The average monthly demand was 34.0 kW and the annual peak demand was 42.0 kW.

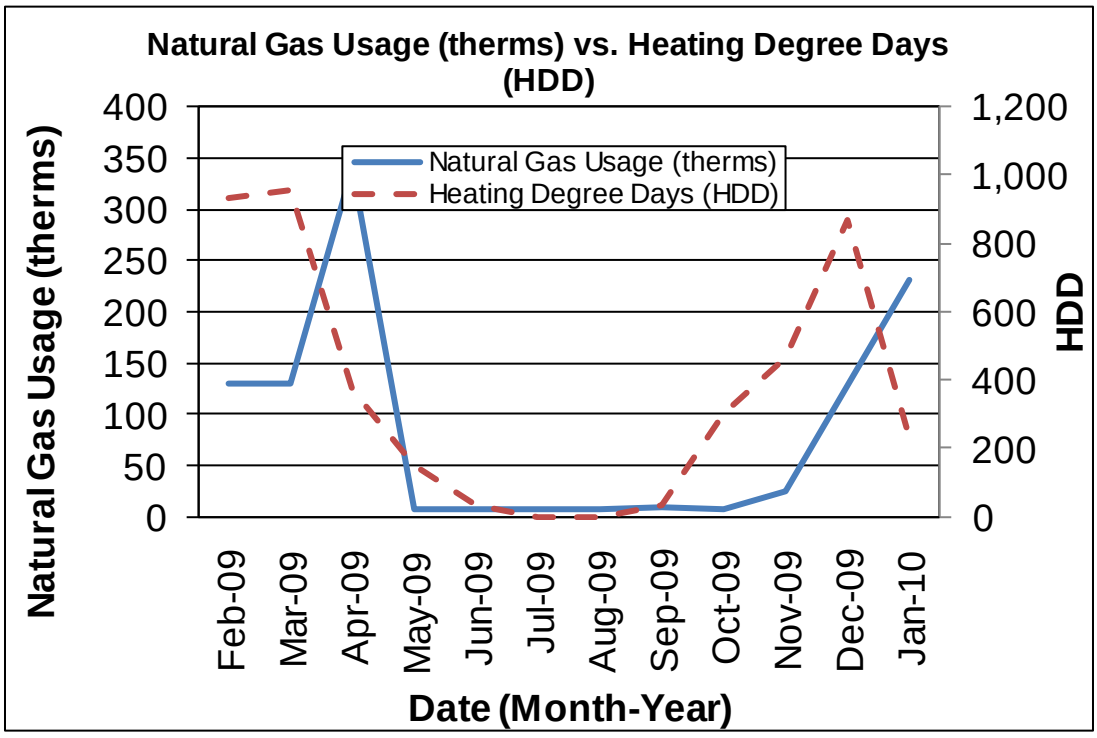
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the Police Department.



Natural gas - The Police Department is currently served by one meter for natural gas. The gas bills provided showed very low usage for January 2009 through April 2009, which is likely the result of a metering issue. The usage for these months was therefore adjusted based on the 2010 metered data. With this adjustment, the Police Department currently buys natural gas from PSE&G at **an average aggregated rate of $1.40/therm**. The Police Department purchased **approximately 1,023 therms, or $1,431 worth of natural gas,** in the previous year.

The chart below shows the adjusted monthly natural gas usage and costs. The green line represents the approximate baseload or minimum natural gas usage required to operate the Police Department.



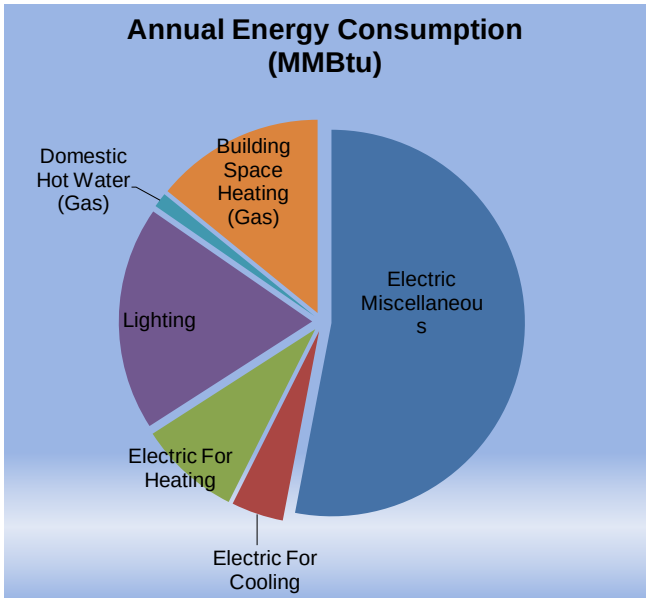


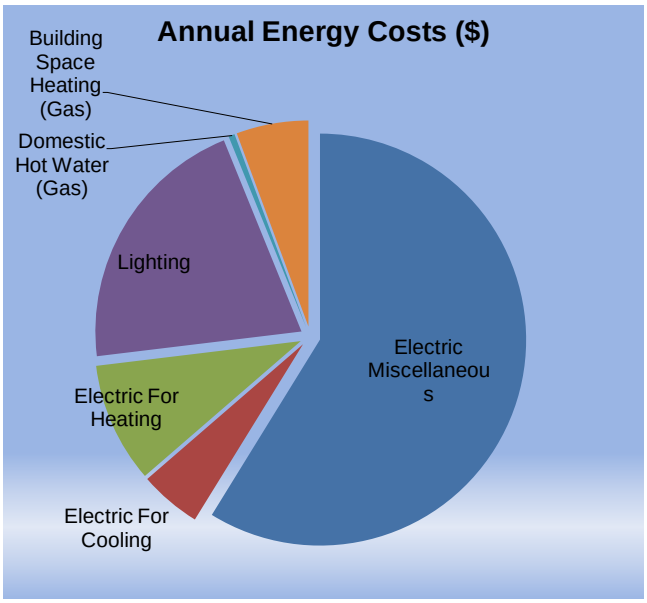
The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base

temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. SWA's analysis used a base temperature of 65 degrees Fahrenheit.

