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March 24th, 2010

**Local Government Energy Program
Energy Audit Final Report**

***Township of Lower
Public Safety Building
405 Breakwater Road
Erma, NJ 08204***

Project Number: LGEA31



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INTRODUCTION

As an approved energy consulting firm under the Local Government Energy Audit Program (LGEA), Steven Winter Associates, Inc. (SWA) was selected to perform an energy audit and assessment for the Township of Lower. The audit included a review of the Township of Lower Municipal Building, Planning and Zoning Annex, Recreation Building, Millman Senior Center, Public Safety Building, Department of Public Works Administrative Offices and Department of Public Works Garage. The buildings are located in both Erma and Villas, NJ. A separate energy audit report is issued for each of the referenced buildings.

This report addresses the Public Safety Building located at 405 Breakwater Road, Erma, NJ. The current conditions and energy-related information were collected in order to analyze and suggest the implementation of building improvements and energy conservation measures.

The Public Safety Building located at 405 Breakwater Road was opened in 1993. It is a single story free-standing building with approximately 48,000 square feet of conditioned space, and is part of a complex surrounding the Cape May Airport. The building itself is home to Lower's police department, rescue squad, courthouses, animal control, fire department and garages for all of these departments. Each department has its own separate section of the public safety building. There are approximately 60 full-time employees working in the building at any time, as it is open twenty-four hours a day, seven days a week. The courthouses and parts of the police station are open to the public, while access to the rest of the building is restricted.

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

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

- Section 1 and section 2 of the report cover a description and analysis of the building's existing conditions.
- Section 3 provides a detailed inventory of major electrical and mechanical systems in the building.
- Sections 4 through 5 provide a description of our recommendations.
- Appendices include further details and information supporting our recommendations.

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Public Safety Building located at 405 Breakwater Road, Erma, NJ. It is a single story, free-standing building with approximately 48,000 square feet of conditioned space, and is part of a complex surrounding the Cape May Airport. The building itself is home to Lower's police department, rescue squad, courthouses, animal control, fire department and garages for all of these departments. Each department has its own separate section of the public safety building.

Based on the field visit performed by the SWA staff on November 10th, 2009 and the results of a comprehensive energy analysis, this report describes the site's current conditions and recommendations for improvements. Suggestions for measures related to energy conservation and improved comfort are provided in the scope of work. Energy and resource savings are estimated for each measure that results in a reduction of heating, cooling, and electric usage.

Existing conditions

From November 2008 through October 2009, the period of analysis for this audit, the building consumed 587,298 kWh or \$90,193 worth of electricity at an approximate rate of \$0.154/kWh, and 8,853 therms or \$14,420 worth of natural gas at an approximate rate of \$1.629/therm. The joint energy consumption for the building, including both electricity and fossil fuel, was 2,889 MMBTUs of energy that cost a total of \$104,613.

SWA has entered energy information about the building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. Currently, the building is not eligible for a performance rating due to its classification as a public safety building, which means that it is also ineligible for Energy Star. SWA encourages the Township of Lower to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather-normalized source energy use over time.

The Site Energy Use Intensity is 61.0 kBtu/sq ft yr compared to the national average of a public safety building consuming 78.0 kBtu/sq ft yr. This building may have lower than average usage since a large portion of the building consists of garage/parking areas for the vehicle fleet, where energy use intensity is much less than office or other typical Public Safety spaces. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 7.9 kBtu/sqft yr, with an additional 3.0 kBtu/sq ft yr from the recommended ECMs and 2.8 kBtu/sq ft yr from the recommended End of Life Cycle (>10 year payback) ECMs.

Implementing this report's recommendations will reduce use by approximately 13.7 kBtu/ft²yr, which would decrease the building's energy use intensity to 47.3 kBtu/ft²yr.

Recommendations

The Public Safety building is relatively well-maintained with the exception of three rooftop units that are nearing the end of their useful lifetime. The building contains a large area of office space as well as fleet garages used by the Police Department, SWAT team and ambulance corps. Due to the variations of building types within the same shell, SWA recommends that the building undergo retro-commissioning in order to better control the existing HVAC system for each area. In addition, SWA recommends lighting upgrades as well as the installation of a 30 kW solar photovoltaic system to offset a piece of the electrical usage for the building.

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

Category I Recommendations: Capital Improvement Measures

- Replace smaller electric DHW heaters located in ceiling plenum

Category II Recommendations: Operations and Maintenance

- Clean and maintain gutter downspouts and downspout diverters
- Inspect and replace cracked/ineffective caulk
- Repair or replace all damaged concrete panels
- Perform bi-annual inspections of roof surfaces
- Perform bi-annual inspections of windows and exterior doors
- Provide weather-stripping/air-sealing
- Provide water-efficient fixtures and controls
- Use Energy Star labeled appliances

Category III Recommendations: Energy Conservation Measures

At this time, SWA highly recommends a total of **3** Energy Conservation Measures (ECMs) for the Public Safety building, as summarized in the following Table 1. The total investment cost for these ECMs with incentives is **\$98,536**. SWA estimates a first-year savings of **\$33,613**, with a simple payback of **2.7 years**. SWA also recommends **3** ECMs with a 5-10 year payback that is summarized in Table 2, and **4** End of Life Cycle ECMs.

The implementation of all the recommended ECMs would reduce the building electric usage by 165,524 kWh annually, or 28% of the building's current electric consumption. The recommended ECMs would also reduce the building natural gas usage by 1,061 therms annually, or 12% of the building's current natural gas consumption. SWA estimates that implementing these ECMs will reduce the carbon footprint of the Public Safety building by **307,898 lbs of CO₂**, which is equivalent to removing approximately 23 cars from the roads each year or avoiding the need of 744 trees to absorb the annual CO₂ produced. SWA also recommends that the Township of Lower contacts third party energy suppliers in order to negotiate a lower electricity rate as well as a natural gas rate. Comparing the current electric and natural gas rates to average utility rates of similar type buildings in New Jersey, it may be possible to save up to \$0.004/kWh and \$.079/therm, which would have equated to \$3,049 for the past 12 months.

There are various incentives that Township of Lower could apply for that could also help lower the cost of installing the ECMs. SWA recommends that the Township of Lower apply for the NJ SmartStart program through the New Jersey Office of Clean Energy. This incentive can help provide technical assistance for the building in the implementation phase of any energy conservation project. A new NJ Clean Power program, Direct Install, could also assist to cover 80% of the capital investment.

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

The following three tables summarize the proposed Energy Conservation Measures (ECM) and their economic relevance.

Table 1 - Highly Recommended 0-5 Year Payback ECMs																			
ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
1	Install 18 new CFL fixtures	RS Means	919	0	919	2,733	0.6	0	0.2	478	899	5	4,093	1.0	345	69	94	3,174	4,893
2	Install 45 new Occupancy Sensors	RS Means	9,900	900	9,000	24,895	5.2	0	1.8	0	3,834	15	45,113	2.3	401	27	32	36,113	44,574
3	Install 458 new T8 fluorescent fixtures	RS Means	87,717	6,870	80,847	82,859	17.3	0	5.9	16,120	28,880	15	339,836	2.8	320	21	23	258,989	148,359
TOTALS			98,536	7,770	90,766	110,487	23.1	0	7.9	16,598	33,613	-	389,042	2.7	-	-	-	298,276	197,827

Assumptions: Discount Rate: 3.2% per DOE FEMP; Energy Price Escalation Rate: 0% per DOE FEMP Guidelines

Note: A 0.0 electrical demand reduction/month indicates that it is very low/negligible

Table 2 - Recommended 5-10 Year Payback ECMs

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
4	Install 30 kW solar Photovoltaic system	Similar Projects	210,000	30,000	180,000	35,412	30.0	0	2.5	0	26,453	25	450,539	6.8	150	6	8	159,988	63,405
5	Install 12 new Pulse Start Metal Halide fixtures	RS Means	9,663	300	9,363	6,938	1.4	0	0.5	105	1,173	15	13,808	8.0	47	3	4	4,445	12,422
6	Replace Bradford-White electric DHW heater	RS Means	1,550	50	1,500	1,130	0.7	-38	0.0	45	157	10	1,327	9.5	-12	-1	1	-173	1,604
TOTALS			221,213	30,350	190,863	43,340	32.1	-38	3.0	150	27,784	-	465,673	6.9	-	-	-	164,260	77,432

Table 3 - Recommended End of Life Cycle ECMs

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
7	Retro-commissioning of HVAC system	Similar Projects	41,250	0	41,250	7,708	0.0	912	2.4	500	3,173	10	26,789	13.0	-35	-4	-5	-14,461	23,854
8	Replace RTU-11; Arcoaire packaged unit	RS Means	8,235	460	7,775	1,437	1.3	53	0.1	60	368	25	6,261	21.1	-19	-1	-4	-1,514	3,157
9	Replace RTU-12; ICP Commercial packaged unit	RS Means	8,500	460	8,040	1,302	1.3	51	0.1	60	344	25	5,852	23.4	-27	-1	-5	-2,188	2,893
10	Replace RTU-13; BDP Company packaged unit	RS Means	8,500	460	8,040	1,250	1.2	45	0.1	60	326	25	5,549	24.7	-31	-1	-6	-2,491	2,734
TOTALS			66,485	1,380	65,105	11,697	3.8	1,061	2.8	680	4,210	-	44,451	15.5	-	-	-	-20,654	32,639

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

1. HISTORIC ENERGY CONSUMPTION

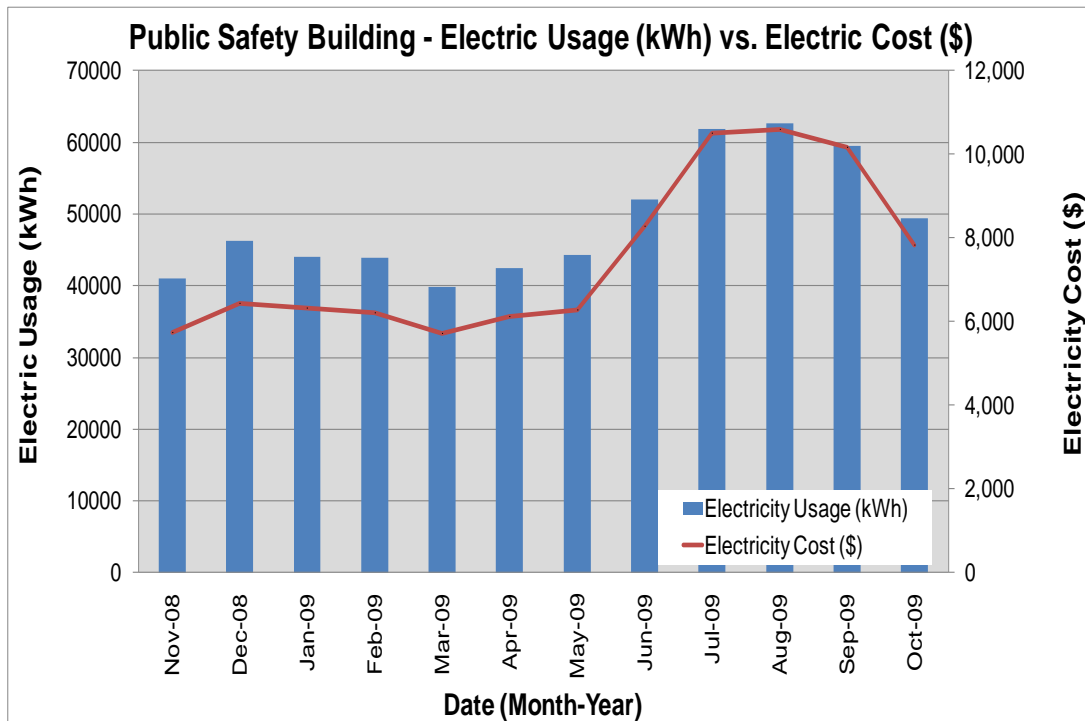
1.1. Energy usage, load profiles and cost analysis

SWA analyzed utility bills from **November 2008 through October 2009** that were received from the utility companies supplying the Public Safety Building with electric and natural gas.

Electricity - The Public Safety Building buys electricity from Atlantic City Electric at **an average rate of \$0.154/kWh** based on 12 months of utility bills from November 2008 to October 2009. They purchased **approximately 587,298 kWh or \$90,193 worth of electricity** in the previous year and are currently charged for demand (kW) which has been factored into each monthly bill. The building had an average monthly demand of **113.4 kW** and an annual peak demand of **145.6 kW**.

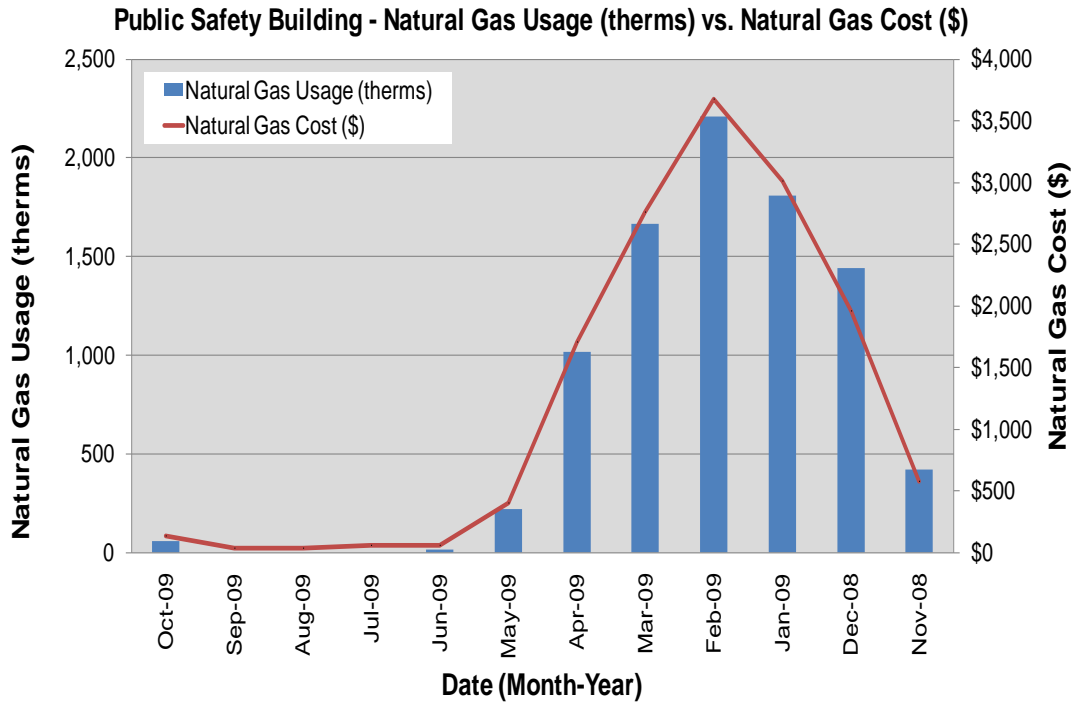
Natural gas – The Public Safety Building is currently served by one meter for natural gas. They currently buy natural gas from South Jersey Natural Gas, which acts as the transportation company and energy supplier, at **an average aggregated rate of \$1.629/therm**. They purchased **approximately 8,853 therms or \$14,420 worth of natural gas** in the 12 months from November 2008 to October 2009.

