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**May 2, 2012**

**Local Government Energy Program  
Energy Audit FINAL Report**

**Township of West Orange**

**Police and Justice Building  
60 Main Street  
West Orange, NJ 07052**

**Project Number: LGEA99**



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## EXECUTIVE SUMMARY

The Police and Justice Building of the Township of West Orange is a two-story, slab-on-grade, 23,000 ft<sup>2</sup> structure built in 1994. The building houses a courtroom, police office and bureaus and a cell block. The following chart provides a comparison of the current building energy usage based on the period from February 2011 through January 2012 with the proposed energy usage resulting from the installation of recommended Energy Conservation Measures (ECMs) excluding any renewable energy:

**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)	Source Energy Use Intensity (kBtu/sq ft /yr)	Joint Energy Consumption (MMBtu/yr)
Current	625,200	10,319	\$107,447	139.0	8,239,570	3,165
Proposed	587,199	10,319	\$97,864	133.4	7,806,467	3,036
Savings	38,001	0	\$9,583*	5.6	433,103	130
% Savings	6.1%	0.0%	8.9%	4.1%	5.3%	4.1%

\*Includes operation and maintenance savings

SWA has entered energy information about the Police and Justice Building into the U.S. Environmental Protection Agency's (EPA) ENERGY STAR<sup>®</sup> Portfolio Manager energy benchmarking system. Because the facility is categorized as a "Police Station", it is not currently eligible to receive an Energy Performance Rating. The Site Energy Use Intensity (EUI) was calculated to be 139 kBtu/sqft/yr, compared to the National Median EUI for Police Stations of 82 kBtu/sqft/yr.

### Recommendations

Based on the current state of the building and its energy use, SWA recommends implementing the following Energy Conservation Measures:

**Table 2: Energy Conservation Measure Recommendations**

ECMs	First Year Savings (\$)	Simple Payback Period	Initial Investment (\$)	CO2 Savings (lbs/yr)
0-5 Year	\$8,682	1.7	\$14,646	57,603
5-10 Year	\$283	7.1	\$2,000	3,149
>10 year	\$618	11.0	\$6,800	7,289
Total	\$9,583	2.4	\$23,446	68,041

In addition to these ECMs, SWA recommends:

- Capital Investment opportunities – measures that would contribute to reducing energy usage but require significant capital resources as well as long-term financial planning
  - Replace existing dual-pane non-insulated aluminum frame windows with insulated, dual- or triple-pane, Energy Star<sup>®</sup>-rated windows.
- Operation and Maintenance (O&M) measures that would contribute to reducing energy usage at low cost – not cost
  - Any equipment that utilizes refrigerant R-22 should be converted to R-410a or replaced by equipment that utilizes R-410a. According to The Montreal Protocol, chemical manufacturers will no longer produce R-22 beyond 2020.

- Provide water-efficient fixtures and controls
- SWA recommends that the building considers purchasing the most energy-efficient equipment, including Energy Star<sup>®</sup> labeled appliances, when equipment is installed or replaced.
- Use smart power electric strips.
- Create an energy educational program.
- Institute a detailed Preventative Maintenance schedule.

**Environmental Benefits**

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 6 cars from the roads each year or is equivalent to planting 166 trees to absorb CO<sub>2</sub> from the atmosphere.

**Energy Conservation Measure Implementation**

SWA recommends that the Township of West Orange implement the following Energy Conservation Measures at the Police and Justice Building, utilizing appropriate Incentive Programs for reduced capital cost:

Recommended ECMs	Incentive Program (Appendix H for details)
Upgrade fourteen (14) incandescent lamps to CFLs	Direct Install
Retrofit one (1) refrigerated vending machines with VendingMiser™ devices	N/A
Upgrade (257) T12 fixtures with T8 retrofit fixtures	SmartStart, Direct Install
Retrofit one (1) vending machines with SnackMiser™ devices	N/A
Retro-commissioning	N/A
Install twelve (12) bi-level fixtures	SmartStart, Direct Install
Install (27) occupancy sensors	SmartStart, Direct Install
Upgrade two (2) high pressure sodium fixtures to pulse start MH	SmartStart, Direct Install

*Appendix I contains an Energy Conservation Measures table which ranks each ECM by Simple Payback.*

## **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 (BPU) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

Steven Winter Associates, Inc. (SWA) is a 40-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 Township of West Orange Police and Justice Building at 66 Main Street in West Orange, NJ. The process of the audit included a facility visit on March 15<sup>th</sup>, 2012, benchmarking and energy bills analysis, assessment of existing conditions, 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 Township of West Orange to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures at the Police and Justice Building.

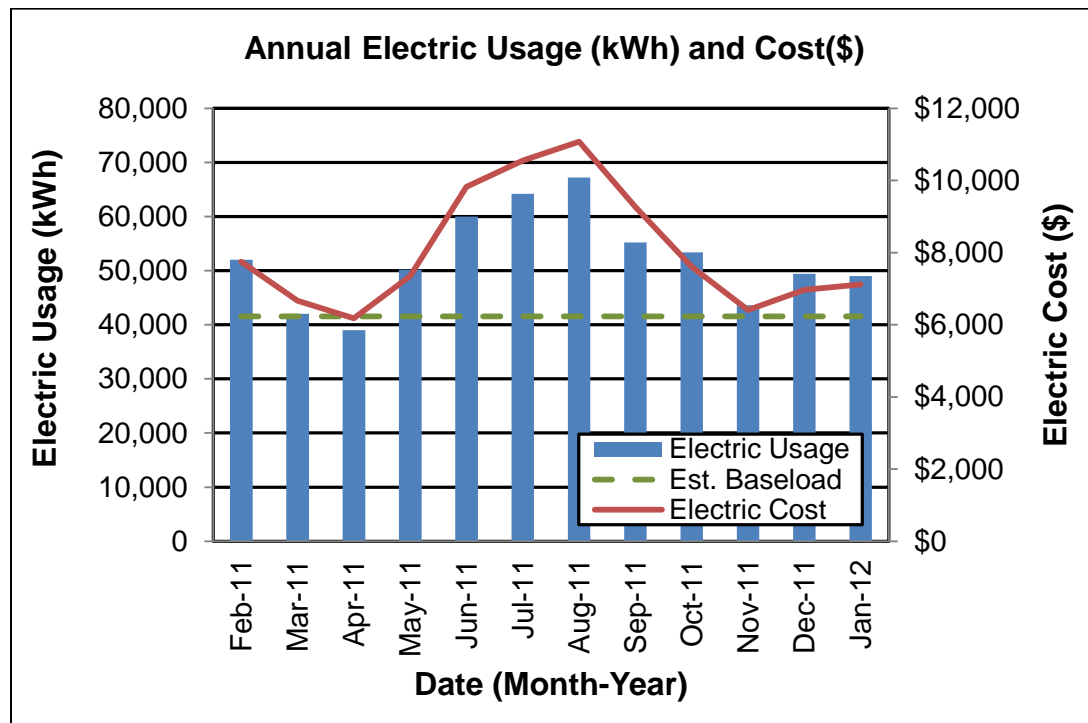
## HISTORICAL ENERGY CONSUMPTION

### Energy usage, load profile and cost analysis

SWA reviewed utility bills from February 2010 through January 2012 that were received from the PSE&G, the utility company supplying the Police and Justice Building with electric and natural gas. A 12-month period of analysis from February 2011 through January 2012 was used for all calculations and for purposes of benchmarking the building.

Electricity – The Police and Justice Building is currently served by one electric meter. The facility purchases electricity from PSE&G at an average aggregated rate of \$0.155/kWh and consumed approximately 625,200 kWh, or \$96,738 worth of electricity, in the previous year. The average monthly demand was 117.2 kW and the annual peak demand was 152.0 kW.