The following graphs, pie charts, and table show energy use for the Police Department based on utility bills for the 12 month period. Note: electrical cost at $39/MMBtu of energy is almost three times as expensive as natural gas at $14/MMBtu

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	353	53%	$13,704	59%	39
Electric For Cooling	29	4%	$1,130	5%	39
Electric For Heating	57	9%	$2,200	9%	39
Lighting	125	19%	$4,843	21%	39
Domestic Hot Water (Gas)	8	1%	$114	0%	14
Building Space Heating (Gas)	94	14%	$1,317	6%	14
Totals	666	100%	$23,308	100%	
Total Electric Usage	564	85%	$21,877	94%	39
Total Gas Usage	102	15%	$1,431	6%	14
Totals	666	100%	$23,308	100%	



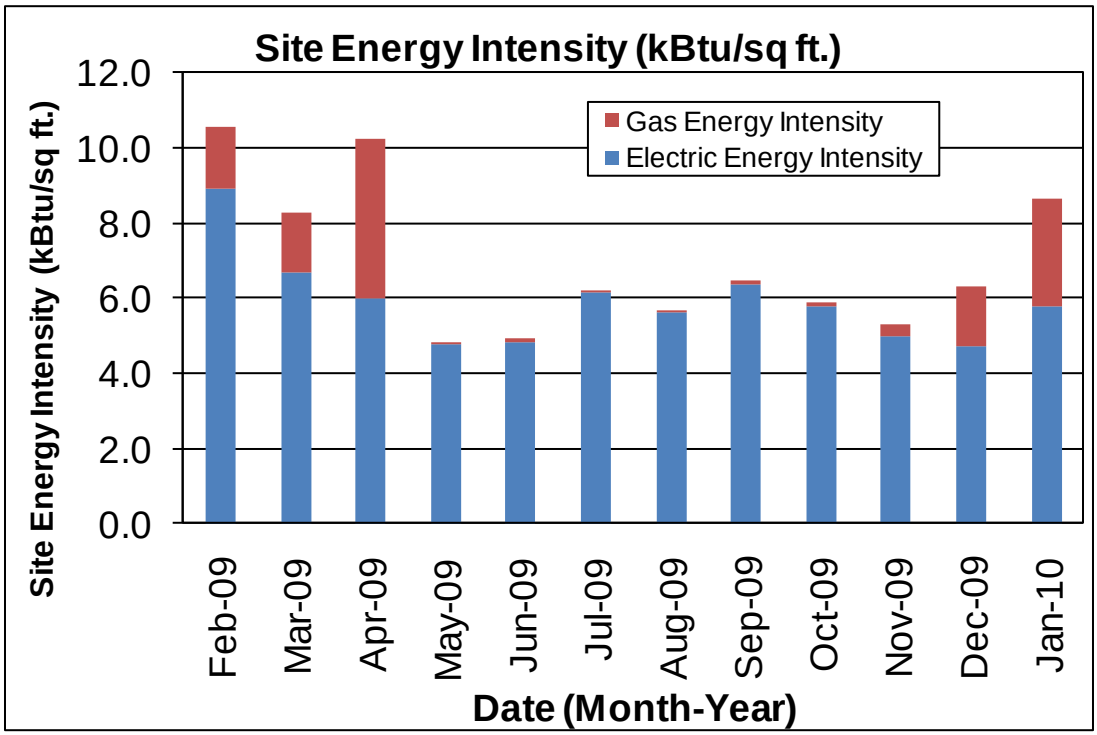


Energy benchmarking

SWA has entered energy information about the Police Department in the U.S. Environmental Protection Agency's (EPA) *ENERGY STAR® Portfolio Manager* energy benchmarking system.

This Police Station facility is categorized as a non-eligible ("Other") space type. Because it is an "Other" space type, there is no rating available. Consequently, the Police Department is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 81.0 kBtu/ft^2-yr compared to the national average of a Police Station building consuming 78.0 kBtu/ft^2-yr. See ECM section for guidance on how to improve the building's rating.

Due to the nature of its calculation based upon a survey of existing buildings of varying usage, the national average for "Other" space types is very subjective, and is not an absolute bellwether for gauging performance. Additionally, should the Borough of Park Ridge desire to reach this average there are other large scale and financially less advantageous improvements that can be made, such as envelope window, door and insulation upgrades that would help the building reach this goal.



Per the LGEA program requirements, SWA has assisted the Borough of Park Ridge to create an *ENERGY STAR® Portfolio Manager* account and share the Police Department facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the Borough of Park Ridge (user name of "parkridgeboro" with a password of *"1parkridge1")* and TRC Energy Services (user name of "TRC-LGEA").

Tariff analysis

As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs. Tariffs are typically assigned to buildings based on size and building type.

Tariff analysis is performed to determine if the rate that a municipality is contracted to pay with each utility provider is the best rate possible resulting in the lowest costs for electric and gas

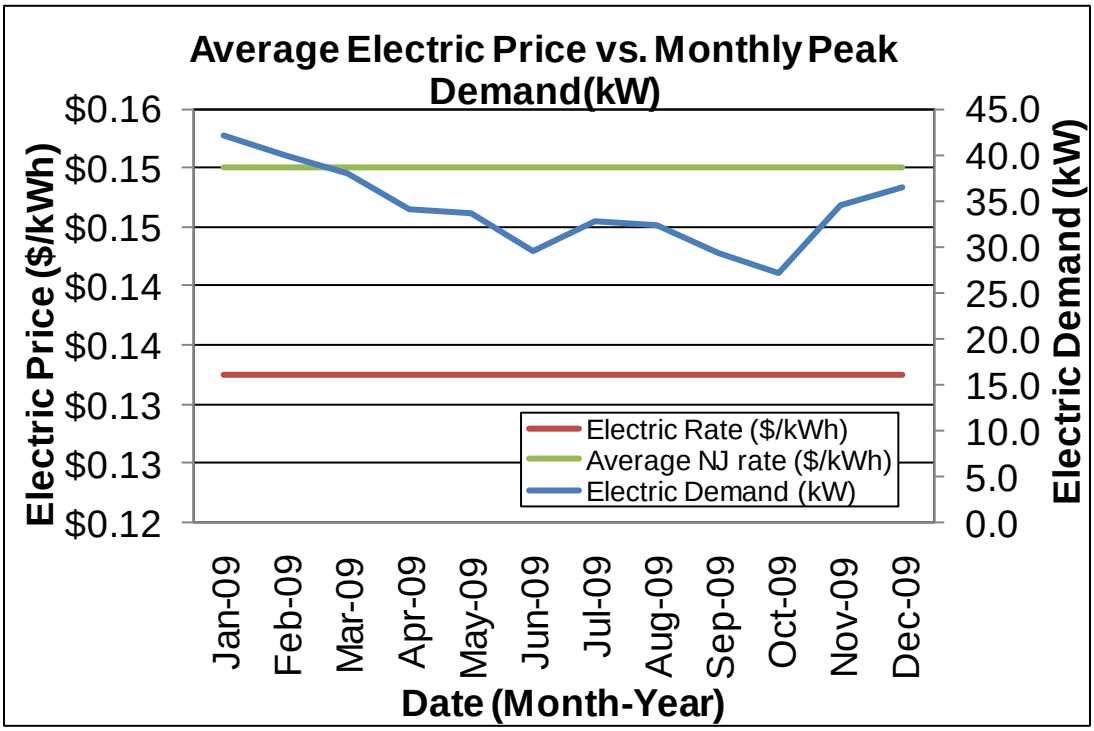
provision. Typically, the natural gas prices increase during the heating months when natural gas is used by the hot water boiler units. Some high gas price per therm fluctuations in the summer may be due to high energy costs that recently occurred and low use caps for the non-heating months. Typically, electricity prices also increase during the cooling months when electricity is used by the HVAC condensing units.