The following chart shows electricity use versus cost for the public safety building based on utility bills for the 12 month period of November 2008 to October 2009.



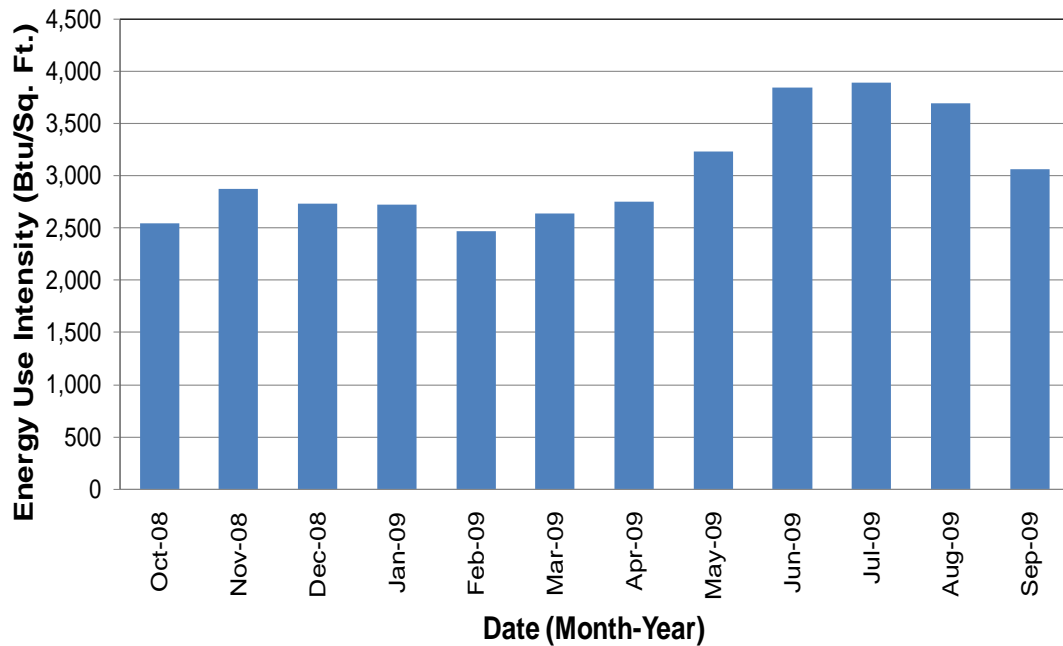
Electricity use follows a trend that is expected for this building because of its cooling systems with usage peaking during the summer. There is a small peak in electricity usage during the winter, indicating that there is some electric heat being used. The cost of electricity fluctuates as expected with usage peaking in the summertime.

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



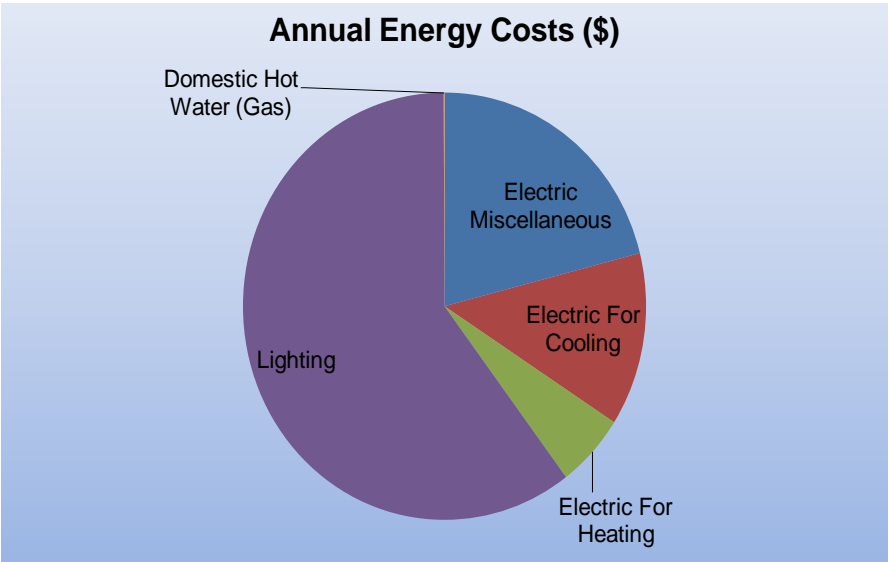
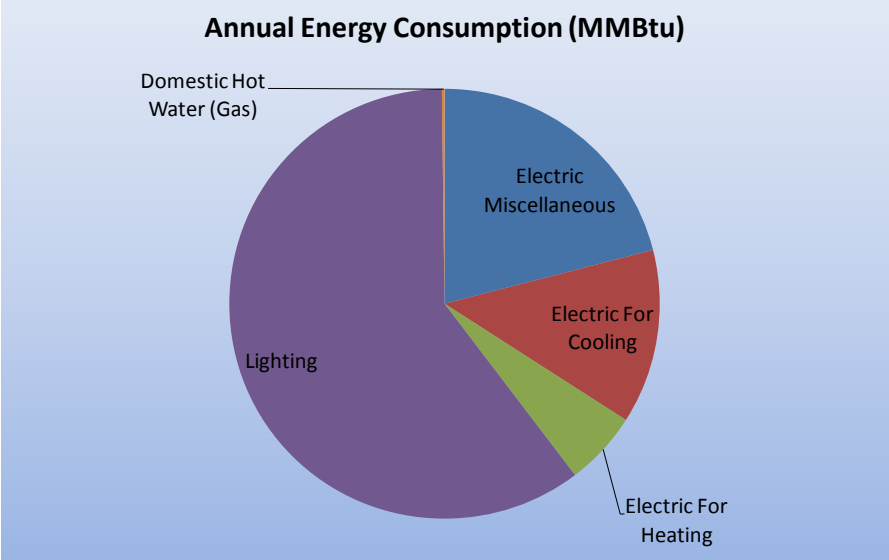
The following chart shows electric consumption in Btu/sq ft for the Public Safety building based on utility bills for the 12 month period of November 2008 to October 2009.

Public Safety Building - Energy Use Intensity (Btu/Sq. Ft.)



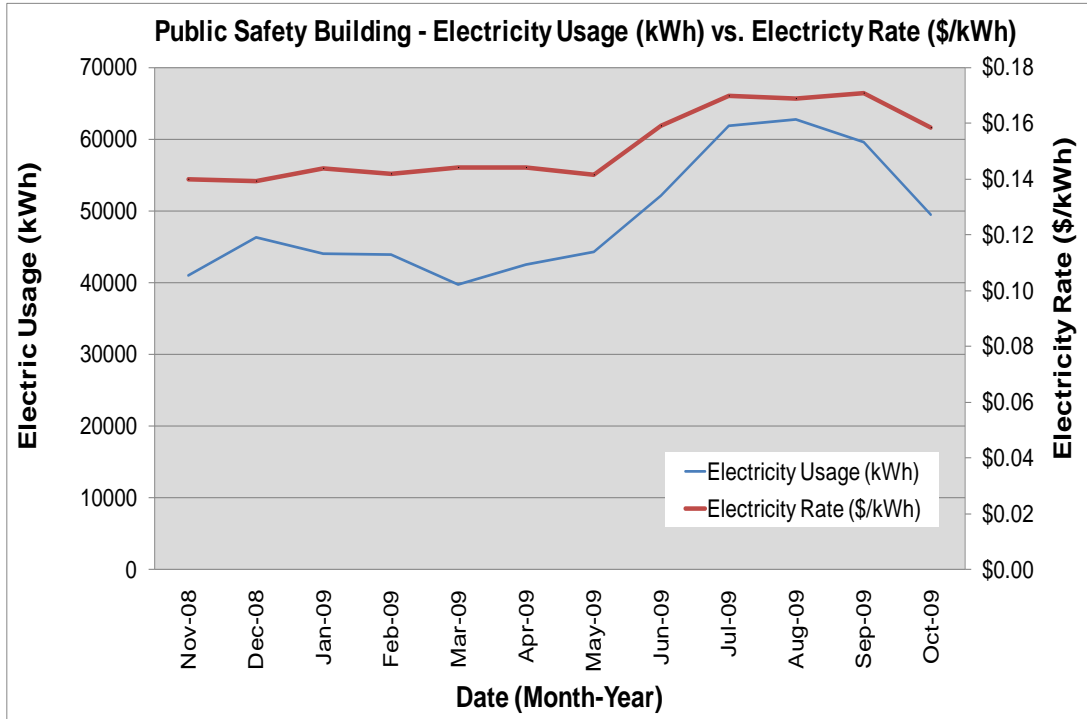
The following table and pie charts show energy use for the Public Safety Building based on utility bills for the 12 month period of November 2008 to October 2009. Note: Electrical cost at \$45/MMBtu of energy is almost more than 3 times as expensive to use as typical natural gas at \$16/MMBtu.

Nov 2008 - Oct 2009 Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	\$	% \$	\$/MMBtu
Electric Miscellaneous	421	14%	\$18,959	18%	45
Electric For Cooling	263	9%	\$11,838	11%	45
Electric For Heating	112	4%	\$5,047	5%	45
Lighting	1,208	41%	\$54,349	52%	45
Domestic Hot Water (Gas)	4	0%	\$64	0%	16
Building Space Heating	912	31%	\$14,334	14%	16
Totals	2,920	100%	\$104,590	100%	
Total Electric Usage	2,004	69%	\$90,193	86%	45
Total Gas Usage	916	31%	\$14,398	14%	16
Totals	2,920	100%	\$104,590	100%	

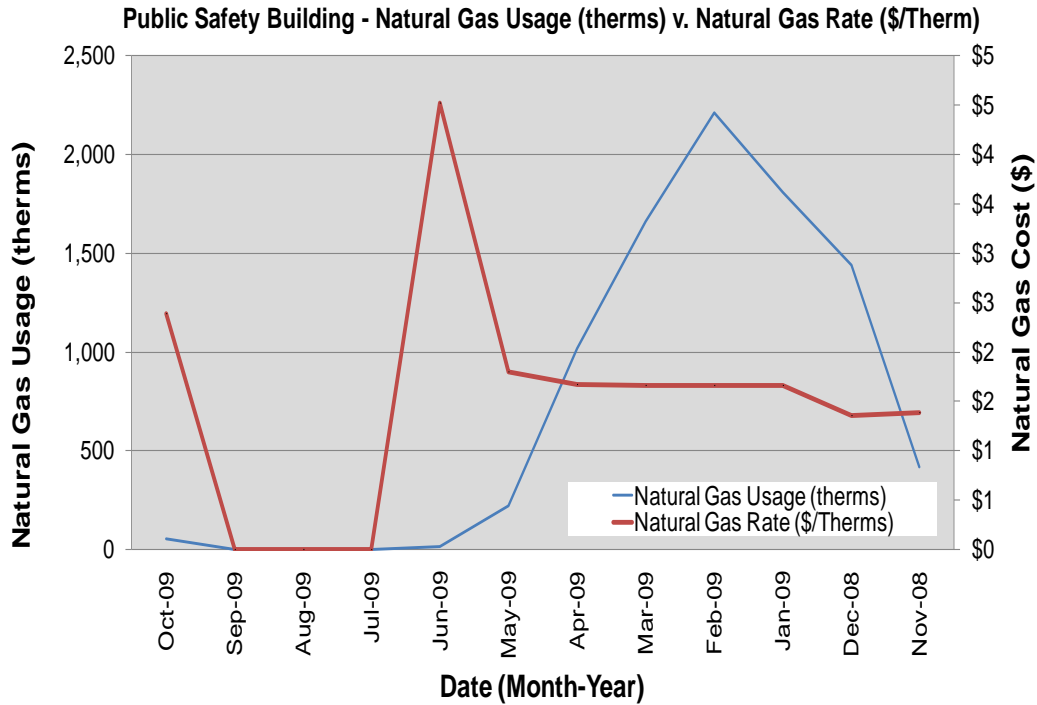


1.2. Utility rate analysis

The Public Safety Building currently purchases electricity from Atlantic City Electric at a general service market rate for electricity use (kWh) including a separate (kW) demand charge that is factored into each monthly bill. The Public Safety Building currently pays an average rate of approximately \$0.154/kWh based on the 12 months of utility bills of November 2008 to October 2009. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. The electric rate does not show large fluctuations throughout the year, except for an anticipated rise in the summer time. Based on these observations, this appears to be the appropriate rate for the building.



