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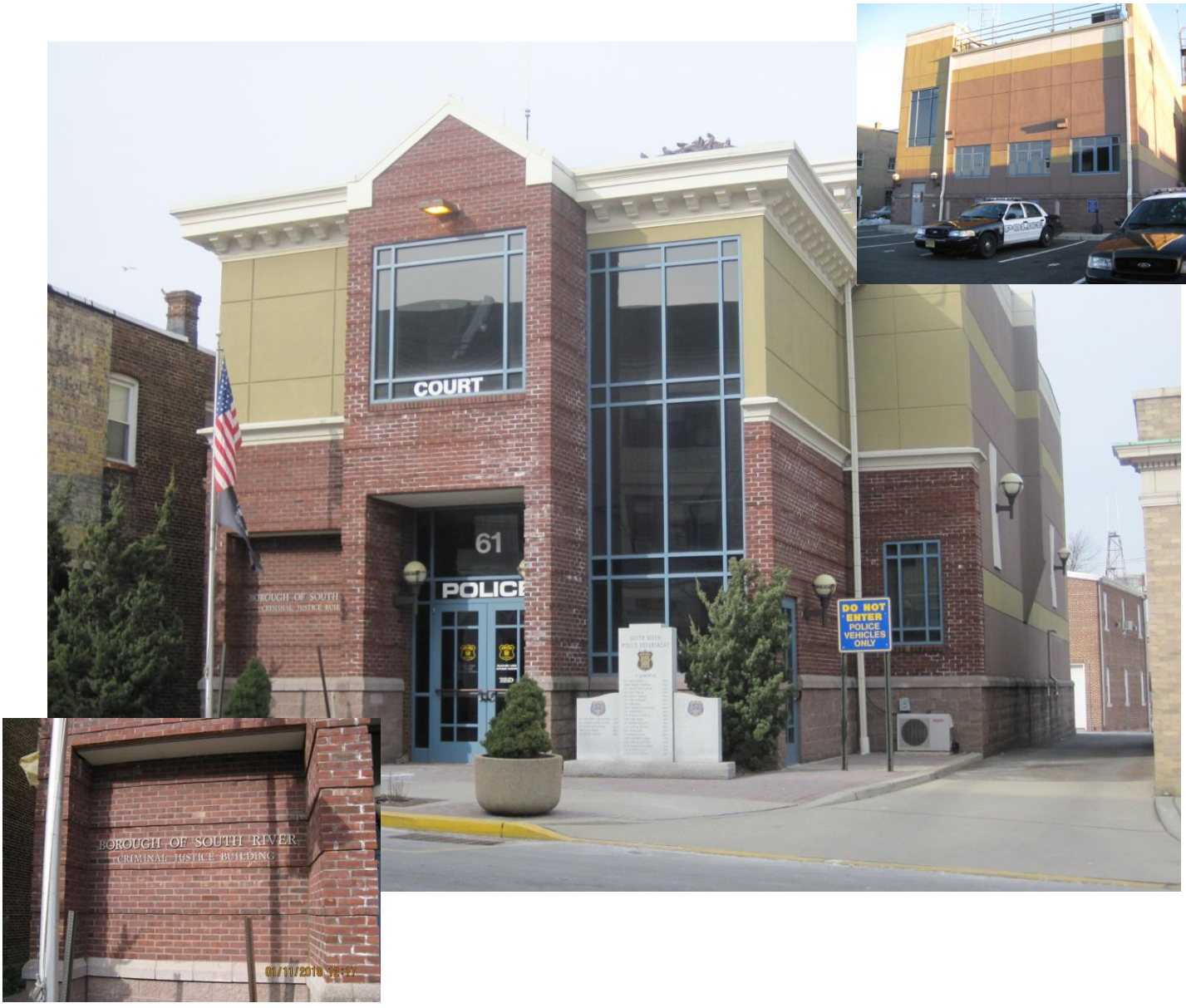
April 30, 2010

Local Government Energy Program
Energy Audit Final Report

South River Criminal Justice Building
South River, NJ 08882

Project Number: LGEA48



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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 Borough of South River municipal buildings. The audit, conducted on January 5th, 11th and 12th, included a review of the:

- Human Services Building
- Public Library
- War Memorial Building
- George Street Firehouse
- Appleby Avenue Firehouse
- Municipal Building
- Criminal Justice Building
- Roads Department Building
- Criminal Justice Building

The buildings are located in South River, NJ. A separate energy audit report is issued for each of the referenced buildings.

This report addresses the South River Criminal Justice Building located at 61 Main St., South River, NJ 08882. The current conditions and energy-related information were collected in order to analyze and facilitate the implementation of energy conservation measures for the building.

The two-story with basement South River Criminal Justice Building, which houses the Police Department and Borough Court has had a few renovations since it was built in 1906 with the last occurring in 2002 when the building underwent a major infrastructure renovation with additions. The building consists of 13,000 square feet of conditioned space, and houses storage spaces, meeting/conference rooms, mechanical equipment rooms, a squad room, bathrooms, locker rooms, administrative offices, two prison cells, a domestic crisis room, radio equipment/server rooms, lobbies, a judge's chamber and the court/council chambers. The normal occupancy for the Criminal Justice Building is approximately 30 full-time administrative employees during the daytime plus visitors (approximately 10 to 30 at any given time during the week) for the Police Department and the Court Room when it is in session (as many as 250 visitors, one day a week). The administrative part of the building is normally operated Monday - Friday 8:00 am to 4:00 pm and also some evenings. The Police Department (which has 63 employees) operates 24 hours/7 days a week with approximately 5-6 employees working the overnight shift and weekends.

The goal of this Local Government Energy Audit (LGEA) is to provide sufficient information to the Borough of South River to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Criminal Justice 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 (BPUs) Office of Clean Energy has assigned TRC Energy Services to administer the Program.

EXECUTIVE SUMMARY

The energy audit performed by Steven Winter Associates (SWA) encompasses the Criminal Justice Building located at 61 Main St., South River, NJ 08882. The Criminal Justice Building is a two-story building with basement comprising of a total floor area of 13,000 square feet. The original structure was built in 1906, with additions and renovations, last major upgrade occurring in the 2002.

Based on the field visits performed by the SWA staff on January 5th, 11th and 12th 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.

From November 2008 through October 2009 the Criminal Justice Building consumed 250,720 kWh or $32,594 worth of electricity at an approximate rate of $0.130/kWh and 3,660 therms or $4,248 worth of natural gas at an approximate rate of $1.161/therm. The joint energy consumption for the building, including both electricity and natural gas, was 1,222 MMBtu of energy that cost a total of $36,842.

SWA has entered energy information about the Criminal Justice Building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* Energy benchmarking system. This mixed use Public Order and Safety/Police Station facility is comprised of non-eligible (Other) space type, since national comparisons are yet unavailable for rating. SWA encourages the Borough of South River to continue entering utility data in *Energy Star Portfolio Manager* in order to track weather normalized source energy use over time. EPA is continually working to expand the available space types.

The Site Energy Use Intensity is 94 kBtu/ft^{2}yr compared to the national average of borough Public Order and Safety/Police Station buildings consuming 78 kBtu/ft^{2}yr. Implementing this report's recommendations will reduce use approximately 11.2 kBtu/ft^{2}yr and subtracting 11.5 kBtu/ft^{2}yr cooling of the server rooms would make the building energy consumption better than the national average.

Based on the assessment of the Criminal Justice 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

- Select NEMA Premium motors when replacing motors at the end of their useful operating lives
- Install a Building Management System (BMS)
- Slope roof surface to drain effectively at time of reroofing with the next major renovation

Category II Recommendations: Operations and Maintenance

- Maintain roofs - SWA recommends regular maintenance to verify water is draining correctly
- Maintain downspouts and cap flashing - repair/install missing downspouts and cap flashing as needed
- Provide weather stripping/air-sealing
- Repair/seal wall cracks and penetrations

- Provide water efficient fixtures and controls
- Use Energy Star labeled appliances
- Use smart power electric strips
- Create an energy educational program

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

At this time, SWA highly recommends a total of **2** Energy Conservation Measures (ECMs) for the Criminal Justice Building, as summarized in the following Table 1. The total investment cost for these ECMs without incentives is **$16,700**. SWA estimates a first year savings of **$6,097** with a simple payback of **2.7 years**. SWA also recommends **3** more ECMs with a total first-year savings of **$454,** as summarized in Table 2. SWA estimates that implementing these recommended ECMs will reduce the carbon footprint of the Criminal Justice Building by **61,554 lbs of CO_2**, which is equivalent to removing approximately five cars from the roads each year or avoiding the need of 150 trees to absorb the annual CO_2 generated.

There are various incentives available in New Jersey to lower the cost of installing the Energy Conservation Measures (ECMs), like the NJ SmartStart program and Direct Install through the New Jersey Office of Clean Energy. These incentive programs can help provide technical assistance for the building in the implementation phase of any energy conservation project. The Borough of South River and six other nearby boroughs have a long-term contract to purchase electricity as a consortium from the South River Electric Utility and do not pay the Societal Benefit Charges (SBCs) that fund NJCEP programs. Therefore, the Borough of South River is not eligible to receive any equipment incentives for energy conservation under the New Jersey Clean Energy Program (NJCEP) at the present time. SWA recommends the Borough of South River initiate a dialogue with the Board of Public Utilities (BPU) to gain access to these and other incentives in the future.

The following two tables summarize the proposed Energy Conservation Measures (ECMs) and their economic relevance. In order to clearly present the overall energy opportunities for the building and ease the decision and choice of which ECM to implement, SWA calculated each ECM independently and did not incorporate slight/potential overlaps between some of the summarized ECMs (i.e. lighting change influence on heating/cooling).

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
1.1	Replace (9) incandescent and (2) Metal Halide lamps with CFLs	RS Means, Lit Search	450	0	450	4,152	0.9	0	1.1	53	592	5	2,961	0.8	558	112	130	2,177	7,434
2	Retro commission-ing	Similar projects	16,250	None at this time	16,250	25,072	5.2	366	9.4	1,820	5,504	12	66,051	3.0	306	26	33	36,716	48,926
	Totals		**16,700**	**0**	**16,700**	**29,224**	**6.1**	**366**	**10.5**	**1,873**	**6,097**	**-**	**69,013**	**2.7**	**313**	**-**	**35**	**38,894**	**56,360**

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
1.2	Install (8) occupancy sensors	RS Means, Lit Search	1,760	0	1,760	2,262	0.5	0	0.6	0	294	12	3,529	6.0	100	8	13	1,097	4,050
3	Replace old basement refrigerator with an 18 cu ft Energy Star model	Energy Star purchasing and procurement site, similar projects	750	0	750	350	0.1	0	0.1	50	96	12	1,146	7.9	53	4	7	183	627
1.3	Replace (1) exterior High Pressure Sodium fixture with pulse start MH type	RS Means, Lit Search	650	0	650	289	0.1	0	0.1	26	64	15	960	10.2	48	3	5	100	517
	Totals		**3,160**	**0**	**3,160**	**2,901**	**0.6**	**0**	**0.8**	**76**	**454**	**-**	**5,634**	**7.0**	**78**	**-**	**10**	**1,380**	**5,194**

1. HISTORIC ENERGY CONSUMPTION

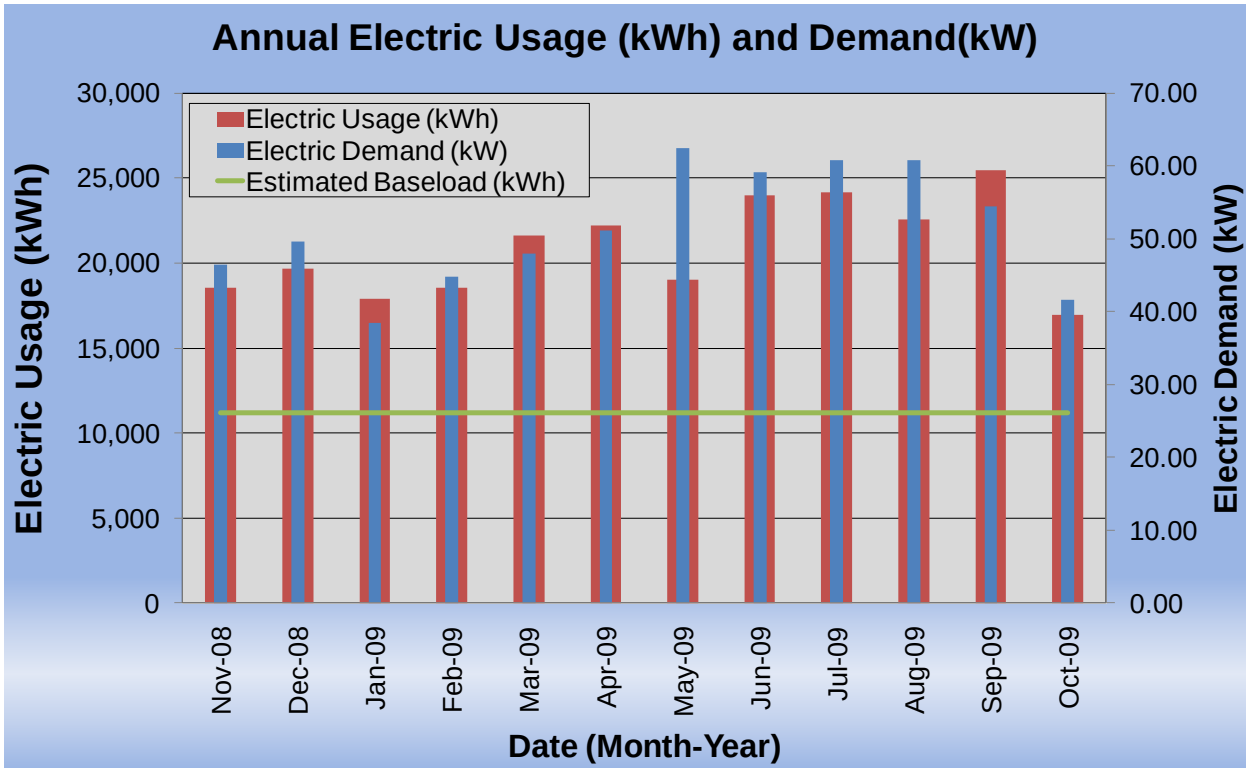
1.1. Energy Usage and Cost Analysis

SWA analyzed utility bills from December 2007 through October 2009 that were received from the utility companies supplying the South River Criminal Justice Building with electric and natural gas.

