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Local Government Energy Program
Energy Audit Draft Report

Borough of Bogota

Municipal Complex
375 Larch Avenue
Bogota, NJ 07603

Project Number: LGEA89

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EXECUTIVE SUMMARY

The Borough of Bogota Municipal Complex is a single-story building with a part mezzanine comprising a total floor area of 17,538 square feet. The original structure was built in 1890, with additions in 1980. The following chart provides a comparison of the current building energy usage based on the period from December 2010 through November 2010 with the proposed energy usage resulting from the installation of recommended Energy Conservation Measures (ECMs):

Table 1: State of Building—Energy Usage

	Electric Usage (kWh/yr)	Gas Usage (therms/yr)	# Fuel Oil (gallons/yr)	Current Annual Cost of Energy ($)	Site Energy Use Intensity (kBtu/sq ft /yr)	Joint Energy Consumption (MMBtu/yr)
Current	223,356	7,344	1,635	$54,504	98.0	1,725
Proposed	207,349	6,557	1,635	$49,958	92.1	1,623
Savings	1,6007	787	0	$4,546*	5.9	102
% Savings	7.2%	10.7%	0.0%	8.3%	6.0%	6.0%
Proposed Renewable Energy	23,600	0	0	$18,407	4.6	80

*Includes Operation and Maintenance savings also

SWA has entered energy information about the residential complex into the U.S. Environmental Protection Agency's (EPA) Energy Star Portfolio Manager Energy Benchmarking system. The building has a Site Energy Utilization of 98.0 kBtu/sqft/yr compared to a national average of 104.0 kBtu/sqft/yr.

Recommendations

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

Table 2: Energy Conservation Measure Recommendations

ECMs	First Year Savings ($)	Simple Payback Period	Initial Investment ($)	CO2 Savings (lbs/yr)
0-5 Year	2,815	1.9	5,365	23,297
5-10 Year	989	6.6	6,550	8,846
>10 year	741	12.7	9,400	5,194
Total	4,545	4.7	21,315	37,337
Proposed Renewable Energy	18,047	7.8	140,000	42,256

In addition to these ECMs, SWA recommends:

- Capital Investment opportunities – measures that would contribute to reducing energy usage but require significant capital resources as well as long-term financial planning
  - Install NEMA Premium motors when making replacements
  - Replace roof top packaged unit serving the Senior Center
  - Conduct a structural evaluation
- Operation and Maintenance (O&M) measures that would contribute to reducing energy usage at low cost – not cost
  - Repair/replace sagging, damaged ceiling insulation
  - Cold air drafts out of the attic opening in the borough office and roof gaps need to be closed
  - Repair downspouts, gutters and leaks

There may be energy procurement opportunities for the Borough of Bogota to reduce annual utility costs, which are $7,123 higher, when compared to the average estimated NJ commercial utility rates. SWA recommends further negotiation with energy suppliers, listed in Appendix D.

Environmental Benefits

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 7 cars from the roads each year or is equivalent of planting 217 trees to absorb CO_2 from the atmosphere.

Energy Conservation Measure Implementation

Based on the requirements of the Local Government Energy Audit (LGEA) program, the Borough of Bogota must commit to implementing some of these measures, and must submit paperwork to the Local Government Energy Audit program within one year of this report's approval to demonstrate that they have spent, net of other NJCEP incentives, at least 25% of the cost of the audit per building. The minimum amount to be spent, net of other NJCEP incentives, is $1,780.

SWA recommends that the Borough of Bogota implement the following Energy Conservation Measures using an appropriate Incentive Programs for reduced capital cost:

Recommended ECMs	Incentive Program (Appendix F for details)
Install Condensing Boiler	Smart Start, Direct Install
Replace T12 Fixtures with T8	Smart Start, Direct Install
Install New CFL fixtures	Direct Install
Install T5 Fixtures	Smart Start, Direct Install
Install 20.0 kW PV System	SRECS

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

INTRODUCTION

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

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

SWA performed an energy audit and assessment for the Municipal Complex at 375 Larch Avenue. The process of the audit included a facility visit on March 3, 2011, benchmarking and energy bills analysis, assessment of existing conditions, energy modeling, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