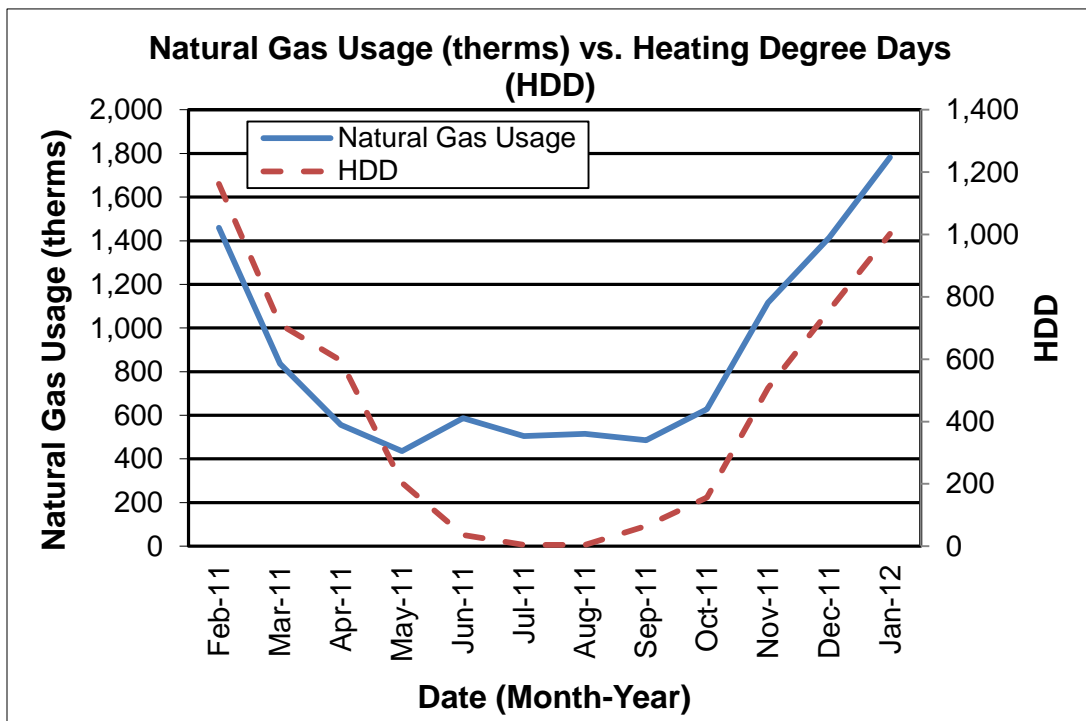
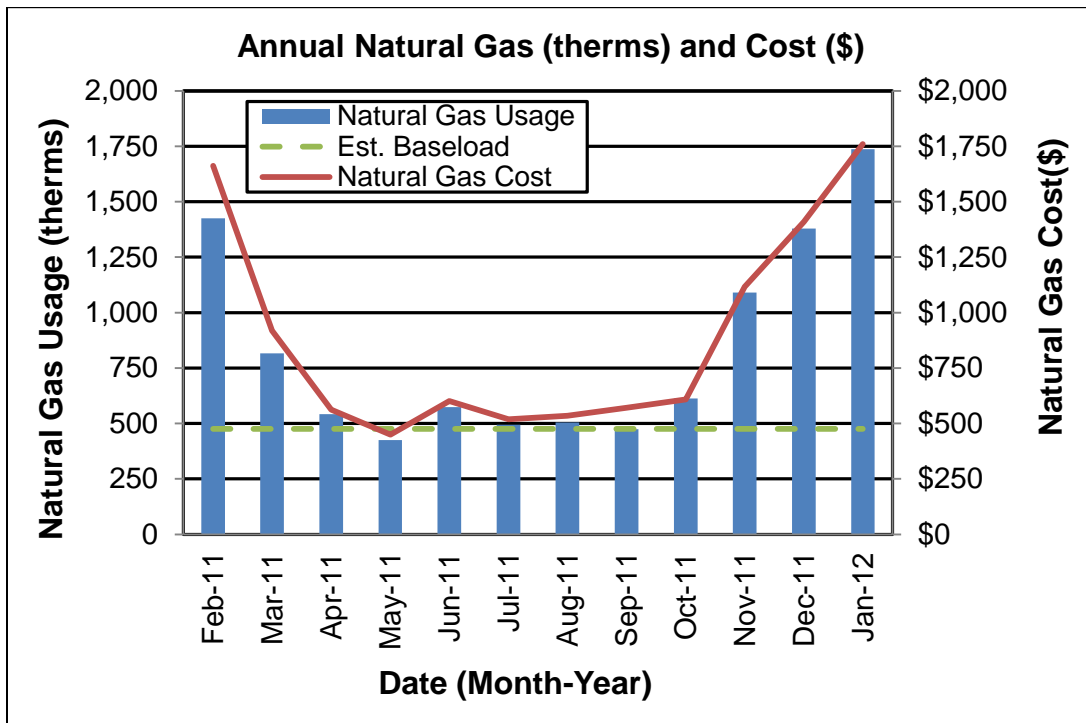
The chart below shows the monthly electric usage and costs. Electric usage expectedly peaks during summer months due to the increased use of electrically powered cooling equipment. Less expectedly, the graph shows a small but noticeable peak during winter months as well. This is attributed to the electric heaters located in many spaces within the building. The dashed green line represents the approximate baseload or minimum electric usage required to operate the Police and Justice Building.



Natural gas – The Police and Justice Building is currently served by one natural gas meter. Gas is purchased from PSE&G at an average aggregated rate of \$1.038/therm. The facility consumed approximately 10,319 therms, or \$10,709 worth of natural gas, in the previous year.

The chart below shows the monthly natural gas usage and costs. The green line represents the approximate baseload or minimum natural gas usage required to operate the Police and Justice Building. Gas consumption expectedly peaks during winter months as heating load increases. However, the baseload remains unexpectedly high throughout the remainder of the year, considering gas should only be used for domestic hot water heating during summer months. It is possible that the gas-fired rooftop packaged units are heating during the summer. SWA

recommends further investigation into the specifics of year-round gas consumption at the Police and Justice building.

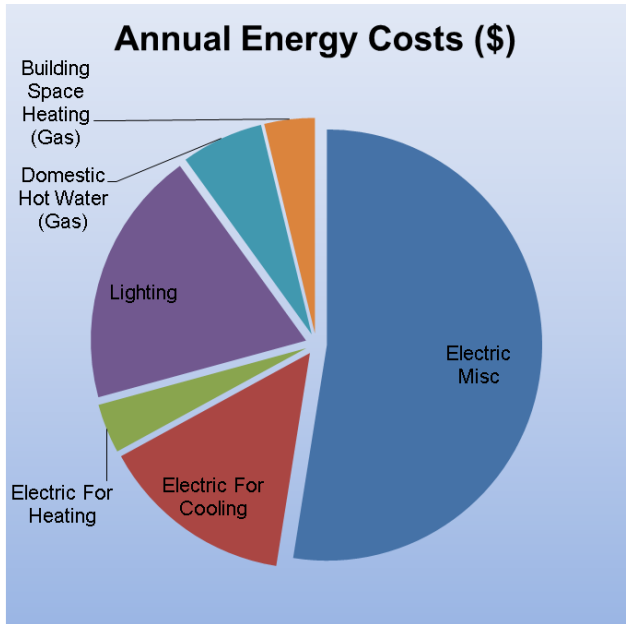
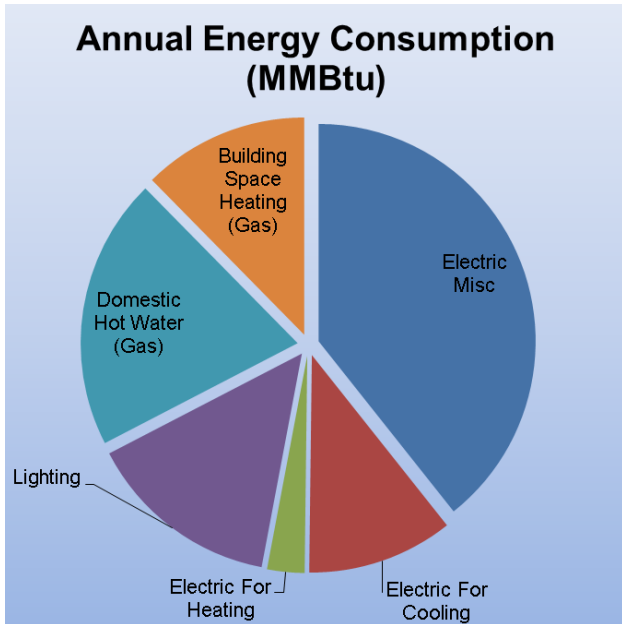


The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days are a measure of the difference of the average daily temperature and a base temperature, on a given day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. For the purpose of this analysis, SWA used a base temperature of 65°F. It is evident from the graph that, for nine months out of the

year, the Police and Justice building is consuming more natural gas, and thus heating more than should be expected according to HDD. As stated earlier, SWA recommends further investigation into the facility's gas usage throughout the year.

The following table and pie charts show energy use for the Police and Justice Building based on utility bills for the 12-month period. Note that the electrical rate of \$45/MMBtu is 4.5 times the natural gas rate of \$10/MMBtu. Note also that miscellaneous electric usage comprises a large portion of total energy usage at the facility. This may be attributed to the fact that the facility is a police station with 24/7 operation and a variety of electronic equipment.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	\$	% \$	\$/MMBtu
Electric Misc	1,244	39%	\$56,418	53%	45
Electric For Cooling	345	11%	\$15,628	15%	45
Electric For Heating	88	3%	\$3,992	4%	45
Lighting	456	14%	\$20,700	19%	45
Domestic Hot Water (Gas)	640	20%	\$6,641	6%	10
Building Space Heating (Gas)	392	12%	\$4,068	4%	10
<b>Totals</b>	<b>3,165</b>	<b>100%</b>	<b>\$107,447</b>	<b>100%</b>	
<b>Total Electric Usage</b>	<b>2,133</b>	<b>67%</b>	<b>\$96,738</b>	<b>90%</b>	<b>45</b>
<b>Total Gas Usage</b>	<b>1,032</b>	<b>33%</b>	<b>\$10,709</b>	<b>10%</b>	<b>10</b>
<b>Totals</b>	<b>3,165</b>	<b>100%</b>	<b>\$107,447</b>	<b>100%</b>	