The Public Safety Building currently purchases natural gas from the South Jersey Gas Company, which acts as the transportation company and energy supplier at a general service market rate for natural gas (therms). There is one gas meter that provides natural gas service to the Public Safety Building currently. The average aggregated rate (supply and transport) for the meter is approximately \$1.629/therm based on 12 months of utility bills November 2008 to October 2009. The suppliers' general service rate for natural gas charges a market-rate price based on use, and the building's billing does not break down demand costs for all periods. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the natural gas prices increase during the summer months when natural gas is only used by the hot water boilers. The high gas price per therm fluctuations in the summer may be due to low use caps for the non-heating months. Thus the building pays for fixed costs, such as meter reading charges, during the summer months.



1.3. Energy benchmarking

SWA has entered energy information about the building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. Currently, the building receives is not eligible for a performance rating due to its classification as a public safety building, which means that it is still ineligible for Energy Star. SWA encourages the Township of Lower to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather-normalized source energy use over time.

The Site Energy Use Intensity is 61.0 kBtu/sq ft yr compared to the national average of a public safety building consuming 78.0 kBtu/sq ft yr. Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 7.9 kBtu/sqft yr, with an additional 3.0 kBtu/sq ft yr from the recommended ECMs, and 2.8 kBtu/sq ft yr from the recommended End of Life Cycle ECMs.

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

Username: LowerTownship
 Password: LOWER

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

STATEMENT OF ENERGY PERFORMANCE Township of Lower - Public Safety Building

Building ID: 1933138
 For 12-month Period Ending: September 30, 2009¹
 Date SEP becomes ineligible: N/A

Date SEP Generated: March 08, 2010

Facility Township of Lower - Public Safety Building 405 Breakwater Road Erma, NJ 08204	Facility Owner N/A	Primary Contact for this Facility N/A
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Year Built: 1978
Gross Floor Area (ft²): 48,000

Energy Performance Rating² (1-100) N/A

Site Energy Use Summary³

Electricity - Grid Purchase(kBtu)	2,010,824
Natural Gas (kBtu) ⁴	913,396
Total Energy (kBtu)	2,924,220

Energy Intensity⁵

Site (kBtu/ft²/yr)	61
Source (kBtu/ft²/yr)	160

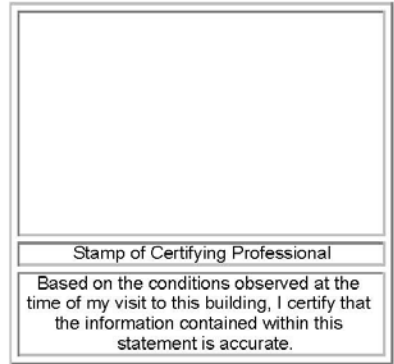
Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	355
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Electric Distribution Utility
Pepco - Atlantic City Electric Co

National Average Comparison

National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	2%
Building Type	Fire Station/Police Station



Meets Industry Standards⁶ for Indoor Environmental Conditions:

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

Certifying Professional
N/A

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

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

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The single story freestanding (slab on grade), 48,000 square feet Public Safety Building was originally constructed in 1993. The building is part of a complex surrounding the Cape May Airport and is home to the township's police department, rescue squad, courthouse, animal control, fire department and garages for all of these departments. Each department has its own separate section of the public safety building.



Partial North Façade



Partial East Façade



Partial South Façade



Partial West Façade

2.2. Building Occupancy Profiles

There are approximately 60 full time employees working in the building at any time, and it is open twenty-four hours a day, seven days a week. The courthouses and parts of the police station are open to the public, while access to the rest of the building is restricted. Additionally some of the non-emergency service offices are open only for a standard Monday through Friday 8:30 AM to 4:30 PM work week.

2.3. Building Envelope

Due to unfavorable weather conditions (min. 18 deg. F delta-T in/outside and no/low wind), no exterior envelope infrared (IR) images were taken during the field audit. Thermal imaging/infrared (IR) technology helps to identify energy-compromising problem areas in a non-invasive way.

2.3.1. Exterior Walls

The exterior wall envelope is mostly constructed of a precast concrete panel system and some stucco accents over concrete block with 0 inches of detectable/ assumed insulation. At certain parts of the building, such as the garage, where the concrete block walls are visible, no insulation was present, however, those portions constructed as part of the recent additions should have suitable insulation due to recent energy code requirements.

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

During the field audit, exterior and interior wall surfaces were inspected. They were found to be in overall good/age appropriate condition, with only a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues located mostly at the side(s) of the building.

The following specific exterior wall problem spots were identified:



Signs of water damage at perimeter walls due to missing/ineffective site drainage

In light of the exterior wall conditions mentioned above, SWA has the following recommendations;

1. Clean and maintain gutters, downspouts and downspout deflectors to minimize uncontrolled roof water run-off causing exterior wall damage.
2. Inspect and replace cracked/ineffective caulk.
3. Repair or replace all damaged concrete panels.

4. Maintain and inspect biannually all exterior surfaces, with a focus on damaged caulking, displaced concrete panels, and signs of water damage, and locations that correspond with building infiltration.

2.3.2. Roof

The building's roof is predominantly a flat and parapet type over steel decking with a built-up bituminous membrane finish. It is original and has never been replaced, and 2-1/2 inches of foam board roof insulation were recorded. Other parts of the building are also covered by a flat and parapet type over steel decking with a rolled asphalt and 2 inches of roof insulation. This roof is original and has never been replaced.

Note: Roof insulation levels could not be verified in the field and are based on reports from building maintenance personnel.

During the field audit, roofs, related flashing, gutters and downspouts were inspected. They were found to be in overall good condition with no signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all roof areas.

The following typical roof surfaces were identified:



Built-up bituminous finish



Rolled asphalt section

In light of the exterior wall conditions mentioned above, SWA has the following recommendations, which may be described, quantified and categorized further in the *Executive Summary*:

1. Maintain/inspect all roof surfaces on a regular basis.

2.3.3. Base

The building's base is composed of a slab-on-grade floor with a perimeter footing, with concrete block foundation walls and a slab edge/perimeter insulation.

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

The building's base and its perimeter were inspected. Judging from signs of uncontrolled moisture or water presence and other energy compromising issues, overall the base was found to be in good condition with no signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected in some areas inside.

2.3.4. Windows

The building contains several different types of windows.

1. Fixed-type windows with an insulated aluminum frame, clear double-glazing and interior roller shades. The windows are located throughout the building and are original/have never been replaced
2. Fixed type windows with an insulated aluminum frame, clear single-glazing and interior roller blinds. The windows are located mostly on the west facade and are original/have never been replaced. Most of these windows are installed with security bars.
3. Sidelight and transom units installed in the glass door systems with clear double-glazing.

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

The following typical windows were identified:



Various types of windows located at the Public Safety building

In light of the exterior wall conditions mentioned above SWA has the following recommendations:

1. Maintain and inspect windows biannually with a focus on the condition of the frames, proper hardware operation, airtight seal and any signs of water damage or infiltration.

2.3.5. Exterior doors

The building contains several different types of exterior doors.

1. Hollow core metal-type exterior doors. They are located throughout the building and are original/have never been replaced.
2. Glass with aluminum/steel frame-type exterior doors. They are located throughout the building and are original/have never been replaced.
3. Overhead aluminum type exterior doors. They are located throughout the building and are original/ have never been replaced.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected. Based on signs of moisture, air-leakage and other energy compromising issues, overall the doors were found to be in good condition with only a few signs of uncontrolled moisture, air-leakage or other energy-compromising issues.

The following specific door problem spots and typical windows were identified:



Missing/worn weather stripping and water damaged frame

In light of the exterior wall conditions mentioned above, SWA has the following recommendations;

1. Install/replace/maintain weather-stripping around all exterior doors and roof hatches.
2. Replace/add/maintain caulk around door frames and sills.
3. Maintain and inspect biannually all exterior doors with a focus on the door frames, weather-stripping, and signs of water damage and infiltration.

2.3.6. Building air-tightness

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

In addition to all the above-mentioned findings, SWA recommends air-sealing, caulking and/or insulating around all structural members, recessed lighting fixtures, electrical boxes and chimney walls that are part of or penetrate the exterior envelope and where air-leakage can occur.

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

2.4. HVAC Systems

The Public Safety building has two sections: an office portion of the building and a garage portion. The office portion of the building is heated and cooled almost entirely using 17 separate rooftop packaged units. These units provide heating, cooling and ventilation. There are several areas throughout the office portion of the building, such as entrance areas, that contain a few electric baseboard heaters. These baseboard heaters are used minimally to maintain the temperature in an entrance/vestibule area that contains a large amount of glass. The garage portion of the building is not cooled, and is heated separately from the office portion of the building using six separate ceiling mounted, gas-fired unit heaters.

2.4.1. Heating

As mentioned above, the building contains two sections; an office portion and a garage portion. These sections of the building are conditioned independently of each other. The office portion of the building is conditioned almost entirely by rooftop package units. There are 17 units in total that provide gas-fired heating as well as DX cooling to all office areas. These single zone units provide heating, cooling and ventilation directly via ductwork to a specified zone. Fourteen of these units were observed to be operating in good condition and would not be cost-effective to replace based on the amount of remaining useful lifetime. Three of these units were observed to have significant rust and are no longer operating as efficiently as designed. There are also four electric baseboard heaters located in vestibule/entrance areas around the building. These heaters are located near large glass areas and are primarily used to prevent freezing near the doorway and to maintain the temperature in the vestibule area. Although these units use electric heat, they would not be cost-effective to replace since they are not located near an existing gas line and are used minimally. The building already contains programmable thermostats to control the temperatures throughout each zone.

The garage portion of the building contains a separate heating system. The garage areas rely on six ceiling-mounted, gas-fired unit heaters. These unit heaters maintain a constant minimal temperature in the garage area. The garage areas are used 24 hours per day.

2.4.2. Cooling

The office areas of the building are cooled using the same 17 packaged rooftop units associated with the heating system. These packaged units provide DX cooling using R-22

refrigerant. Each unit is ducted directly to a space below the rooftop and conditions a single zone. There is also one split system AC unit used to condition the Dispatch area.

2.4.3. Ventilation

As mentioned above, the office portion of the building is heated and cooled by 17 package rooftop units. These rooftop units mix return air with fresh outside air before conditioning it and delivering it to the separate zones in the building.

In addition to the packaged rooftop units, bathroom exhaust fans help rid the building of stale air and also help induce fresh air into the building. The garage areas of the building contain exhaust fans that operate when CO2 levels raise to high concentrations. All exhaust fans were observed to be in good condition and would not be cost-effective to replace at this time.

2.4.4. Domestic Hot Water

The building contains six electric domestic hot water heaters located throughout the building. Five of these units are located in the ceiling plenum above bathroom or kitchen areas. Due to the location of five of these units and the distance they are from the natural gas line, it would not be cost-effective to upgrade to gas-fired units at this time. There is one electric domestic hot water heater located in the ambulance area to provide hot water to the shower and sinks located adjacent to the unit. SWA recommends upgrading this unit to a gas-fired unit in order to reduce the costs of using electricity for gas water heating.

2.5. Electrical systems

2.5.1. Lighting

Interior Lighting – The Public Safety building contains mostly inefficient lighting. There are primarily inefficient lighting fixtures such as the existing 4' T12 fixtures with magnetic ballasts and screw in incandescent fixtures, and there are also 4' T8 fixtures with electronic ballasts that should remain. There are also some HID (High intensity discharge) fixtures installed in the form of metal halides that SWA recommends replacing with pulse-start metal halide fixtures. SWA recommends replacing the T12 lights with T8 electronic ballast fixtures and incandescent fixtures with CFL's, as well as installing forty-five new occupancy sensors to reduce electricity usage. See attached lighting schedule in Appendix A for a complete lighting inventory throughout the building and estimated power consumption.

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

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a recessed 90 W incandescent fixtures that SWA recommends replacing with CFL's.

2.5.2. Appliances

SWA performed a basic survey of appliances installed at the Public Safety building and has determined that it would be cost-effective to replace all existing refrigerators with comparable Energy Star qualified units and refrigerated vending machines with comparable Energy Star qualified units. Appliances, such as refrigerators, that are over 10 years of age

should be replaced with newer, efficient models with the Energy Star label. Energy Star refrigerators use as little as 315 kWh/yr. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Building management should select Energy Star label appliances and equipment when replacing: refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: <http://www.energystar.gov>.

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

2.5.3. Elevators

The Public Safety building does not have any elevators installed on the premises.