Currently, the Borough of Park Ridge is its own electric supplier and therefore is exempt from regional and demand service charges. The building is direct metered and is charged a constant rate throughout the year, with no fluctuations due to season or usage.

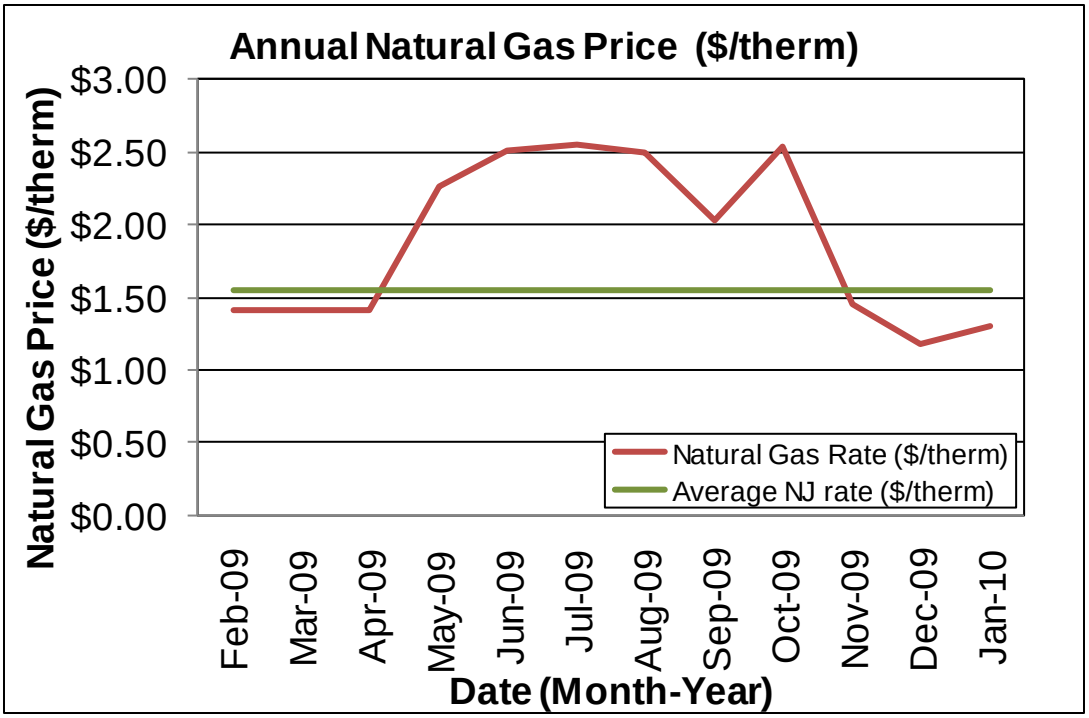
Energy Procurement strategies

Billing analysis is conducted using an average aggregated rate that is estimated based on the total cost divided by the total energy usage per utility per 12 month period. Average aggregated rates do not separate demand charges from usage, and instead provide a metric of inclusive cost per unit of energy. Average aggregated rates are used in order to equitably compare building utility rates to average utility rates throughout the state of New Jersey.

Since the Borough of Park Ridge is its own electricity provider, the electric rate for the building is highly competitive at $0.132/kWh, which is less than the average estimated NJ commercial electric rate of $0.150/kWh. There are no cost fluctuations due to demand or usage reflected in the provided electric bills.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while Police Department pays a rate of $1.40/therm. Natural gas bill analysis shows fluctuations up to 54% over the most recent 12 month period.



Utility rate fluctuations may have been caused by adjustments between estimated and actual meter readings; others may be due to unusual high and recent escalating energy costs.

SWA recommends that the Police Department further explore opportunities of purchasing both natural gas and electricity from third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Police Department. Appendix C contains a complete list of third-party energy suppliers for the Borough of Park Ridge service area.

EXISTING FACILITY AND SYSTEMS DESCRIPTION

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

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Based on visits from SWA on March 10, 2010 and March 24, 2010, the following data was collected and analyzed.

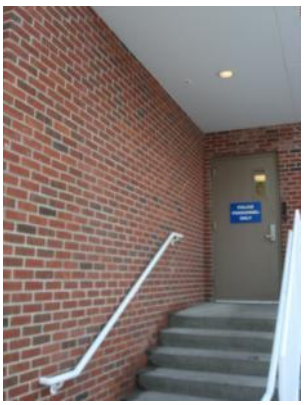
Building Characteristics

The single-story, (slab on grade), 8,000 square feet Police Department Building was originally constructed in 2004 with no additions/alterations. It houses an office area, traffic offices, a sally port garage and utility rooms.

Front and Side Façade

Front Façade

Side Façade (typ.)



Rear Façade

Building Occupancy Profiles

Its occupancy is approximately eight employees daily from 8:00 am to 8:00 pm, with intermittent occupancy overnight by no more than four officers.