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

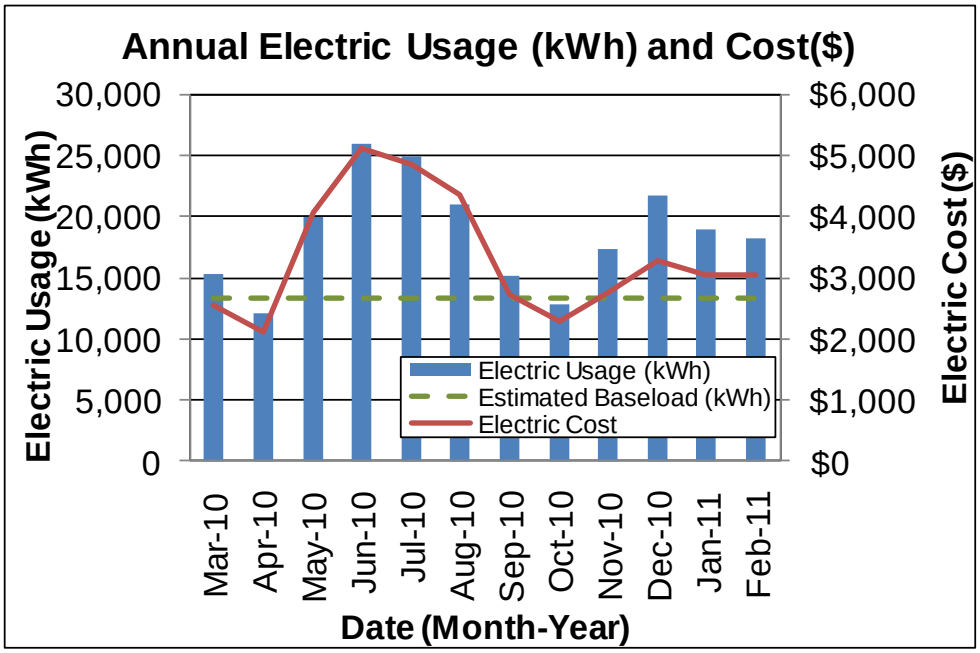
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from March 2009 through February 2011 that were received from the utility companies supplying the Municipal Complex with electricity, natural gas, and #2 fuel oil. A 12 month period of analysis from March 2010 through February 2011 was used for all calculations and for purposes of benchmarking the building.

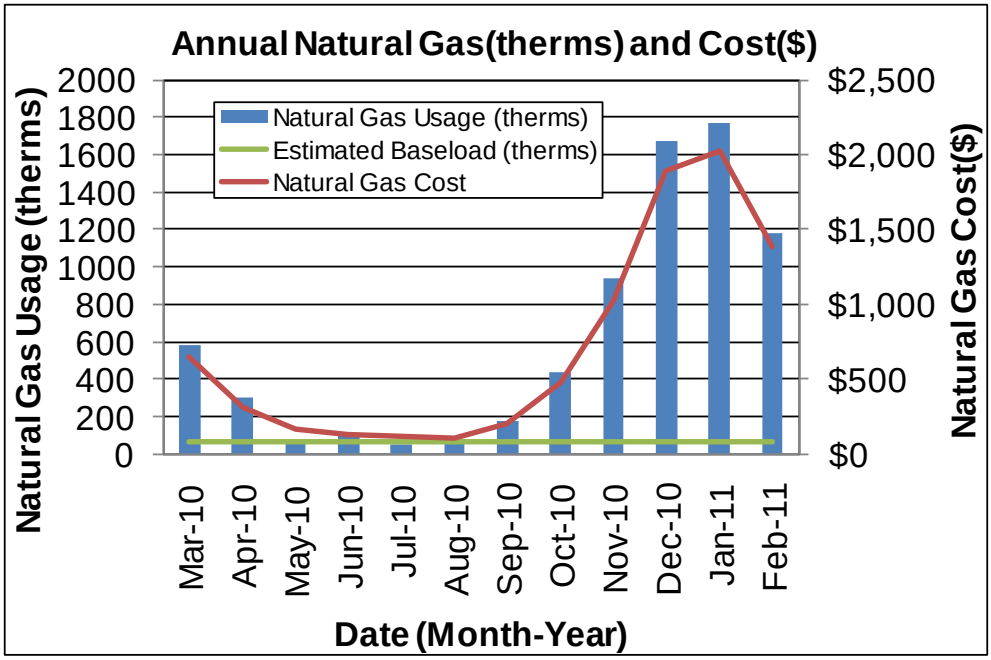
Electricity - The Municipal Complex is currently served by two electric meters that serve various sections of the facility. The Municipal Complex currently buys electricity from PSE&G at **an average aggregated rate of $0.180/kWh** and consumed **approximately 223,356 kWh, or $40,193 worth of electricity,** in the previous year. The average combined monthly demand is 67.6 kW and the combined annual peak demand was 98.8 kW.