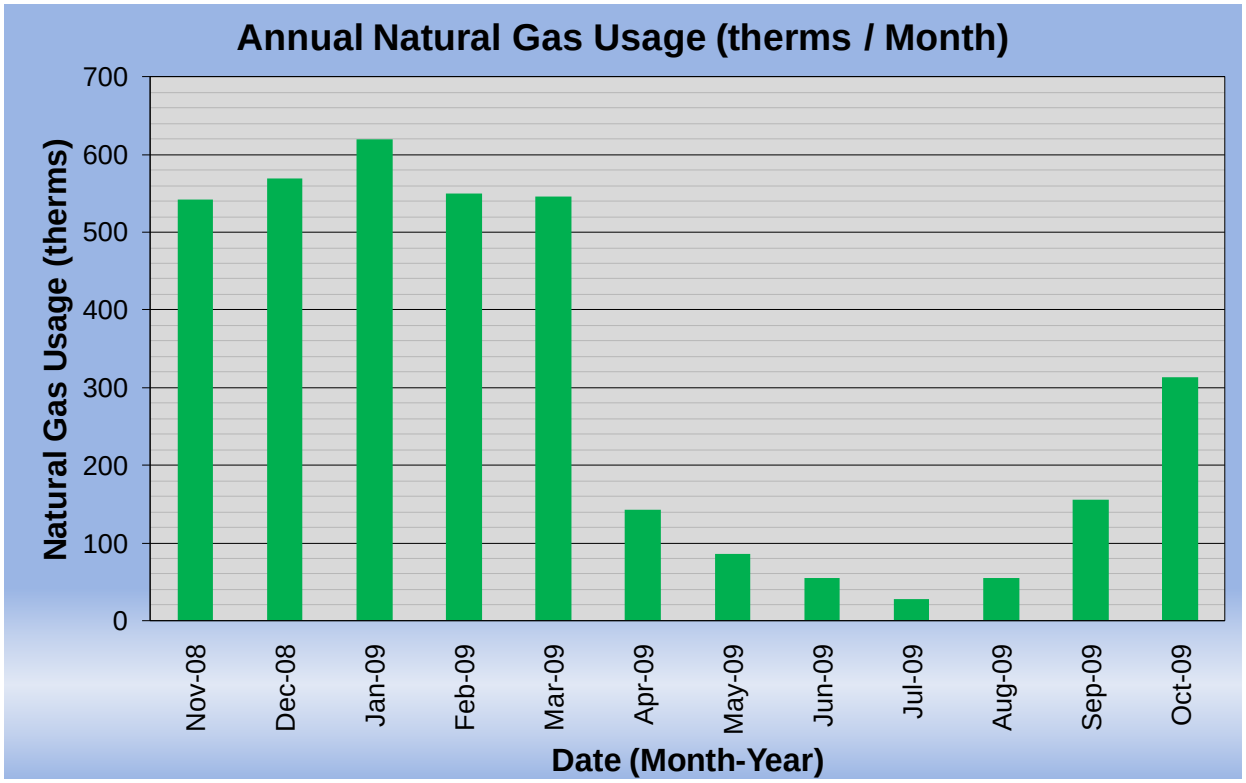
Electricity - The South River Criminal Justice Building is currently served by one electric meter. The Criminal Justice Building currently buys electricity from South River Electric Utility at **an average rate of $0.130/kWh** based on 12 months of utility estimates from November 2008 through October 2009. The Criminal Justice Building purchased **approximately 250,720 kWh or $32,594 worth of electricity** in the previous year. The average monthly demand was 51 kW.

Natural gas - The South River Criminal Justice Building is currently served by one meter for natural gas. The South River Criminal Justice Building currently buys natural gas from PSE&G at **an average aggregated rate of $1.161/therm** based on 12 months of utility bills for November 2008 through October 2009. The South River Criminal Justice Building purchased **approximately 3,660 therms or $4,248 worth of natural gas** in the previous year at a very competitive rate.

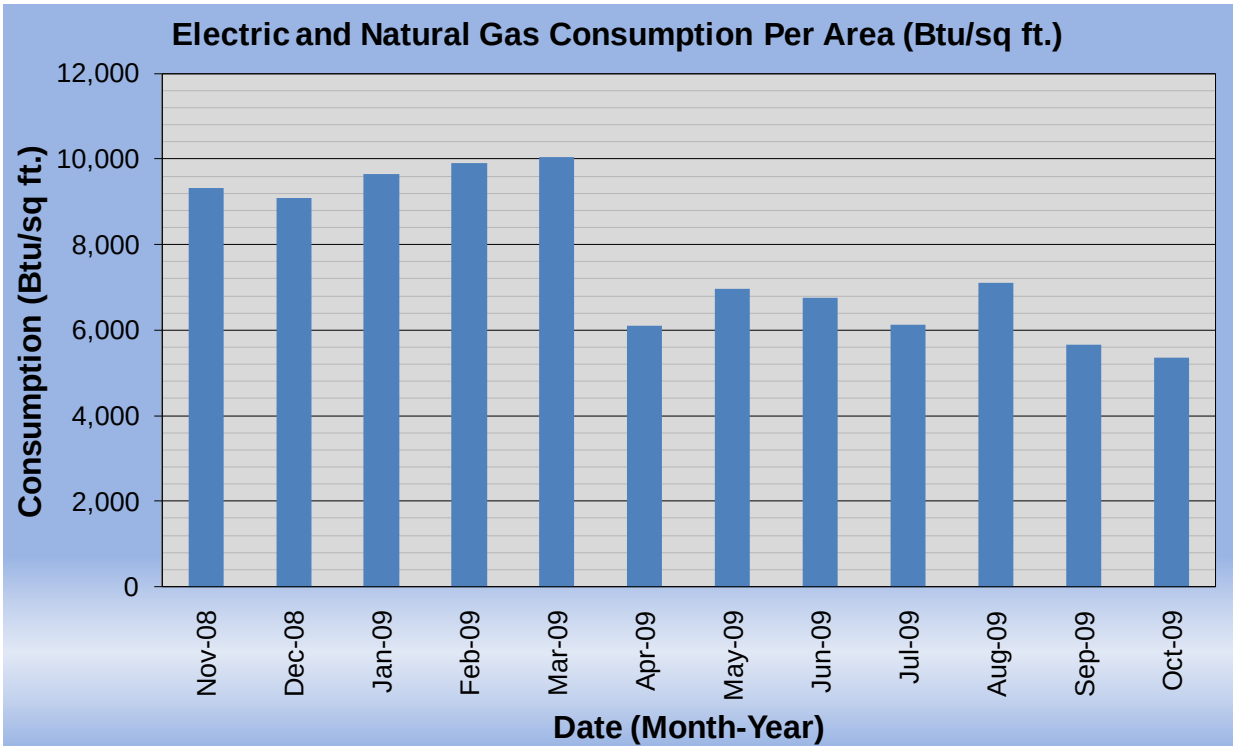
The following chart shows electricity consumption for the Criminal Justice Building based on electric bills for the 12 month period of November 2008 through October 2009.



The following chart shows the natural gas consumption for the Criminal Justice Building based on natural gas bills for the 12 month period of November 2008 through October 2009.

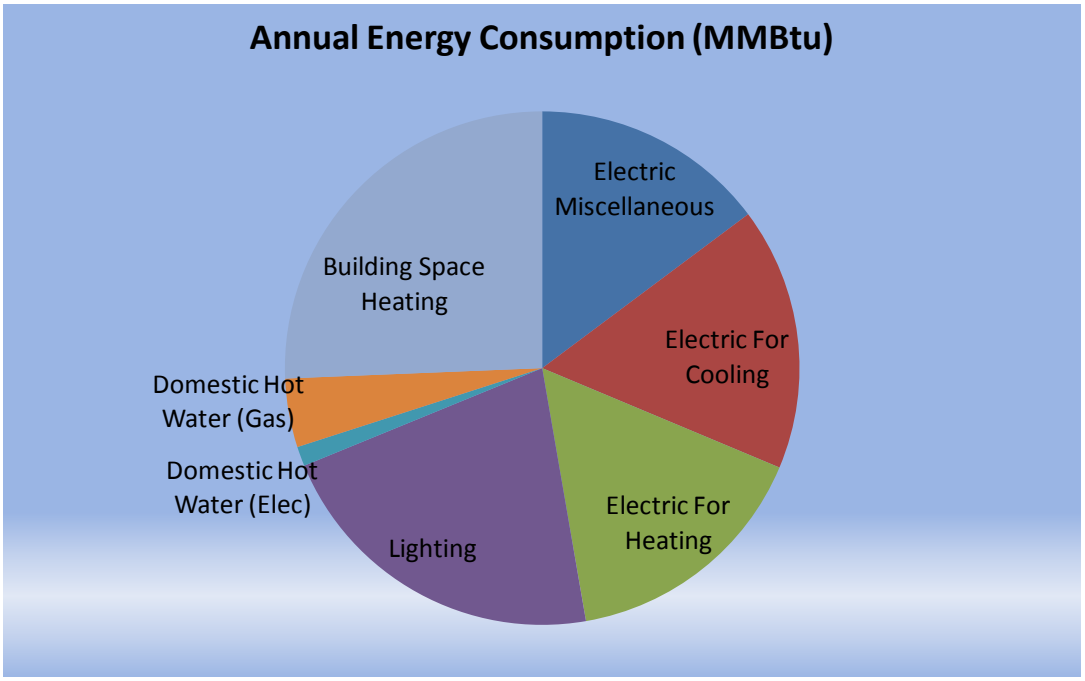


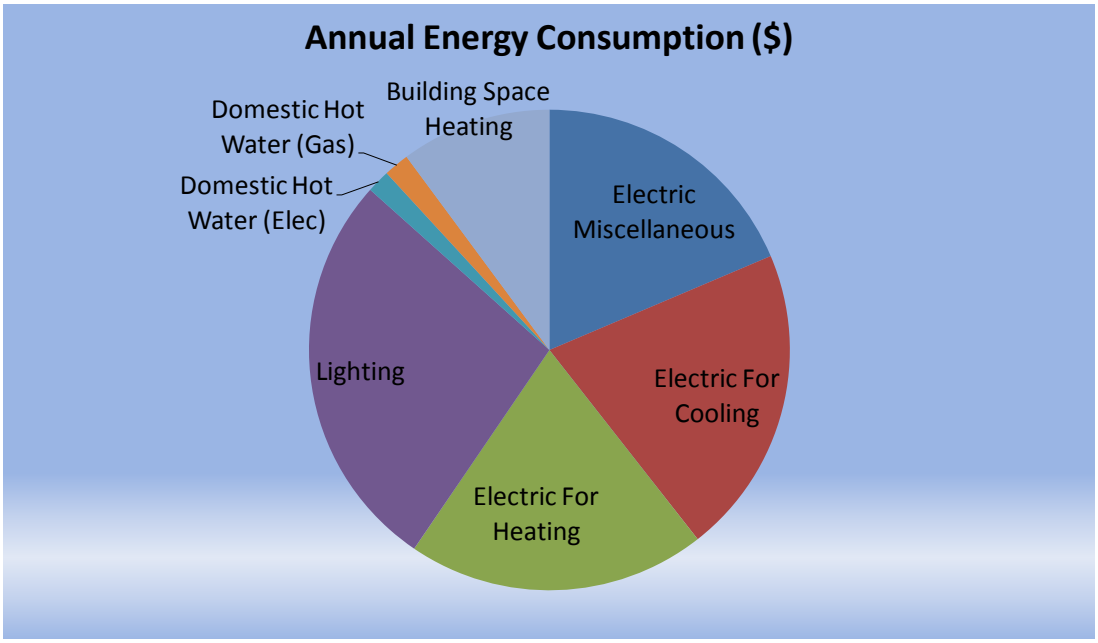
The following chart shows combined natural gas and electric consumption in Btu/sq ft for the Criminal Justice Building based on estimates and utility bills for the 12 month period of November 2008 through October 2009.