Building Envelope

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

Exterior Walls

The exterior wall envelope is mostly constructed of brick veneer and some vinyl clapboard siding accents, over concrete block with an unconfirmed level insulation. The interior is mostly painted gypsum wallboard.

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

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall good condition with only a few signs of uncontrolled moisture mostly on the northeast corner of the building.

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

Efflorescence on brick and masonry walls indicate moisture presence within the wall cavity.

Efflorescence on brick and masonry walls indicate moisture presence within the wall cavity.

Roof

The building's roof is predominantly a flat and parapet type over steel decking, with a light-colored EPDM single-membrane finish and is original. There was no access to the ceiling insulation but it is assumed that there is at least two inches of roof insulation.

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

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall good condition, with no signs of uncontrolled moisture, air-leakage or other energy-compromising issues.

The following specific roof problem spots were identified:

Base

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

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

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

Windows

The building contains basically two different types of windows.

1. Most are double-hung type windows with an insulated aluminum frame, clear double glazing and interior roller shades. The windows are located throughout the building and are original.
2. Several are skylight type windows with an insulated aluminum frame, clear double glazing and no interior or exterior shading devices. The windows are located above on a raised section of the ceiling and are original.

Windows, shading devices, sills, related flashing and caulking were inspected as far as accessibility allowed for signs of moisture, air-leakage and other energy compromising issues. Overall, the windows were found to be in good condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

Exterior doors

The building contains several different types of exterior doors..

1. Two are glass with aluminum frame type exterior doors. They are located at the entrance and are original.
2. One aluminum garage door in the south east corner of the building.
3. One aluminum type exterior doors located at the back entrance and is original.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in good condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

Building air-tightness

Overall the field auditors found the building to be reasonably air-tight, considering the building's use and occupancy, as described in more detail earlier in this chapter.

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

Mechanical Systems

Heating Ventilation Air Conditioning

There are some concerns that the building heating and cooling controls are insufficient. Occupants were told that both heating and cooling set points on thermostats must be the same in order for the equipment to operate correctly. Also, based on electric usage for the building, it is apparent that there is a large amount of supplemental electric heating during winter months in the form of electric space heaters.

Equipment

The Police Department is heated/cooled by three Carrier rooftop package units. There are also several exhaust fans for ventilation. A comprehensive Equipment List can be found in Appendix A.

The rooftop units contain a natural gas burner for heating and a direct expansion (DX) system for cooling, made up of an evaporator, condenser and refrigerant loop. The burner provides heat to the passing air through the combustion of natural gas; for cooling the R-22 refrigerant absorbs heat from the passing air in the evaporator coil and transfers the heat to the atmosphere in the condenser.

Carrier Weathermaster Rooftop Unit

The various spaces of the building are provided ventilation by outside air intake louvers on the rooftop units, and ducted outside air intake ducts for furnaces. There are gravity dampers on the return section which purge excess air out of the system in order to maintain pressure equilibrium.

There are two Cook exhaust fans located on the roof which serve the bathrooms and general exhaust. In general, the building exhaust fans have an estimated 60% useful operating life left.

Distribution Systems

A typical rooftop unit arrangement draws in fresh air and brings it into a mixing box, where it is combined with return air from the building. A small portion of the return air is purged and vented outside prior to entering the mixing box. The mixed air inside the air handler is sent through a filter before passing through the evaporator or direct expansion (DX) coil. The air handler fan then pushes the air through the furnace section before the conditioned air is distributed into the building spaces. The furnace is only active in the heating season and the DX system is only active in the cooling season. In between these seasons neither system may operate and only the blower will be active to provide fresh air to the building.

The Police Department has a constant volume air system with manual volume dampers.

Controls

The heating and cooling equipment is controlled by digital thermostats in each room and one central programmable thermostat in the lobby area. Currently the system is set up with no dead band temperature range and the heating and cooling set points are always the same. Even though there are several adjustable thermostats in each room, there are no individual volume dampers to respond to the set point. The one programmable thermostat controls the operation of all three rooftop units.

One of many temperature sensors

Domestic Hot Water

The domestic hot water (DHW) for the Police Department is provided by a natural gas Rheem heater with 50 gal storage. The unit was installed in 2004 and appears in good condition.

Electrical systems

Lighting

See attached lighting schedule in Appendix B for a complete inventory of lighting throughout the building including estimated power consumption and proposed lighting recommendations.

Interior Lighting - The Police Department currently contains mostly T8 fixtures, halogen track lights and wall sconces with self-ballast bulbs. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas. There were staff complaints about not sufficient light due to halogen lights burning out.

T8 Fixtures and Halogen Track Lights

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

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of Incandescent and CFL fixtures. Exterior lighting is controlled by timers.

Appliances and process

SWA has conducted a general survey of larger, installed equipment. Appliances and other miscellaneous equipment account for a significant portion of electrical usage within the building. Typically, appliances are referred to as “plug-load” equipment, since they are not inherent to the building’s systems, but rather plug into an electrical outlet. Equipment such as process motors, computers, computer servers, radio and dispatch equipment, refrigerators, vending machines, printers, etc. all create an electrical load on the building that is hard to separate out from the rest of the building’s energy usage based on utility analysis.

Elevators

The Police Department does not have an installed elevator.

Other electrical systems

There are not currently any other significant energy-impacting electrical systems installed at the Police Department other than a Cummins Quietside natural gas generator with 100 kW capacity.

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

Renewable energy is defined as any power source generated from sources which are naturally replenished, such as sunlight, wind and geothermal. Technology for renewable energy is improving, and the cost of installation is decreasing, due to both demand and the availability of state and federal government-sponsored funding. Renewable energy reduces the need for using either electricity or fossil fuel, therefore lowering costs by reducing the amount of energy purchased from the utility company. Technology such as photovoltaic panels or wind turbines, use natural resources to generate electricity on the site. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Solar thermal collectors heat a specified volume of water, reducing the amount of energy required to heat water using building equipment. Cogeneration or CHP allows you to generate electricity locally, while also taking advantage of heat wasted during the generation process.

Existing systems

Currently there are no renewable energy systems installed in the building.