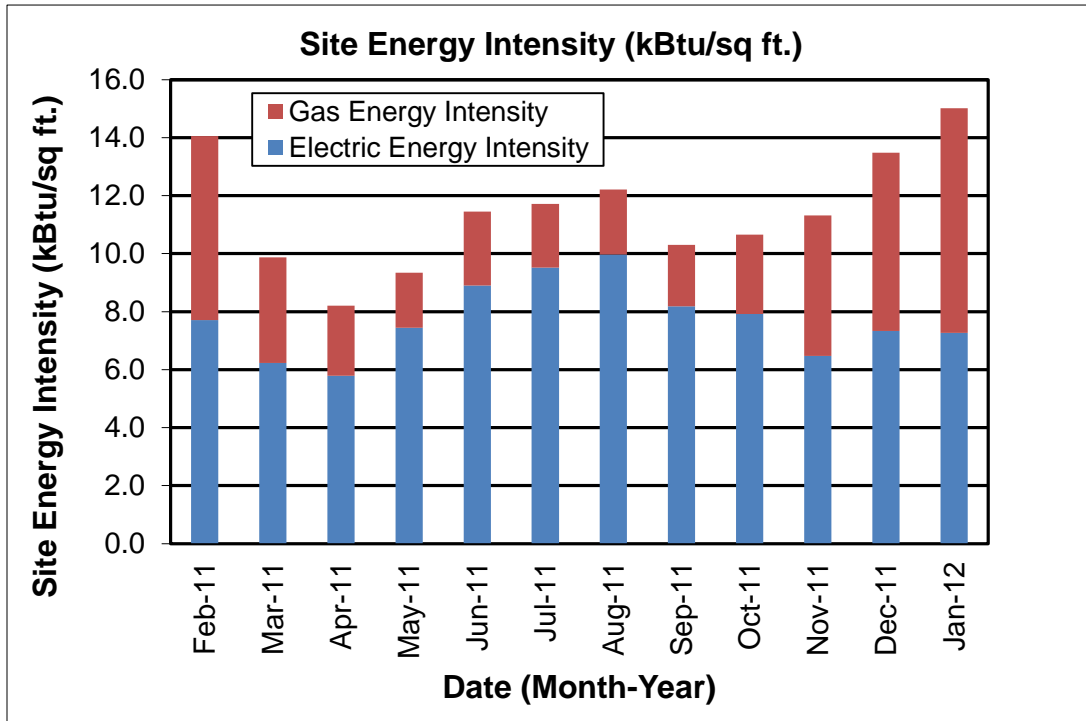


**Energy benchmarking**

SWA has entered energy information about the Police and Justice Building into the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager energy benchmarking system. Because the facility is categorized as a "Police Station", it is not currently eligible to receive an Energy Performance Rating. The Site Energy Use Intensity (EUI) was calculated to be 139 kBtu/sqft/yr, compared to the National Median EUI for Police Stations of 82 kBtu/sqft/yr. This is a 69.5% difference between the building's intensity and the national average. See ECM section for guidance on how to improve the building's rating.



The ENERGY STAR® Portfolio Manager uses a national survey conducted by the U.S. Energy Information Administration (EIA). This national survey, known as the Commercial Building Energy Consumption Survey (CBECS), is conducted every four years, and gathers data on building characteristics and energy use from thousands of buildings across the United States. The Portfolio Manager software uses this data to create a database by building type. By entering the building parameters and utility data into the software, Portfolio Manager is able to generate a performance scale from 1-100 by comparing it to similar office buildings. This 100 point scale determines how well the building performs relative to other buildings across the country, regardless of climate and other differentiating factors.



Per the LGEA program requirements, SWA has assisted the Township of West Orange to create an ENERGY STAR® Portfolio Manager account and share the Police and Justice Building’s information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account [REDACTED]

**Tariff analysis**

Tariff analysis can help determine if the municipality is paying the lowest rate possible for electric and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate fluctuations are expected during periods of peak usage. Natural gas prices often increase during winter months since a large volume of natural gas is needed for heating equipment. Similarly, electricity prices often increase during the summer months when additional electricity is needed for cooling equipment.

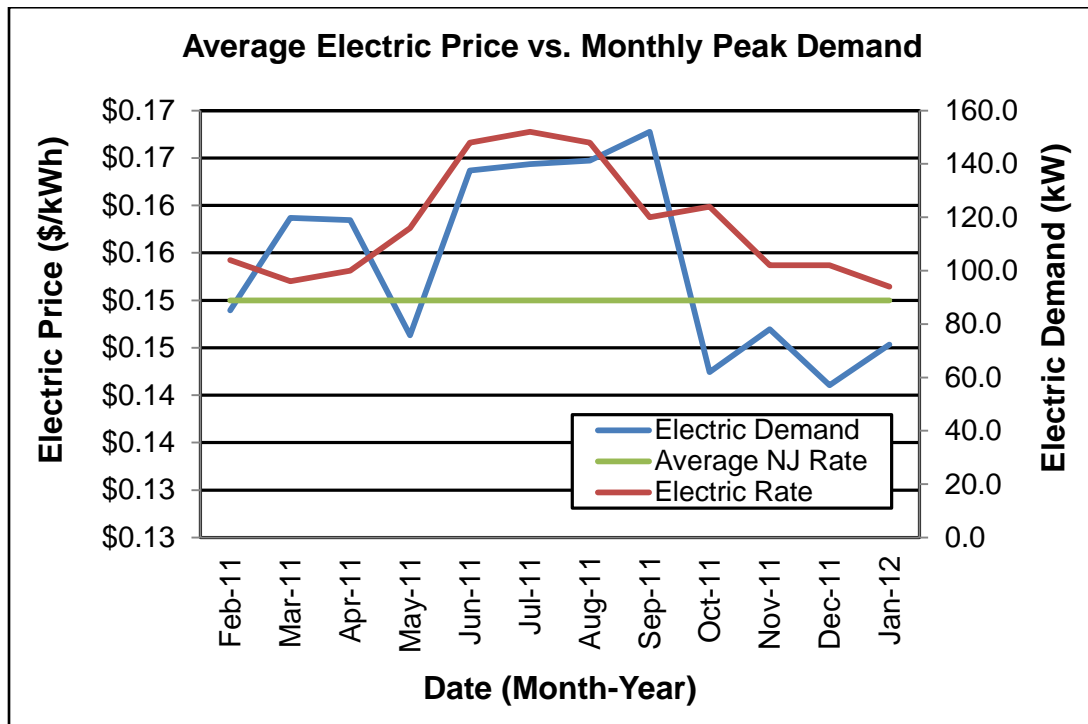
As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs for the Township of West Orange. The Police and Justice Building is currently paying a general service rate for natural gas including fixed costs such as meter reading charges. The electric use for the building is direct-metered and purchased at a general service rate with an additional charge for electrical demand factored into each monthly bill. The general service rate is a market-rate

based on electric usage and electric demand. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

**Energy Procurement strategies**

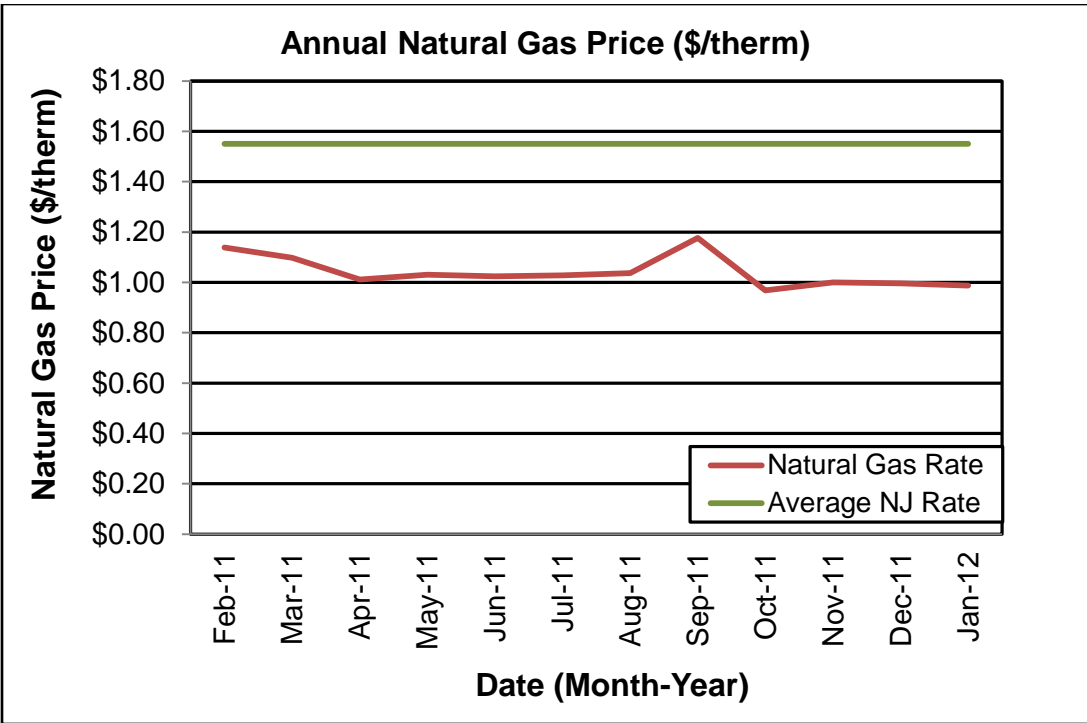
Billing analysis was conducted using an average aggregated rate which is estimated based on the total cost divided by the total energy usage for each utility over a 12-month period. Average aggregated rates do not separate demand charges from usage, and instead provide a metric of inclusive cost per 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.

The average estimated NJ commercial utility rates for electric are \$0.150/kWh, while the Police and Justice Building pays a competitive rate of \$0.155/kWh. Electric bill analysis shows fluctuations of 18.9% over the most recent 12-month period.



The average estimated NJ commercial utility rates for gas are \$1.550/therm, while the Police and Justice Building pays a competitive rate of \$1.038/therm that is much lower. Natural gas bill analysis shows fluctuations of 21.5% over the most recent 12-month period.

SWA recommends that the Police and Justice Building further explore opportunities of purchasing electricity from third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the facility. Appendix C contains a complete list of third-party energy suppliers for the Township of West Orange service area.



Utility rate fluctuations in the summer months may have been caused by a combination of low usage and the assessment of fixed fees and costs.

## 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.

Based on the visit from SWA on Thursday, March 15<sup>th</sup>, 2012, the following data was collected and analyzed.

### Building Characteristics

The Police and Justice Building is a two-story, slab-on-grade, 23,000 ft<sup>2</sup> building constructed in 1994. The building houses the Township's judicial offices and departments. The first floor has a Courtroom, Judge's Chambers, Detectives' Bureau, Violations Bureau, Offices for the Prosecutor and Public Defender, Central Records Office, Communication Desk, Telephone and Radio Rooms, Internal Affairs, Sally Porte, Interrogation and a Cell Block. On the second floor are Central Command, Chief of Staff and Administrative Offices, the Chief of Police Suite, Computer and Data Processing, the Operations Suite and Juvenile Aid Bureau. Additional spaces throughout the building include locker rooms, bathrooms, storage rooms and mechanical spaces.