2.5.4. Process and others electrical systems

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

3. EQUIPMENT LIST

Inventory

Building System	Description	Physical Location	Make/ Model	Fuel	Space served	Date Installed	Estimated Remaining useful life %
Heating/ Cooling	RTU-1; Carrier Weathermaker packaged unit, gas-fired heating with DX cooling, 250,000 BTUH heating input, 200,000 BTUH heating output, 80% thermal efficiency, 73.3 kW cooling input, 58.6 kW cooling output, R-22 refrigerant	Rooftop	Carrier, Weathermaker, Model #48HJF012---551DA, Serial #3098G30946	Natural Gas/ Electricity	Hallway, Chief's Office	1998	52%
Heating/ Cooling	RTU-2; Trane Voyager packaged unit, gas-fired heating with DX cooling, 250,000 BTUH heating input, 203,000 BTUH heating output, 81% thermal efficiency, 12.5 tons cooling, R-22 refrigerant	Rooftop	Trane, Voyager, Model #YCD150D3HABA, Serial #402100852D	Natural Gas/ Electricity	Detective's Office	2004	76%
Heating/ Cooling	RTU-3; Trane Precedent packaged unit, gas-fired heating with DX cooling, 200,000 BTUH heating input, 160,000 BTUH heating output, 80% thermal efficiency, 8.5 ton cooling, R-22 refrigerant	Rooftop	Trane, Precedent, Model #YSC102A3RHA19D000A1A00600, Serial #402101528L	Natural Gas/ Electricity	Fire Safety	2004	76%
Heating/ Cooling	RTU-4; Unitary Product Group packaged unit, gas-fired heating with DX cooling, 70,000 BTUH heating input, R-22 refrigerant, unit has some rusting	Rooftop	Unitary Product Group, Model #DAYA-F030N070C, Serial #NMHM157586	Natural Gas/ Electricity	Court	1997	48%
Heating/ Cooling	RTU-5; Unitary Product Group packaged unit, gas-fired heating with DX cooling, 70,000 BTUH heating input, R-22 refrigerant, unit has some rusting	Rooftop	Unitary Product Group, Model #DAYA-F030N070C, Serial #NAJM005579	Natural Gas/ Electricity	Court Personnel Office	1997	48%
Heating/ Cooling	RTU-6; Trane Precedent packaged unit, gas-fired heating with DX cooling, 200,000 BTUH heating input, 160,000 BTUH heating output, 80% thermal efficiency, 7.5 tons dual compressors, R-22 refrigerant	Rooftop	Trane, Precedent, Model #YHC092A3EHA22D0, Serial #852100972L	Natural Gas/ Electricity	Court Room	2008	92%
Heating/ Cooling	RTU-7; Trane Precedent packaged unit, gas-fired heating with DX cooling, 200,000 BTUH heating input, 160,000 BTUH heating output, 80% thermal efficiency, 7.5 tons dual compressors, R-22 refrigerant	Rooftop	Trane, Precedent, Model #YHC092A3EHA22D0, Serial #852100980L	Natural Gas/ Electricity	Dispatch	2008	92%

Heating/ Cooling	RTU-8; Carrier packaged unit, gas-fired heating with DX cooling, 115,000 BTUH heating input, 93,150 BTUH heating output, 81% thermal efficiency, 33.7 kW cooling input, 27.3 kW cooling output, R-22 refrigerant	Rooftop	Carrier, Model #48HJE005-H-551HQ, Serial #3806G20461	Natural Gas/ Electricity	Room #109 (archives)	1993	32%
Heating/ Cooling	RTU-9; Rheem packaged unit, gas-fired heating with DX cooling, 125,000 BTUH heating input, 96,200 BTUH heating output, 77% thermal efficiency, R-22 refrigerant	Rooftop	Rheem, Model #RRGG-12E61CKR, Serial #AYA5151 C HA A F0194 0769	Natural Gas/ Electricity	Room #164	1994	36%
Heating/ Cooling	RTU-10; Carrier packaged unit, gas-fired heating with DX cooling, 115,000 BTUH heating input, 92,000 BTUH heating output, 80% thermal efficiency, 33.7 kW cooling input, 27.0 kW cooling output, 3-6 ton unit, R-22 refrigerant	Rooftop	Carrier, Model #48TJF004---311BF, Serial #2998G20590	Natural Gas/ Electricity	Men's Locker	1990	20%
Heating/ Cooling	RTU-11; Arcoaire packaged unit, gas-fired heating with DX cooling, R-22 refrigerant, unit had rusted nameplate that could not be read	Rooftop	Arcoaire, Model #NA, Serial #NA	Natural Gas/ Electricity	Lady's Locker	1990	20%
Heating/ Cooling	RTU-12; ICP Commercial packaged unit, gas-fired heating with DX cooling, 115,000 BTUH heating input, 91,000 BTUH heating output, 79% thermal efficiency, R-22 refrigerant	Rooftop	ICP Commercial, Model #PGB060E1HC, Serial #L983838551, MFR #NPGB060E1HC, Style #PGB060E1H	Natural Gas/ Electricity	Room #146	1990	20%
Heating/ Cooling	RTU-13; BDP company packaged unit, 180,000 BTUH heating input, 144,000 BTUH heating output, 80% thermal efficiency, 52.7 kW cooling input, 42.2 kW cooling output, R-22 refrigerant	Rooftop	BDP company, Model #5A0DPV090180ACAA, Serial #3499G30187	Natural Gas/ Electricity	Room #169	1990	20%
Heating/ Cooling	RTU-14; Carrier packaged unit, 18-25 tons, 360,000 BTUH heating input, 292,000 BTUH heating output, 81% thermal efficiency, 105.4 kW cooling input, 85.5 kW cooling output	Rooftop	Carrier, Model #48TMF016---511AA, Serial #0706U03130, Work Order #0586005483	Natural Gas/ Electricity	Clerk's Office	2000	60%
Heating/ Cooling	RTU-15; Carrier Weathermaster packaged unit, 115,000 BTUH heating input, 93,150 BTUH heating output, 81% thermal efficiency, 33.7 kW cooling input, 27.3 kW cooling output, R-22 refrigerant	Rooftop	Carrier, Weathermaster, Model #48HJE006---351--, Serial #2507G50444	Natural Gas/ Electricity	Room #416	1993	32%
Heating/ Cooling	RTU-16; Rheem packaged unit, 125,000 BTUH heating input, 80% estimated thermal efficiency, R-22 refrigerant	Rooftop	Rheem, Model #RRGG-12E61JKR, Serial #AYA 5023 C HA A F0194 0357	Natural Gas/ Electricity	Chief's Office	1992	28%

Heating/ Cooling	RTU-17; Bryant packaged unit, 60,000 BTUH heating input, 48,400 BTUH heating output, 80.6% thermal efficiency, 17.6 kW cooling input, 14.2 kW cooling output, R-22 refrigerant	Rooftop	Bryant, Model #582ANW024060AAAD, Serial #1301G14411	Natural Gas/ Electricity	Ready Room	1993	32%
Cooling	Fujitsu Halcyon condensing unit for split system, 9,400 BTUH cooling capacity, SEER 10.0	Rooftop	Fujitsu, Halcyon, Model #A0U9C1, Serial #004139	Natural Gas/ Electricity	Dispatch	2000	60%
Heating	UH-1; Reznor gas-fired unit heater, ceiling mounted, convective unit, 200,000 BTUH input, 166,000 BTUH output, 83% thermal efficiency	Police and Rescue Garage, ceiling mounted	Reznor, T-core, Model #UDAP 200, Serial #Bhj79U2N72144X	Natural Gas/ Electricity	Police and Rescue Garage	2009	96%
Heating	UH-2; Reznor gas-fired unit heater, ceiling mounted, convective unit, 200,000 BTUH input, 166,000 BTUH output, 83% thermal efficiency	Main Garage, ceiling mounted	Reznor, T-core, Model #UDAP 200, Serial #Bhj79U2N72144X	Natural Gas/ Electricity	Main Garage	2009	96%
Heating	UH-3; Reznor gas-fired unit heater, ceiling mounted, convective unit, 200,000 BTUH input, 166,000 BTUH output, 83% thermal efficiency	Main Garage, ceiling mounted	Reznor, T-core, Model #UDAP 200, Serial #Bhj79U2N72144X	Natural Gas/ Electricity	Main Garage	2009	96%
Heating	UH-4; Reznor gas-fired unit heater, ceiling mounted, convective unit, 200,000 BTUH input, 166,000 BTUH output, 83% thermal efficiency	Bike Pen, ceiling mounted	Reznor, T-core, Model #UDAP 200, Serial #Bhj79U2N72144X	Natural Gas/ Electricity	Bike Pen	2009	96%
Heating	UH; Dayton gas-fired unit heater, ceiling mounted, convective unit, 150,000 BTUH input, 120,000 BTUH output, 80% thermal efficiency	Ambulance Garage, ceiling mounted	Dayton, Model #3E230D, Serial #M97G019898	Natural Gas/ Electricity	Ambulance Garage	2002	68%
Heating	UH; Sterling gas-fired unit heater, ceiling mounted, convective unit, 200,000 BTUH input, 162,000 BTUH output, 81% thermal efficiency	Ambulance Garage, ceiling mounted	Sterling, Model #TF-20, Serial #M06696111007001	Natural Gas/ Electricity	Ambulance Garage	2002	68%
Heating	Four electric baseboards, no nameplate info available	Front vestibule, 3 units in bathrooms	No nameplate info	Electricity	Entrance areas/ Bathrooms	1993	32%

Domestic Hot Water	Pacemaker electric hot water heater, 20 gallons, model nameplate could not be accessed	SWAT garage ceiling	Pacemaker, Model #NA, Serial #NA	Electricity	Bathroom in SWAT garage	2008	80%
Domestic Hot Water	Pacemaker electric hot water heater, 20 gallons, model nameplate could not be accessed	Ceiling plenum above interior bathroom	Pacemaker, Model #NA, Serial #NA	Electricity	Interior bathroom	2005	60%
Domestic Hot Water	Four Pacemaker electric hot water heaters, 10 gallons, model nameplate could not be accessed	Ceiling plenum above interior bathrooms	Pacemaker, Model #NA, Serial #NA	Electricity	Interior bathrooms	2000	20%
Domestic Hot Water	Bradford-White electric domestic hot water heater, 40 gallons, 4,500W upper element, 4,500W lower element	Ambulance area, outside of showers	Bradford-White, Model #MI4056D513, Serial #SE1999057	Electricity	Ambulance Showers	2000	20%
Lighting	See Appendix A	-	-	-	-	-	-

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

4. ENERGY CONSERVATION MEASURES

Based on the assessment of the Public Safety building, SWA has separated the investment opportunities into three recommended categories:

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

Category I Recommendations: Capital Improvements

- Replace smaller electric DHW heaters located in ceiling plenum – The building contains five electric DHW heaters located in various locations in the ceiling plenum of the building that should be replaced with natural gas heaters. These units are located in the ceiling plenum and not directly near a natural gas line. SWA recommends that the Township of Lower consider as part of a capital improvement program to extend the gas lines to these units and upgrade to gas-fired heaters.

Category II Recommendations: Operations and Maintenance

- Clean and maintain gutter downspouts and downspout diverters – The field inspection revealed that there were several areas on the roof that allowed water to pool due to clogged roof drains and downspouts. In addition, some downspouts did not divert water properly away from the building, allowing water to cause surface damage to the exterior walls.
- Inspect and replace cracked/ineffective caulk – Some areas of the exterior walls were noted to have deficient caulk, specifically around windows, exterior doors and transition areas. SWA recommends that all caulk is repaired or replaced immediately in order to prevent excessive air infiltration or water damage.
- Repair or replace all damaged concrete panels – There were some areas of precast concrete panels that appeared to be damaged on the exterior surface. SWA recommends that every damaged panel is repaired or replaced immediately in order to prevent excessive air infiltration or water damage.
- Perform bi-annual inspections of exterior walls – SWA recommends bi-annual inspections of exterior walls as part of a preventative maintenance plan. Wall inspections should be focused on locating and repairing areas with excessive air infiltration and signs of water damage.
- Perform bi-annual inspections of roof surfaces – SWA recommends bi-annual inspections of all roof surfaces as part of a preventative maintenance plan. Roof surface inspections should be focused on locating and repairing areas with excessive water pooling, signs of air infiltration or water damage.
- Perform bi-annual inspections of windows and exterior doors – SWA recommends bi-annual inspections of all windows and exterior doors as part of a preventative maintenance plan. Window and exterior door inspections should be focused on locating and repairing areas with high air infiltration or signs of water damage.
- Provide weather-stripping/air-sealing – SWA observed that all windows and doors had proper weather-stripping and air-sealing due to their age. As a best practice, SWA recommends that

each window and door is inspected twice per year for deficiencies. Any time that a seal has been compromised, building maintenance staff should repair and replace the seal immediately to ensure that thermal barriers are not breached.

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

Category III Recommendations: Energy Conservation Measures

Summary table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	Install 18 new CFL fixtures
2	Install 45 new Occupancy Sensors
3	Install 458 new T8 fluorescent fixtures
Description of Recommended 5-10 Year Payback ECMs	
4	Install 30 kW solar Photovoltaic system
5	Install 12 new Pulse Start Metal Halide fixtures
6	Replace Bradford-White electric DHW heater
Description of Recommended End of Life Cycle ECMs	
7	Retro-commissioning of HVAC system
8	Replace RTU-11; Arcoaire packaged unit
9	Replace RTU-12; ICP Commercial packaged unit
10	Replace RTU-13; BDP Company packaged unit

ECM#1: *Install 18 new CFL lamps*

Description:

The Public Safety building contains 18 light bulbs that are inefficient and should be replaced. Eight of these light bulbs are incandescent bulbs used for interior lighting, while ten of these light bulbs are halogen or incandescent light bulbs used for exterior lighting. SWA recommends replacing the above mentioned bulbs with Compact Fluorescent Lamps (CFLs) that have an equivalent light output. Typically, CFL replacement bulbs will have the same light output while consuming 2/3 less power. See Appendix A for complete lighting schedule and analysis.

Installation cost:

Estimated installed cost: \$919

Source of cost estimate: *RS Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
1	Install 18 new CFL fixtures	RS Means	919	0	919	2,733	0.6	0	0.2	478	899	5	4,093	1.0	345	69	94	3,174	4,893

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

Rebates / financial incentives:

There are currently no incentives for this measure at this time.

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.

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

ECM#2: Install 45 new Occupancy Sensors

Description:

The Public Safety building contains 45 areas that could benefit from the installation of occupancy sensors. These areas were identified as areas with sporadic usage. Occupancy sensors are equipped with a delay timer that automatically shuts off lights when no motion is detected for a set amount of time.. See Appendix A for complete lighting schedule and analysis.

Installation cost:

Estimated installed cost: \$9,000

Source of cost estimate: RS Means; Published and established costs

Economics:

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
2	Install 45 new Occupancy Sensors	RS Means	9,900	900	9,000	24,895	5.2	0	1.8	0	3,834	15	45,113	2.3	401	27	32	36,113	44,574

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes operational hours based on field observations, billing analysis and staff interviews.

Rebates / financial incentives:

NJ Clean Energy – Occupancy Sensors (\$20 per sensor)

Maximum incentive amount is \$900.

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.