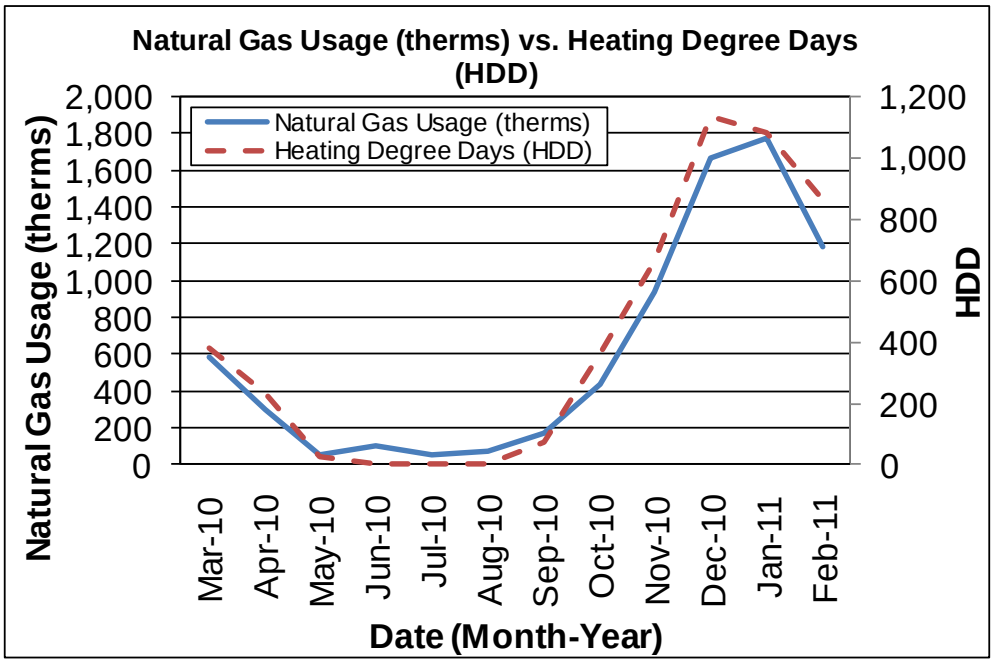
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the Municipal Complex.



Natural gas - The Municipal Complex is currently served by three meters for natural gas. The Municipal Complex currently buys natural gas from PSE&G at **an average aggregated rate of $1.154/therm** and consumed **approximately 7,344 therms, or $8,475 worth of natural gas,** in the previous year.

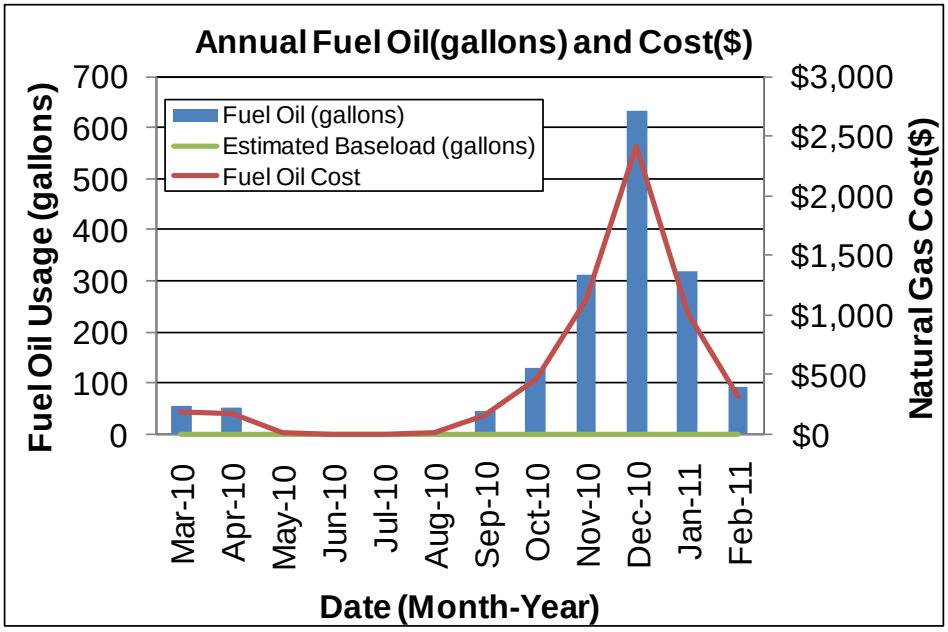
The chart below shows the monthly natural gas usage and costs. The green line represents the approximate baseload or minimum natural gas usage required to operate the Municipal Complex.