The following table and pie charts show energy use for the Criminal Justice Building based on utility bills for the 12 month period of November 2008 through October 2009. Note electrical cost at $37/MMBtu of energy is more than 3 times as expensive to use as natural gas at $12/MMBtu.

2009 Annual Energy Consumption/Costs					
	MMBtu	**% MMBtu**	**$**	**% $**	**$/MMBtu**
Electric Miscellaneous	181	15%	$6,879	19%	38
Electric For Cooling	202	17%	$7,696	21%	38
Electric For Heating	195	16%	$7,426	20%	38
Lighting	263	22%	$10,021	27%	38
Domestic Hot Water (Electric)	15	1%	$572	2%	38
Domestic Hot Water (Gas)	53	4%	$613	2%	12
Building Space Heating	313	26%	$3,635	10%	12
Totals	1,222	100%	$36,842	100%	30
Total Electric Usage	856	70%	$32,594	88%	38
Total Gas Usage	366	30%	$4,248	12%	12
Totals	1,222	100%	$36,842	100%	30





1.2. Utility Rate

The Criminal Justice Building currently purchases electricity from South River Electric Utility at a general service market rate for electricity use (kWh) with a separate (kW) demand charge. The Criminal Justice Building currently pays an average rate of approximately $0.130/kWh based on the 12 months estimates of November 2008 through October 2009.

The Criminal Justice Building currently purchases natural gas supply from the PSE&G at a competitive general service market rate for natural gas (therms). PSE&G also acts as the transport company. There is one gas meter that provides natural gas service to the Criminal Justice Building currently. The average aggregated rate (supply and transport) for the meter is approximately $1.161/therm based on 12 months of utility bills for November 2008 through October 2009.

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

1.3. Energy Benchmarking

SWA has entered energy information about the Criminal Justice Building in the U.S. Environmental Protection Agency's (EPA) *Energy Star Portfolio Manager* energy benchmarking system. This Public Order and Safety/Police Station facility is comprised of non-eligible (Other) space type, since national comparisons are yet unavailable for rating. A Public Assembly/Recreation facility space or "Other" can be used to classify a facility or a portion of a facility where the primary activity does not fall into any of the available space types. Consequently, the Criminal Justice Building is not eligible to receive a national energy performance rating at this time.

The Site Energy Use Intensity is 94.0 kBtu/sq ft yr compared to the national average of a borough Public Order and Safety/Police Station building consuming 78.0 kBtu/sq ft yr.

Implementing this report's highly recommended Energy Conservations Measures (ECMs) will reduce use by approximately 10.5 kBtu/sq ft yr, with an additional 0.8 kBtu/sq ft yr from the recommended ECMs. These recommendations could account for at least 11.2 kBtu/sq ft yr reduction when implemented and subtracting 11.5 kBtu/ft^2yr cooling of the server rooms would make the building energy consumption better than the national average.

Per the LGEA program requirements, SWA has assisted the Borough of South River to create an *Energy Star Portfolio Manager* account and share the Criminal Justice Building facilities information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager site information with the Borough of South River (user name of "sriverboro" with a password of "sriverboro") and TRC Energy Services (user name of TRC-LGEA).

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of South River - Criminal Justice Building

Building ID: 2019123
For 12-month Period Ending: October 31, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: February 03, 2010

Facility
Borough of South River - Criminal Justice Building
61 Main Street
South River, NJ 08882

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1906
Gross Floor Area (ft²): 13,000

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	848,165
Natural Gas (kBtu)[4]	377,161
Total Energy (kBtu)	1,225,326

Energy Intensity[5]

Site (kBtu/ft²/yr)	94
Source (kBtu/ft²/yr)	248

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	149

Electric Distribution Utility
Borough of South River

National Average Comparison

National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	58%
Building Type	Fire Station/Police Station

Stamp of Certifying Professional

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

Certifying Professional
N/A

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

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

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

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

EPA Form 5900-16

2. FACILITY AND SYSTEMS DESCRIPTION

2.1. Building Characteristics

The two-story with basement South River Criminal Justice Building which houses the Police Department and Borough Court, has had a few renovations since it was built in 1906, with the last occurring in 2002 when the building underwent a major infrastructure renovation with additions. The building consists of 13,000 square feet of conditioned space. The basement houses a janitor's closet, a meeting room, a mechanical equipment room, a squad room, an evidence storage area, a men's locker room, a records storage area, a women's locker room, an elevator equipment room and a general storage room. The Police Department first floor houses a captain's office, an administrative assistant space, a chief's office, a booking room, a women's restroom, a men's restroom, a general storage area, a detective bureau, an evidence lockup area, an interview report room, two prison cells, a domestic crisis room, a general office, a communication room, a radio equipment room and the lower and upper lobbies. The Court second floor houses a meeting room, a restroom, a general storage area, a consultation room, a judge's chamber, a lateral file area, a court clerk room, the court/council chambers, conference rooms 1 & 2, a women's restroom, a men's restroom and a lobby. There is a Sever room at the top of the stairs leading to the rooftop.

Front and Partial Side Façade

Rear and Partial Side Façade

2.2. Building Occupancy Profiles

The normal occupancy for the South River Criminal Justice Building is approximately 30 full-time administrative employees during the daytime, plus visitors (approximately 10 to 30 at any onetime during the week) for the Police Department and the Court Room when it is in session (as many as 250 visitors, one day a week). The administrative part of the building is normally operated Monday - Friday 8:00 am to 4:00 pm and also some evenings for court/council sessions and committee meetings (7:00 pm to 10:00 pm). The Police Department (which has 63 employees) operates 24 hours/7 days a week with approximately 20 officers/staff working during the day (8:00 am to 4:00 pm), 10-15 employees working the afternoons/evenings (4:00 pm to 10:00 pm) and 5-6 employees working the overnight shift and weekends.

2.3. Building Envelope

Due to unfavorable weather conditions (min. 20 deg F delta-T in/outside & no/low wind) for the building's exterior envelope finish material (EIFS), no infrared (IR) images were taken during the field audit of this building.

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

2.3.1. Exterior Walls

The exterior wall envelope is mostly constructed of EIFS (Exterior Insulation Finishing System) with a split-face stone veneer base and some brick veneer accents over 5-1/2" framing with 6 inches of fiberglass batt cavity R-19 insulation. Other areas are constructed of brick veneer with a split-face base and some assumed limestone accents over 5-1/2" framing with 6 inches of fiberglass batt cavity R-19 insulation. The interior is mostly painted gypsum wallboard and painted CMU (Concrete Masonry Unit).

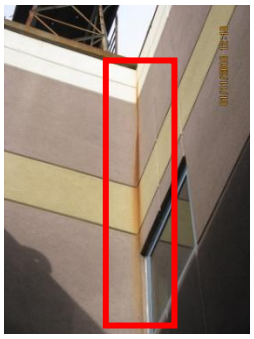
Note: Wall as built insulation levels could not be verified in the field or on construction plans and are based upon similar wall types and time of construction.

During the field audit exterior and interior wall surfaces were inspected. They were found/reported to be in overall acceptable condition with only a few signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues detected on all facades.

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

Horizontal EIFS/stucco surface is directly exposed to the elements lacking cover or flashing.

Missing/ineffectively-applied caulk *and damaged exterior finish material.*



Uncontrolled roof water run-off due to missing gutters and downspouts.

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

Missing/ineffectively-applied caulk/mortar

Signs of uncontrolled roof water runoff on walls due to missing/defective roof flashing

Missing/ ineffectively-applied caulk

In light of the exterior wall conditions mentioned above SWA offers the following recommendations, which are further outlined and categorized in the *Executive Summary*:

1. Install pan/strip flashing at horizontal EIFS/stucco projections.

2. Inspect and replace cracked/ineffective caulk/mortar joints.

3. Install/repair and maintain flashing to minimize uncontrolled wind driven and roof water run-off causing exterior wall damage.

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

2.3.2. Roof

Over half of the building's roof is a flat and parapet type over steel decking with a built-up asphalt finish and reflective coating in part and 2002 EPDM rubber over 3" insulation toward the back of the building. The older built-up section/has been patched several times however not replaced. 5 inches of acoustic tile applied fiberglass batt attic/ceiling and 3 inches of XPS (extruded polystyrene, blue or pink) foam board roof insulation were recorded. Other parts of the building are also covered by a low-pitch gable type over a wood structure with an asphalt shingle finish and 6 inches of fiberglass batt attic/ceiling and 3 inches of detectable/assumed roof insulation. The built-up and shingled roof sections have not been replaced for at least 15-20 years.

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

During the field audit roofs, related flashing, gutters and downspouts were inspected. They were found/reported to be in overall acceptable condition with only a few signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues mostly detected on flat roof areas.

The following specific roof problem spot and area was identified:

Signs of standing water/pooling

In light of the roof conditions mentioned above SWA has the following recommendation, which is further outlined and categorized in the *Executive Summary*:

1. Slope roof surface to drain effectively at time of reroofing.

2.3.3. Base

The building's base is composed of a 4" concrete slab below grade floor with a perimeter footing with poured concrete foundation walls, over 6 mil vapor barrier and no detectable slab edge/perimeter insulation.

Slab/perimeter insulation levels could not be verified in the field and are based on available construction plans.

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/reported to be in good condition with no signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues visible on the interior nor exterior.

In light of the base conditions mentioned above, SWA does not have any recommendations at this time.

2.3.4. Windows

The building contains only one type of window.

1. Mostly fixed-type unit windows with a non-insulated aluminum frame, low-E coated double glazing and no interior or exterior shading devices. They are located throughout the building and some were replaced during the last renovation.

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 and/or reported to be in good/age appropriate condition with no signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues.

The following specific window problem spot and area was identified:

Missing window sill and drip-edge detail.

In light of the window conditions mentioned above SWA has the following recommendation, which is further outlined and categorized in the *Executive Summary*:

1. Install/repair pan or strip flashing and drip edge detail at window sills instead of applying caulk and EIFS.

2.3.5. Exterior Doors

The building contains two different types of exterior doors.

1 3 French aluminum type exterior doors. They are located in the front of the building and were replaced during the last renovation.
2 1 solid metal type exterior door. It is located in the rear of the building and was replaced during the last renovation..

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/reported to be in good/age-appropriate condition with only a few signs of uncontrolled moisture, air-leakage and/or other energy-compromising issues.

The following specific door problem spots and areas were identified:

Missing/worn weather stripping

In light of the door conditions mentioned above SWA offers the following recommendation, which is further outlined and categorized in the *Executive Summary*:

1. Install/replace/maintain weather stripping around all exterior doors and roof hatches.

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 in previous section *2.3. Building Envelope*

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 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 Criminal Justice Building heating/cooling is provided by two rooftop package units with natural gas furnaces, a number of small split air conditioning units and heat pump for a few specialized rooms and a condensing furnace with evaporator cooling coils for the general basement area.

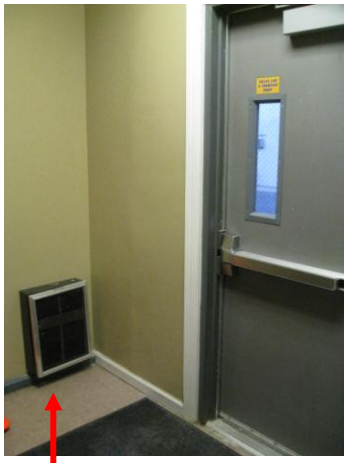
2.4.1. Heating

The heating to the building is provided mainly by two rooftop Carrier package units. The second floor area is served by RTU-1, which has a condenser with an estimated SEER efficiency of 9.0 and a furnace with an estimated AFUE efficiency of 81%. The first floor area is served by RTU-2 which has a condenser with an estimated SEER efficiency of 9.2 and a furnace with an estimated AFUE efficiency of 80%. Both units have estimated 50% useful operating lives left. The basement area is heated/cooled by a Carrier WeatherMaker 9200 condensing furnace. It was installed during the 2002 building upgrade and has a 93% AFUE efficiency. It has approximately 50% useful life left on it. All the building forced-air heat is distributed via diffusers supported by the drop ceiling. There isn't any wall perimeter heating. A couple of small wall- mounted electric heaters are in the entrance vestibules.

Generally, each furnace system has associated thermostats controlling the zone dampers. The air handler units are programmed for occupied/unoccupied mode of operation through their respective space thermostats. During the occupied mode of operation, the supply air fan runs continuously. Minimum outdoor air is provided through the outdoor air louver. When the space thermostat is in the heating mode of operation as selected through the heat cool switch, the associated gas-fired furnace is cycled to maintain the space temperature. Also, when the switch is indexed to the cool mode, the remote condensing unit is cycled to maintain the space temperature. The programmable thermostats are generally located in public areas and because of poor heat balance in the building, when local space heaters are turned on or some windows opened the room temperature sensors provide a different feedback to the thermostats than would be otherwise. When doors are closed, and depending on the higher activity in some areas of the building vs. other lower occupancy

spaces, the comfort level for heating/cooling varies significantly to the point where floor plug in heaters and room fans are often used to alleviate the ambient conditions.