Evaluated Systems

Solar Photovoltaic

Photovoltaic panels convert light energy received from the sun into a usable form of electricity. Panels can be connected into arrays and mounted directly onto building roofs, as well as installed onto built canopies over areas such as parking lots, building roofs or other open areas. Electricity generated from photovoltaic panels is generally sold back to the utility company through a net meter. Net-metering allows the utility to record the amount of electricity generated in order to pay credits to the consumer that can offset usage and demand costs on the electric bill. In addition to generation credits, there are incentives available called Solar Renewable Energy Credits (SRECs) that are subsidized by the state government. Specifically, the New Jersey State government pays a market-rate SREC to facilities that generate electricity in an effort to meet state-wide renewable energy requirements.

Based on utility analysis and a study of roof conditions, the Police Department is a good candidate for a 15 kW Solar Panel installation. See ECM#3 for details.

Solar Thermal Collectors

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

Geothermal

The Police Department is not a good candidate for geothermal installation since it would require replacement of the entire existing HVAC system, of which major components still have over 60% remaining useful life.

Combined Heat and Power

The Police Department is not a good candidate for CHP installation and would not be cost-effective due to the size and operations of the building. Typically, CHP is best suited for buildings with a high electrical base-load to accommodate the electricity generated, as well as a means for using waste heat generated. Typical applications include buildings with an absorption chiller, where waste heat would be used efficiently.

PROPOSED ENERGY CONSERVATION MEASURES

Energy Conservation Measures (ECMs) are recommendations determined for the building based on improvements over current building conditions. ECMs have been determined for the building based on installed cost, as well as energy and cost-savings opportunities.

Recommendations: Energy Conservation Measures

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	Lighting Upgrades: Replace Halogen and Inc with CFL
2	Lighting Upgrades: Install Occupancy Sensors
	Description of Recommended 5-10 Year Payback ECMs
3	Install 15 kW PV rooftop system

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

ECM#1: *Building Lighting Upgrade: Replace Halogen and Incandescent with CFL*

On the days of the site visits, SWA completed a lighting inventory of the Police Department (see Appendix B). The existing lighting consists of mostly T8 fluorescent fixtures with electronic ballasts as well as some halogen and incandescent lights. SWA recommends replacing 18 incandescent and halogen lamps with CFL lamps which produce the same lumens for a third or less of the wattage. Due to these characteristics, energy savings can be realized via one-to-one substitution of lower-wattage systems, or by taking advantage of higher light output and reducing the number of fixtures required in the space. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Borough of Park Ridge may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor, to obtain savings.

Installation cost:
Estimated installed cost: $540 (includes $150 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

ECM #	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	annual return on investment, %	CO_2 reduced, lbs/yr
1	540	none at this time	540	5,739	1.20	0	2.4	117	875	5	4375.1	0.6	164	10,276

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 3 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- *None at this time*

Please see Appendix F for more information on Incentive Programs.

ECM#2: *Building Lighting Upgrade: Install Occupancy Sensors*

On the days of the site visits, SWA completed a lighting inventory of the Police Department (see Appendix B). The existing lighting consists of mostly T8 fluorescent fixtures with electronic ballasts as well as some halogen and incandescent lights. SWA recommends installing five occupancy sensors in bathrooms, closets, offices or areas that are occupied only part of the day, and where payback on savings is justified. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advance micro-phonic lighting sensors include sound detection as a means to control lighting operation. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Borough of Park Ridge may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor, to obtain savings.

Installation cost:

Estimated installed cost: $1,000 (includes $200 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

ECM #	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	annual return on investment, %	CO_2 reduced, lbs/yr
2	1,100	100	1,000	1,945	0.41	0	0.8	0	257	15	3,851	3.9	19	3,482

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 5 hrs/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- *NJ Clean Energy - Wall Mounted occupancy sensors ($25 per control) - Maximum incentive amount is $100.*

Please see Appendix F for more information on Incentive Programs.

ECM#3*: Install 15 kW Solar PV System*

SWA presents below the economics, and recommends at this time that Borough of Park Ridge further review installing a 15 kW 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. As an electricity supplier, reducing the Borough's electric load allows for more capacity for the town and also serves as an example of energy efficiency for the community.

The size of the system was determined using the amount of roof surface area as a limiting factor, as well as the facilities annual base load. A PV system could be installed on a portion of the sloped roof that faces South or West. 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 35 kW system needs approximately 122 panels, which would take up 1,304 square feet, nearly 16% of the current roof area.

Installation cost: Estimated installed cost: $90,000 (includes $30,000 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

ECM #	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	annual return on investment, %	CO_2 reduced, lbs/yr
3	105,000	15,000	90,000	17,700	15.00	0	7.5	0	12,536	25	211,410	7.2	540	31,692

25 Year Cash flow Breakdown													
Year	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Sub total	-90,000	12,536	12,536	12,536	12,536	12,536	12,536	12,536	12,536	12,536	12,536	12,536	12,536
Year	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Sub total	12,536	12,536	12,536	2,336	2,336	2,336	2,336	2,336	2,336	2,336	2,336	2,336	2,336

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 15,000 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 for systems 50 kW or less. Incentive amount for this application is $15,000 for the Park Ridge Borough Hall/Public Library*

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 1,000kWh (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. A total of $10,200/year, based on $600/SREC, has been incorporated in the above costs for a period of 15 years; however it requires proof of performance, application approval and negotiations with the utility.*

PROPOSED FURTHER RECOMMENDATIONS

Capital Improvements

Capital Improvements are recommendations for the building that may not be cost-effective at the current time, but that could yield a significant long-term payback. These recommendations should typically be considered as part of a long-term capital improvement plan. Capital improvements should be considered if additional funds are made available, or if the installed costs can be shared with other improvements, such as major building renovations. SWA recommends the following capital improvements for the Police Department:

- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives.

Operations and Maintenance

Operations and Maintenance measures consist of low/no cost measures that are within the capability of the current building staff to handle. These measures typically require little investment, and they yield a short payback period. These measures may address equipment settings or staff operations that, when addressed will reduce energy consumption or costs.

- Efflorescence-coated brick and masonry materials need to dry out, and possible cause of water infiltration into wall cavities should be investigated.

- Thoroughly and evenly insulate space above the ceiling tiles and plug all ceiling penetration. All missing ceiling tiles should be put back in place.

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

- Soot visible from air supply diffusers; equipment air filters must be regularly replaced as per manufacturers recommendations

- Maintain downspouts and cap flashing - Repair/install missing downspouts and cap flashing as needed to prevent water/moisture infiltration and insulation damage. SWA recommends round downspout elbows to minimize clogging.