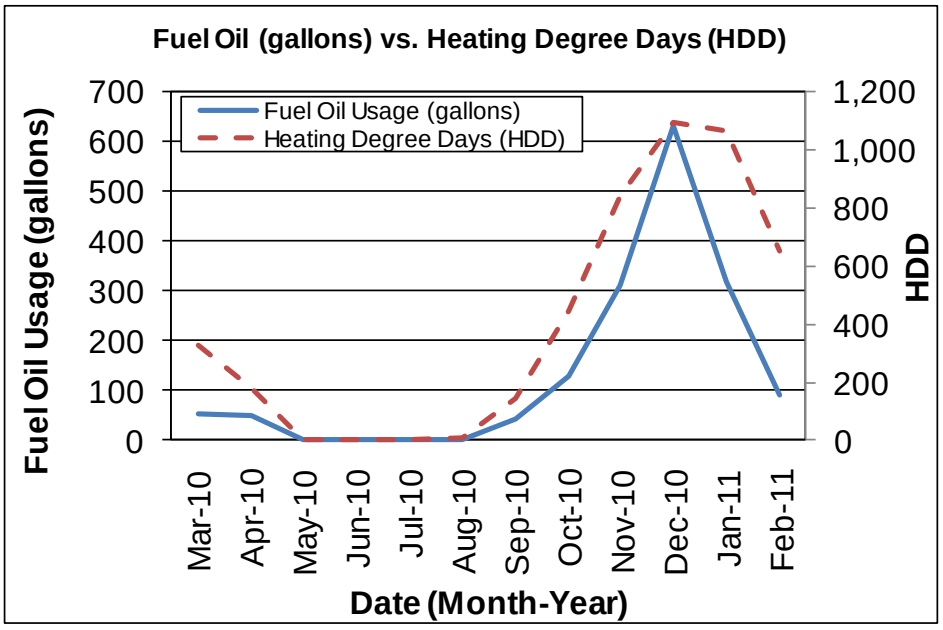




The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. SWA's analysis used a base temperature of 65 degrees Fahrenheit.

Fuel Oil #2 – Part of the Municipal Complex is also served by #2 fuel oil. The Municipal Complex currently buys fuel oil from Metro Energy at **an average aggregated rate of $3.570/gallon** and consumed **approximately 1,635 gallons, or $8,836 worth of fuel oil,** in the previous year. The chart below shows the monthly fuel oil usage and costs. The green line represents the approximate baseload or minimum fuel oil usage required to operate the Municipal Complex.

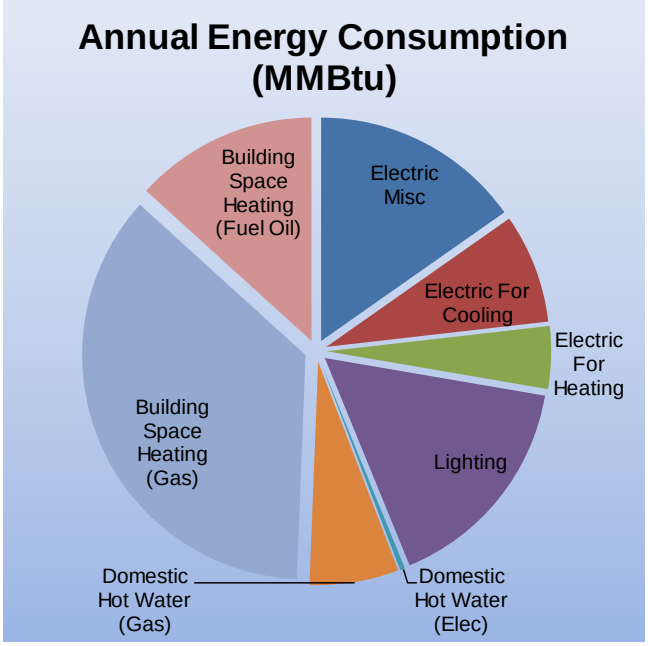


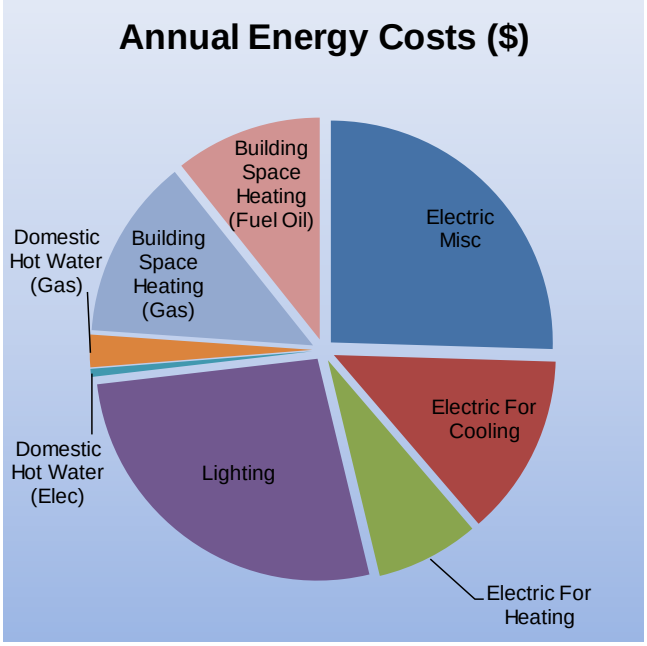


The chart above shows the monthly fuel oil usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base temperature. SWA's analysis used a base temperature of 65 degrees Fahrenheit.