*Satellite image of the Police and Justice Building courtesy of Google Earth*



*Partial East Façade – Main Entrance*



*Partial North Façade*



*Partial West Façade*



*Southwest Façade*

### **Building Occupancy Profiles**

Certain areas of the Police and Justice Building are open 24 hours per day, while a number of offices are occupied during the first shift only, from 8:30am through 4:30pm. There are three shifts of occupants at the facility. 57 employees work the first shift. 33 employees work the second shift, from 4:30pm to 11:30pm. 22 employees work the overnight shift, from 11:30pm until 8:30am.

### **Building Envelope**

*General Note:* All findings and recommendations on the exterior envelope (base, walls, roofs, doors and windows) are based on the energy auditor's experience and expertise, on construction document reviews (if available) and on detailed visual analysis, as far as accessibility and weather conditions allowed at the time of the field audit.

#### **Exterior Walls**

The exterior wall envelope at the Police and Justice Building is a mix of fluted and rock-faced concrete block on block, block on studs, brick on studs and brick on block construction. Rigid board insulation is present at block walls while batt insulation may be found in stud wall systems. Interior walls are primarily painted gypsum wallboard plus a few areas of painted concrete block.

*Note:* Wall insulation levels could not be verified in the field and are based on available construction plans.

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall good, age-appropriate condition.



## Roof

The Police and Justice Building has both first and second story roofs. The first story roof consists of a gable roof flanked by two hipped roofs and a flat portion where mechanical equipment is located. The gable roof consists of dark gray shingles over wood decking supported on a timber arch. The hipped roofs have dark gray shingles over metal decking supported by a metal frame. The flat portion is a ballasted roof system with a metal deck, board insulation and a dark-colored EPDM single-ply membrane finish held in place by loosely scattered stones.

The second story roof is predominantly a flat, ballasted roof system with a metal deck, board insulation and a dark-colored EPDM singly-ply membrane finish held in place by stones. Two steel-framed equipment screens finished with dark gray shingles surround mechanical equipment located on the roof. The domed section of the second story roof is timber-framed with an angled metal deck, insulation and dark gray shingle finish.

*Note:* Roof insulation levels could not be verified in the field, and are based on available construction plans.

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall good, age-appropriate condition. Small sections of the first story roof were noted to have EPDM membrane stretched thin and lifted a few inches off the decking, causing the material to “bounce” when stepped on. Facility engineers said the roof is due for some work, primarily the addition of a second ply of EPDM.



*Typical roof system with no visible energy-compromising issues*

## Base

The building’s base is composed of a slab-on-grade floor with concrete perimeter footing and concrete block foundation walls plus 1” polystyrene perimeter insulation.

*Note:* Slab/perimeter insulation levels could not be verified in the field and are based on similar base types and available construction plans.

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 several different types of windows, original to the 1994 construction date:

1. Unit (fixed and awning) type windows with a non-insulated aluminum frame, clear double glazing and interior vinyl blind shading. The windows are located throughout the buildings.
2. Side light and transom type windows with a non-insulated aluminum frame, clear double glazing and no interior or exterior shading devices. The windows are located at entrances with glass and metal doors.
3. Skylight type windows with a non-insulated aluminum frame, clear single glazing and no interior or exterior shading devices.

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 apparent signs of uncontrolled moisture. Occupants in certain offices do, however, report cold air infiltration issues stemming from the poorly insulated aluminum window frames.



*Typical transom and awning windows with no visible energy-compromising issues other than the non-insulated aluminum window frames.*

### **Exterior doors**

The building contains several different types of exterior doors:

1. Overhead aluminum type exterior doors located at the vehicular entrance and exit of the Sally Porte.
2. A solid metal type exterior door is located at the southwest entrance to the Sally Porte.
3. Fiberglass type exterior doors. They are located throughout the buildings.
4. Glass with aluminum frame type exterior doors. They are located at the main entrance and the entrances to the Violations and Police lobbies.



*Typical doors with no signs of energy-compromising issues*

### **Building air-tightness**

Overall the field auditor found the buildings to be reasonably air-tight, considering the buildings' 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**

The Police and Justice Building has heating, cooling and ventilation throughout. Specific comfort issues were not noticeable at the time of the audit; however, general complaints were voiced by a number of occupants. The windows, original to the building, are dual-paned but with poorly insulated frames, allowing warm and cold air infiltration during the summer and winter months. Excessive cold fresh air entering the building during winter months was said to be an issue. The Township is currently employing the services of a third-party contractor, RJ Vales HVAC Systems, to review and balance the building's equipment in an effort to mitigate these inefficiencies and other energy-compromising issues.

### **Equipment**

The Police and Justice Building is heated and cooled primarily by large rooftop air handling units and ductless split systems equipped with natural gas heating and direct expansion (DX) cooling. Backup baseboard and in-ceiling electric heating is available in certain spaces when forced-air heating is insufficient. Exhaust fans on the roof provide mechanical ventilation for the building and a gas-fired hot water heater supplies domestic hot water. A comprehensive Equipment List can be found in Appendix A.

#### *Packaged Unit Descriptions*

Four packaged units with natural gas heating and electric cooling are installed at the Police and Justice Building. Packaged units combine air handlers with a direct expansion (DX) system for cooling made up of an evaporator, condenser and refrigerant loop; the refrigerant absorbs heat from intake air at the evaporator coil and transfers the heat to the atmosphere in the condenser.

The four units are mounted on the 2<sup>nd</sup> floor rooftop. Two units provide 25-Ton cooling capacity and 193,800 Btuh heating capacity. They serve Central Command, Operations



Suite, Chief of Police Suite, Administrative Office, hallways and male and female bathrooms and locker rooms. One unit provides 12.5-Ton cooling capacity and 160,000 Btuh heating capacity for the Juvenile Aid and Violations Bureau. The fourth unit provides 12.5-Ton cooling capacity and 184,000 Btuh heating for the building's Main Entrance and Courtroom. The 25-Ton units are charged with R-22 refrigerant while the smaller 12.5-Ton units have R-410A refrigerant.



*Typical packaged rooftop units*

#### *Ductless Split System and Condenser Descriptions*

A number of spaces in the Police and Justice Building are conditioned by split system indoor units with outdoor condensers located on the roof and grounds around the building. The Internal Affairs office receives heating and cooling from an NCP-manufactured system with R-22 refrigerant and 18,500 Btuh cooling plus 19,500 Btuh heating. The corresponding condensing unit is located on the grounds on the northside of the building.

The building's Computer Room is served by two units in constant operation. One unit is manufactured by Fujitsu, with R-410A refrigerant and heating/cooling capacities of 24,000/22,200 Btuh, respectively. The second unit, cooling-only, is manufactured by Sanyo, with R-22 refrigerant and a cooling capacity of 22,400 Btuh. Condensing units for both are located on the 2<sup>nd</sup> floor roof.

The Radio Room is equipped with two Daikin split system heat pumps with roof-mounted condensers. Both units are identical with R-410A refrigerant and heating/cooling capacities of 24,000/22,000 Btuh, respectively. Only one unit operates at any given time, typically alternating on a month by month basis.

Finally, four rooftop condensing units provide cooling for the Data Processing and Telephone Rooms plus the Police and Violations Lobbies. Data Processing and the Telephone Room are fed by two identical Carrier units that are charged with R-22 refrigerant and provide 5 Tons of cooling. The lobbies are served by Liebert-manufactured units; however, nameplates for those were unavailable and further information about them is not known at this time.



*Split system units and corresponding rooftop condensers*

*Air Handling Unit Descriptions*

The Detentions area of the Police and Justice Building is served by a cooling-only Carrier light commercial air handling unit. The unit has a 10-Ton cooling capacity and is charged with R-22 refrigerant. It is located in the Detentions mechanical room, which is accessible only from the exterior of the building, on the north side.



*Carrier air handling unit*

*Unit Heater Description*

The Detentions area of the Police and Justice Building is heated by a natural gas-fired Reznor indoor ducted furnace located in the Detentions mechanical room. A nameplate was unavailable for the unit and further information is unknown at this time.



*Reznor gas-fired unit heater*

### **Ventilation**

Building spaces are provided ventilation by outside air intake louvers on the air handling units. Louvers also provide ventilation to the elevator machine room, the external access mechanical room and the Sally Porte.

There are exhaust fans located on both roofs, which serve the bathrooms, locker rooms and general exhaust. In general, the building exhaust fans appear to be in age-appropriate condition.



*Typical rooftop exhaust units and louvers*

### **Distribution Systems**

The Police and Justice Building employs a constant air volume system whereby conditioned air is sent from packaged unit and air handlers to various spaces throughout the building via distribution ducts.

## Controls

The Police and Justice Building is controlled by a Carrier-manufactured Building Management System. The system has trending capability but no trending is being logged at this time. In general, larger offices and bureaus are set to maintain a comfort range of 73°F to 76°F. Personal offices, such as that of the Prosecutor's, have a slightly wider comfort range from 70°F to 78°F. SWA was unable to review BMS settings for all spaces and recommends that the facility do so. Too high a space setting during summer months may lead to rooftop units kicking on and supplying heat to an unoccupied space when overnight temperatures dip.

While occupants have no control over primary heating and cooling in spaces, rooms equipped with backup electrical heating do have manual thermostat controls that may be adjusted if primary conditioning is insufficient.

The BMS is currently managed by a sergeant of the police force. However, control of the BMS will be transferred to the building manager in the near future.

## Domestic Hot Water

The Police and Justice Building is provided domestic hot water by respective a natural gas-fired domestic hot water heater. The Bradford White manufactured unit serves the entire facility, has a capacity of 75 gallons, 76,000 Btuh input and approximately 70% of its estimated useful operating life remaining.