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

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

- Provide water-efficient fixtures and controls - Adding controlled on/off timers on all lavatory faucets is a cost-effective way to reduce domestic hot water demand and save water. Building staff can also easily install faucet aerators and/or low-flow fixtures to reduce water consumption.

There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures/appliances will reduce energy consumption for water heating, while also decreasing water/sewer bills.

- SWA recommends that the building considers purchasing the most energy-efficient equipment, including ENERGY STAR® labeled appliances, when equipment is installed or replaced. More information can be found in the "Products" section of the ENERGY STAR® website at: http://www.energystar.gov.

- Use smart power electric strips - in conjunction with occupancy sensors to power down computer equipment when left unattended for extended periods of time.

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

APPENDIX A: EQUIPMENT LIST

Inventory

Building System	Description	Location	Model #	Fuel	Space Served	Date Installed	Estimated Remaining Useful Life %
Domestic Hot Water	DHW Heater 50 Gal, 40,000 Btu/hr, 75% Eff	1st Fl Storage Rm	Rheem42V50-40F; RHLN 0304557222	Natural Gas	All Areas	2004	60%
Heating / Cooling	RTU - Heating 50,000 Btu/hr, 82% Eff.; Cooling, 3 tons, 80% Eff.	Roof	Carrier Weathermaster; 48HJE004-541; 4603G40400	Natural Gas/Electric	All Areas	2004	60%
Heating / Cooling	RTU - Heating 180,000 Btu/hr, 82% Eff.; Cooling, 8.5 tons, 80% Eff.	Roof	Carrier ; 48HJD009-551; 2484G48743	Natural Gas/Electric	All Areas	2004	60%
Heating / Cooling	RTU - Heating 250,000 Btu/hr, 80% Eff.; Cooling, 12.5 tons, 80% Eff.	Roof	Carrier; 48HJE014---561; 1904G50616	Natural Gas/Electric	All Areas	2004	60%
Ventilation	Exhaust Fan 0.167 HP, 1162 RPM, 200 CFM	Roof	Cook; 100 ACE 100C2B 50; 214S789161	Electric	All Areas	2004	60%
Ventilation	Exhaust Fan 0.333 HP, 1138 RPM, 1200 CFM	Roof	Cook; 135 ACE 135C4B; 214S789161	Electric	All Areas	2004	60%
Generator	100 kW, Emergency Generator, No access to unit during audit	Outside, Ground	Cummins Quietside	Natural Gas	Emergency Power	2009	100%
Lighting	T8s, halogens	All Areas	See Appendix A for Details	Electric	All Areas	varies	Varies

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.

Appendix B: Lighting Study

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	Ext	Exterior	Ceiling Mounted	S	CFL	9	2	15	T	16	365	0	270	1,577	N/A	Ceiling Mounted	CFL	S	T	9	2	15	16	365	0	270	1577	0	0	0
2	1	Sally Port	Ceiling Mounted	S	CFL	4	6	26	MS	5	365	0	624	1,139	N/A	Ceiling Mounted	CFL	S	MS	4	6	26	5	365	0	624	1139	0	0	0
3	Ext	Exterior	Ceiling Mounted	S	Inc	1	1	100	T	16	365	0	100	584	CFL	Ceiling Mounted	CFL	S	T	1	1	35	16	365	0	35	204	380	0	380
4	1	Lobby	Ceiling Mounted	S	Hal	6	1	60	Sw	24	365	13	439	3,847	CFL	Ceiling Mounted	CFL	S	Sw	6	1	20	24	365	0	120	1051	2796	0	2796
5	1	Lobby	Ceiling Mounted	S	CFL	10	2	15	Sw	24	365	0	300	2,628	N/A	Ceiling Mounted	CFL	S	Sw	10	2	15	24	365	0	300	2628	0	0	0
6	1	Lobby	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
7	1	Office Area	Recessed	M	4'T8	4	3	32	Sw	12	365	5	404	1,770	N/A	Recessed	4'T8	M	Sw	4	3	32	12	365	5	404	1770	0	0	0
8	1	Hallway	Recessed	M	4'T8	2	3	32	Sw	12	365	5	202	885	N/A	Recessed	4'T8	M	Sw	2	3	32	12	365	5	202	885	0	0	0
9	1	Hallway	Ceiling Mounted	S	Hal	3	1	60	Sw	12	365	13	220	962	CFL	Ceiling Mounted	CFL	S	Sw	3	1	20	12	365	0	60	263	699	0	699
10	1	Hallway	Ceiling Mounted	S	CFL	3	2	15	Sw	12	365	0	90	394	N/A	Ceiling Mounted	CFL	S	Sw	3	2	15	12	365	0	90	394	0	0	0
11	1	Bathroom Women	Recessed	M	4'T8	3	3	32	Sw	12	365	5	303	1,327	C	Recessed	4'T8	M	OS	3	3	32	9	365	5	303	995	0	332	332
12	1	Bathroom Men	Recessed	M	4'T8	4	3	32	Sw	12	365	5	404	1,770	C	Recessed	4'T8	M	OS	4	3	32	9	365	5	404	1327	0	442	442
13	1	Locker Rom	Recessed	M	4'T8	4	3	32	Sw	12	365	5	404	1,770	C	Recessed	4'T8	M	OS	4	3	32	9	365	5	404	1327	0	442	442
14	1	Vestibule	Ceiling Mounted	S	CFL	6	2	15	Sw	12	365	0	180	788	N/A	Ceiling Mounted	CFL	S	Sw	6	2	15	12	365	0	180	788	0	0	0
15	1	Conference Rm	Recessed	M	4'T8	3	2	32	Sw	9	365	5	207	680	N/A	Recessed	4'T8	M	Sw	3	2	32	9	365	5	207	680	0	0	0
16	1	Detective	Recessed	M	4'T8	4	3	32	Sw	9	365	5	404	1,327	N/A	Recessed	4'T8	M	Sw	4	3	32	9	365	5	404	1327	0	0	0
17	1	Patrol	Recessed	M	4'T8	2	3	32	Sw	9	365	5	202	664	N/A	Recessed	4'T8	M	Sw	2	3	32	9	365	5	202	664	0	0	0
18	1	Executive Officer	Recessed	M	4'T8	2	3	32	Sw	9	365	5	202	664	N/A	Recessed	4'T8	M	Sw	2	3	32	9	365	5	202	664	0	0	0
19	1	Chief Office	Recessed	M	4'T8	4	3	32	Sw	9	365	5	404	1,327	N/A	Recessed	4'T8	M	Sw	4	3	32	9	365	5	404	1327	0	0	0
20	1	Pantry	Recessed	M	4'T8	3	3	32	Sw	12	365	5	303	1,327	N/A	Recessed	4'T8	M	Sw	3	3	32	12	365	5	303	1327	0	0	0
21	1	Utility Rm	Recessed	M	4'T8	2	2	32	Sw	2	365	5	138	101	N/A	Recessed	4'T8	M	Sw	2	2	32	2	365	5	138	101	0	0	0
22	1	Storage Rm	Recessed	M	4'T8	2	3	32	Sw	2	365	5	202	147	N/A	Recessed	4'T8	M	Sw	2	3	32	2	365	5	202	147	0	0	0
23	1	Phone Rm	Recessed	M	4'T8	2	3	32	Sw	12	365	5	202	885	N/A	Recessed	4'T8	M	Sw	2	3	32	12	365	5	202	885	0	0	0
24	1	Monito Rm	Recessed	M	4'T8	4	3	32	Sw	24	365	5	404	3,539	N/A	Recessed	4'T8	M	Sw	4	3	32	24	365	5	404	3539	0	0	0
25	1	Office Area	Recessed	M	4'T8	2	3	32	Sw	16	365	5	202	1,180	N/A	Recessed	4'T8	M	Sw	2	3	32	16	365	5	202	1180	0	0	0
26	1	Closet	Recessed	M	4'T8	1	2	32	Sw	2	365	5	69	50	N/A	Recessed	4'T8	M	Sw	1	2	32	2	365	5	69	50	0	0	0
27	1	Conference Rm	Recessed	M	4'T8	5	3	32	Sw	12	365	5	505	2,212	C	Recessed	4'T8	M	OS	5	3	32	9	365	5	505	1659	0	553	553
28	1	Conference Rm	Ceiling Mounted	S	Hal	8	1	60	Sw	12	365	13	586	2,565	CFL	Ceiling Mounted	CFL	S	OS	8	1	20	9	365	0	160	526	1864	175	2039
29	1	Sally Port	Recessed	M	4'T8	2	3	32	Sw	5	365	5	202	369	N/A	Recessed	4'T8	M	Sw	2	3	32	5	365	5	202	369	0	0	0
30	1	Sally Port	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
Totals:						**107**	**73**	**979**				**135**	**8,182**	**36,572**						**107**	**73**				**96**	**7,213**	**28,889**	**5,739**	**1,945**	**7,684**