The following graphs, pie charts, and table show energy use for Municipal Complex based on utility bills for the 12 month period. Note that electricity cost at $53/MMBtu of energy is over 2 times as expensive as fuel oil at $25/MMBtu, and approximately 4.4 times as expensive as natural gas at $12/MMBtu.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Misc	263	15%	$13,885	25%	53
Electric For Cooling	137	8%	$7,218	13%	53
Electric For Heating	78	5%	$4,100	8%	53
Lighting	278	16%	$14,672	27%	53
Domestic Hot Water (Elec)	6	0%	$319	1%	53
Domestic Hot Water (Gas)	111	6%	$1,283	2%	12
Building Space Heating (Gas)	623	36%	$7,192	13%	12
Building Space Heating (Fuel Oil)	229	13%	$5,836	11%	25
Totals	1,725	87%	$54,504	100%	
Total Electric Usage	762	44%	$40,193	74%	53
Total Gas Usage	734	43%	$8,475	16%	12
Total Fuel Oil Usage	229	13%	$5,836	11%	25
Totals	1,725	87%	$54,504	100%	

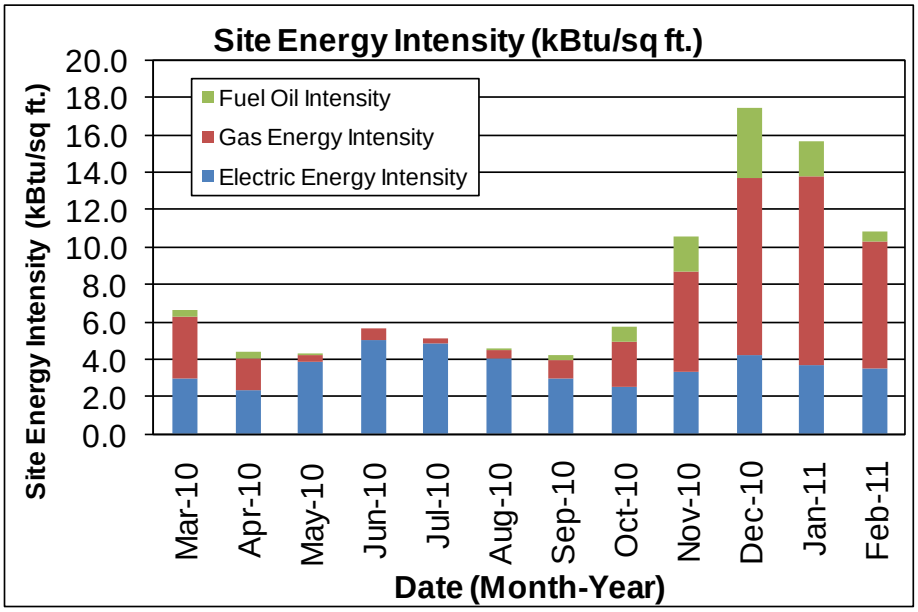




Energy benchmarking

SWA has entered energy information about the Municipal Complex in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager energy benchmarking system. This mixed use facility is categorized as a non-eligible ("Other") space type. Because it is an "Other" space type, there is no rating available. Consequently, the Municipal Complex is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 98.0 kBtu/sqft/yr compared to the national average of an "Other" building consuming 104.0 kBtu/sqft/yr. See ECM section for guidance on how to improve the building's rating.

Due to the nature of its calculation based upon a survey of existing buildings of varying usage, the national average for “Other” space types is very subjective, and is not an absolute bellwether for gauging performance.



Per the LGEA program requirements, SWA has assisted the Borough of Bogota to create an ENERGY STAR® Portfolio Manager account and share the Municipal Complex information to allow future data to be added and tracked using the benchmarking tool. SWA has shared this Portfolio Manager account information with the Borough of Bogota (user name of “BogotaBoro” with a password of “BOGOTABORO”) and TRC Energy Services (user name of “TRC-LGEA”).

Tariff analysis

Tariff analysis can help determine if the Borough of Bogota is paying the lowest rate possible for electricity, #2 fuel oil, and gas service. Tariffs are typically assigned to buildings based on size and building type. Rate fluctuations are expected during periods of peak usage. Natural gas and fuel oil prices often increase during winter months since large volumes of natural gas and fuel oil are needed for heating equipment. Similarly, electricity prices often increase during the summer months when additional electricity is needed for cooling equipment.