*Natural gas-fired domestic hot water heater*

## 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 primary interior lighting at the Police and Justice Building is comprised mostly of magnetically ballasted, T12-lamped fixtures. Second-most prevalent are self-ballasted compact fluorescent lamps (CFLs) and twin-tube fluorescent bulbs recessed in ceilings. All interior lighting is manually switch operated; there are no controls.





*Typical Interior Lighting*

### *Exit Lights*

Photoluminescent exit signs were present throughout the Police and Justice Building. They are completely non-electrical, illuminating instead by absorbing light emitted from regular light sources such as incandescent, halogen and fluorescent bulbs. Only a small amount of light is required to charge the exit signs, an amount easily satisfied by the general lighting systems of most commercial facilities. Photoluminescent exit signs have up to a 25 year lifespan.



*Typical photoluminescent LED exit lighting*

### *Exterior Lighting*

Exterior lighting around the perimeter of the Police and Justice Building included self-ballasted recessed incandescent bulbs, wall-pack high pressure sodium fixtures and eleven metal halide lamps mounted in bollards planted along the three front entrances of the facility. All exterior lighting fixtures are controlled by automatic 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 and printers 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.

The Police and Justice Building has a variety of plug-load appliances throughout. There is one snack vending machine and one cold drink vending machine in the main entrance lobby of the building. SWA recommends retrofitting these machines with VendingMiser<sup>®</sup> devices. There are also five compact refrigerators and five microwaves can be found in lounges and small kitchenette areas throughout the facility. Of these, only one compact refrigerator appeared to be a newer, more efficient or Energy Star<sup>®</sup>-rated model. SWA recommends replacing any appliances over the age of 10 years with Energy Star<sup>®</sup>-rated models.



*Various appliances located throughout the Police and Justice Building*

### **Elevators**

The Police and Justice Building has one Dover-manufactured 4,000 lb. capacity submerged hydraulic type elevator that serves the first and second floors. It is powered by a 40 HP power unit.



*Submerged hydraulic type elevator motor*

## **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 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. Solar photovoltaic panels and wind turbines use natural resources to generate electricity. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Cogeneration or Combined Heat and Power (CHP) allows for heat recovery during electricity generation.

### **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 and Justice Building is not a good candidate for Solar Photovoltaic installation.

#### **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.

#### **Wind**

This facility is not a good candidate for wind power generation due to insufficient wind conditions in this area of New Jersey.

#### **Geothermal**

This facility 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 between 30% and 60% remaining useful life.

#### **Combined Heat and Power**

This facility 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 baseload 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

	List of Highly Recommended 0-5 Year Payback ECMs
ECM 1	Upgrade fourteen (14) incandescents to CFLs
ECM 2	Retrofit one (1) refrigerated vending machine with VendingMiser™ device
ECM 3	Upgrade 257 T12 fixtures to T8 fixtures
ECM 4	Retrofit one (1) snack vending machine with SnackMiser™ device
	List of Recommended 5-10 Year Payback ECMs
ECM 5	Install twelve (12) bi-level fixtures in stairwells
	List of Recommended >10 Year Payback ECMs
ECM 6	Install 27 occupancy sensors
ECM 7	Upgrade two high pressure sodium fixtures to pulse start metal halide

In order to clearly present the overall energy opportunities for the building and ease the decision of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight/potential overlaps between some of the listed ECMs (i.e. lighting change influence on heating/cooling).



**ECM #1: Install fourteen (14) new CFL fixtures**

SWA completed a lighting inventory of the Police and Justice Building (see Appendix B) and found the existing lighting to contain 14 inefficient incandescent lamps. SWA recommends that each incandescent lamp is replaced with a more efficient, Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power when compared to incandescent, halogen and Metal Halide fixtures. CFL bulbs produce the same lumen output with less wattage than incandescent bulbs and last up to five times longer.

**Installation cost:**

Estimated installed cost: \$222 (includes \$56 of labor)

Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

**Economics:**

ECM #	ECM description	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, \$	est. energy & operating 1st year cost 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 <sub>2</sub> reduced, lbs/yr
1	Upgrade (14) Incandescents to CFLs	222	0	222	6,742	1	0	2.3	286	1,297	5	6,486	0.2	2,822	564	584	5,509	12,072

**Assumptions:**

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

**Rebates/financial incentives:**

- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

*Please see Appendix H for more information on Incentive Programs.*

## ECM #2: Retrofit one (1) refrigerated vending machine with VendingMiser™ device

Energy vending miser devices are now available for conserving energy used by beverage vending machines and coolers. There isn't a need to purchase new machines to reduce operating costs and greenhouse gas emissions. When equipped with the vending miser devices, refrigerated beverage vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR® qualified machines. Vending miser devices incorporate innovative energy-saving technology into small plug-and-play devices that installs in minutes, either on the wall or on the vending machine. Vending miser devices use a Passive Infrared Sensor (PIR) to: Power down the machine when the surrounding area is vacant; Monitor the room's temperature; Automatically repower the cooling system at one- to three-hour intervals, independent of sales; Ensure the product stays cold.

### Installation cost:

Estimated installed cost: \$199 (includes \$20 of labor)

Source of cost estimate: [www.usatech.com](http://www.usatech.com) and established costs

### Economics:

ECM #	ECM description	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, \$	est. energy & operating 1st year cost 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 <sub>2</sub> reduced, lbs/yr
2	Retrofit 1 refrigerated vending machine with a VendingMiser™ device	199	0	199	971	0	0	0.1	0	158	12	1,893	1.3	851	71	79	1,310	1,739

**Assumptions:** SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes energy savings based on modeling calculator found at [http://www.usatech.com/energy\\_management/energy\\_calculator.php](http://www.usatech.com/energy_management/energy_calculator.php)

### ECM #3: Upgrade 257 T12 fixtures with T8 retrofit fixtures

SWA completed a lighting inventory of the Police and Justice Building (see Appendix B) and found existing inefficient T12 and T12 U-shaped bulbs with magnetic ballasts in a number of fixtures. SWA recommends replacing each existing fixture with more efficient T8 fluorescent lamps and electronic ballasts. The existing fixtures are capable of being retrofitted with the new ballasts, eliminating the need to replace the entire fixture and reducing upfront costs. T8 fixtures with electronic ballasts provide equivalent or better light output while reducing energy consumption by 30% when compared to T12 fixtures with magnetic ballasts. T8 fixtures also provide better lumens for less wattage when compared to incandescent, halogen and Metal Halide fixtures.

#### Installation cost:

Estimated installed cost: \$16,076 (includes \$9,524 of labor)

Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

#### Economics:

ECM #	ECM description	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, \$	est. energy & operating 1st year cost 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 <sub>2</sub> reduced, lbs/yr
3	Upgrade (257) T12 Fixtures to T8 Fixtures	16,635	2,570	14,065	24,134	5	0	8.2	3,557	7,177	15	107,656	2.0	665	44	51	68,205	43,213

**Assumptions:** SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis.

#### Rebates/financial incentives:

- NJ Clean Energy - SmartStart - T8 fixtures with electronic ballasts (\$10 per fixture) - Maximum incentive amount is \$320
- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

*Please see Appendix H for more information on Incentive Programs.*

#### ECM #4: Retrofit one (1) snack vending machine with SnackMiser™ device

SnackMiser devices are now available for conserving energy used by vending machines. There isn't a need to purchase new machines to reduce operating costs and greenhouse gas emissions. When equipped with the snack miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines.

SnackMiser devices can be used on snack vending machines to achieve maximum energy savings that result in reduced operating costs and decreased greenhouse gas emissions with existing machines. Snack vending miser devices also use a Passive Infrared Sensor (PIR) to determine if there is anyone within 25 feet of the machine. It waits for 15 minutes of vacancy, then powers down the machine. If a customer approaches the machine while powered down, the snacks vending miser will sense the presence and immediately power up.

#### Installation cost:

Estimated installed cost: \$99 (includes \$20 of labor)

Source of cost estimate: [www.usatech.com](http://www.usatech.com) and established costs

#### Economics:

ECM #	ECM description	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, \$	est. energy & operating 1st year cost 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 <sub>2</sub> reduced, lbs/yr
4	Retrofit 1 vending machine with a SnackMiser™ device	160	0	160	324	0	0	0.0	0	50	12	602	3.2	276	23	30	323	580

**Assumptions:** SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes energy savings based on modeling calculator found at [http://www.usatech.com/energy\\_management/energy\\_calculator.php](http://www.usatech.com/energy_management/energy_calculator.php)

## ECM #5: Upgrade stairwells with bi-level fixtures

During the field audit, SWA completed a building lighting inventory (see Appendix B). SWA observed that the existing lighting has minimal to no control via motion sensors. SWA identified areas that could benefit from the installation of motion sensors. SWA recommends installing motion sensors to turn on lights and make dark areas safe, while at the same time conserve energy. There are two fundamental types of motion sensors, active and passive sensors. Active sensors are based on the premise of being activated on either breaking a beam of light, basic radar signal, or ultrasonic wave. The commonality across the three is that they are emitting energy and are triggered by a change in the return of the energy to the unit. The majority of motion sensing lighting, however, uses a passive detection means. The passive systems detect infrared energy and are set to detect the temperature of a human body which radiates IR energy between nine and ten micrometers. The passive sensors are set at a range bracketing the normal human readings. The passive device is similar to a photo sensor. The passive motion sensor will pick up motion, but will not detect a human who is not moving. This is due to the fact that the sensor detects significant change in the infrared energy being detected. If the threshold of detection is set too low, then the sensor would be triggered by small animals and other environmental factors when the lighting should remain off. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

### Installation cost:

Estimated installed cost: \$2000 (includes \$720 of labor)

Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

### Economics:

ECM #	ECM description	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, \$	est. energy & operating 1st year cost 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 <sub>2</sub> reduced, lbs/yr
5	Install (12) bi-level fixtures	2,350	0	2,000	1,759	0	0	0.1	0	283	15	4,248	7.1	112	7	11	1,291	3,149