Also, there isn't any heating/cooling/ventilation schedule controlled by an overall Building Management System (BMS). SWA recommends that some of the diffusers be replaced with variable air volume (VAV) boxes for modulating flow better with more local programmable thermostats, as well as additional reheat electric elements in the VAV boxes to assist when local temperatures became too cold. SWA also recommends rebalancing the air distribution in the building, as well as investment into a building-wide state of the art BMS. This recommendation will ensure that the retro-commissioning estimated savings (per ECM#2) are maintained and reproducible. The basement Sergeant's room has a heat pump serving it. Perhaps this would not be necessary if the air distribution from the Carrier WeatherMaker furnace with cooling evaporator coil was rebalanced.



Small vestibule electric heater; typical thermostat; rooftop package unit, basement furnace & condenser

2.4.2. Cooling

The Criminal Justice Building cooling is provided by Carrier evaporator coils (located in the furnace discharge ductwork). These Carrier cooling systems and fan-cooled condensers are located in the RTU-1 and RTU-2 package units and split units behind the building for the

basement associated system. They use R-22 Freon for air cooling. Thermostat control issues are similar to those addressed in the above 2.4.1 Heating section.

A typical arrangement draws fresh air via intake grilles and brings it into a mixing chamber where it is combined with return air and filtered. The air handling unit blower then pushes the filtered, conditioned air to the distribution system. The air is then distributed via diffusers into the building spaces. The air handlers and outdoor condensers (RTU-1, -2 and basement split system), installed in 2002, have an estimated 50% useful operating lives remaining.

Several server rooms in the basement and attic have split ductless Sanyo air conditioning systems providing additional cooling. These have approximately 50% useful lives left on them.

Carrier rooftop packaged unit; typical Sanyo ductless server room condenser and wall unit

2.4.3. Ventilation

The various spaces of the building are ventilated by the Carrier basement furnace, RTU-1 and RTU-2 units that serve the respective spaces as described in the "Heating/Cooling" sections above. The bathrooms and some closets/storage areas also have exhaust fans (with fractional HP motors) that exhaust air to the outside. In general, the building's 11 Penn Ventilator exhaust fans have 50% estimated useful operating lives remaining.

2.4.4. Domestic Hot Water

The domestic hot water (DHW) for the Criminal Justice Building is provided by 2 DHW heaters. A small State Industries electric heater with 17 gal storage provides water for the

2nd floor bathrooms. The balance of the building is supplied with DHW by a condensing type State Industries natural gas fired heater with 80 gal storage and a small circulating pump. Both heaters have 40% estimated useful operating lives left.

2.5. Electrical Systems

2.5.1. Lighting

Interior Lighting - The interior lighting of the Criminal Justice Building consists of 4ft T8 lamps with electronic ballasts, compact fluorescent (CFL) lights and a few incandescent bulbs. Based on measurements of lighting levels for each space, there are not any vastly over-illuminated areas. SWA recommends replacing the incandescent bulbs with CFLs. CFL bulbs produce the same lumen output with less wattage than incandescent bulbs and last up to five times longer. All replacements should meet local code requirements, such as shielding for safety hazards. SWA also recommends installing 8 occupancy sensors in areas that are occupied only part of the day and the payback on savings is justified, such as the basement break room. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advance micro-phonic lighting sensors include sound detection as a mean to control lighting operation. See the attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption.

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

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of Metal Halide (MH) lamp fixtures, High Pressure Sodium (HPS) lamp fixtures and Compact Fluorescent Lights (CFL). Exterior lighting is controlled by automatic timers. SWA recommends replacing each MH fixture with a CFL fixture and the HPS fixture with a Pulse-start MH fixture. SWA is not recommending at this time any upgrades to the exterior light timers.

2.5.2. Appliances and Process

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. Also, energy vending miser devices are now available for conserving energy usage by beverage and snack vending machines. When equipped with the vending miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines.

Computers left on in the building consume a lot of energy. A typical desk top computer uses 65 to 250 watts and uses the same amount of energy when the screen saver is left on. Televisions (along with DVDs, stereos, computers, and kitchen appliances which now have internal memories or clocks that always require a trickle of power) use approximately 3-5 watts of electricity when turned off. SWA recommends all computers and all appliances (i.e. fridges, coffee makers, televisions, etc) be plugged in to power strips and turned off each evening just as the lights are turned off. The building’s computers are generally NOT

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 Criminal Justice Building is a two-story building with basement and one 2,100 lbs capacity ThyssenKrupp elevator. The hydraulic system driving the elevator piston is located in the basement and has a 20 HP, 3470 RPM motor which has left an estimated 70% left of its useful operating life.

2.5.4. Other Electrical Systems

Besides a few small transformers and a Kohler 100 kVA emergency generator (located outside and at the back of the building), there are not currently any other significant energy impacting electrical systems installed at the George Street Firehouse. The generator has 60% left of its expected service life.

3. EQUIPMENT LIST

Inventory

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
Heating/Cooling	1 heat pump through the wall unit	Basement Sergeant's room	Missing nametag	Electric	Basement Sergeant's room	2002	50%
Cooling	1 AC split unit - capacity: 17,000-16,500	Rooftop server rm - evap; rooftop - condenser	Sanyo split units: rooftop condenser: CL 1852; Serial # for rooftop condenser: 0013421	Electric	Rooftop server room	2002	50%
Cooling	1 AC split unit in basement - capacity: 17,000-16,500	Basement sprinkler system server rm area	Sanyo split units: front of bldg condenser: CL 1852; Serial # for front of bldg condenser: 0013521	Electric	Basement server rm	2002	50%
Heating/Cooling	1 condensing furnace (100 MBTUH input, 93 MBTUH output) - 93% est. htg. eff. with evaporator (R-22 refrigerant), 14.8 amp motor	Basement Evidence Rm closet	Carrier WeatherMaker 9200; Heat Controller evaporator MHE60EB-21; Serial # for evaporator: E08-00026159	Natural Gas - furnace/Electric - blower	Criminal Justice basement	2002	50%
Cooling	Carrier condenser (R22) with an est. eff. of 13 SEER	Rear of the building	Carrier RSE1360-1A; Serial #: 765 8N200 804769	Electric	Criminal Justice basement	2002	50%
Heating/Cooling	RTU-1 with an est condenser eff. of 9.0 SEER and furnace eff. of 81% AFUE	Rooftop	Carrier 48TJF016 - - - 581AA, R22, 225-300 MBH input, 243 MBH output; Serial #: 290 2F66585	Natural Gas/Electric	2nd flr	2002	50%
Heating/Cooling	RTU-2 with an est condenser eff. of 9.2 SEER and furnace eff. of 80% AFUE	Rooftop	Carrier 48TFD012-M-511HV, R22, 120-180 MBH input, 96-144 MBH output; Serial #: 280 264 0727	Natural Gas/Electric	1st flr	2002	50%
Ventilation	(3) EF-1 - 70% est. eff.	Janitor closet, basement toilets - exhaust rooftop	Penn Ventilator Z 8H RA - 130 Watts	Electric	Janitor closet, basement toilets	2002	50%
Ventilation	(2+3) EF-2 - 70% est. eff.	Bathrooms - exhaust rooftop	Penn Ventilator Z 6H RA	Electric	Bathrooms	2002	50%
Ventilation	(2) EF-3 - 70% est. eff.	Jail cells - exhaust rooftop	Penn Ventilator Z 10S RA - 243 Watts	Electric	Jail cells	2002	50%
Ventilation	(1) EF-4 - 70% est. eff.	Elevator equip room - exhaust rooftop	Penn Ventilator Z 8H RA - 130 Watts	Electric	Elevator equip room	2002	50%

continued on the next page

Building System	Description	Location	Model #	Fuel	Space Served	Year Installed	Estimated Remaining Useful Life %
continued from the previous page							
Domestic Hot Water	1 unit basement - condensing type, 140 MBTUH, 80 gal tank - 90% est. eff., with B&G circulating pump	Basement storage rm	State Ind. SOV30140NETWN; Serial #: AO1140149	Natural Gas	Police Dept	2002	40%
Domestic Hot Water	1 DHW electric unit, 1,650 Watt lower element, 17 gal tank - 95% est. eff.	2nd flr janitor closet	State Select P61710MSK; Serial #: M02500279	Electric	Criminal Justice Bldg 2nd floor bathrooms	2002	40%
Generator	One generator diesel driven 80 kW, 100 kVA, PF=0.8	Outside back of bldg	Kohler, Cooper Power Systems 80 REOZJB, Spec. GM21199-GA9; John Deere engine R515817; Serial #: 0743387	Diesel	Criminal Justice Bldg	2002	60%
Elevator	One ThyssenKrupp Elevator - 2,100 lbs capacity; hydraulic submersible motor 20 HP, 3470 RPM	Hydraulic unit is in basement	Hydraulic unit: ThyssenKrupp Elevator Hydraulic Power Unit EP08020, 590AF1; Serial # for hydraulic unit: LR145538, 091201064500	Electric	Criminal Justice Bldg	2002	70%
Lighting	See details - Appendix A	See details - Appendix A	See details - Appendix A	Electric	Criminal Justice Bldg	2002	50%

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

4. ENERGY CONSERVATION MEASURES

Based on the assessment of the South River Criminal Justice 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

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

- Install a Building Management System (BMS) - Currently, the building is controlled by individual stand alone programmable thermostats. An overall digital BMS will result in energy savings via improved temperature control and coordination for the building. This recommendation will ensure that the retro-commissioning estimated savings (per ECM#2) are maintained and reproducible. SWA recommends this upgrade with the next major building renovation.

- Slope roof surface to drain effectively at time of reroofing with the next major renovation.

Category II Recommendations: Operations and Maintenance

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

- Maintain downspouts and cap flashing - Repair/install missing downspouts and cap flashing as needed to prevent water/moisture infiltration and insulation damage.

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

- Repair/seal wall cracks and penetrations - SWA recommends as part of the maintenance program to install proper flashing, seal wall cracks and penetrations wherever necessary in order to keep insulation dry and effective. Install pan/strip flashing at horizontal EIFS/stucco projections. Inspect and replace cracked/ineffective caulk/mortar joints. Install/repair and maintain flashing to minimize uncontrolled wind driven and roof water run-off causing exterior wall damage. Efflorescence coated brick and masonry materials need to dry out and possible causes of water infiltration into wall cavities should be investigated. Install/repair pan or strip flashing and drip edge detail at window sills instead of applying caulk and EIFS.

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

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

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

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

Category III Recommendations: Energy Conservation Measures - Summary Table

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1.1	Replace incandescent and Metal Halide lamps and with CFL fixtures
2	Retro-commission mechanical equipment
	Description of Recommended 5-10 Year Payback ECMs
1.2 & 1.3	Install occupancy sensors, replace a HPS with pulse start Metal Halide fixture
3	Replace old refrigerator with Energy Star type model
	Description of Renewable ECMs
4	Install a 10 kW solar PV rooftop system

ECM#1: *Building Lighting Upgrades*

Description:

On the days of the site visits, SWA completed a lighting inventory of the Criminal Justice Building (see Appendix A).

The interior lighting of the Criminal Justice Building consists of 4ft T8 lamps with electronic ballasts, compact fluorescent (CFL) lights and a few incandescent bulbs. SWA recommends replacing the incandescent bulbs with CFLs. CFL bulbs produce the same lumen output with less wattage than incandescent bulbs and last up to five times longer. SWA also recommends installing 8 occupancy sensors in areas that are occupied only part of the day and the payback on savings is justified, such as the basement break room. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advance micro-phonic lighting sensors include sound detection as a means to control lighting operation. The exterior lighting surveyed during the building audit was found to be a mix of Metal Halide (MH) lamp fixtures, High Pressure Sodium (HPS) lamp fixtures and Compact Fluorescent Lights (CFL). SWA recommends replacing each MH fixture with a CFL fixture and the HPS fixture with a Pulse-start MH fixture. See attached lighting schedule in Appendix A for a complete inventory of lighting throughout the building and estimated power consumption. The labor in all these installations was evaluated using prevailing electrical contractor wages. The Borough of South River may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor, to obtain savings.

Installation cost:

Estimated installed cost: $2,860 (includes $1,816 of labor)
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
1.1	Replace (9) incandescent and (2) Metal Halide lamps with CFLs	RS Means, Lit Search	450	0	450	4,152	0.9	0	1.1	53	592	5	2,961	0.8	558	112	130	2,177	7,434
1.2	Install (8) occupancy sensors	RS Means, Lit Search	1,760	0	1,760	2,262	0.5	0	0.6	0	294	12	3,529	6.0	100	8	13	1,097	4,050
1.3	Replace (1) exterior High Pressure Sodium fixture with pulse-start MH type	RS Means, Lit Search	650	0	650	289	0.1	0	0.1	26	64	15	960	10.2	48	3	5	100	517
	Totals		**2,860**	**0**	**2,860**	**6,703**	**1.4**	**0**	**1.8**	**79**	**950**	**-**	**7,450**	**3.0**	**160**	**-**	**26**	**3,374**	**12,002**

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 1.8 hr/yr to replace aging burnt out lamps vs. newly installed.

Rebates/Financial Incentives:

NJ Clean Energy - There aren't any incentives at this time offered by the state of NJ for this energy conservation measure.