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

ECM#3: Install 458 new T8 fluorescent fixtures

Description:

The Public Safety building currently contains 458 inefficient T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacing each one of these T12 fixtures with equivalent T8 fluorescent fixtures with electronic ballasts. Typically, T8 fluorescent fixtures with electronic ballasts use 30% less energy than equivalent T12 fixtures with magnetic ballasts. In addition, there will be operating cost savings associated with each bulb since CFLs have a longer rated lifetime than incandescent bulbs. See Appendix A for complete lighting schedule and analysis.

Installation cost:

Estimated installed cost: \$80,847

Source of cost estimate: RS Means; Published and established costs

Economics:

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
3	Install 458 new T8 fluorescent fixtures	RS Means	87,717	6,870	80,847	82,859	17.3	0	5.9	16,120	28,880	15	339,836	2.8	320	21	23	258,989	148,359

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

Rebates / financial incentives:

NJ Clean Energy Prescriptive Lighting – T-5 and T8 lamps with electronic ballast in existing facilities (\$15 per fixture)
Maximum incentive amount is \$6,870

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.

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

ECM#4: Install a 30 kW Solar Photovoltaic system

Description:

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

There are a few locations for a 30 kW PV installation on the building roofs and away from shade. A commercial multi-crystalline 123 watt panel (17.2 volts, 7.16 amps) has 10.7 square feet of surface area (11.51 watts per square foot). A 30 kW system needs approximately 246 panels which would take up 2,610 square feet. The installation of a renewable Solar Photovoltaic power generating system could serve as a good educational tool and exhibit for the community.

Installation cost:

Estimated installed cost: \$180,000

Source of cost estimate: *Similar projects*

Economics:

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
4	Install 30 kW solar Photovoltaic system	Similar Projects	210,000	30,000	180,000	35,412	30.0	0	2.5	0	26,453	25	450,539	6.8	150	6	8	159,988	63,405

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

Rebates/financial incentives:

NJ Clean Energy - Renewable Energy Incentive Program, Incentive based on \$1.00 / watt Solar PV application. Incentive amount for this application is \$30,000.

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

NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. \$21,000 has been incorporated in the above costs for a period of 15 years; however it requires proof of performance, application approval and negotiations with the utility.

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.

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

ECM#5: Install 12 new Pulse Start Metal Halide fixtures

Description:

The Public Safety building currently contains 12 exterior Probe Start Metal Halide fixtures. Probe Start Metal Halide fixtures are typically installed at high wattages since they degrade over time. Installing Pulse Start Metal Halide fixtures allows a lower wattage fixture to be used and provide a better quality light since the light does not degrade over time. In addition, Pulse Start Metal Halide lamps last longer, saving money by requiring less lamp changes over time. See Appendix A for complete lighting schedule and analysis.

Installation cost:

Estimated installed cost: \$9,363

Source of cost estimate: RS Means; Published and established costs

Economics:

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
5	Install 12 new Pulse Start Metal Halide fixtures	RS Means	9,663	300	9,363	6,938	1.4	0	0.5	105	1,173	15	13,808	8.0	47	3	4	4,445	12,422

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

Rebates / financial incentives:

NJ Clean Energy Prescriptive Lighting – Metal Halide with Pulse Start (\$25 per fixture)

Maximum incentive amount is \$300

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.

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

ECM#6: Replace Bradford-White electric DHW heater

Description:

The Public Safety building currently contains a total of six electric DHW heaters located throughout the building. Five of these heaters are mounted in the ceiling plenum and would not be cost-effective to replace with gas-fired units since they are not located within the proximity of a gas line. There is one Bradford-White electric domestic hot water (DHW) heater located in the ambulance area of the building that is mounted on the ground and is located adjacent to the shower area. SWA recommends that this unit is upgraded to a gas-fired unit. Gas-fired units are cost-effective since they use a cheaper fuel source and also result in a smaller carbon footprint. SWA recommends that a natural gas-fired, sealed combustion domestic hot water with a minimum efficiency of 85% is installed.

Installation cost:

Estimated installed cost: \$1,500

Source of cost estimate: RS Means; *Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
6	Replace Bradford-White electric DHW heater	RS Means	1,550	50	1,500	1,130	0.7	-38	0.0	45	157	10	1,327	9.5	-12	-1	1	-173	1,604

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. Domestic Hot Water usage has been calculated from nameplate information and also derived from utility bills. SWA assumes that electricity savings will equal natural gas savings in MMBTUs, however there will be a cost savings associated by upgrading to a cheaper fuel.

Rebates / financial incentives:

NJ Clean Energy, Gas hot water heating, units >50 gallons (\$50 per unit)

Maximum incentive amount is \$50

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.

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

ECM#7: Retro-commissioning of HVAC system

Description:

The Public Safety building is approximately 48,000 square feet and is served primarily by rooftop units. Since these units have been installed, the areas that they serve may have changed such as re-configuring of offices or use of existing spaces. There were particularly areas near the ambulance area such as Room 416 (archives) that are not properly balanced. The thermostat for one half of the ambulance area offices are controlled by a thermostat located in this room. Since this room is small compared to the rest of the floor area served by the same rooftop unit, the thermostat has to be programmed to extreme temperatures to condition the entire area effectively. SWA recommends that the Township of Lower contact a local HVAC contractor to perform retro-commissioning of the entire rooftop system. Retro-commissioning will involve manually inspecting each unit as well the appropriate distribution systems to make sure that each unit is capable of meeting the load of each zone. SWA recommends that the HVAC contractor evaluate the condition of the unit as well as the ability of the unit to satisfy the heating/cooling/ventilation loads of the appropriated zone. SWA recommends that the HVAC contractor also evaluate whether the location of each thermostat is appropriate or whether the thermostat should be moved to a more ideal location.

Installation cost:

Estimated installed cost: \$41,250

Source of cost estimate: *Similar Projects*

Economics:

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
7	Retro-commissioning of HVAC system	Similar Projects	41,250	0	41,250	7,708	0.0	912	2.4	500	3,173	10	26,789	13.0	-35	-4	-5	-14,461	23,854

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes that Retro-commissioning will be able to achieve a savings equivalent to 10% of heating and cooling usage only. SWA assumes cost based on similar projects of similar sized that paid \$0.75/square feet.

Rebates / financial incentives:

There are currently no incentives available for this measure

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.

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

ECM#8: *Replace RTU-11; Arcoaire packaged unit*

Description:

The Public Safety building uses 17 packaged rooftop units to provide heating, cooling and ventilation to the office areas of the building. RTU-11 was observed to be in deteriorating condition. The unit had an excessive amount of rust and is no longer performing as efficiently as intended. SWA recommends replacing this unit with an equivalent size unit.

Installation cost:

Estimated installed cost: \$7,775

Source of cost estimate: *RS Means; Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
8	Replace RTU-11; Arcoaire packaged unit	RS Means	8,235	460	7,775	1,437	1.3	53	0.1	60	368	25	6,261	21.1	-19	-1	-4	-1,514	3,157

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes the existing unit has a heating efficiency of 78% and a SEER value of 9.0. Savings are based on an equivalent sized unit with 83% heating efficiency and a SEER value of 12.0. Unit is assumed to be 5 tons.

Rebates / financial incentives:

NJ Clean Energy – Electric Unitary HVAC – Unitary AC and split systems (\$73-\$92 per ton).

Maximum incentive amount is \$460

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.

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

ECM#9: Replace RTU-12; ICP Commercial packaged unit

Description:

The Public Safety building uses 17 packaged rooftop units to provide heating, cooling and ventilation to the office areas of the building. RTU-12 was observed to be in deteriorating condition. The unit had an excessive amount of rust and is no longer performing as efficiently as intended. SWA recommends replacing this unit with an equivalent size unit.

Installation cost:

Estimated installed cost: \$8,040

Source of cost estimate: RS Means; *Published and established costs*

Economics:

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
9	Replace RTU-12; ICP Commercial packaged unit	RS Means	8,500	460	8,040	1,302	1.3	51	0.1	60	344	25	5,852	23.4	-27	-1	-5	-2,188	2,893

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes the existing unit has a heating efficiency of 79% and a SEER value of 9.0. Savings are based on an equivalent sized unit with 83% heating efficiency and a SEER value of 12.0. Unit is assumed to be 5 tons.

Rebates / financial incentives:

NJ Clean Energy – Electric Unitary HVAC – Unitary AC and split systems (\$73-\$92 per ton).

Maximum incentive amount is \$460

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.

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

ECM#10: Replace RTU-13; BDP Company packaged unit

Description:

The Public Safety building uses 17 packaged rooftop units to provide heating, cooling and ventilation to the office areas of the building. RTU-12 was observed to be in deteriorating condition. The unit had an excessive amount of rust and is no longer performing as efficiently as intended. SWA recommends replacing this unit with an equivalent size unit.

Installation cost:

Estimated installed cost: \$8,040

Source of cost estimate: RS Means; Published and established costs

Economics:

ECM #	ECM description	Source	est. installed cost, \$	est. incentives, \$	net est. ECM cost with incentives, \$	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, \$	total 1st yr savings, \$	life of measure, yrs	est. lifetime cost savings, \$	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, \$	CO ₂ reduced, lbs/yr
10	Replace RTU-13; BDP Company packaged unit	RS Means	8,500	460	8,040	1,250	1.2	45	0.1	60	326	25	5,549	24.7	-31	-1	-6	-2,491	2,734

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA assumes the existing unit has a heating efficiency of 80% and a SEER value of 9.0. Savings are based on an equivalent sized unit with 83% heating efficiency and a SEER value of 12.0. Unit is assumed to be 5 tons.

Rebates / financial incentives:

NJ Clean Energy – Electric Unitary HVAC – Unitary AC and split systems (\$73-\$92 per ton).

Maximum incentive amount is \$460

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.

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

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There aren't currently any existing renewable energy systems.

5.2. Wind

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

5.3. Solar Photovoltaic

Please see the above recommended ECM#4.

5.4. Solar Thermal Collectors

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

5.5. Combined Heat and Power

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

5.6. Geothermal

Geothermal is not applicable for this building because there is currently no hydronic heating system.

6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

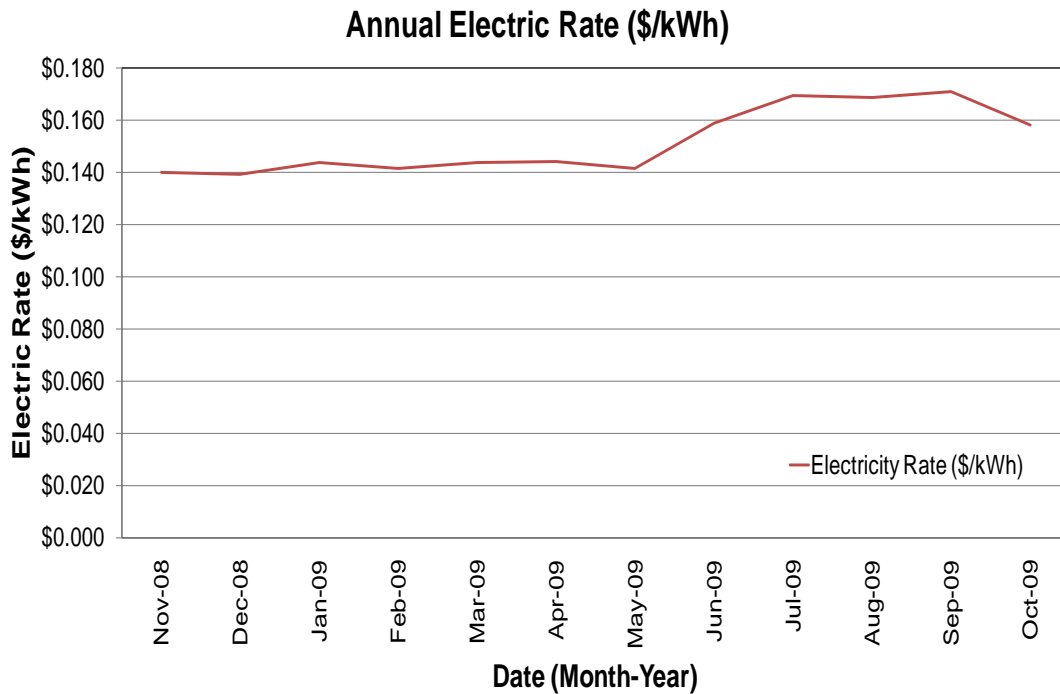
6.1. Energy Purchasing

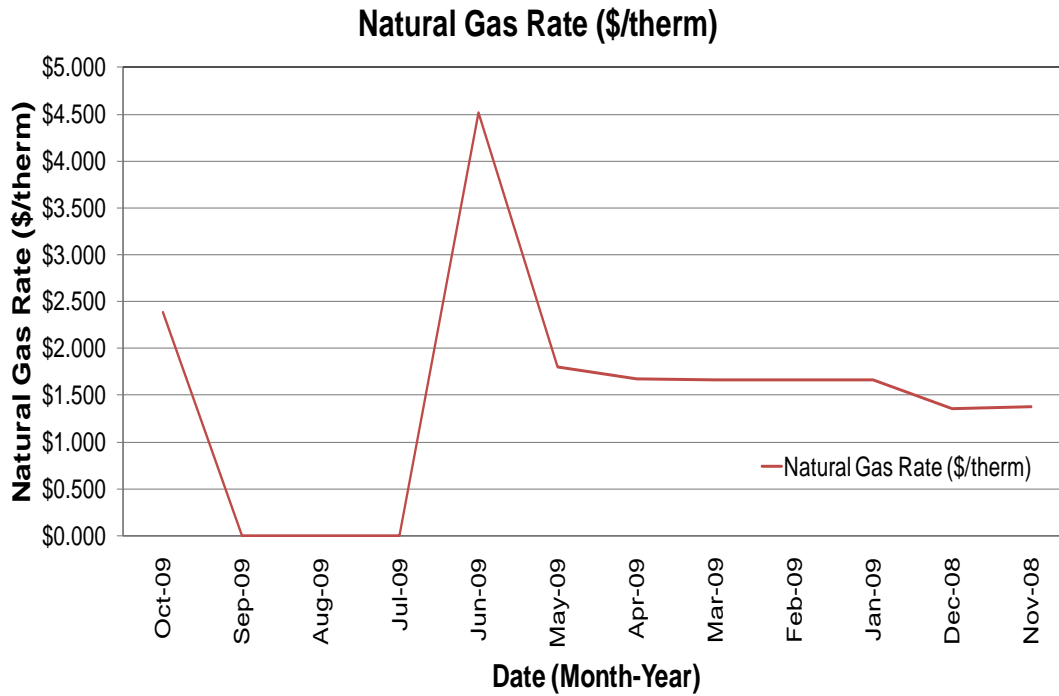
The Public Safety building receives electricity purchased via three incoming meters directly from Atlantic City Electric without an ESCO. An Energy Services Company (ESCO) is a consultancy group that engages in a performance-based contract with a client firm to implement measures which reduce energy consumption and costs in a technically and financially viable manner. SWA analyzed the utility rate for electricity supply over an extended period. Electric bill analysis shows fluctuations of 18% over the 12 month period between November, 2008 and October, 2009.