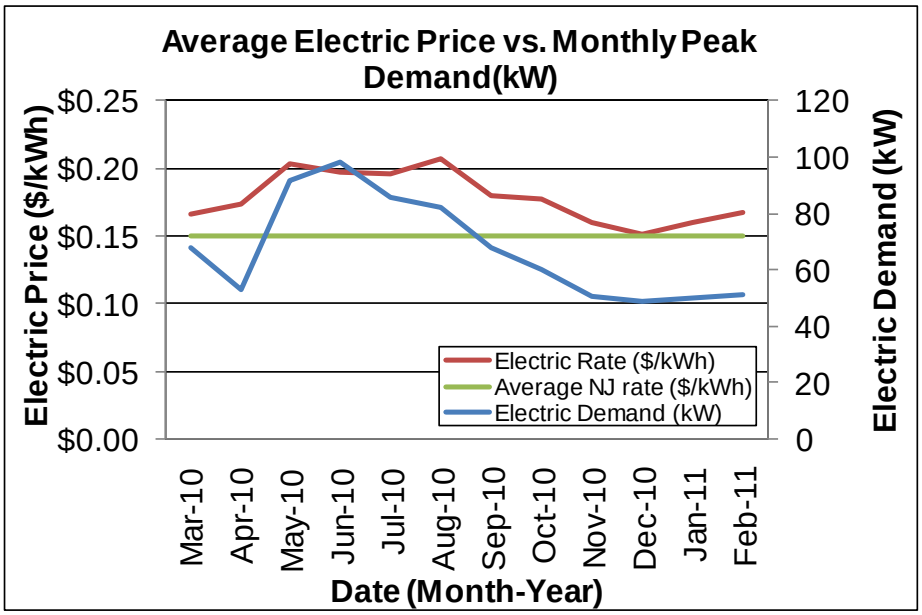
As part of the utility bill analysis, SWA evaluated the current utility rates and tariffs for the Borough of Bogota. The Municipal Complex is currently paying a general service rate for natural gas including fixed costs such as meter reading charges. The electric use for the building is direct-metered and purchased at a general service rate with an additional charge for electrical demand factored into each monthly bill. The general service rate is a market-rate based on electric usage and electric demand. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

Energy Procurement strategies

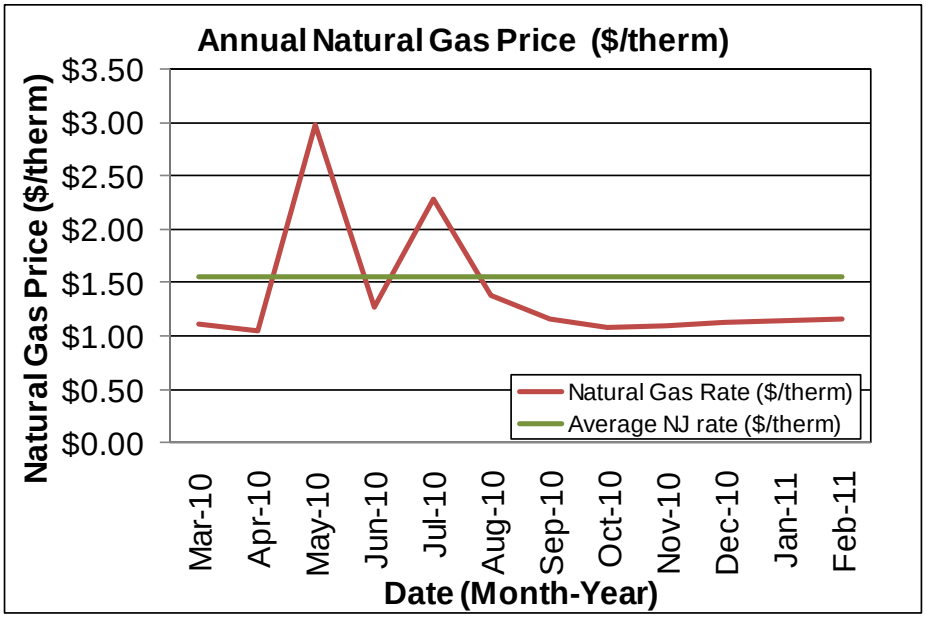
Billing analysis was conducted using an average aggregated rate which is estimated based on the total cost divided by the total energy usage for each utility over a 12 month period. Average

aggregated rates do not separate demand charges from usage, and instead provide a metric of inclusive cost per unit of energy. Average aggregated rates are used in order to equitably compare building utility rates to average utility rates throughout the state of New Jersey.