**Assumptions:** SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis.

### Rebates/financial incentives:

- NJ Clean Energy - SmartStart - Wall-mounted motion sensors (\$20 per motion sensor) - Maximum incentive amount is \$180

*Please see Appendix H for more information on Incentive Programs.*



## ECM #6: Install twenty-seven (27) new occupancy sensors

During the field audit, SWA completed a building lighting inventory (see Appendix B) and observed that the existing lighting has minimal to no control via occupancy sensors. SWA identified a number of areas that could benefit from the installation of occupancy sensors. SWA recommends installing occupancy sensors in areas that are occupied only part of the day and the 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 for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

### Installation cost:

Estimated installed cost: \$5,400 (includes \$1,620 of labor)

Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

### Economics:

ECM #	ECM description	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, \$	est. energy & operating 1st year cost 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 <sub>2</sub> reduced, lbs/yr
6	Install (27) Occupancy Sensors	5,940	540	5,400	3,545	1	0	1.2	0	532	15	7,976	10.2	48	3	5	830	6,347

**Assumptions:** SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis.

### Rebates/financial incentives:

- NJ Clean Energy – SmartStart - Wall-mounted occupancy sensors (\$20, or check latest incentive per occupancy sensor) - Maximum incentive amount is \$160
- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

*Please see Appendix H for more information on Incentive Programs*

## ECM #7: Upgrade two (2) High Pressure Sodium (HPS) Fixtures to Pulse Start Metal Halide Fixtures (PSMH)

SWA completed an exterior lighting inventory of the Police and Justice Building (see Appendix B) and found the existing wallpack lighting to contain two inefficient high pressure sodium fixtures. SWA recommends replacing them with more efficient, Pulse Start Metal Halide fixtures with electronic ballasts. They produce higher light output both initially and over time, operate more efficiently, produce whiter light, and turn on and re-strike faster. 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 for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

### Installation cost:

Estimated installed cost: \$1400 (includes \$770 of labor)

Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program

### Economics:

ECM #	ECM description	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, \$	est. energy & operating 1st year cost 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 <sub>2</sub> reduced, lbs/yr
7	Upgrade (2) High Pressure Sodium fixtures to pulse start MH	1,450	50	1,400	526	0	0	0.2	7	86	15	1,290	16.3	-8	-1	-1	-376	942

**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 2.5 hr/yr to replace aging burnt out lamps vs. newly installed.

### Rebates/financial incentives:

- NJ Clean Energy - Smart Start - Pulse Start Metal Halide Fixtures (\$25 per fixture)
  - Maximum Incentive Amount: \$1,500
- NJ Clean Energy – Direct Install (Up to 70% of installed cost)

*Please see Appendix H for more information on Incentive Programs.*



## PROPOSED FURTHER RECOMMENDATIONS

### Capital Improvements

Capital Improvements (CIs) 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 Wharton Board of Education schools.

**CI #1:** The existing windows at the Police and Justice Building are original units with dual-pane glass and uninsulated aluminum framing. Occupants report cold coming off the uninsulated aluminum framing during winter. SWA recommends conducting a feasibility assessment to replace the original windows with insulated, dual- or triple-pane, Energy Star<sup>®</sup>-rated windows that include a low-E coating to help block solar radiation and reduce heat gains in the summer. This recommendation may reduce perimeter heating and cooling loads and outside air infiltration. A detailed analysis on cost and savings would be required.

### Operations and Maintenance

Operations and Maintenance (O&M) 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.

- Any equipment that utilizes refrigerant R-22 should be converted to R-410a or replaced by equipment that utilizes R-410a. According to The Montreal Protocol, chemical manufacturers will no longer produce R-22 beyond 2020.
- 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<sup>®</sup> labeled appliances, when equipment is installed or replaced. More information can be found in the “Products” section of the Energy Star<sup>®</sup> 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/>.

- Detailed Preventative Maintenance schedule – While the maintenance crew does perform preventative maintenance tasks on a regular basis, specifics of the schedule were not readily available. SWA provides a comprehensive list of recommended preventative maintenance measures to cross-reference with the facilities' existing plan. Please see Appendix K for a typical Preventative Maintenance Plan provided by SWA.

## APPENDIX A: EQUIPMENT LIST

### Inventory

Building System	Description	Model #	Fuel	Location	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating/ Cooling	Ductless split-system outdoor condenser unit; R-22, 18500 Btuh cooling, 19500 Btuh heating	NCP: m/n S240HP-19K10-O; s/n N/A	Electric	Ground	Internal Affairs Office	2005	53%
Heating/ Cooling	Ductless split-system indoor evaporator unit; R-22, 18500 Btuh cooling, 19500 Btuh heating	NCP: m/n S240HP-19K10-I; s/n N/A	Electric	Internal Affairs Office	Internal Affairs Office	2005	53%
Heating/ Cooling	Split-system air conditioner/ heat pump outdoor unit; R-410A, 22200 Btuh cooling, 24000 heating, 15.0 SEER	Fujitsu: m/n AOU24RLX; s/n 003946	Electric	Roof	Computer Room 209	-	-
Heating/ Cooling	AC-3 – Rooftop unit; R-22, 193800 Btuh heating, 25 Tons cooling, 80.0% thermal efficiency	Carrier: m/n 48DJD028---600AA; s/n 1992F99229	Natural Gas/ Electric	Roof	Central Command, Operations Suite, hallways, locker rooms	-	-
Heating/ Cooling	AC-4 – Rooftop unit; R-22, 160000 Btuh heating, 12.5 Tons cooling, 80.0% thermal efficiency, 9.5 EER	Carrier: m/n 48TME014---601; s/n 4307G50640	Natural Gas/ Electric	Roof	Juvenile Aid and Violations Bureaus	-	-
Heating/ Cooling	AC-5 – Rooftop unit; R-410A, 184000 Btuh heating, 12.5 Tons cooling, 82.0% thermal efficiency, 10.8 EER	Carrier: m/n 48TCED14A3A6 A0A0A0; s/n 2411G40606	Natural Gas/ Electric	Roof	Courtroom and Main Entrance	2011	93%
Heating/ Cooling	AC-2 – Rooftop unit; R-22, 193800 Btuh heating, 25 Tons cooling, 80.0% thermal efficiency	Carrier: m/n 48DJD028---600A; s/n 3392F15322	Natural Gas/ Electric	Roof	Chief's Suite, Admin. Offices, women's locker room, men's small locker room	-	-
Cooling	Split-system air conditioner outdoor unit; R-22, 22400 Btuh cooling, 10.0 SEER	Sanyo: m/n CL2432A; s/n 0078543	Electric	Roof	Computer Room 209	-	-
Cooling	AC-1 – Light commercial air handling unit; 10 Tons cooling	Carrier: m/n 39LD1031AB212 1-R; s/n 3492T25849	Electric	External access mechanical room	Cell block	-	-

Cooling	Mini split-system heat pump outdoor unit; R-410A, 24000 Btuh heating, 22000 Btuh cooling, 13.0 SEER	Daikin: m/n RX24FVJU, s/n E001258	Electric	Roof	Radio Room	2007	67%
Cooling	Mini split-system heat pump outdoor unit; R-410A, 24000 Btuh heating, 22000 Btuh cooling, 13.0 SEER	Daikin: m/n RX24FVJU, s/n E001259	Electric	Roof	Radio Room	2007	67%
Cooling	Air-cooled air conditioner; R-22, 5 Tons cooling, 10.0 SEER	Carrier: 38TKB060600; s/n 2992E07795	Electric	Roof	Data Processing	-	-
Cooling	Air-cooled air conditioner; R-22, 5 Tons cooling, 10.0 SEER	Carrier: 38TKB060600; s/n 2992E07797	Electric	Roof	Telephone Room	-	-
Cooling	Air conditioner; nameplate unavailable	Liebert: nameplate unavailable	Electric	Roof	Police Lobby	-	-
Cooling	Air conditioner; nameplate unavailable	Liebert: nameplate unavailable	Electric	Roof	Violations Lobby	-	-
Ventilation	EF-11 – Exhaust fan	Nameplate unavailable	Electric	Roof	Bathrooms	-	-
Ventilation	EF-15 – Exhaust fan	Nameplate unavailable	Electric	Roof	Bathrooms	-	-
Ventilation	EF-13 – Exhaust fan	Dayton: m/n 4YC896; s/n 11537685 0810	Electric	Roof	Bathrooms	-	-
Ventilation	EF-12 – Exhaust fan	Penn Ventilation: m/n BB 45	Electric	Roof	Bathrooms	-	-
Ventilation	Exhaust fan	Nameplate unavailable	Electric	Roof	Bathrooms	-	-
Ventilation	Exhaust fan	Penn Ventilation: m/n BB 45	Electric	Roof	Large locker room	-	-
Ventilation	EF-7 – Exhaust fan	Penn Ventilation: m/n AB-10	Electric	Roof	Bathrooms	-	-
Ventilation	EF-1 – Exhaust fan	Penn Ventilation: m/n AB-10	Electric	Roof	Small locker room	-	-
Ventilation	EF-9 – Exhaust fan	Nameplate unavailable	Electric	External access mechanical room	External access mechanical room	-	-
DHW	Natural gas-fired, atmospheric vent hot water heater; 75 gallon capacity; 76000 Btuh input	Bradford White Corporation Defender Safety System Energy Saver: m/n MI75S6BN; s/n GF13608612	Natural Gas	Vestibule between elevator and exit to 1 <sup>st</sup> roof	All areas	-	-
Elevator	Rota-Flow Power Unit; 40 HP max.	Dover Elevators: m/n EP-15040; s/n EC-9612	Electric	Elevator Machine Room	1 <sup>st</sup> and 2 <sup>nd</sup> floors	1999	48%
Elevator	Submersible hydraulic elevator motor; 40 HP	Dover Elevators m/n 590AJ3; s/n 40H527	Electric	Elevator Machine Room	1 <sup>st</sup> and 2 <sup>nd</sup> floors	1999	48%