The Public Safety Building receives natural gas via two incoming meters from the South Jersey Gas Company, which acts as the transportation company and energy supplier. There is not an ESCO engaged in the process. Electricity is also purchased via three incoming meters directly from Atlantic City Electric without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric bill analysis shows fluctuations of 18% over the 12 month period between November, 2008 and October, 2009. Natural gas bill analysis

shows fluctuations up to 71% over the 12 month period between November, 2008 and October, 2009. The high gas price per therm fluctuations in the summer may be due to low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months.

Currently, New Jersey commercial buildings of similar type pay \$0.150/kWh for electricity and \$1.55/therm for natural gas. Currently, the electricity rate for the Public Safety building is \$0.154/kWh, which means there is a potential cost savings of \$2,349 per year. The current natural gas rate for the Public Safety building is \$1.629/therm which means there is a potential cost savings of \$696 per year. Although a large cost savings potential for electricity exists, this involves contacting third party suppliers and negotiating utility rates. SWA recommends that the Township of Lower further explore opportunities of purchasing electricity from third party energy suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the building. Appendix B contains a complete list of third party energy suppliers for the Township of Lower service area. The Township of Lower may want to consider partnering with other school districts, municipalities, townships and communities to aggregate a substantial electric and natural gas use for better leveraging in negotiations with ESCOs and of improving the pricing structures. This sort of activity is happening in many parts of the country and in New Jersey.





6.2. Energy Procurement strategies

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

7. METHOD OF ANALYSIS

7.1. Assumptions and tools

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

7.2. Disclaimer

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

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

Appendix A: Lighting Study of the Public Safety Building

Marker	Floor	Location Room Identification	Existing Fixture Information										Retrofit Information										Annual Savings							
			Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	1	Meeting Room (119)	Recessed	M	4'T12	6	4	40	S	8	365	24	1,104	3,224	T8	Recessed	4'T8	E	OS	6	4	32	6	365	13	846	1853	753	618	1371
2	1	Lunch Room (118)	Recessed	M	4'T12	6	4	40	S	8	365	24	1,104	3,224	T8	Recessed	4'T8	E	OS	6	4	32	6	365	13	846	1853	753	618	1371
3	1	Bathroom (119)	Recessed	M	4'T12	2	4	40	S	4	365	24	368	537	T8	Recessed	4'T8	E	S	2	4	32	4	365	13	282	412	126	0	126
4	1	Bathroom (119)	Parabolic	M	2'T12	1	2	20	S	4	365	16	56	82	T8	Parabolic	2'T8	E	S	1	2	17	4	365	3	37	54	28	0	28
5	1	Storage Room (110)	Recessed	M	4'T12	4	4	40	S	2	365	24	736	537	T8	Recessed	4'T8	E	S	4	4	32	2	365	13	564	412	126	0	126
6	1	Vestibule (110)	Recessed	N	Inc	1	1	65	S	24	365	0	65	569	N/A	Recessed	CFL	N	S	1	1	65	24	365	0	65	569	0	0	0
7	1	Janitor's Closet	Parabolic	M	4'T12	1	1	40	S	2	365	12	52	38	T8	Parabolic	4'T8	E	S	1	1	32	2	365	3	35	26	12	0	12
8	1	Bathroom Men	Parabolic	E	4'T12	1	2	40	S	4	365	15	95	139	T8	Parabolic	4'T8	E	S	1	2	32	4	365	6	70	102	37	0	37
9	1	Bathroom Women	Parabolic	E	4'T12	1	2	40	S	4	365	15	95	139	T8	Parabolic	4'T8	E	S	1	2	32	4	365	6	70	102	37	0	37
10	1	Vestibule	Recessed	M	2'T12	3	4	20	S	24	365	32	336	2,943	T8	Recessed	2'T8	E	S	3	4	17	24	365	5	219	1918	1025	0	1025
11	1	Vestibule	Exit Sign	N	LED	1	1	5	S	24	365	1	6	53	N/A	Exit Sign	LED	N	S	1	1	5	24	365	1	6	53	0	0	0
12	1	Exercise Room (134)	Recessed	M	2'T12	2	4	20	S	8	365	32	224	654	T8	Recessed	2'T8	E	S	2	4	17	8	365	5	146	426	228	0	228
13	1	Electrical Room (134)	Recessed	M	2'T12	1	4	20	S	2	365	32	112	82	T8	Recessed	2'T8	E	S	1	4	17	2	365	5	73	53	28	0	28
14	1	Evidence Room (132)	Recessed	M	2'T12	4	4	20	S	8	365	32	448	1,308	T8	Recessed	2'T8	E	S	4	4	17	8	365	5	292	853	456	0	456
15	1	Hallway	Recessed	M	4'T12	3	4	40	S	24	365	24	552	4,836	T8	Recessed	4'T8	E	S	3	4	32	24	365	13	423	3705	1130	0	1130
16	1	Hallway	Exit Sign	N	LED	2	1	5	S	24	365	1	12	105	N/A	Exit Sign	LED	N	S	2	1	5	24	365	1	12	105	0	0	0
17	1	Office (135)	Recessed	M	4'T12	9	4	40	S	12	365	24	1,656	7,253	T8	Recessed	4'T8	E	OS	9	4	32	9	365	13	1269	4169	1695	1390	3085
18	1	Interview Room (139)	Recessed	M	4'T12	3	4	40	S	4	365	24	552	806	T8	Recessed	4'T8	E	S	3	4	32	4	365	13	423	618	188	0	188
19	1	Interview Room (140)	Recessed	M	4'T12	3	4	40	S	4	365	24	552	806	T8	Recessed	4'T8	E	S	3	4	32	4	365	13	423	618	188	0	188
20	1	Office (141)	Recessed	M	4'T12	3	4	40	S	12	365	24	552	2,418	T8	Recessed	4'T8	E	OS	3	4	32	9	365	13	423	1390	565	463	1028
21	1	Hallway	2'U-shape	M	2'T12	6	2	24	S	24	365	16	384	3,364	T8	2'U-shape	2'T8	E	S	6	2	18	24	365	5	246	2155	1209	0	1209
22	1	Hallway	Exit Sign	N	LED	3	1	5	S	24	365	1	18	158	N/A	Exit Sign	LED	N	S	3	1	5	24	365	1	18	158	0	0	0
23	1	Office (120)	Recessed	M	4'T12	4	4	40	S	12	365	24	736	3,224	T8	Recessed	4'T8	E	OS	4	4	32	9	365	13	564	1853	753	618	1371
24	1	Hallway	2'U-shape	M	2'T12	3	2	24	S	24	365	16	192	1,682	T8	2'U-shape	2'T8	E	S	3	2	18	24	365	5	123	1077	604	0	604
25	1	Storage Room (142)	Recessed	M	4'T12	1	4	40	S	2	365	24	184	134	T8	Recessed	4'T8	E	S	1	4	32	2	365	13	141	103	31	0	31
26	1	Storage Room (143)	Recessed	M	4'T12	2	4	40	S	2	365	24	368	269	T8	Recessed	4'T8	E	S	2	4	32	2	365	13	282	206	63	0	63
27	1	Vestibule	2'U-shape	M	2'T12	1	2	24	S	24	365	16	64	561	T8	2'U-shape	2'T8	E	S	1	2	18	24	365	5	41	359	201	0	201
28	1	Hallway	2'U-shape	M	2'T12	12	2	24	S	24	365	16	768	6,728	T8	2'U-shape	2'T8	E	S	12	2	18	24	365	5	492	4310	2418	0	2418
29	1	Hallway	Exit Sign	N	LED	2	1	5	S	24	365	1	12	105	N/A	Exit Sign	LED	N	S	2	1	5	24	365	1	12	105	0	0	0
30	1	Office (136)	Recessed	M	4'T12	4	4	40	S	12	365	24	736	3,224	T8	Recessed	4'T8	E	OS	4	4	32	9	365	13	564	1853	753	618	1371
31	1	Office (137)	Recessed	M	4'T12	2	4	40	S	12	365	24	368	1,612	T8	Recessed	4'T8	E	OS	2	4	32	9	365	13	282	926	377	309	685
32	1	Office (138)	Recessed	M	4'T12	2	4	40	S	12	365	24	368	1,612	T8	Recessed	4'T8	E	OS	2	4	32	9	365	13	282	926	377	309	685
33	1	Office (138)	Screw-in	N	Inc	4	1	100	S	12	365	0	400	1,752	CFL	Screw-in	CFL	N	OS	4	1	35	9	365	0	140	460	1139	153	1292
34	1	Hallway	2'U-shape	M	2'T12	11	2	24	S	24	365	16	704	6,167	T8	2'U-shape	2'T8	E	S	11	2	18	24	365	5	451	3951	2216	0	2216
35	1	Hallway	Exit Sign	N	LED	2	1	5	S	24	365	1	12	105	N/A	Exit Sign	LED	N	S	2	1	5	24	365	1	12	105	0	0	0
36	1	Bathroom Men	Parabolic	M	2'T12	1	2	20	S	4	365	16	56	82	T8	Parabolic	2'T8	E	S	1	2	17	4	365	3	37	54	28	0	28
37	1	Bathroom Women	Parabolic	M	2'T12	1	2	20	S	4	365	16	56	82	T8	Parabolic	2'T8	E	S	1	2	17	4	365	3	37	54	28	0	28
38	1	Bathroom Women (144)	Recessed	M	4'T12	6	4	40	S	4	365	24	1,104	1,612	T8	Recessed	4'T8	E	OS	6	4	32	3	365	13	846	926	377	309	685
39	1	Janitor's Closet (124)	2'U-shape	M	2'T12	1	2	24	S	2	365	16	64	47	T8	2'U-shape	2'T8	E	S	1	2	18	2	365	5	41	30	17	0	17
40	1	Office (114)	Recessed	M	4'T12	4	4	40	S	12	365	24	736	3,224	T8	Recessed	4'T8	E	OS	4	4	32	9	365	13	564	1853	753	618	1371
41	1	Office (123)	Recessed	M	4'T12	4	4	40	S	12	365	24	736	3,224	T8	Recessed	4'T8	E	OS	4	4	32	9	365	13	564	1853	753	618	1371
42	1	Office (122)	Recessed	M	4'T12	3	4	40	S	12	365	24	552	2,418	T8	Recessed	4'T8	E	OS	3	4	32	9	365	13	423	1390	565	463	1028
43	1	Office (122)	2'U-shape	M	2'T12	1	2	24	S	12	365	16	64	280	T8	2'U-shape	2'T8	E	S	1	2	18	12	365	5	41	180	101	0	101
44	1	Office (113)	Recessed	M	4'T12	4	4	40	S	12	365	24	736	3,224	T8	Recessed	4'T8	E	OS	4	4	32	9	365	13	564	1853	753	618	1371
45	1	Office (121)	Recessed	M	4'T12	4	4	40	S	12	365	24	736	3,224	T8	Recessed	4'T8	E	OS	4	4	32	9	365	13	564	1853	753	618	1371