Options for Funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.

http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#2: *Retro-Commissioning*

Description:

Retro-commissioning is a process that seeks to improve how building equipment and systems function together. Depending on the age of the building, retro-commissioning can often resolve problems that occurred during design or construction and/or address problems that have developed throughout the building's life. Owners often undertake retro-commissioning to optimize building systems, reduce operating costs, and address comfort complaints from building occupants.

Since the systems at the Criminal Justice building have undergone some renovations in recent years, and the building continues to have concerns with thermal comfort control, SWA recommends undertaking retro-commissioning to optimize system operation as a follow-up to completion of the upgrades. The retro-commissioning process should include a review of existing operational parameters for both newer and older installed equipment. During retro-commissioning, the individual loop temperatures should also be reviewed to identify opportunities for optimizing system performance.

Installation cost:

Estimated installed cost: $16,250 (includes $13,813 of labor)
Source of cost estimate: Similar projects

Economics (without incentives):

ECM #	ECM description	source	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime 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	Retro commission-ing	Similar projects	16,250	None at this time	16,250	25,072	5.2	366	9.4	1,820	5,504	12	66,051	3.0	306	26	33	36,716	48,926

Assumptions: Since the utility bills have some accounting fluctuations, it is difficult to determine the amount of energy used for heating and cooling the Criminal Justice building. Based on experience with similar buildings, SWA estimated the heating and cooling energy consumption. Typical savings for retro-commissioning range from 5-20%, as a percentage of the total space conditioning consumption. SWA assumed 10% savings. Estimated costs for retro-commissioning range from $0.50-$2.00 per square foot. SWA assumed $1.25 per square foot of a total

square footage of 13,000. SWA also assumed on the average 1 hr/wk operational savings when systems are operating per design vs. the need to make more frequent adjustments.

Rebates/financial incentives:

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

Options for funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.

http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#3: *Replace Old Refrigerator with an Energy Star Model*

Description:

On the day of the site visit, SWA observed that there was an old refrigerator in the basement room #15 which was not Energy Star rated (using approximately 773 kWh/yr). Appliances, such as refrigerators, that are over 10 years of age should be replaced with newer efficient models with the Energy Star label. SWA recommends the replacement of the existing refrigerator with an 18.2 cu. ft. top freezer refrigerator ENERGY STAR®, Mfr. model #6897, 407 kWh/yr, or equivalent. Besides saving energy, the replacement will also keep the pantry and other areas cooler. When compared to the average electrical consumption of older equipment, Energy Star equipment results in large savings. Look for the Energy Star label when replacing appliances and equipment, including: window air conditioners, 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.

Installation cost:

Estimated installed cost: $750 (includes $70 of labor)
Source of cost estimate: *Manufacturer and Store 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
3a	Replace (1) old basement refrigerator with an 18 cu ft model in kind	Energy Star purchasing and procurement site, similar projects	700	0	700	50	0.0	0	0.0	50	57	12	678	12.4	-3	0	0	-140	90
3b	Incremental difference to replace (1) old basement refrigerator with an 18 cu ft Energy Star model	Energy Star purchasing and procurement site, similar projects	50	0	50	300	0.1	0	0.1	0	39	12	468	1.3	836	70	78	323	537
3 (a+b)	Replace old basement refrigerator with an 18 cu ft Energy Star model	Energy Star purchasing and procurement site, similar projects	750	0	750	350	0.1	0	0.1	50	96	12	1,146	7.9	53	4	7	183	627

Assumptions: SWA calculated the savings for this measure using measurements taken the day of the field visit and using the billing analysis.

Rebates/financial incentives: *NJ Clean Energy - There aren't any incentives at this time offered by the state of NJ for this energy conservation measure.*

Options for Funding ECM:

This project may benefit from applying for a grant from the State of New Jersey - American Recovery and Reinvestment Act Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.
http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

ECM#4: *Install a 10 kW PV System*

Description:

Currently the Criminal Justice 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. The Borough of South River may want to review installing a 10 kW PV system to offset electrical demand and reduce the annual net electric consumption for the Criminal Justice building. The Criminal Justice building is not eligible for a 30% federal tax credit. The Criminal Justice building may want to 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. Typically, a major utility provides the ability to buy SREC's at $600/MWh or best market offer. However, this option is not available from the local utility. See below for more information.

Considering the available square footage of the Criminal Justice building roof at this time, it would be possible to install a 50 kW PV system. However, considering the facts that:

- the solar PV system should be limited in size to below the minimum electrical demand since the utility will not buy back excess power generated by the system
- the solar PV system installation cost should be limited to allow for available grant money to considerably shorten the payback period

SWA is only recommending a 10 kW PV system. Should the Criminal Justice decide to expand the building and increase the air conditioned spaces, the minimum demand would increase over the historical data cited in this analysis, and therefore further study into expanding the proposed system would be recommended.

There are many possible locations for a 10 kW PV installation on the building roofs. A commercial crystalline 230 watt panel has 17.5 square feet of surface area (13.1 watts per square foot). A 10 kW system needs approximately 43 panels which would take up 761 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: $75,000 (includes $30,000 of labor)
Source of cost estimate: Similar Projects

Economics (<u>without</u> NJ EECBG Grant):

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 a 10 kW Solar Photovoltaic system	Similar Projects	75,000	0	75,000	11,804	10.0	0	3.1	0	1,535	25	38,363	48.9	0	0	-5	-47,350	21,135

Assumptions: SWA estimated the cost and savings of the system based on past PV projects. SWA projected physical dimensions based on a typical Polycrystalline Solar Panel (230 Watts, model #ND-U230C1). 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 rebates are not available since the South River Utility is part of an energy consortium that does not pay the Societal Benefits Charge that funds these rebates.

NJ Clean Energy - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1,000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. An estimated SREC value of $6,000 could be realized with a traditional solar PV system setup. However since net metering is not available from the local utility, savings in the form of SRECs were NOT incorporated into the above analysis.

Options for funding ECM:

This project may benefit from applying for a grant from the State of New Jersey Energy Efficiency and Conservation Block Grant (EECBG) Program to offset a portion of the cost of implementation.
http://www.state.nj.us/recovery/infrastructure/eecbg_program_criteria.html

5. RENEWABLE AND DISTRIBUTED ENERGY MEASURES

5.1. Existing systems

There aren't currently any existing renewable energy systems.

5.2. Wind

Description:

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

Description:

A Solar PV System is not applicable because of insufficient financial incentives and a simple payback greater than 40 years. See ECM#4.

5.4. Solar Thermal Collectors

Description:

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

5.5. Combined Heat and Power

Description:

CHP is not applicable for this building because insufficient domestic hot water use.

5.6. Geothermal

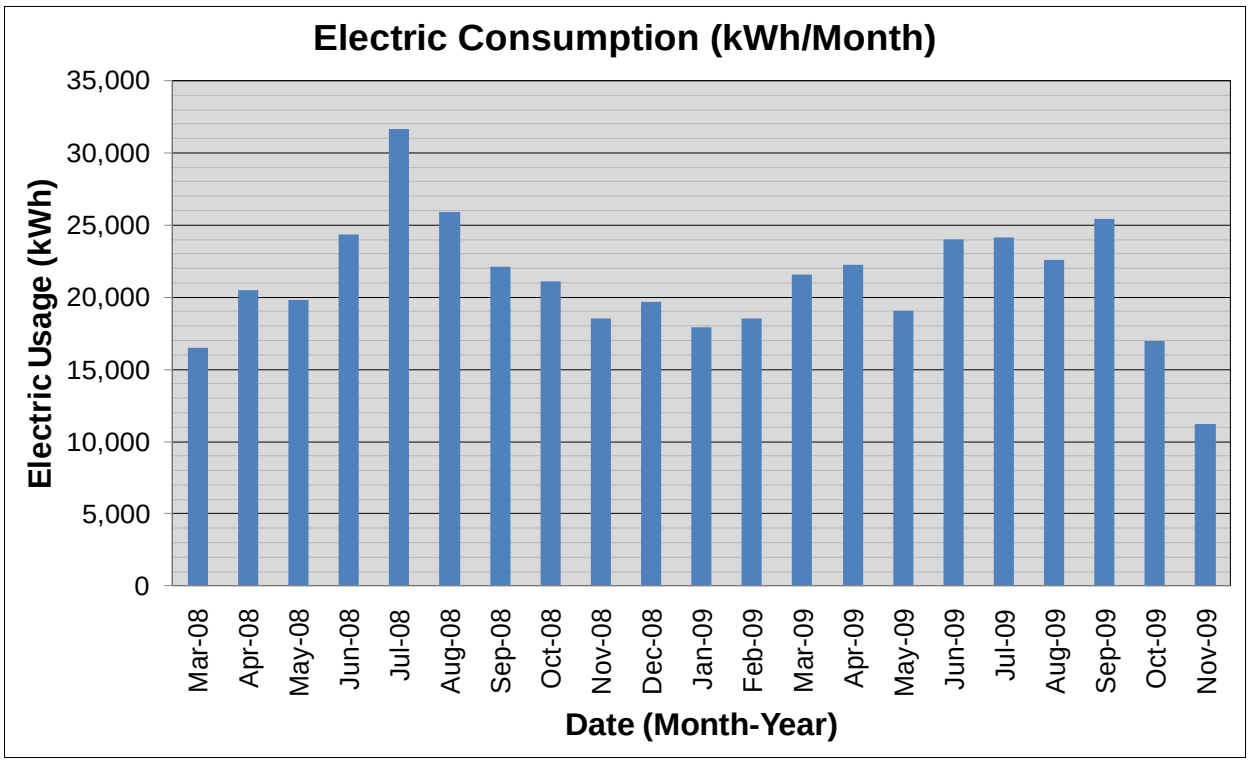
Description:

Geothermal is not applicable for this building because it would not be cost-effective, since it would require replacement of the existing HVAC system, of which major components still have as a whole a number of useful operating years.

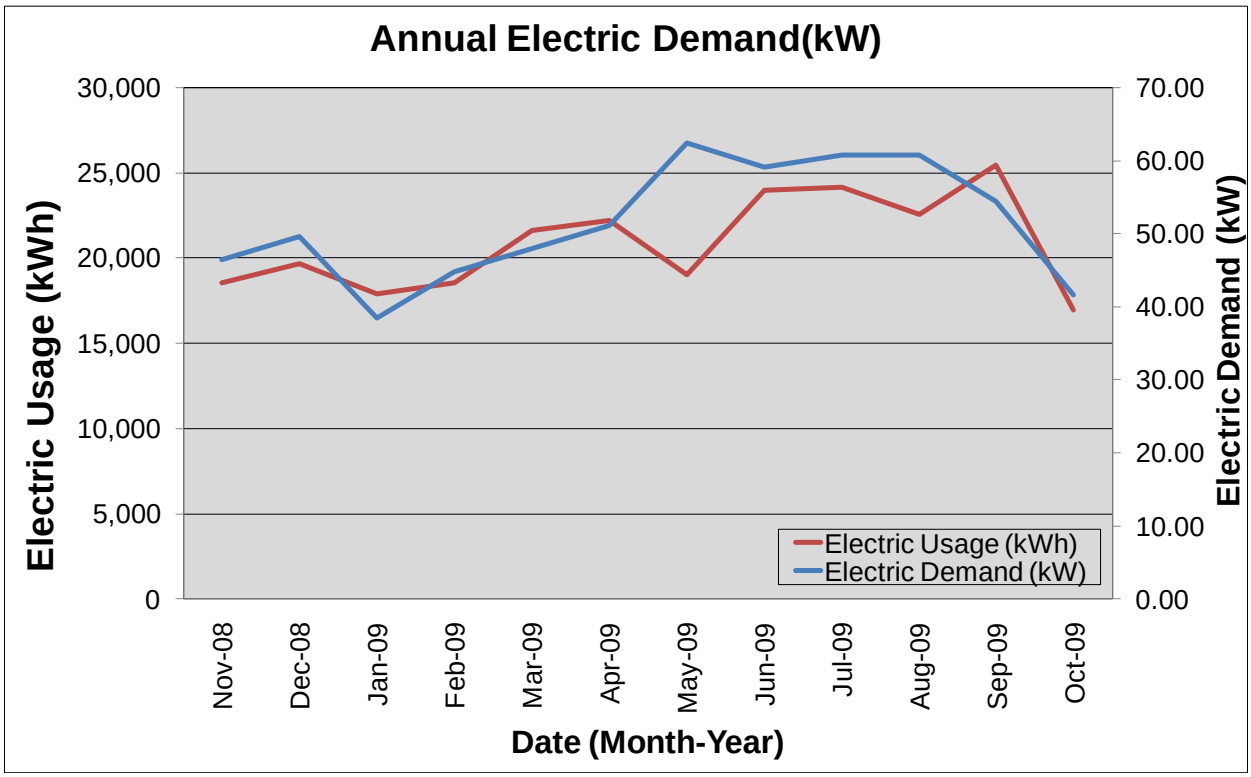
6. ENERGY PURCHASING AND PROCUREMENT STRATEGIES