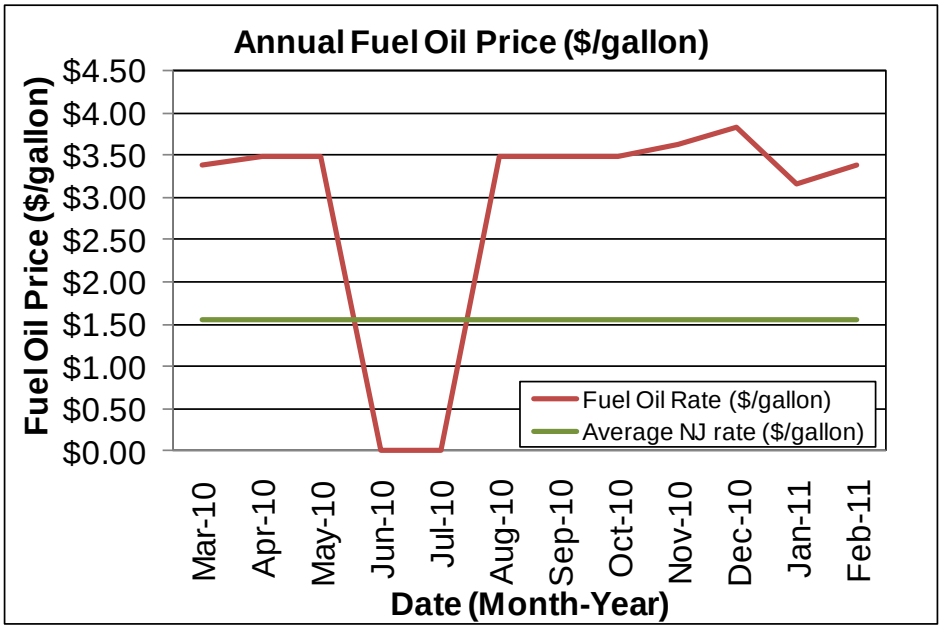
The average estimated NJ commercial utility rates for electric are $0.150/kWh, while Municipal Complex pays a rate of $0.180/kWh. The Municipal Complex annual electric utility costs are $6,690 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 27% over the most recent 12 month period.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while Municipal Complex pays a rate of $1.154/therm. Natural gas bill analysis shows fluctuations up to 65% over the most recent 12 month period.



The average estimated NJ commercial utility rate for fuel oil is 3.305/gallon, while Municipal Complex pays a rate of $3.570/gallon. The Municipal Complex annual #2 fuel oil costs are $433 higher, when compared to the average estimated NJ commercial utility rates. Fuel oil bill analysis shows fluctuations up to 18% over the most recent 12 month period.



Utility rate fluctuations may have been caused by adjustments between estimated and actual meter readings; others may be due to unusual high and recent escalating energy costs. The unusual trend in the graph above is due low usage during shoulder months while there are still metering costs.

SWA recommends that the Municipal Complex further explore opportunities of purchasing fuel oil, natural gas and electricity from third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Municipal Complex. Appendix D contains a complete list of third-party energy suppliers for the Borough of Bogota service area.

EXISTING FACILITY AND SYSTEMS DESCRIPTION

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

Based on visits from SWA on Thursday, March 03, 2011, the following data was collected and analyzed.

Building Characteristics

The Borough of Bogota Municipal Complex is 17,538 square feet multiple use facility with a partial second story and a partial basement. The original structure was a school built in the 1890's with further additions of a library in the 1980's and a senior center in 1988. The complex houses administration offices and a municipal court on the first and second floors, a library on the first floor, a senior center on the second floor, a police station in the daylight basement and a volunteer fire station in the rear.

West Façade

South Façade

Building Occupancy Profiles

Various portions of the building are occupied in a different manner. Police department remains open round the clock and has more visitors during the daytime than at night. The Borough hall remains open on weekdays from 9am through 5pm. The Library is generally open for the whole week – it is open till late on weekdays and closes early on weekends. The Fire department mostly remains on a standby, and can be occupied at random times even during the night. There are about 40 to 50 people during the weekdays on average in the building.

Building Envelope

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

Exterior Walls

The exterior wall envelope of the administrative offices and library is mostly constructed of fiber cement clapboard siding over concrete block. No wall insulation was detected. The police station walls are made up concrete block with a painted stucco finish and the fire

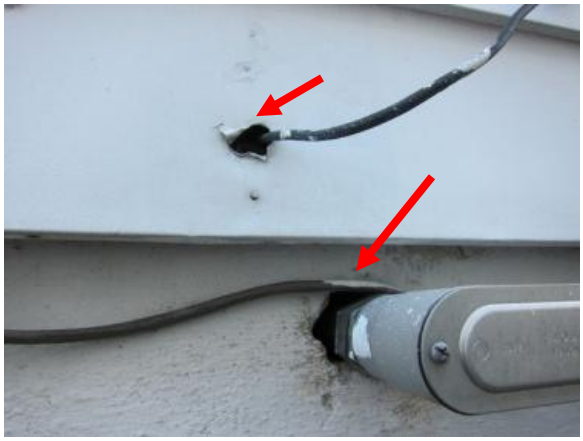
station walls are painted CMU (construction masonry unit), with no insulation. The interior is mostly stucco and gypsum board.