Location			Existing Fixture Information										Retrofit Information										Annual Savings							
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
46	1	Meeting Room (112)	Recessed	M	4T12	3	4	40	S	8	365	24	552	1,612	T8	Recessed	4T8	EM	OS	3	4	32	6	365	13	423	926	377	309	685
47	1	Office (111)	Recessed	M	4T12	4	4	40	S	12	365	24	736	3,224	T8	Recessed	4T8	EM	OS	4	4	32	9	365	13	564	1853	753	618	1371
48	1	Janitor's Closet (105)	2'U-shape	M	2T12	1	2	24	S	2	365	16	64	47	T8	2'U-shape	2T8	E	S	1	2	18	2	365	5	41	30	17	0	17
49	1	Storage Room (101)	Parabolic	M	8T12	1	2	80	S	2	365	24	184	134	T8	Parabolic	8T8	E	S	1	2	59	2	365	13	131	96	39	0	39
50	1	Bathroom Women (104)	Parabolic	M	2T12	1	2	20	S	4	365	16	56	82	T8	Parabolic	2T8	E	S	1	2	17	4	365	3	37	54	28	0	28
51	1	Bathroom Women (103)	Parabolic	M	2T12	1	2	20	S	4	365	16	56	82	T8	Parabolic	2T8	E	S	1	2	17	4	365	3	37	54	28	0	28
52	1	Electrical Room (100)	Parabolic	M	8T12	1	2	80	S	2	365	24	184	134	T8	Parabolic	8T8	E	S	1	2	59	2	365	13	131	96	39	0	39
53	1	Sprinkler Pump Room (102)	Screw-in	N	Inc	1	1	75	S	4	365	0	75	110	CFL	Screw-in	CFL	N	S	1	1	25	4	365	0	25	37	73	0	73
54	1	Vestibule	2'U-shape	M	2T12	1	2	24	S	24	365	16	64	561	T8	2'U-shape	2T8	E	S	1	2	18	24	365	5	41	359	201	0	201
55	1	Hallway	2'U-shape	M	2T12	14	2	24	S	24	365	16	896	7,849	T8	2'U-shape	2T8	E	S	14	2	18	24	365	5	574	5028	2821	0	2821
56	1	Hallway	Exit Sign	N	LED	4	1	5	S	24	365	1	24	210	N/A	Exit Sign	LED	N	S	4	1	5	24	365	1	24	210	0	0	0
57	1	Evidence Room (106)	Parabolic	M	8T12	3	2	80	S	4	365	24	552	806	T8	Parabolic	8T8	EM	OS	3	2	59	4	365	13	393	574	232	0	232
58	1	Storage Room (115)	Parabolic	M	8T12	1	1	80	S	2	365	16	96	70	T8	Parabolic	8T8	EM	OS	1	1	59	2	365	8	85	47	23	0	23
59	1	Storage Room (107)	Parabolic	M	8T12	1	2	80	S	2	365	24	184	134	T8	Parabolic	8T8	EM	OS	1	2	59	2	365	13	131	96	39	0	39
60	1	Lounge (108)	Recessed	M	4T12	4	4	40	S	8	365	24	736	2,149	T8	Recessed	4T8	EM	OS	4	4	32	6	365	13	564	1235	502	412	914
61	1	Dispatch Room (116)	Recessed	M	4T12	13	4	40	S	24	365	24	2,392	20,954	T8	Recessed	4T8	E	S	13	4	32	24	365	13	1833	16057	4897	0	4897
62	1	Bathroom (116)	2'U-shape	M	2T12	1	2	24	S	4	365	16	64	93	T8	2'U-shape	2T8	E	S	1	2	18	4	365	5	41	60	34	0	34
63	1	Meeting Room (129)	Recessed	M	4T12	8	4	40	S	8	365	24	1,472	4,298	T8	Recessed	4T8	E	OS	8	4	32	6	365	13	1128	2470	1004	823	1828
64	1	Storage Room (109)	Parabolic	M	8T12	3	2	80	S	2	365	24	552	403	T8	Parabolic	8T8	E	S	3	2	59	2	365	13	393	287	116	0	116
65	1	Storage Room (145)	Parabolic	M	8T12	3	2	80	S	2	365	24	552	403	T8	Parabolic	8T8	E	S	3	2	59	2	365	13	393	287	116	0	116
66	1	Hallway	2'U-shape	M	2T12	11	2	24	S	24	365	16	704	6,167	T8	2'U-shape	2T8	E	S	11	2	18	24	365	5	451	3951	2216	0	2216
67	1	Hallway	Exit Sign	N	LED	2	1	5	S	24	365	1	12	105	N/A	Exit Sign	LED	N	S	2	1	5	24	365	1	12	105	0	0	0
68	1	Server Room (156)	Recessed	M	4T12	3	4	40	S	4	365	24	552	806	T8	Recessed	4T8	E	S	3	4	32	4	365	13	423	618	188	0	188
69	1	Office (146)	Recessed	M	4T12	4	4	40	S	12	365	24	736	3,224	T8	Recessed	4T8	E	OS	4	4	32	9	365	13	564	1853	753	618	1371
70	1	Office (147)	Recessed	M	4T12	4	4	40	S	12	365	24	736	3,224	T8	Recessed	4T8	E	OS	4	4	32	9	365	13	564	1853	753	618	1371
71	1	Bathroom Women (157)	Recessed	M	4T12	2	4	40	S	4	365	24	368	537	T8	Recessed	4T8	E	S	2	4	32	4	365	13	282	412	126	0	126
72	1	Bathroom Women (157)	2'U-shape	M	2T12	1	2	24	S	4	365	16	64	93	T8	2'U-shape	2T8	E	S	1	2	18	4	365	5	41	60	34	0	34
73	1	Bathroom Women (157)	Screw-in	N	Inc	1	1	75	S	4	365	0	75	110	CFL	Screw-in	CFL	N	S	1	1	25	4	365	0	25	37	73	0	73
74	1	Men's Locker Room (165)	Recessed	M	4T12	2	4	40	S	8	365	24	368	1,075	T8	Recessed	4T8	E	OS	2	4	32	6	365	13	282	618	251	206	457
75	1	Office (166)	Recessed	M	4T12	2	4	40	S	12	365	24	368	1,612	T8	Recessed	4T8	E	OS	2	4	32	9	365	13	282	926	377	309	685
76	1	Bathroom Men (165)	Screw-in	N	Inc	1	1	75	S	4	365	0	75	110	CFL	Screw-in	CFL	N	S	1	1	25	4	365	0	25	37	73	0	73
77	1	Hallway	2'U-shape	M	2T12	4	2	24	S	24	365	16	266	2,243	T8	2'U-shape	2T8	E	S	4	2	18	24	365	5	164	1437	806	0	806
78	1	Hallway	Exit Sign	N	LED	1	1	5	S	24	365	1	6	53	N/A	Exit Sign	LED	N	S	1	1	5	24	365	1	6	53	0	0	0
79	1	Hallway	Recessed	M	4T12	1	4	40	S	24	365	24	184	1,612	T8	Recessed	4T8	E	S	1	4	32	24	365	13	141	1235	377	0	377
80	1	Janitor's Closet (167)	Parabolic	M	4T12	1	2	40	S	2	365	15	95	69	T8	Parabolic	4T8	E	S	1	2	32	2	365	6	70	51	18	0	18
81	1	Janitor's Closet (168)	Parabolic	M	4T12	1	2	40	S	2	365	15	95	69	T8	Parabolic	4T8	E	S	1	2	32	2	365	6	70	51	18	0	18
82	1	Office (169)	Parabolic	M	4T12	6	4	40	S	12	365	24	1,104	4,836	T8	Parabolic	4T8	E	OS	6	4	32	9	365	13	846	2779	1130	926	2056
83	1	Lunch Room (158)	Recessed	M	4T12	3	4	40	S	4	365	24	552	806	T8	Recessed	4T8	E	S	3	4	32	4	365	13	423	618	188	0	188
84	1	Storage Room (158)	2'U-shape	M	2T12	1	2	24	S	2	365	16	64	47	T8	2'U-shape	2T8	E	S	1	2	18	2	365	5	41	30	17	0	17
85	1	Office (159)	Recessed	M	4T12	9	4	40	S	12	365	24	1,656	7,253	T8	Recessed	4T8	E	OS	9	4	32	9	365	13	1269	4169	1695	1390	3085
86	1	Office (148)	Recessed	M	4T12	3	4	40	S	12	365	24	552	2,418	T8	Recessed	4T8	E	OS	3	4	32	9	365	13	423	1390	565	463	1028
87	1	Office (148)	2'U-shape	M	2T12	1	2	24	S	12	365	16	64	280	T8	2'U-shape	2T8	E	S	1	2	18	12	365	5	41	180	101	0	101
88	1	Office (149)	2'U-shape	M	2T12	1	2	24	S	12	365	16	64	280	T8	2'U-shape	2T8	E	S	1	2	18	12	365	5	41	180	101	0	101
89	1	Office (149)	Recessed	M	4T12	3	4	40	S	12	365	24	552	2,418	T8	Recessed	4T8	E	OS	3	4	32	9	365	13	423	1390	565	463	1028
90	1	Hallway	2'U-shape	M	2T12	4	2	24	S	24	365	16	256	2,243	T8	2'U-shape	2T8	E	S	4	2	18	24	365	5	164	1437	806	0	806

Location			Existing Fixture Information											Retrofit Information											Annual Savings					
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
91	1	Hallway	Exit Sign	N	LED	1	1	5	S	24	365	1	6	53	N/A	Exit Sign	LED	N	S	1	1	5	24	365	1	6	53	0	0	0
92	1	Office (150)	Recessed	M	4T12	6	4	40	S	12	365	24	1,104	4,836	T8	Recessed	4T8	EM	OS	6	4	32	9	365	13	846	2779	1130	926	2056
93	1	Office (150)	Recessed	M	4T12	2	2	40	S	12	365	15	190	832	T8	Recessed	4T8	EM	S	2	2	32	12	365	6	140	613	219	0	219
94	1	Office (150)	Recessed	M	4T12	2	2	40	S	12	365	15	190	832	T8	Recessed	4T8	EM	S	2	2	32	12	365	6	140	613	219	0	219
95	1	Jail cell (153)	Parabolic	M	4T12	1	2	40	S	24	365	15	95	832	T8	Parabolic	4T8	EM	S	1	2	32	24	365	6	70	613	219	0	219
96	1	Jail cell (154)	Parabolic	M	4T12	1	2	40	S	24	365	15	95	832	T8	Parabolic	4T8	EM	S	1	2	32	24	365	6	70	613	219	0	219
97	1	Jail cell (150)	2'U-shape	M	2T12	3	2	24	S	24	365	16	192	1,682	T8	2'U-shape	2T8	EM	S	3	2	18	24	365	5	123	1077	604	0	604
98	1	Garage Bay	Parabolic	M	8T12	2	2	80	S	24	365	24	368	3,224	T8	Parabolic	8T8	EM	S	2	2	59	24	365	13	262	2295	929	0	929
99	1	Garage Bay	HID	N	MH	1	1	150	S	24	365	38	188	1,647	PSMH	HID	PSMH	N	S	1	1	100	24	365	22	122	1069	578	0	578
100	1	Vestibule	2'U-shape	M	2T12	1	2	24	S	24	365	16	64	561	T8	2'U-shape	2T8	E	S	1	2	18	24	365	5	41	359	201	0	201
101	1	Office	Recessed	M	4T12	10	4	40	S	12	365	24	1,840	8,059	T8	Recessed	4T8	EM	S	10	4	32	12	365	13	1410	6176	1883	0	1883
102	1	Storage Room (161)	Recessed	M	4T12	2	4	40	S	2	365	24	368	269	T8	Recessed	4T8	EM	S	2	4	32	2	365	13	282	206	63	0	63
103	1	Office (180)	Recessed	M	4T12	2	4	40	S	12	365	24	368	1,612	T8	Recessed	4T8	EM	OS	2	4	32	9	365	13	282	926	377	309	885
104	1	Office-reception (160)	Recessed	M	4T12	4	4	40	S	6	365	24	736	2,149	T8	Recessed	4T8	EM	OS	4	4	32	6	365	13	564	1235	502	412	914
105	1	Lobby	2'U-shape	M	2T12	4	2	24	S	24	365	16	256	2,243	T8	2'U-shape	2T8	EM	S	4	2	18	24	365	5	164	1437	806	0	806
106	1	Lobby	Exit Sign	N	LED	1	1	5	S	24	365	1	6	53	N/A	Exit Sign	LED	N	S	1	1	5	24	365	1	6	53	0	0	0
107	1	Hallway	Exit Sign	N	LED	1	1	5	S	24	365	1	6	53	N/A	Exit Sign	LED	N	S	1	1	5	24	365	1	6	53	0	0	0
108	1	Hallway	2'U-shape	M	2T12	4	2	24	S	24	365	16	256	2,243	T8	2'U-shape	2T8	E	S	4	2	18	24	365	5	164	1437	806	0	806
109	1	Office (171)	Recessed	M	4T12	2	4	40	S	12	365	24	368	1,612	T8	Recessed	4T8	E	OS	2	4	32	9	365	13	282	926	377	309	685
110	1	Office / Daycare (170)	Screw-in	N	Inc	4	1	15	S	8	365	0	60	175	CFL	Screw-in	CFL	N	S	4	1	5	8	365	0	20	58	117	0	117
111	1	Hallway	Exit Sign	N	LED	1	1	5	S	24	365	1	6	53	N/A	Exit Sign	LED	N	S	1	1	5	24	365	1	6	53	0	0	0
112	1	Hallway	2'U-shape	M	2T12	1	2	24	S	24	365	16	64	561	T8	2'U-shape	2T8	E	S	1	2	18	24	365	5	41	359	201	0	201
113	1	Office	Recessed	M	4T12	3	4	40	S	12	365	24	552	2,418	T8	Recessed	4T8	E	OS	3	4	32	9	365	13	423	1390	565	463	1028
114	1	Janitor's Closet	2'U-shape	M	2T12	1	2	24	S	2	365	16	64	47	T8	2'U-shape	2T8	E	S	1	2	18	2	365	5	41	30	17	0	17
115	1	Office (210)	Recessed	M	4T12	9	4	40	S	12	365	24	1,656	7,253	T8	Recessed	4T8	E	OS	9	4	32	9	365	13	1269	4169	1695	1390	3085
116	1	Office (206)	Recessed	M	4T12	4	4	40	S	12	365	24	736	3,224	T8	Recessed	4T8	EM	OS	4	4	32	9	365	13	564	1853	753	618	1371
117	1	Office (206)	Recessed	M	4T12	1	4	40	S	12	365	24	184	806	T8	Recessed	4T8	E	S	1	4	32	12	365	13	141	618	188	0	188
118	1	Storage Room (206)	Parabolic	M	8T12	1	1	80	S	2	365	16	96	70	T8	Parabolic	8T8	E	S	1	1	59	2	365	6	65	47	23	0	23
119	1	Hallway	2'U-shape	M	2T12	9	2	24	S	24	365	16	576	5,046	T8	2'U-shape	2T8	E	S	9	2	18	24	365	5	369	3232	1813	0	1813
120	1	Hallway	Exit Sign	N	LED	3	1	5	S	24	365	1	18	158	N/A	Exit Sign	LED	N	S	3	1	5	24	365	1	18	158	0	0	0
121	1	Office (207)	Recessed	M	4T12	1	4	40	S	12	365	24	184	806	T8	Recessed	4T8	EM	S	1	4	32	12	365	13	141	618	188	0	188
122	1	Bathroom Men	Parabolic	M	4T12	1	2	40	S	4	365	15	95	139	T8	Parabolic	4T8	E	S	1	2	32	4	365	6	70	102	37	0	37
123	1	Bathroom Women	Parabolic	M	4T12	1	2	40	S	4	365	15	95	139	T8	Parabolic	4T8	E	S	1	2	32	4	365	6	70	102	37	0	37
124	1	Office (200)	Recessed	M	4T12	12	4	40	S	12	255	24	2,208	6,756	T8	Recessed	4T8	E	OS	12	4	32	9	255	13	1692	3883	1579	1294	2873
125	1	Office (200)	2'U-shape	M	2T12	1	2	24	S	12	255	16	64	196	T8	2'U-shape	2T8	E	S	1	2	18	12	255	5	41	125	70	0	70
126	1	Office (200)	Recessed	M	4T12	4	4	40	S	12	255	24	736	2,252	T8	Recessed	4T8	E	S	4	4	32	12	255	13	564	1726	526	0	526
127	1	Office - Prosecutor	Recessed	M	4T12	4	4	40	S	8	255	24	736	1,501	T8	Recessed	4T8	E	OS	4	4	32	6	255	13	564	863	351	288	639
128	1	Hallway	Recessed	M	4T12	2	4	40	S	24	365	24	368	3,224	T8	Recessed	4T8	E	S	2	4	32	24	365	13	282	2470	753	0	753
129	1	Court Room (210)	Recessed	M	4T12	12	4	40	S	8	255	24	2,208	4,504	T8	Recessed	4T8	E	S	12	4	32	8	255	13	1692	3452	1053	0	1053
130	1	Court Room (210)	Exit Sign	N	LED	2	1	5	S	8	255	1	12	24	N/A	Exit Sign	LED	N	S	2	1	5	8	255	1	12	24	0	0	0
131	1	Hallway	Exit Sign	N	LED	2	1	5	S	24	365	1	12	105	N/A	Exit Sign	LED	N	S	2	1	5	24	365	1	12	105	0	0	0
132	1	Hallway	Recessed	M	4T12	5	2	40	S	24	365	15	475	4,161	T8	Recessed	4T8	E	S	5	2	32	24	365	6	350	3066	1095	0	1095
133	1	Hallway	Recessed	M	4T12	2	4	40	S	24	365	24	368	3,224	T8	Recessed	4T8	E	S	2	4	32	24	365	13	282	2470	753	0	753
134	1	Hallway	2'U-shape	M	2T12	2	2	24	S	24	365	16	128	1,121	T8	2'U-shape	2T8	E	S	2	2	18	24	365	5	82	718	403	0	403
135	1	Janitor's Closet (214)	Screw-in	N	Inc	1	1	75	S	2	255	0	75	38	CFL	Screw-in	CFL	N	S	1	1	25	2	255	0	25	13	26	0	26