6.1. Load Profiles

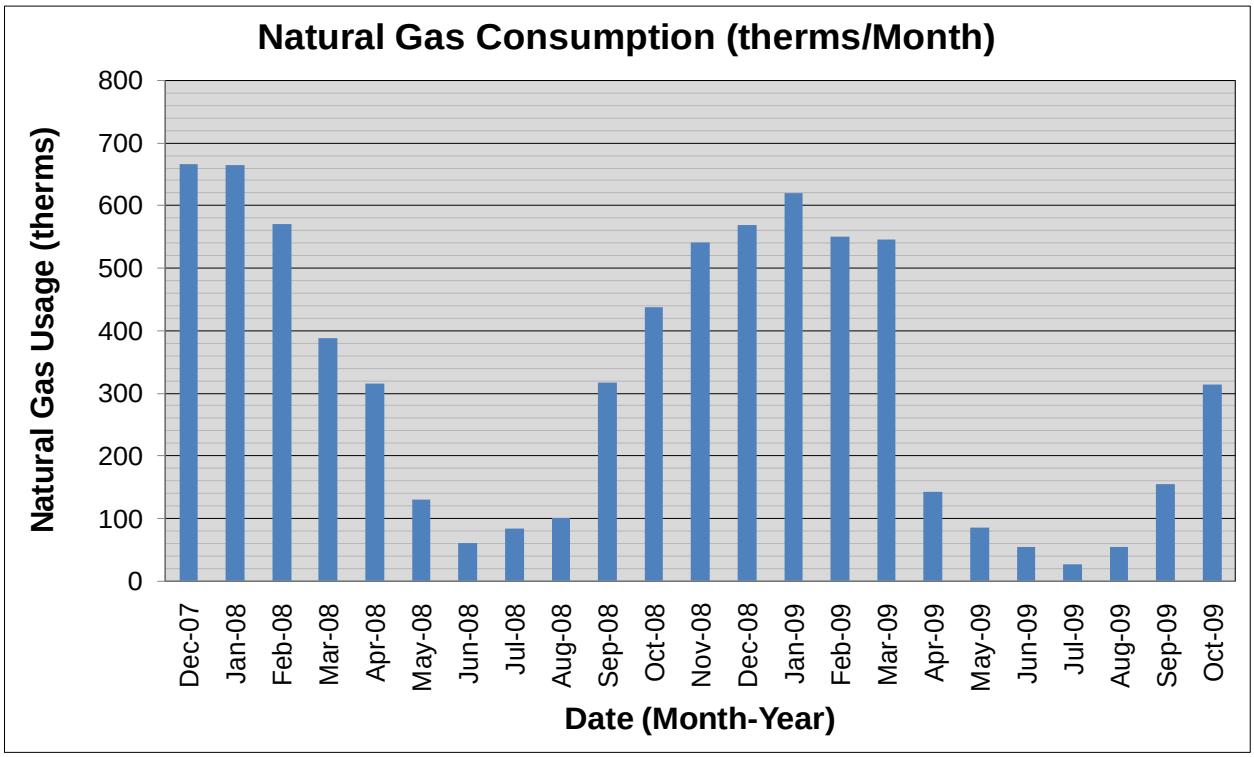
The following are charts that show the annual electric and natural gas load profiles for the Criminal Justice Building. For annual electric and natural gas usage please also see Section 1. Historic Energy Consumption.

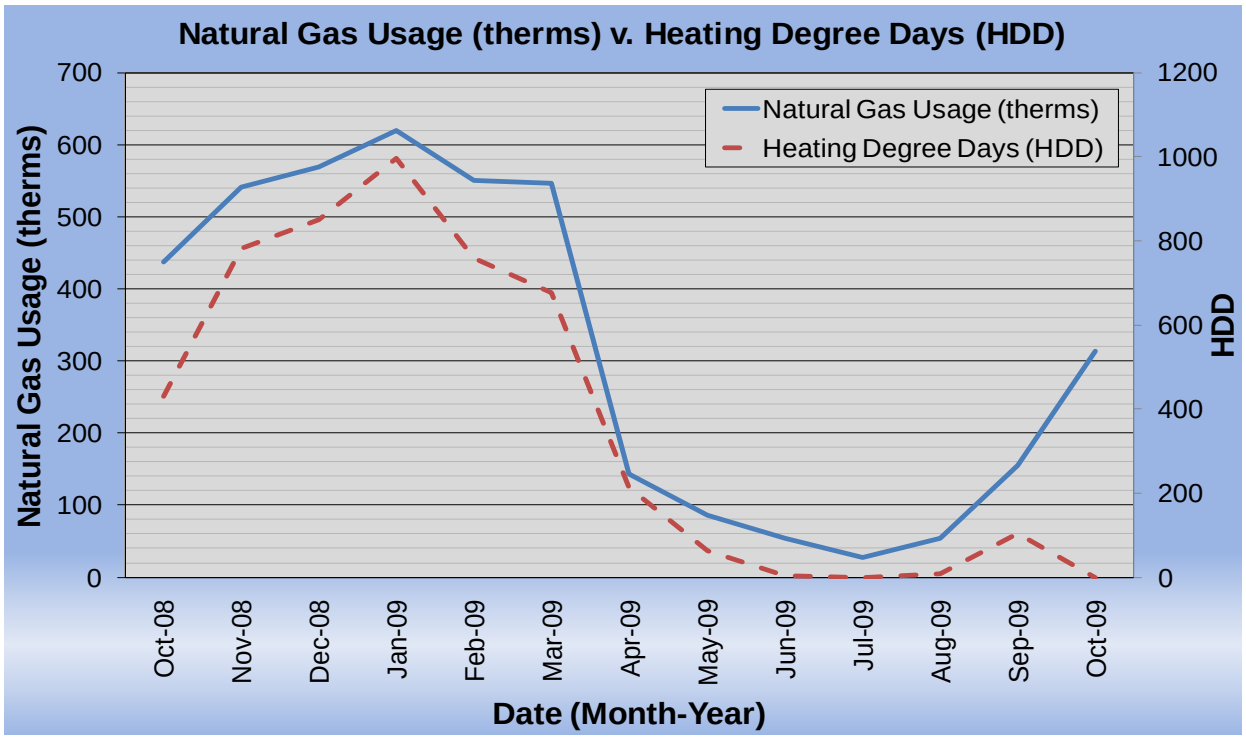


Some minor unusual electric fluctuations shown may be due to adjustments between estimated and actual meter readings. Also, note on the following chart how the electrical Demand peaks (except for a few unusual fluctuation anomalies) follow the electrical consumption peaks.



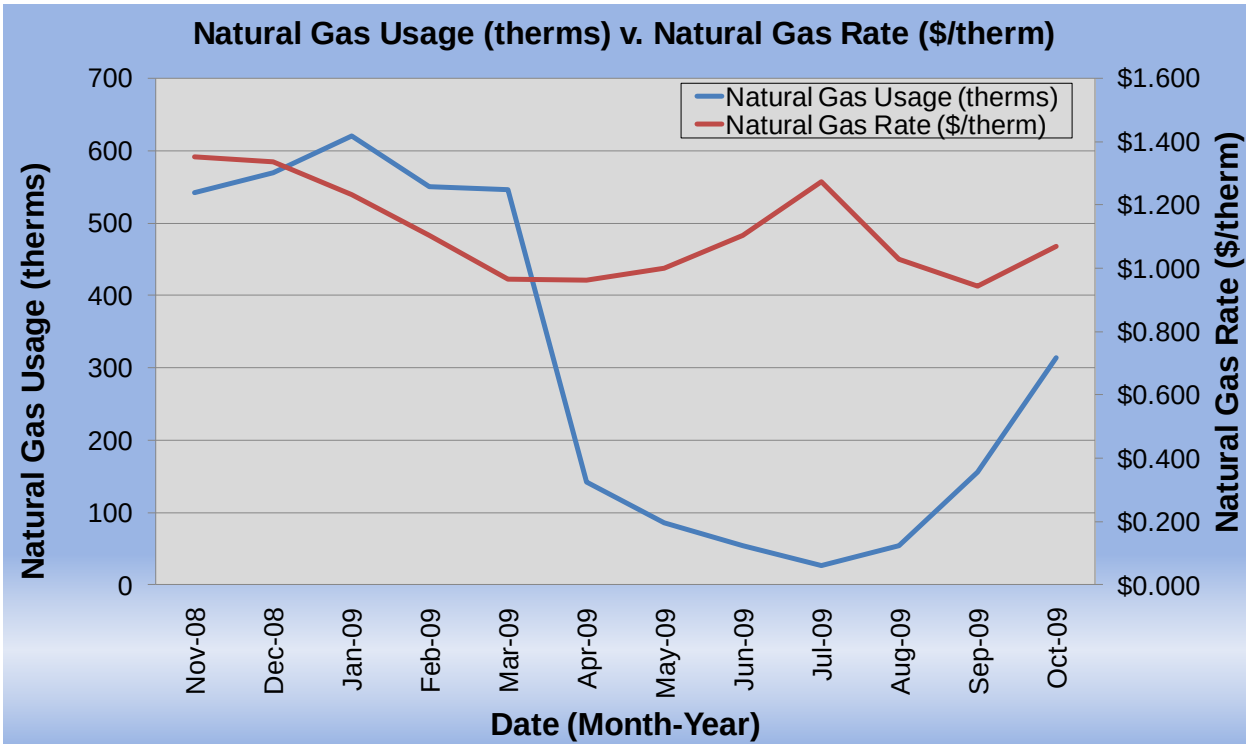
The following is a chart of the natural gas load profile for the building, peaking in the coldest months of the year and a chart showing natural gas consumption following the “heating degree days” curve. Some utility bills have more than one month estimated and combined.





6.2. Tariff Analysis

Currently, natural gas is provided to the Criminal Justice Building via one gas meter with the PSE&G acting as the supply and also the transport company. Gas is provided by the PSE&G at a general and very competitive service rate. The suppliers' general service rate for natural gas charges a market-rate price based on use and the Criminal Justice Building billing does not breakdown demand costs for all periods. Demand prices are accounted in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the natural gas prices increase during the heating months when natural gas is used by the boiler and the furnace units. Some high gas price per therm fluctuations in the summer may be due to high energy costs that recently occurred and low use caps for the non-heating months. Thus the building pays for fixed costs such as meter reading charges during the summer months. Some of the cap payments are excluded from the following chart.



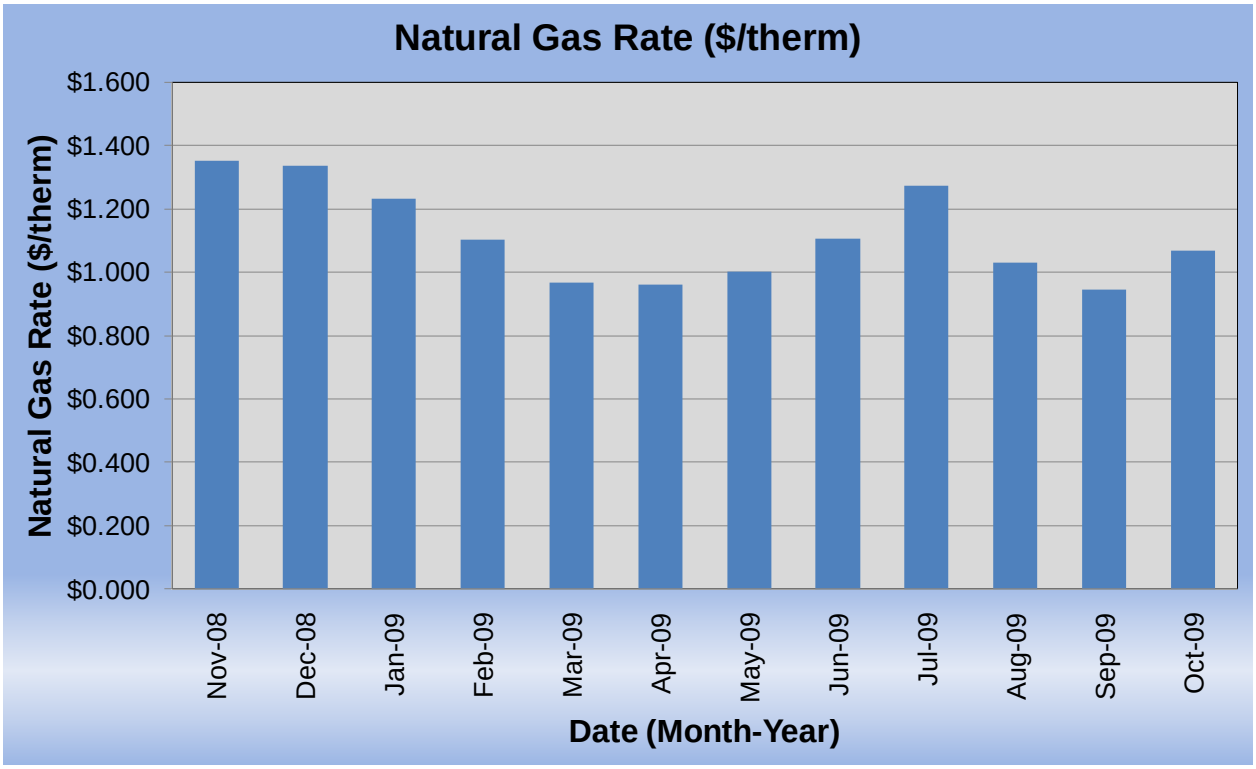
The Criminal Justice Building is direct-metered and currently purchases electricity from the South River Electric Utility at a general service rate. The general service rate for electric charges is market-rate based on use and the Criminal Justice Building does not track a breakdown of demand costs. Demand prices are generally reflected in the utility bills and can be verified by observing the price fluctuations throughout the year. Typically, the electricity prices increase during the cooling months when electricity is used by the HVAC condensing units and air handlers.