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 C: UPCOMING EQUIPMENT PHASEOUTS

### LIGHTING:

- As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps will no longer be produced for commercial and industrial applications.
- As of **January 1, 2012** 100 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.
- Starting **July 2012** many non energy saver model T12 lamps will be phased out of production.
- As of **January 1, 2013** 75 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.
- As of **January 1, 2014** 60 and 40 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.
- Energy Independence and Security Act of 2007 incandescent lamp phase-out exclusions:
  1. Appliance lamp (e.g. refrigerator or oven light)
  2. Black light lamp
  3. Bug lamp
  4. Colored lamp
  5. Infrared lamp
  6. Left-hand thread lamp
  7. Marine lamp
  8. Marine signal service lamp
  9. Mine service lamp
  10. Plant light lamp
  11. Reflector lamp
  12. Rough service lamp
  13. Shatter-resistant lamp (including a shatter-proof lamp and a shatter-protected lamp)
  14. Sign service lamp
  15. Silver bowl lamp
  16. Showcase lamp
  17. 3-way incandescent lamp
  18. Traffic signal lamp
  19. Vibration service lamp
  20. Globe shaped "G" lamp (as defined in ANSI C78.20-2003 and C79.1-2002 with a diameter of 5 inches or more
  21. T shape lamp (as defined in ANSI C78.20-2003 and C79.1-2002) and that uses not more than 40 watts or has a length of more than 10 inches
  22. A B, BA, CA, F, G16-1/2, G-25, G30, S, or M-14 lamp (as defined in ANSI C79.1-2002 and ANSI C78.20-2003) of 40 watts or less
  23. Candelabra incandescent and other lights not having a medium Edison screw base.
- When installing compact fluorescent lamps (CFLs), be advised that they contain a very small amount of mercury sealed within the glass tubing and EPA guidelines concerning cleanup and safe disposal of compact fluorescent light bulbs should be followed.

Additionally, all lamps to be disposed should be recycled in accordance with EPA guidelines through state or local government collection or exchange programs instead.

**HCFC (Hydrochlorofluorocarbons):**

- As of **January 1, 2010**, no production and no importing of R-142b and R-22, except for use in equipment manufactured before January 1, 2010, in accordance with adherence to the Montreal Protocol.
- As of **January 1, 2015**, No production and no importing of any HCFCs, except for use as refrigerants in equipment manufactured before January 1, 2010.
- As of **January 1, 2020** No production and no importing of R-142b and R-22.



**APPENDIX D: THIRD PARTY ENERGY SUPPLIERS**

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

Third Party Electric Suppliers for Atlantic City Electric Service Territory	Telephone & Web Site
<b>Hess Corporation</b> 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 <a href="http://www.hess.com">www.hess.com</a>
<b>American Powernet Management, LP</b> 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 <a href="http://www.americanpowernet.com">www.americanpowernet.com</a>
<b>BOC Energy Services, Inc.</b> 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 <a href="http://www.boc.com">www.boc.com</a>
<b>Commerce Energy, Inc.</b> 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 <a href="http://www.commerceenergy.com">www.commerceenergy.com</a>
<b>ConEdison Solutions</b> 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 <a href="http://www.conedsolutions.com">www.conedsolutions.com</a>
<b>Constellation NewEnergy, Inc.</b> 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 <a href="http://www.newenergy.com">www.newenergy.com</a>
<b>Direct Energy Services, LLC</b> 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 <a href="http://www.directenergy.com">www.directenergy.com</a>
<b>FirstEnergy Solutions</b> 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 <a href="http://www.fes.com">www.fes.com</a>
<b>Glacial Energy of New Jersey, Inc.</b> 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 <a href="http://www.glacialenergy.com">www.glacialenergy.com</a>
<b>Integritys Energy Services, Inc.</b> 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 <a href="http://www.integritysenergy.com">www.integritysenergy.com</a>
<b>Liberty Power Delaware, LLC</b> Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 <a href="http://www.libertypowercorp.com">www.libertypowercorp.com</a>
<b>Liberty Power Holdings, LLC</b> Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 <a href="http://www.libertypowercorp.com">www.libertypowercorp.com</a>
<b>Pepco Energy Services, Inc.</b> 112 Main St. Lebanon, NJ 08833	(800) 363-7499 <a href="http://www.pepco-services.com">www.pepco-services.com</a>
<b>PPL EnergyPlus, LLC</b> 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 <a href="http://www.pplenergyplus.com">www.pplenergyplus.com</a>

<b>Sempra Energy Solutions</b> 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 <a href="http://www.semprasolutions.com">www.semprasolutions.com</a>
<b>South Jersey Energy Company</b> One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 <a href="http://www.southjerseyenergy.com">www.southjerseyenergy.com</a>
<b>Strategic Energy, LLC</b> 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 <a href="http://www.sel.com">www.sel.com</a>
<b>Suez Energy Resources NA, Inc.</b> 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 <a href="http://www.suezenergyresources.com">www.suezenergyresources.com</a>
<b>UGI Energy Services, Inc.</b> 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 <a href="http://www.ugienergyservices.com">www.ugienergyservices.com</a>

<b>Third Party Gas Suppliers for South Jersey Gas Service Territory</b>	<b>Telephone &amp; Web Site</b>
<b>Cooperative Industries</b> 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 <a href="http://www.cooperativenet.com">www.cooperativenet.com</a>
<b>Direct Energy Services, LLC</b> 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 <a href="http://www.directenergy.com">www.directenergy.com</a>
<b>Gateway Energy Services Corp.</b> 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 <a href="http://www.gesc.com">www.gesc.com</a>
<b>UGI Energy Services, Inc.</b> 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 <a href="http://www.ugienergyservices.com">www.ugienergyservices.com</a>
<b>Great Eastern Energy</b> 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 <a href="http://www.greateastern.com">www.greateastern.com</a>
<b>Hess Corporation</b> 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 <a href="http://www.hess.com">www.hess.com</a>
<b>Intelligent Energy</b> 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 <a href="http://www.intelligentenergy.org">www.intelligentenergy.org</a>
<b>Metromedia Energy, Inc.</b> 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 <a href="http://www.metromediaenergy.com">www.metromediaenergy.com</a>
<b>MxEnergy, Inc.</b> 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 <a href="http://www.mxenergy.com">www.mxenergy.com</a>

<b>NATGASCO (Mitchell Supreme)</b> 532 Freeman Street Orange, NJ 07050	(800) 840-4427 <a href="http://www.natgasco.com">www.natgasco.com</a>
<b>Pepco Energy Services, Inc.</b> 112 Main Street Lebanon, NJ 08833	(800) 363-7499 <a href="http://www.pepco-services.com">www.pepco-services.com</a>
<b>PPL EnergyPlus, LLC</b> 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 <a href="http://www.pplenergyplus.com">www.pplenergyplus.com</a>
<b>South Jersey Energy Company</b> One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 <a href="http://www.southjerseyenergy.com">www.southjerseyenergy.com</a>
<b>Woodruff Energy</b> 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 <a href="http://www.woodruffenergy.com">www.woodruffenergy.com</a>

## APPENDIX E: 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 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 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:

	A	B	C	D	E	F	G	H	I
1									
2									
3									
4					Year	Cash Flow			
5					0	\$ (5,000.00)		Investment Cost	
6					1	\$ 850.00		Cash Flow: Annual Energy Cost Savings + Annual Maintenance Savings	
7					2	\$ 850.00			
8					3	\$ 850.00			
9					4	\$ 850.00			
10					5	\$ 850.00			
11					6	\$ 850.00			
12					7	\$ 850.00			
13					8	\$ 850.00			
14					9	\$ 850.00			
15					10	\$ 850.00			
16					IRR	11.03%		Formula: =IRR(F4:F14) =NPV(0.03,F5:F14)+F4	
17					NPV	\$2,250.67			

## 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 Solar Renewable Energy Credits (SRECs) – Market-rate incentive. Calculations assume \$608/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 + \$608/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 Equipment Life Span

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 F: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347



## STATEMENT OF ENERGY PERFORMANCE West Orange - Police Building

Building ID: 3084695  
For 12-month Period Ending: December 31, 2011<sup>1</sup>  
Date SEP becomes ineligible: N/A

Date SEP Generated: April 02, 2012

<b>Facility</b> West Orange - Police Building 60 Main Street West Orange, NJ 07052	<b>Facility Owner</b> N/A	<b>Primary Contact for this Facility</b> N/A
<b>Year Built:</b> 1994		
<b>Gross Floor Area (ft<sup>2</sup>):</b> 23,000		

Energy Performance Rating<sup>2</sup> (1-100) N/A

### Site Energy Use Summary<sup>3</sup>

Electricity - Grid Purchase(kBtu)	2,132,005
Natural Gas (kBtu) <sup>4</sup>	1,068,456
Total Energy (kBtu)	3,200,461

### Energy Intensity<sup>4</sup>

Site (kBtu/ft <sup>2</sup> /yr)	139
Source (kBtu/ft <sup>2</sup> /yr)	358

### Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO <sub>2</sub> e/year)	359
---	-----

### Electric Distribution Utility

Public Service Electric & Gas Co

### National Median Comparison

National Median Site EUI	82
National Median Source EUI	146
% Difference from National Median Source EUI	145%
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.