Location			Existing Fixture Information										Retrofit Information										Annual Savings							
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
136	1	Lobby	2'U-shape	M	2'T12	1	2	24	S	24	365	16	64	561	T8	2'U-shape	2'T8	EM	S	1	2	18	24	365	5	41	359	201	0	201
137	1	Office - Public Defender (211)	Recessed	M	4'T12	2	4	40	S	8	255	24	368	751	T8	Recessed	4'T8	EM	S	2	4	32	8	255	13	282	575	175	0	175
138	1	Bathroom Men	2'U-shape	M	2'T12	3	2	24	S	4	255	16	192	196	T8	2'U-shape	2'T8	EM	S	3	2	18	4	255	5	123	125	70	0	70
139	1	Bathroom Women	2'U-shape	M	2'T12	3	2	24	S	4	255	16	192	196	T8	2'U-shape	2'T8	EM	S	3	2	18	4	255	5	123	125	70	0	70
140	1	Bathroom Women	Parabolic	M	4'T12	1	1	40	S	4	255	12	52	53	T8	Parabolic	4'T8	EM	S	1	1	32	4	255	3	35	36	17	0	17
141	1	Bathroom Men	Parabolic	M	4'T12	1	1	40	S	4	255	12	52	53	T8	Parabolic	4'T8	EM	S	1	1	32	4	255	3	35	36	17	0	17
142	1	Vestibule	Screw-in	N	Inc	4	1	65	S	24	255	0	260	1,591	CFL	Screw-in	CFL	N	S	4	1	20	24	255	0	80	490	1102	0	1102
143	1	Garage Bay	HID	N	MH	11	1	150	S	24	365	38	2,068	18,116	PSMH	HID	PSMH	N	S	11	1	100	24	365	22	1342	11756	6360	0	6360
144	1	Garage Bay	Parabolic	M	8'T12	14	2	80	S	24	365	24	2,576	22,566	T8	Parabolic	8'T8	EM	S	14	2	59	24	365	13	1834	16066	6500	0	6500
145	1	Garage Bay	Exit Sign	N	LED	2	1	5	S	24	365	1	12	105	NA	Exit Sign	LED	N	S	2	1	5	24	365	1	12	105	0	0	0
146	1	Garage Bay	Parabolic	M	8'T12	14	2	80	S	24	365	24	2,576	22,566	T8	Parabolic	8'T8	EM	S	14	2	59	24	365	13	1834	16066	6500	0	6500
147	1	Vestibule	2'U-shape	M	2'T12	2	2	24	S	24	365	16	128	1,121	T8	2'U-shape	2'T8	EM	S	2	2	18	24	365	5	82	718	403	0	403
148	1	Vestibule	Exit Sign	N	LED	1	1	5	S	24	365	1	6	51	N/A	Exit Sign	LED	N	S	1	1	5	24	365	1	6	51	33	0	33
149	1	Office	Recessed	M	4'T12	4	4	40	S	8	365	24	736	2,149	T8	Recessed	4'T8	EM	S	4	4	32	8	365	13	564	1847	502	0	502
150	1	Bathroom	Parabolic	M	4'T12	1	2	40	S	4	365	15	95	139	T8	Parabolic	4'T8	EM	S	1	2	32	4	365	6	70	102	37	0	37
151	1	Bathroom (419)	Parabolic	M	4'T12	1	2	40	S	4	365	15	95	139	T8	Parabolic	4'T8	EM	S	1	2	32	4	365	6	70	102	37	0	37
152	1	Office (418)	Recessed	E	4'T8	1	4	32	S	8	365	13	141	412	N/A	Recessed	4'T8	E	S	1	4	32	8	365	13	141	412	0	0	0
153	1	Office (202)	Recessed	E	4'T8	2	4	32	S	8	365	13	282	823	N/A	Recessed	4'T8	E	S	2	4	32	8	365	13	282	823	0	0	0
154	1	Office (202)	Exit Sign	N	LED	1	1	5	S	8	365	1	6	18	N/A	Exit Sign	LED	N	S	1	1	5	8	365	1	6	18	0	0	0
155	1	Office (417)	Recessed	E	4'T8	4	4	32	S	8	365	13	564	1,647	N/A	Recessed	4'T8	E	S	4	4	32	8	365	13	564	1,647	0	0	0
156	1	Office (415)	Recessed	E	4'T8	2	4	32	S	8	365	13	282	823	C	Recessed	4'T8	E	OS	2	4	32	6	365	13	282	618	0	206	206
157	1	Office (416)	Recessed	E	4'T8	2	4	32	S	8	365	13	282	823	N/A	Recessed	4'T8	E	S	2	4	32	8	365	13	282	823	0	0	0
158	1	Office (414)	Recessed	E	4'T8	3	4	32	S	8	365	13	423	1,235	C	Recessed	4'T8	E	OS	3	4	32	6	365	13	423	926	0	309	309
159	1	Office (420)	Recessed	E	4'T8	6	4	32	S	8	365	13	846	2,470	C	Recessed	4'T8	E	OS	6	4	32	6	365	13	846	1,853	0	618	618
160	1	Storage Room (420)	Recessed	E	4'T8	3	4	32	S	2	365	13	423	309	N/A	Recessed	4'T8	E	S	3	4	32	2	365	13	423	309	0	0	0
161	1	Office (413)	Recessed	E	4'T8	3	4	32	S	8	365	13	423	1,235	C	Recessed	4'T8	E	OS	3	4	32	6	365	13	423	926	0	309	309
162	1	Office (421)	Recessed	E	4'T8	4	4	32	S	8	365	13	564	1,647	C	Recessed	4'T8	E	OS	4	4	32	6	365	13	564	1,235	0	412	412
163	1	Office (412)	Recessed	E	4'T8	3	4	32	S	8	365	13	423	1,235	C	Recessed	4'T8	E	OS	3	4	32	6	365	13	423	926	0	309	309
164	1	Office (411)	Recessed	E	4'T8	4	4	32	S	8	365	13	564	1,647	C	Recessed	4'T8	E	OS	4	4	32	6	365	13	564	1,235	0	412	412
165	1	Lunch Room (410)	Recessed	E	4'T8	4	4	32	S	8	365	13	564	1,647	C	Recessed	4'T8	E	OS	4	4	32	6	365	13	564	1,235	0	412	412
166	1	Storage Room (423)	Recessed	E	4'T8	6	4	32	S	2	365	13	846	618	N/A	Recessed	4'T8	E	S	6	4	32	2	365	13	846	618	0	0	0
167	1	Storage Room (422)	Recessed	E	4'T8	4	4	32	S	2	365	13	564	412	N/A	Recessed	4'T8	E	S	4	4	32	2	365	13	564	412	0	0	0
168	1	Garage	Parabolic	M	4'T12	10	2	40	S	24	365	15	950	8,322	T8	Parabolic	4'T8	EM	S	10	2	32	24	365	6	700	6132	2190	0	2190
169	1	Laundry (409)	Parabolic	E	4'T8	2	2	32	S	2	365	6	140	102	N/A	Parabolic	4'T8	E	S	2	2	32	2	365	6	140	102	0	0	0
170	1	Showers Women (408)	Screw-in	N	Inc	1	1	65	S	4	365	0	65	95	CFL	Screw-in	CFL	N	S	1	1	20	4	365	0	20	29	66	0	66
171	1	Showers Men (407)	Screw-in	N	Inc	1	1	65	S	4	365	0	65	95	CFL	Screw-in	CFL	N	S	1	1	20	4	365	0	20	29	66	0	66
172	1	Bathroom	Parabolic	M	2'T12	1	2	20	S	4	365	16	56	82	T8	Parabolic	2'T8	EM	S	1	2	17	4	365	3	37	54	28	0	28
173	1	Bathroom Men	Parabolic	M	2'T12	1	2	20	S	4	365	16	56	82	T8	Parabolic	2'T8	EM	S	1	2	17	4	365	3	37	54	28	0	28
174	1	Meeting Room (401)	Recessed	E	4'T8	4	4	32	S	8	365	13	564	1,647	C	Recessed	4'T8	E	OS	4	4	32	6	365	13	564	1,235	0	412	412
175	1	Meeting Room (401)	Exit Sign	N	LED	1	1	5	S	8	365	1	6	18	N/A	Exit Sign	LED	N	S	1	1	5	8	365	1	6	18	0	0	0
176	1	Electrical Room (402)	Parabolic	M	8'T12	2	2	80	S	2	365	24	368	269	T8	Parabolic	8'T8	E	S	2	2	59	2	365	13	262	191	77	0	77
177	1	Garage	Exit Sign	N	LED	3	1	5	S	24	365	1	18	158	N/A	Exit Sign	LED	N	S	3	1	5	24	365	1	18	158	0	0	0
178	1	Storage Room (404)	Parabolic	M	8'T12	1	2	80	S	2	365	24	184	134	T8	Parabolic	8'T8	E	S	1	2	59	2	365	13	131	96	39	0	39
179	1	Storage Room (403)	Parabolic	M	8'T12	1	2	80	S	2	365	24	184	134	T8	Parabolic	8'T8	E	S	1	2	59	2	365	13	131	96	39	0	39
180	1	Hallway	2'U-shape	M	2'T12	12	2	24	S	24	365	16	768	6,728	T8	2'U-shape	2'T8	E	S	12	2	18	24	365	5	492	4310	2418	0	2418
181	1	Hallway	Exit Sign	N	LED	4	1	5	S	24	365	1	24	210	N/A	Exit Sign	LED	N	S	4	1	5	24	365	1	24	210	0	0	0
182	Ext	Exterior (1)	Exterior	N	Inc	10	1	90	T	12	365	0	900	3,942	N/A	Exterior	CFL	N	T	10	1	90	12	365	0	900	3,942	0	0	0
Totals:						596	479	6,782				2,997	77,369	353,896						596	479	5,161			1,482	58,925	236,471	92,530	24,895	117,425

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

Appendix B: Third Party Energy Suppliers (ESCOs)
<http://www.state.nj.us/bpu/commercial/shopping.html>

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Third Party Gas Suppliers for South Jersey Gas Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greastern.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
MxEnergy, Inc. 510 Thomall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

Appendix C: Glossary and Method of Calculations

Glossary of ECM Terms

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

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

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

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

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

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

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

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

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

Calculation References

ECM = Energy Conservation Measure
AOCS = Annual Operating Cost Savings
AECS = Annual Energy Cost Savings
LOCS = Lifetime Operating Cost Savings
LECS = Lifetime Energy Cost Savings

NPV = Net Present Value
 IRR = Internal Rate of Return
 DR = Discount Rate

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

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

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

Excel NPV and IRR Calculation

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

	A	B	C	D	E	F	G	H	I
1									
2									
3					Year	Cash Flow			
4					0	\$ (5,000.00)	←	Investment Cost	
5					1	\$ 850.00			
6					2	\$ 850.00			
7					3	\$ 850.00			
8					4	\$ 850.00			
9	ECM Lifetime				5	\$ 850.00			
10					6	\$ 850.00			
11					7	\$ 850.00			
12					8	\$ 850.00			
13					9	\$ 850.00			
14					10	\$ 850.00			
15									
16					IRR	11.03%	←	Formula: =IRR(F4:F14) =NPV(0.03,F5:F14)+F4	
17					NPV	\$2,250.67			
18									
19									

ECM and Equipment Lifetimes

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

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

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

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

NJCEP C & I Lifetimes

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