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

Proposed Lighting Summary Table			
Total Surface Area (SF)	8,000		
Average Power Cost ($/kWh)	0.1320		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	2,161	1,781	**380**
Exterior Power (watts)	370	305	**65**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	34,412	27,107	**7,304**
Lighting Power (watts)	7,812	6,908	**904**
Lighting Power Density (watts/SF)	0.98	0.86	**0.11**
Estimated Cost of Fixture Replacement ($)	540		
Estimated Cost of Controls Improvements ($)	1,000		
Total Consumption Cost Savings ($)	**1,132**		

Legend							
Fixture Type		**Lamp Type**			**Control Type**	**Ballast Type**	**Retrofit Category**
Ceiling Suspended	Recessed	CFL	3'T12	8'T5	Autom. Timer (T)	S (Self)	N/A (None)
Exit Sign	Sconce	Inc	3'T12 U-Shaped	8'T5 U-Shaped	Bi-Level (BL)	E (Electronic)	T8 (Install new T8)
High Bay	Spotlight	LED	3'T5	8'T8	Contact (Ct)	M (Magnetic)	T5 (Install new T5)
Parabolic Ceiling Mounted	Track	HPS	3'T5 U-Shaped	8'T8 U-Shaped	Daylight & Motion (M)		CFL (Install new CFL)
Parabolic Ceiling Suspended	Vanity	MH	3'T8	Circline - T5	Daylight & Switch (DLSw)		LEDex (Install new LED Exit)
Pendant	Wall Mounted	MV	3'T8 U-Shaped	Circline - T8	Daylight Sensor (DL)		LED (Install new LED)
Recessed Parabolic	Wall Suspended	1'T12	4'T5	Circline - T12	Delay Switch (DSw)		D (Delamping)
Ceiling Mounted	Wallpack	1'T12 U-Shaped	4'T5 U-Shaped	Fl.	Dimmer (D)		C (Controls Only)
Chandelier		1'T5	6'T12	Hal	Motion Sensor (MS)		PSMH (Install new Pulse-Start Metal Halide)
Equipment / Fume Hood		1'T5 U-Shaped	6'T12 U-Shaped	Induction	Motion& Switch (MSw)		
Flood		1'T8	6'T5	Infrared	None (N)		
Landscape		1'T8 U-Shaped	6'T5 U-Shaped	LPS	Occupancy Sensor (OS)		
Low Bay		2'T12 U-Shaped	6'T8	Mixed Vapor	Occupancy Sensor - CM (OSCM)		
Parabolic Wall Mounted		2'T5	6'T8 U-Shaped	Neon	Photocell (PC)		
Pole Mounted		2'T5 U-Shaped	8'T12	Quartz Halogen	Switch (Sw)		
Pole Mounted Off Building		2'T8 U-Shaped	8'T12 U-Shaped				

APPENDIX C: THIRD PARTY ENERGY SUPPLIERS

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

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Dominion Retail, Inc. 395 Highway 170, Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Hudson Energy Services, LLC 545 Route 17 South Ridgewood, NJ 07450	(877) 483-7669 www.hudsonenergyservices.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002	(877) 797-8786 www.systrumenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	(800) 646-6457 www.stuyfuel.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX D: GLOSSARY AND METHOD OF CALCULATIONS

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

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

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

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

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

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

Return on Investment (ROI): The ROI is 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.