### Meets Industry Standards<sup>5</sup> for Indoor Environmental Conditions:

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

**Certifying Professional**  
N/A

#### Notes:

1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12 month period.
4. Values represent energy intensity, annualized to a 12 month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, Licensed Professional facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

EPA Form 5800-16



## APPENDIX G: SnackMiser™ and VendingMiser™ Savings Calculations



### EnergyMisers

[VendingMiser®](#)  
 [CoolerMiser™](#)  
 [SnackMiser™](#)  
 [PlugMiser™](#)  
 [VM2iQ®](#)  
 [CM2iQ®](#)

### Savings Calculator

Please replace the default values in the table below with your location's unique information and then click on the "calculate savings" button.

**Note:** To calculate for CoolerMiser, use the equivalent VendingMiser results. To calculate for PlugMiser, use the equivalent SnackMiser results.

Energy Costs (\$0.000 per kWh)	0.155
Facility Occupied Hours per Week	112
Number of Cold Drink Vending Machines	1
Number of Non-refrigerated Snack Machines	1
Power Requirements of Cold Drink Machine (Watts; 400 typical)	400
Power Requirements of Snack Machine (Watts; 80 typical)	80
VendingMiser® VM150 Price (for cold drink machines)	\$179.00
SnackMiser™ SM150 Price (for snack machines)	\$160.00

#### Results of your location's projected savings with VendingMiser® installed:

COLD DRINK MACHINES				
	Current	Projected	Total Savings	% Savings
kWh	3494	2524	971	28%
Cost of Operation	\$541.63	\$391.18	\$150.45	28%
SNACK MACHINES				
	Current	Projected	Total Savings	% Savings
kWh	699	466	233	33%
Cost of Operation	\$108.33	\$72.22	\$36.11	33%

#### Location's Total Annual Savings

	Current	Projected	Total Savings	% Savings
kWh	4193	2990	1203	29%
Cost of Operation	\$649.96	\$463.40	\$186.56	29%

#### Total Project Cost Break Even (Months)

\$339                      21.81

Estimated Five Year Savings on ALL Machines = \$932.81

Estimated Five Year Return on Investment = 175%

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## APPENDIX H: 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.

#### Energy Provider Incentives

- **South Jersey Gas** - Offers financing up to \$100,000 on the customer's portion of project cost through private lender. In addition to available financing, it provides matching incentive on gas P4P incentives #2 and #3 up to \$100,000 (not to exceed total project cost).

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

### Direct Install 2011 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 60%** 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 100 kW** within 12 months of applying (the 100 kW peak demand threshold has been waived for local government entities who receive and utilize their Energy Efficiency and Conservation Block Grant in conjunction with Direct Install)
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies

#### Energy Provider Incentives

- **South Jersey Gas** – Program offers financing up to \$25,000 on customer's 40% portion of the project and combines financing rate based on portion of the project devoted to gas and electric measures. All gas measures financed at 0%, all electric measures financed at normal rate. Does not offer financing on projects that only include electric measures.
- **Atlantic City Electric** – Provides a free audit, and additional incentives up to 20% of the current incentive up to a maximum of \$5,000 per customer.

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> or visit the utility web sites.

### **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.

#### Energy Provider Incentives

- **South Jersey Gas** – Program to finance projects up to \$25,000 not covered by incentive
- **New Jersey Natural Gas** – Will match SSB incentives on gas equipment
- **PSE&G** - Provides funding for site-specific uses of emerging technology. The incentives are determined on a case by case basis.

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>.

### **Combined Heat and Power (CHP)**

#### Energy Provider Incentives

- **South Jersey Gas** - Provides additional incentive of \$1.00/watt up to \$1,000,000 on top of NJCEP incentive.

### **Utility Sponsored Programs**

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

### **Energy Efficiency and Conservation Block Grant Rebate Program**

The Energy Efficiency and Conservation Block Grant (EECBG) Rebate Program provides supplemental funding up to \$20,000 for eligible New Jersey local government entities to lower the cost of installing energy conservation measures. Funding for the EECBG Rebate Program is provided through the American Recovery and Reinvestment Act (ARRA).

For the most up to date information on how to participate in this program, go to:

<http://njcleanenergy.com/EECBG>.

### **Other 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/>.

\*Subject to availability. Incentive program timelines might not be sufficient to meet the 25% in 12 months spending requirement outlined in the LGEA program.

## APPENDIX I: ENERGY CONSERVATION MEASURES

ECM #	ECM description	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 cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO <sub>2</sub> reduced, lbs/yr
1	Upgrade (14) Incandescents to CFLs	222	0	222	6,742	1.4	0	2.3	286	1,297	5	6,486	0.2	2,822	564	584	5,509	12,072
2	Retrofit 1 refrigerated vending machine with a VendingMiser™ device	199	0	199	971	0	0	0.1	0.00	158	12	1,893	1.3	851	71	79	1,310	1,739
3	Upgrade (257) T12 Fixtures to T8 Fixtures	16,635	2,570	14,065	24,134	5	0	8.2	3,557	7,177	15	107,656	2.0	665	44	51	68,205	43,213
4	Retrofit 1 vending machine with a SnackMiser™ device	160	0	160	324	0	0	0.0	0	50	12	602	3.2	276	23	30	323	580
5	Install (12) bi-level fixtures	2,350	0	2,000	1,759	0	0	0.1	0	283	15	4,248	7.1	112	7	11	1,291	3,149
6	Install (27) Occupancy Sensors	5,940	540	5,400	3,545	1	0	1.2	0	532	15	7,976	10.2	48	3	5	830	6,347
7	Upgrade (2) High Pressure Sodium fixtures to pulse start MH	1,450	50	1,400	526	0	0	0.2	7	86	15	1,290	16.3	-8	-1	-1	-376	942
	<b>Total</b>	<b>26,956</b>	<b>3,160</b>	<b>23,446</b>	<b>38,001</b>	<b>8</b>	<b>0</b>	<b>12.2</b>	<b>3,850</b>	<b>9,583</b>	<b>89</b>	<b>130,150</b>	<b>2.4</b>	<b>4,766</b>	<b>713</b>	<b>760</b>	<b>77,093</b>	<b>68,041</b>

**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 K: PREVENTATIVE MAINTENANCE PLAN**

Facility operation and maintenance requirements cover a wide range of services to ensure that building systems operate as required to meet the demands of the facility and the occupants that these systems serve. To ensure continuous, problem free operation it is imperative that building operators maintain a consistent preventative maintenance plan. While not all problems can be avoided, a well thought out maintenance plan can reduce unexpected equipment failures, extend the lifetime of equipment and alleviate occupant complaints. A well rounded preventive maintenance plan consists of scheduled maintenance requirements (varying by equipment) that provide a basis for performing maintenance procedures including adjustment, calibration or replacement of wear and tear parts and an overall investigation of equipment condition and operation.

Preventive Maintenance typically provides significant benefits such as:

- Lower overall operation and maintenance costs
- Reduced equipment down time
- Improved equipment lifetime
- Maintain performance efficiency of operating equipment
- Lower replacement costs through longer equipment life
- Improve occupant comfort, health and safety.

The following list provides a general guidance for estimating minimum preventative maintenance frequency for typical equipment found within commercial buildings. It is necessary for owners and operators to consult manufacturer operations and maintenance manuals for specific requirements to ensure all warranties are maintained.

See Schedule on the next page.

<b>Heating Systems</b>	<b>Frequency (Per Year)</b>
Boilers	4
Boiler water treatment	3 (heating season)
Expansion tanks	2
Condenser pumps	4
Deaerator tank	1
Steam traps & valves	3
Valves & actuators	3
Fuel tanks & distribution	1
Heat exchangers	2
Terminal/package units	2
Fin tubes/radiators	2
Dampers/draft control	4
Ductwork & insulation	2
Piping & insulation	2
Control sensors	2
<b>Air Handling Systems</b>	<b>Frequency (Per Year)</b>
Air handling units	4
Unit ventilators	4
Fans	2
Fire dampers	1
Filters	2
Humidifiers	2
<b>Cooling Systems</b>	<b>Frequency (Per Year)</b>
Condensing units	2
Expansion Tanks	2
Heat exchangers	2
Water treatment	1
Water filtration	2
Piping & insulation	2
Valves & actuators	3
Control sensors	2

Packaged A/C units	4
Chillers: oil levels and operation	26 (cooling season)
Chillers: tubes	1
CHW Pumps	2
Heat pumps	2
<b>Mechanical Controls</b>	<b>Frequency (Per Year)</b>
Compressors	4
Pneumatic valves/levers	2
Pneumatic tubing	2
Electronic controls	4
<b>Plumbing Systems</b>	<b>Frequency (Per Year)</b>
Cold/Hot water piping	1
Water heaters	2
Piping insulation	2
Circulation pumps	4
Sump pumps	6
Valves and traps	6
<b>Lighting Systems</b>	<b>Frequency (Per Year)</b>
Fluorescent fixtures	2
Incandescent fixtures	4
HID fixtures	2
Emergency lighting	12
Exterior lighting	2
Occupancy controls	2
Daylight controls	2
Other controls	2
<b>Roof Systems</b>	<b>Frequency (Per Year)</b>
Roofing membranes	2
Insulation	2
Paving and ballast paving	1
Equipment curbs/supports	2
Expansion/seismic joints	1



Drains, gutters, etc.	12
Flashing and trim	2
Roof openings	4
Parapet caps	2
<b>Exterior Wall Systems</b>	
	<b>Frequency (Per Year)</b>
Facade integrity	2
Cladding/sheathing	1
Doors	3
Window systems	2
Louvers and screens	1
Expansion/seismic joints	3
Insulation	1
Protective coating	1
Sealants	2
<b>Power Distribution Systems</b>	
	<b>Frequency (Per Year)</b>
Power Panels	3
Transformers	1
Wiring	1
Substation	1
Switchgear	1
Overcurrent protection	1
<b>Conveying Systems</b>	
	<b>Frequency (Per Year)</b>
Elevator & Escalator Motors and Drives	2

## APPENDIX L: 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 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.**