6.3. Energy Procurement strategies

The Criminal Justice Building receives natural gas via one incoming meter. PSE&G supplies the gas and transports it. There is not an ESCO engaged in the process. An Energy Services Company (ESCO) is a consultancy group that engages in a performance-based contract with a client firm to implement measures which reduce energy consumption and costs in a technically

and financially viable manner. Electricity is also purchased via one incoming meter directly for the main Criminal Justice Building from South River Electricity Company without an ESCO. SWA analyzed the utility rate for natural gas and electricity supply over an extended period. Electric rates were estimated by the Borough of South River over the most recent 12 month period. Natural gas bill analysis shows fluctuations up to 19% over the most recent 12 month period. Some of these fluctuations may have been caused by adjustments between estimated and actual meter readings, others may be due to unusual high and recent escalating energy costs.

The average estimated NJ commercial utility rates for electric and gas are $0.150/kWh and $1.550/therm respectively. The Criminal Justice Building annual utility costs are competitive when compared to the average estimated NJ commercial utility rates. SWA recommends that the Borough of South River further explore opportunities of purchasing both natural gas and electricity from ESCOs in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Criminal Justice Building. Appendix B contains a complete list of third party energy suppliers for the Borough of South River service area. The Borough of South River may want to consider partnering with other school districts, municipalities, boroughs 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. Also, the Criminal Justice 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. The following chart show the Criminal Justice Building monthly natural gas spending per unit of energy in 2009. Electric rates were estimated by the Borough at a constant rate of $0.130/kWh.



7. METHOD OF ANALYSIS

7.1. Assumptions and tools

Energy modeling tool:	established/standard industry assumptions, E-Quest
Cost estimates:	RS Means 2009 (Facilities Maintenance & Repair Cost Data) RS Means 2009 (Building Construction Cost Data) RS Means 2009 (Mechanical Cost Data) Published & established specialized equipment material & 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

Location			Existing Fixture Information													Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	B	Mechanical Room (017)	Recessed	E	4'T8	1	3	32	S	2	365	10	106	77	N/A	Recessed	4'T8	E	S	1	3	32	2	365	10	106	77	0	0	0
2	B	Mechanical Room (016)	Recessed	E	4'T8	2	3	32	S	2	365	10	212	155	N/A	Recessed	4'T8	E	S	2	3	32	2	365	10	212	155	0	0	0
3	B	Janitor's Closet (019)	Recessed	N	CFL	1	1	23	S	2	365	0	23	17	N/A	Recessed	CFL	N	S	1	1	23	2	365	0	23	17	0	0	0
4	B	Storage Room (010)	Recessed	E	4'T8	2	3	32	S	2	365	10	212	155	N/A	Recessed	4'T8	E	S	2	3	32	2	365	10	212	155	0	0	0
5	B	Meeting Room (015)	Recessed	E	4'T8	4	3	32	S	8	261	10	424	885	C	Recessed	4'T8	E	OS	4	3	32	6	261	10	424	664	0	221	221
6	B	Women's Locker Room (012	Recessed	E	4'T8	2	3	32	S	4	365	10	212	310	N/A	Recessed	4'T8	E	S	2	3	32	4	365	10	212	310	0	0	0
7	B	Bathroom Women (013)	Recessed	E	4'T8	1	3	32	S	4	365	10	106	155	N/A	Recessed	4'T8	E	S	1	3	32	4	365	10	106	155	0	0	0
8	B	Bathroom Men (018)	Recessed	E	4'T8	1	3	32	S	4	365	10	106	155	N/A	Recessed	4'T8	E	S	1	3	32	4	365	10	106	155	0	0	0
9	B	Men's Locker Room (007)	Recessed	E	4'T8	3	3	32	S	4	365	10	318	464	N/A	Recessed	4'T8	E	S	3	3	32	4	365	10	318	464	0	0	0
10	B	Records Room (006)	Recessed	E	4'T8	1	3	32	S	2	365	10	106	77	N/A	Recessed	4'T8	E	S	1	3	32	2	365	10	106	77	0	0	0
11	B	Records Room (005)	Recessed	E	4'T8	6	3	32	S	2	365	10	636	464	N/A	Recessed	4'T8	E	S	6	3	32	2	365	10	636	464	0	0	0
12	B	Storage Room (003)	Recessed	E	4'T8	1	3	32	S	2	365	10	106	77	N/A	Recessed	4'T8	E	S	1	3	32	2	365	10	106	77	0	0	0
13	B	Elevator Mech. Room (003	Recessed	E	4'T8	1	3	32	S	2	365	10	106	77	N/A	Recessed	4'T8	E	S	1	3	32	2	365	10	106	77	0	0	0
14	B	Hallway	Recessed	E	4'T8	11	3	32	S	24	365	10	1,166	10,214	N/A	Recessed	4'T8	E	S	11	3	32	24	365	10	1166	10214	0	0	0
15	B	Hallway	Recessed	E	4'T8	11	3	32	S	24	365	10	1,166	10,214	N/A	Recessed	4'T8	E	S	11	3	32	24	365	10	1166	10214	0	0	0
16	B	Armory (011)	Recessed	N	CFL	1	1	23	S	2	365	0	23	17	N/A	Recessed	CFL	N	S	1	1	23	2	365	0	23	17	0	0	0
17	B	Bathroom Men (009)	Recessed	N	CFL	2	1	23	S	4	365	0	46	67	N/A	Recessed	CFL	N	S	2	1	23	4	365	0	46	67	0	0	0
18	B	Bathroom Women (008)	Recessed	N	CFL	2	1	23	S	4	365	0	46	67	N/A	Recessed	CFL	N	S	2	1	23	4	365	0	46	67	0	0	0
19	B	Showers Men (009)	Recessed	N	CFL	2	1	23	S	4	365	0	46	67	N/A	Recessed	CFL	N	S	2	1	23	4	365	0	46	67	0	0	0
20	B	Showers Women (008)	Recessed	N	CFL	2	1	23	S	4	365	0	46	67	N/A	Recessed	CFL	N	S	2	1	23	4	365	0	46	67	0	0	0
21	1	Office (119)	Recessed	E	4'T8	2	3	32	S	12	365	10	212	929	C	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	232	232
22	1	Office (120)	Recessed	E	4'T8	2	3	32	S	12	365	10	212	929	C	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	232	232
23	1	Office (121)	Recessed	E	4'T8	2	3	32	S	12	365	10	212	929	C	Recessed	4'T8	E	OS	2	3	32	9	365	10	212	696	0	232	232
24	1	Meeting Room (118)	Recessed	E	4'T8	2	3	32	S	8	261	10	212	443	N/A	Recessed	4'T8	E	S	2	3	32	8	261	10	212	443	0	0	0
25	1	ffice Area - Det. Bureau (11	Recessed	E	4'T8	4	3	32	S	12	365	10	424	1,857	C	Recessed	4'T8	E	OS	4	3	32	9	365	10	424	1393	0	464	464
26	1	ffice Area - Det. Bureau (11	Recessed	E	4'T8	1	3	32	S	12	365	10	106	464	N/A	Recessed	4'T8	E	S	1	3	32	12	365	10	106	464	0	0	0
27	1	Bathroom Women (117)	2'U-shape	E	2'T8	1	2	18	S	4	365	5	41	60	N/A	2'U-shape	2'T8	E	S	1	2	18	4	365	5	41	60	0	0	0
28	1	Bathroom Men (116)	2'U-shape	E	2'T8	1	2	18	S	4	365	5	41	60	N/A	2'U-shape	2'T8	E	S	1	2	18	4	365	5	41	60	0	0	0
29	1	Hallway	2'U-shape	E	2'T8	8	2	18	S	24	365	5	328	2,873	N/A	2'U-shape	2'T8	E	S	8	2	18	24	365	5	328	2873	0	0	0
30	1	Hallway	2'U-shape	E	2'T8	8	2	18	S	24	365	5	328	2,873	N/A	2'U-shape	2'T8	E	S	8	2	18	24	365	5	328	2873	0	0	0
31	1	Storage Room (114)	2'U-shape	E	2'T8	1	2	18	S	2	365	5	41	30	N/A	2'U-shape	2'T8	E	S	1	2	18	2	365	5	41	30	0	0	0
32	1	Evidence Room (111)	Recessed	E	4'T8	1	3	32	S	2	365	10	106	77	N/A	Recessed	4'T8	E	S	1	3	32	2	365	10	106	77	0	0	0
33	1	Interview Room (109)	Recessed	E	4'T8	2	3	32	S	2	365	10	212	155	N/A	Recessed	4'T8	E	S	2	3	32	2	365	10	212	155	0	0	0
34	1	Meeting Room (108)	Recessed	E	4'T8	2	3	32	S	8	365	10	212	619	N/A	Recessed	4'T8	E	S	2	3	32	8	365	10	212	619	0	0	0
35	1	Records Room (104)	Recessed	E	4'T8	4	3	32	S	2	365	10	424	310	N/A	Recessed	4'T8	E	S	4	3	32	2	365	10	424	310	0	0	0
36	1	Communication Room (103	Recessed	E	4'T8	4	3	32	S	24	365	10	424	3,714	N/A	Recessed	4'T8	E	S	4	3	32	24	365	10	424	3714	0	0	0
37	1	Office (106)	Recessed	E	4'T8	2	3	32	S	12	261	10	212	664	N/A	Recessed	4'T8	E	S	2	3	32	12	261	10	212	664	0	0	0
38	1	Vestibule (107)	Recessed	E	4'T8	1	3	32	S	16	365	10	106	619	N/A	Recessed	4'T8	E	S	1	3	32	16	365	10	106	619	0	0	0
39	1	Storage Room (108A)	Recessed	N	CFL	1	1	23	S	2	365	0	23	17	N/A	Recessed	CFL	N	S	1	1	23	2	365	0	23	17	0	0	0
40	1	Storage Room (115)	Recessed	N	CFL	1	1	23	S	2	365	0	23	17	N/A	Recessed	CFL	N	S	1	1	23	2	365	0	23	17	0	0	0
41	1	Lobby (100A)	Recessed	N	CFL	5	1	23	S	24	365	0	115	1,007	N/A	Recessed	CFL	N	S	5	1	23	24	365	0	115	1007	0	0	0
42	1	Lobby (100)	Recessed	N	CFL	4	1	23	S	24	365	0	92	806	N/A	Recessed	CFL	N	S	4	1	23	24	365	0	92	806	0	0	0
43	1	Lobby-Chandeliers (100)	Pin	N	CFL	2	2	36	S	24	365	0	144	1,261	N/A	Pin	CFL	N	S	2	2	36	24	365	0	144	1261	0	0	0
44	2	Meeting Room (216)	Recessed	E	4'T8	7	3	32	S	8	261	10	742	1,549	C	Recessed	4'T8	E	OS	7	3	32	6	261	10	742	1162	0	387	387
45	2	Staircase (217)	Recessed	E	4'T8	6	3	32	S	24	365	10	636	5,571	N/A	Recessed	4'T8	E	S	6	3	32	24	365	10	636	5571	0	0	0
46	2	Storage Room (214)	Recessed	E	4'T8	1	3	32	S	2	365	10	106	77	N/A	Recessed	4'T8	E	S	1	3	32	2	365	10	106	77	0	0	0
47	2	Office (215)	Recessed	E	4'T8	1	3	32	S	8	261	10	106	221	N/A	Recessed	4'T8	E	S	1	3	32	8	261	10	106	221	0	0	0
48	2	Judges Chamber (210)	Recessed	E	4'T8	2	3	32	S	8	261	10	212	443	N/A	Recessed	4'T8	E	S	2	3	32	8	261	10	212	443	0	0	0
49	2	File Room (209)	Recessed	E	4'T8	2	3	32	S	8	261	10	212	443	N/A	Recessed	4'T8	E	S	2	3	32	8	261	10	212	443	0	0	0
50	2	Office - Court Clerk (208)	Recessed	E	4'T8	4	3	32	S	8	261	10	424	885	N/A	Recessed	4'T8	E	S	4	3	32	8	261	10	424	885	0	0	0
51	2	Vestibule (211)	2'U-shape	E	2'T8	1	2	18	S	24	365	5	41	359	N/A	2'U-shape	2'T8	E	S	1	2	18	24	365	5	41	359	0	0	0
52	2	Vestibule (213)	2'U-shape	E	2'T8	2	2	18	S	24	365	5	82	718	N/A	2'U-shape	2'T8	E	S	2	2	18	24	365	5	82	718	0	0	0
53	2	Hallway (206)	2'U-shape	E	2'T8	1	2	18	S	24	365	5	41	359	N/A	2'U-shape	2'T8	E	S	1	2	18	24	365	5	41	359	0	0	0
54	2	Hallway (205)	2'U-shape	E	2'T8	2	2	18	S	24	365	5	82	718	N/A	2'U-shape	2'T8	E	S	2	2	18	24	365	5	82	718	0	0	0
55	2	Meeting Room (204)	Recessed	E	4'T8	2	4	32	S	8	261	13	282	589	N/A	Recessed	4'T8	E	S	2	4	32	8	261	13	282	589	0	0	0
56	2	Meeting Room (204)	Recessed	N	CFL	4	1	23	S	8	261	0	92	192	N/A	Recessed	CFL	N	S	4	1	23	8	261	0	92	192	0	0	0
57	2	Staircase (201)	Recessed	E	4'T8	1	3	32	S	24	365	10	106	929	N/A	Recessed	4'T8	E	S	1	3	32	24	365	10	106	929	0	0	0
58	2	Janitor's Closet (218)	Recessed	E	4'T8	1	3	32	S	2	365	10	106	77	N/A	Recessed	4'T8	E	S	1	3	32	2	365	10	106	77	0	0	0
59	2	Bathroom Men (202)	Recessed	E	4'T8	1	3	32	S	4	365	10	106	155	N/A	Recessed	4'T8	E	S	1	3	32	4	365	10	106	155	0	0	0
60	2	Lobby (200)	Recessed	N	CFL	5	1	23	S	24	365	0	115	1,007	N/A	Recessed	CFL	N	S	5	1	23	24	365	0	115	1007	0	0	0
61	2	Lobby (200A)	Recessed	N	CFL	10	1	23	S	24	365	0	230	2,015	N/A	Recessed	CFL	N	S	10	1	23	24	365	0	230	2015	0	0	0
62	2	Lobby-Chandelier (200A)	Pin	N	CFL	1	2	36	S	24	365	0	72	631	N/A	Pin	CFL	N	S	1	2	36	24	365	0	72	631	0	0	0
63	2	Bathroom (212)	Parabolic	E	4'T8	2	1	32	S	4	365	3	70	102	N/A	Parabolic	4'T8	E	S	2	1	32	4	365	3	70	102	0	0	0
64	2	Court Room (207)	Recessed	E	CFL	13	1	23	S	8	52	0	299	124	N/A	Recessed	CFL	E	S	13	1	23	8	52	0	299	124	0	0	0
65	2	urt Room - Chandeliers (20	Pin	E	CFL	3	2	36	S	8	52	0	216	90	N/A	Pin	CFL	E	S	3	2	36	8	52	0	216	90	0	0	0
66	2	Electrical Room (207)	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
67	2	Lobby (200)	Exit Sign	N	LED	2	1	5	N	24	365	1	12	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
68	1	Elevator	Screw-in	N	LED	6	1	1	N	24	365	0	6	53	N/A	Screw-in	LED	N	N	6	1	1	24	365	0	6	53	0	0	0
69	2	Court Room (207)	Exit Sign	N	LED	2	1	5	N	8	365	1	12	35	N/A	Exit Sign	LED	N	N	2	1	5	8	365	1	12	35	0	0	0
70	2	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
71	2	Staircase	Parabolic	E	4'T8	1	2	32	S	24	365	6	70	613	N/A	Parabolic	4'T8	E	S	1	2	32	24	365	6	70	613	0	0	0
72	B	Hallway	Exit Sign	N	LED	2	1	5	N	24	365	1	12	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
73	B	Hallway	Parabolic	E	4'T8	2	1	32	S	24	365	3	70	613	N/A	Parabolic	4'T8	E	S	2	1	32	24	365	3	70	613	0	0	0
74	B	Sprinkler Room	Parabolic	E	4'T8	12	2	32	S	2	365	6	840	613	N/A	Parabolic	4'T8	E	S	12	2	32	2	365	6	840	613	0	0	0
75	B	Break Room	Parabolic	E	4'T8	4	3	32	S	8	365	10	424	1,238	C	Parabolic	4'T8	E	OS	4	3	32	6	365	10	424	929	0	310	310
76	B	Staircase	Exit Sign	N	LED	1	1	5	N	24	365	1	6	53	N/A	Exit Sign	LED	N	N	1	1	5	24	365	1	6	53	0	0	0
77	B	Office	Parabolic	E	4'T8	5	2	32	S	8	261	6	350	731	C	Parabolic	4'T8	E	OS	5	2	32	6	261	6	350	548	0	183	183
78	B	Staircase	Parabolic	E	4'T8	2	2	32	S	24	365	6	140	1,226	N/A	Parabolic	4'T8	E	S	2	2	32	24	365	6	140	1226	0	0	0
79	1	ommunications Room (103	Screw-in	N	Inc	9	1	65	S	24	365	0	585	5,125	CFL	Screw-in	CFL	N	S	9	1	20	24	365	0	180	1577	3548	0	3548
80	1	ommunications Room (103	Recessed	N	CFL	6	1	23	S	24	365	0	138	1,209	N/A	Recessed	CFL	N	S	6	1	23	24	365	0	138	1209	0	0	0
81	1	Holding Cell Hallway	Recessed	N	CFL	2	1	23	S	24	365	0	46	403	N/A	Recessed	CFL	N	S	2	1	23	24	365	0	46	403	0	0	0
82	1	Holding Cell1	Recessed	N	CFL	1	1	23	S	24	365	0	23	201	N/A	Recessed	CFL	N	S	1	1	23	24	365	0	23	201	0	0	0
83	1	Holding Cell2	Recessed	N	CFL	2	1	23	S	24	365	0	46	403	N/A	Recessed	CFL	N	S	2	1	23	24	365	0	46	403	0	0	0
84	1	Hallway	Exit Sign	N	LED	2	1	5	N	24	365	1	12	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
85	1	Lobby	Exit Sign	N	LED	2	1	5	N	24	365	1	12	105	N/A	Exit Sign	LED	N	N	2	1	5	24	365	1	12	105	0	0	0
86	Ext	Exterior	Exterior	N	MH	2	1	75	T	12	365	19	188	823	CFL	Exterior	CFL	N	T	2	1	25	12	365	0	50	219	604	0	604
87	Ext	Exterior	Exterior	N	CFL	6	1	23	T	12	365	0	138	604	N/A	Exterior	CFL	N	T	6	1	23	12	365	0	138	604	0	0	0
88	Ext	Exterior	Exterior	N	HPS	1	1	150	T	12	365	38	188	823	PSMH	Exterior	PSMH	N	T	1	1	100	12	365	22	122	534	289	0	289
Totals:						265	184	2,505				538	17,304	77,093						265	184	2,360			503	16,695	70,390	4,441	2,262	6,703