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

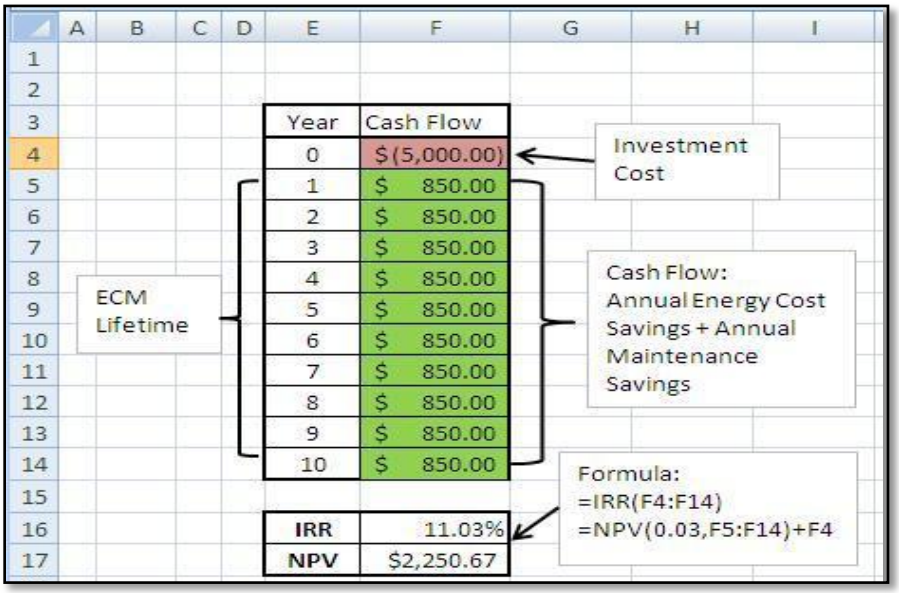
Calculation References

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

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

Excel NPV and IRR Calculation

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



Solar PV ECM Calculation

There are several components to the calculation:

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

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

ECM and Equipment Lifetimes

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

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

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

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

New Jersey Clean Energy Program Commercial & Industrial Lifetimes

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

APPENDIX E: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Park Ridge - Police Station

Building ID: 2253039
For 12-month Period Ending: December 31, 2009[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: May 18, 2010

Facility	Facility Owner	Primary Contact for this Facility
Borough of Park Ridge - Police Station 33 Park Avenue Park Ridge, NJ 07656	N/A	N/A

Year Built: 2004
Gross Floor Area (ft²): 8,000

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	563,662
Natural Gas (kBtu)[4]	85,939
Total Energy (kBtu)	649,601
Energy Intensity[5]	
Site (kBtu/ft²/yr)	81
Source (kBtu/ft²/yr)	247
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	90
Electric Distribution Utility	
Borough of Park Ridge	
National Average Comparison	
National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	57%
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

APPENDIX F: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

The NJ Clean Energy Pay for Performance (P4P) Program relies on a network of Partners who provide technical services to clients. LGEA participating clients who are not receiving Direct Energy Efficiency and Conservation Block Grants are eligible for P4P. SWA is an eligible Partner and can develop an Energy Reduction Plan for each project with a whole-building traditional energy audit, a financial plan for funding the energy measures and an installation construction schedule.

The Energy Reduction Plan must define a comprehensive package of measures capable of reducing a building's energy consumption by 15+%. P4P incentives are awarded upon the satisfactory completion of three program milestones: submittal of an Energy Reduction Plan prepared by an approved Program Partner, installation of the recommended measures and completion of a Post-Construction Benchmarking Report. The incentives for electricity and natural gas savings will be paid based on actual savings, provided that the minimum 15%performance threshold savings has been achieved.

For further information, please see: http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings .

Direct Install 2010 Program

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC and other equipment with energy efficient alternatives. The program pays **up to 80%** of the retrofit costs, including equipment cost and installation costs.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 200 kW** within 12 months of applying
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies
    - Electric: Atlantic City Electric, Jersey Central Power & Light, Orange Rockland Electric, PSE&G
    - Natural Gas: Elizabethtown Gas, New Jersey Natural Gas, PSE&G, South Jersey Gas

For the most up to date information on contractors in New Jersey who participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

Smart Start

New Jersey's SmartStart Building Program is administered by New Jersey's Office of Clean Energy. The program also offers design support for larger projects and technical assistance for smaller projects. If your project specifications do not fit into anything defined by the program, there are even incentives available for custom projects.

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings.

Renewable Energy Incentive Program

The Renewable Energy Incentive Program (REIP) provides incentives that reduce the upfront cost of installing renewable energy systems, including solar, wind, and sustainable biomass. Incentives vary depending upon technology, system size, and building type. Current incentive levels, participation information, and application forms can be found at the website listed below.

Solar Renewable Energy Credits (SRECs) represent all the clean energy benefits of electricity generated from a solar energy system. SRECs can be sold or traded separately from the power, providing owners a source of revenue to help offset the cost of installation. All solar project owners in New Jersey with electric distribution grid-connected systems are eligible to generate SRECs. Each time a system generates 1,000 kWh of electricity an SREC is earned and placed in the customer's account on the web-based SREC tracking system.

For the most up to date information on how to participate in this program, go to: http://www.njcleanenergy.com/renewable-energy/home/home.

Utility Sponsored Programs

Check with your local utility companies for further opportunities that may be available.

Federal and State Sponsored Programs

Other federal and state sponsored funding opportunities may be available, including BLOCK and R&D grant funding. For more information, please check http://www.dsireusa.org/.

APPENDIX G: ENERGY CONSERVATION MEASURES

	ECM #	ECM description	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 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
0-5 Year Payback	1	**18 New CFL fixtures to be installed with incentives**	none at this time	540	5,739	1.2	0	2.4	117	875	5.0	4,375	0.6	819	164	161	3,445	10,276
	2	**5 New occupancy sensors to be installed with incentives**	100	1,000	1,945	0.4	0	0.8	0	257	15.0	3,851	3.9	285	19	24	2,021	3,482
5-10 Year Payback	3	**Install 15 kW Solar Photovoltaic system**	15,000	90,000	17,700	15.0	0	7.5	0	12,536	25.0	211,410	7.2	135	540	9	69,816	31,692

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

APPENDIX H: METHOD OF ANALYSIS

Assumptions and tools

Energy modeling tool:	Established/standard industry assumptions
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

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 Police Department 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 Police Department(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.