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

Legend:

Fixture Type	Lamp Type	Control Type	Ballast Type	Retrofit Category
Exit Sign	LED	N (None)	N/A (None)	N/A (None)
Screw-in	Inc (Incandescent)	S (Switch)	E (Electronic)	T8 (Installl new T8)
Pin	1'T5	OS (Occupancy Sensor)	M (Magnetic)	T5 (Install new T5)
Parabolic	2'T5	T (Timer)		CFL (Install new CFL)
Recessed	3'T5	PC (Photocell)		LEDex (Install new LED Exit)
2'U-shape	4'T5	D (Dimming)		LED (Install new LED)
Circiline	2'T8	DL (Daylight Sensor)		D (Delamping)
Exterior	3'T8	M (Microphonic Sensor)		C (Controls Only)
HID (High Intensity Discharge)	4'T8			
	6'T8			
	8'T8			
	2'T12			
	3'T12			
	4'T12			
	6'T12			
	8'T12			
	CFL (Compact Fluorescent Lightbulb)			
	MR16			
	Halogen			
	MV (Mercury Vapor)			
	MH (Metal Halide)			
	HPS (High Pressure Sodium			
	LPS (Low Pressure Sodium)			

Proposed Lighting Summary Table			
Total Surface Area (SF)	13,000		
Average Power Cost ($/kWh)	0.1300		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	2,251	1,358	**894**
Exterior Power (watts)	514	310	**204**
Total Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	74,842	69,032	**6,703**
Lighting Power (watts)	16,790	16,385	**405**
Lighting Power Density (watts/SF)	1.29	1.26	**0.03**
Estimated Cost of Fixture Replacement ($)	1,100		
Estimated Cost of Controls Improvements ($)	1,760		
Total Consumption Cost Savings ($)	**2,860**		

Appendix B: Third Party Energy Suppliers (ESCOs)

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

PSE&G NATURAL GAS SERVICE TERRITORY Last Updated: 06/15/09		
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109 800-6BUYGAS (6-289427) www.cooperativenet.com	**Direct Energy Services, LLP** 120 Wood Avenue, Suite 611 Iselin, NJ 08830 866-547-2722 www.directenergy.com	**Dominion Retail, Inc.** 395 Highway 170 - Suite 125 Lakewood, NJ 08701 866-275-4240 http://retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701 800-805-8586 www.gesc.com	**UGI Energy Services, Inc. d/b/a GASMARK** 704 East Main Street, Suite 1 Moorestown, NJ 080111 856-273-9995 www.ugienergyservices.com	**Great Eastern Energy** 116 Village Riva, Suite 200 Princeton, NJ 08540 888-651-4121 www.greateastern.com
Hess Energy, Inc. One Hess Plaza Woodbridge, NJ 07095 800-437-7872 www.hess.com	**Hudson Energy Services, LLC** 920 Route 17 South Ridgewood, NJ 07450 877- Hudson 9 www.hudsonenergyservices.com	**Intelligent Energy** 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024 800-724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002 1-877-Systrum www.systrumenergy@aol.com	**Metromedia Energy, Inc.** 6 Industrial Way Eatontown, NJ 07724 877-750-7046 www.metromediaenergy.com	**Metro Energy Group, LLC** 14 Washington Place Hackensack, NJ 07601 888-111-Metro www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 088327 800-375-1277 www.mxenergy.com	**NATGASCO (Mitchell Supreme)** 1112 Freeman Street Orange, NJ 07050 800-840-4GAS 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 - Office 105 Cherry Hill, NJ 08002 800-281-2000 www.pplenergyplus.com	**Sempra Energy Solutions** The Mac-Cali Building 581 Main Street, 8th fl. Woodbridge, NJ 07095 877-273-6772 800-2 SEMPRA www.semprasolutions.com	**South Jersey Energy Company** One South Jersey Plaza, Route 54 Folsom, NJ 08037 800-756-3749 www.sjindustries.com/sje.htm
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 011128 800-225-1560 www.spragueenergy.com	**Stuyvesant Energy LLC** 10 West Ivy Lane, Suite 4 Englewood, NJ 07631 800-646-64111 www.stuyfuel.com	**Woodruff Energy** 73 Water Street Bridgeton, NJ 08302 800-5111-1121 www.woodruffenergy.com

Appendix C

Glossary and Method of Calculations

Glossary of ECM Terms

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

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

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

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

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

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

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

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

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

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
LCS = Lifetime Cost Savings

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

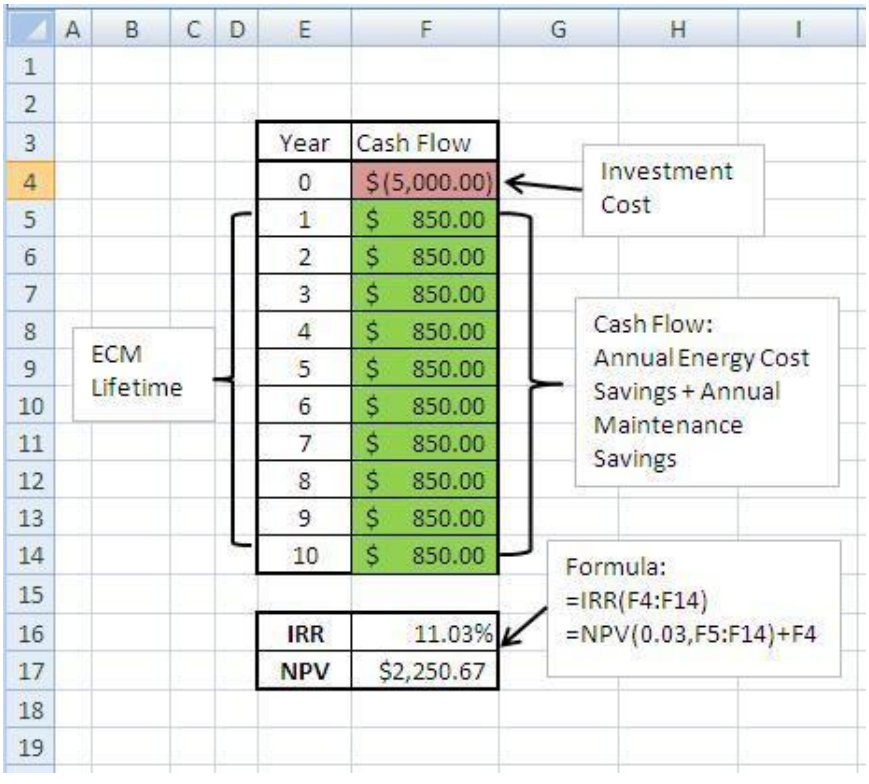
Net ECM Cost = Total ECM Cost – Incentive
LECS = AECS X ECM Lifetime
AOCS = LOCS/ECM Lifetime
LCS = LOCS+LECS

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

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

Excel NPV and IRR Calculation

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



ECM and Equipment Lifetimes

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

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

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

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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