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

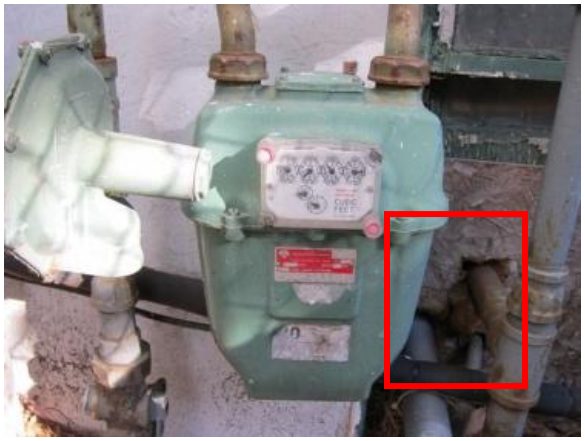
Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall acceptable condition with some signs of uncontrolled moisture, air-leakage and other energy-compromising issues located mostly at the side(s) of the building. The Borough hall office building had major fire around 1930's and since then a tie rod was put in place to support the exterior walls. The tie rod is still in place and may pose an imminent danger.

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

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



Un-caulked/un-sealed exterior wall penetrations



Un-caulked/un-sealed exterior wall penetrations

Roof

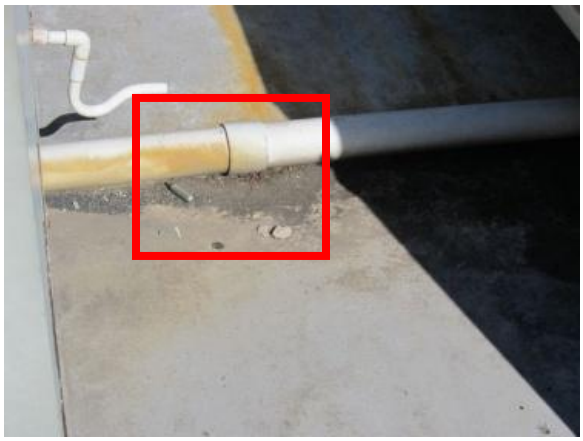
The building's roof is predominantly a medium-pitch hip and valley type over a wood structure, with an asphalt shingle finish, over the administration offices, senior center and library. It was replaced approximately 80 years ago. At least two inches of vermiculite attic/ceiling insulation roof insulation was recorded. Based on the age of the building, this

type of insulation may contain asbestos. Other parts of the building including the police station, fire marshals office and the fire station are covered by a flat and parapet type roof, over steel decking, with a light colored EPDM single membrane finish. This roof is original and has never been replaced.

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

Roofs, related flashing, gutters and downspouts were inspected during the field audit. They were reported to be in overall acceptable condition, with some signs of uncontrolled moisture, air-leakage and other energy-compromising issues mostly detected on flat roof areas.

The following specific roof problem spots were identified:



Rocks/nails or other sharp objects on roof surface, and debris including small CO2 cartridges

Ground vegetation touching/overhanging roof surfaces, and broken branches can lead to clogged drains

Deteriorating soffit and typical vermiculite attic insulation

Base

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

Slab/perimeter insulation levels could be verified visually in the field by non-destructive methods.

The building's base and its perimeter were inspected for signs of uncontrolled moisture or water presence and other energy-compromising issues. Overall the base was reported to be in good/ age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues detected in some areas inside.

Windows

The building contains several different types of windows.

1. Double hung type windows with a non-insulated, aluminum frame, clear double glazing and interior mini blinds, are located on either side of the building and were replaced recently
2. Some single pane windows with wood frames exist in the Borough hall offices
3. A few fixed and casement type windows are located at the front or west facade of the facility.

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

The following specific window problem spots were identified:

Single-glazed windows with ineffective wood frames – leading to cold drafts

Exterior doors

The building contains several different types of exterior doors..

1. Glass and aluminum frame type exterior doors. They are located at the main entrance and police station entrance.
2. Solid metal type exterior doors. They are located throughout the building.
3. Overhanging type exterior doors. They are found at the front of the fire station garage.

All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in acceptable condition with some signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific door problem spots were identified:

Missing/worn weather-stripping

Building air-tightness

Overall the field auditors found the building to be not adequately air-tight with numerous areas of suggested improvements, as described in more detail earlier in this chapter.

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

Mechanical Systems

Heating Ventilation Air Conditioning

The Borough Hall building consists of a Borough Hall office, Police department, Fire department, Senior Center and a Library. The whole building is conditioned except the Fire department garage which is only provided heating. There were no major complaints or comfort issues reported. The building occupancy is highly variable and depends on the actual office type – for example, Senior Center is mostly used in the evenings, weekends, and occasionally during the weekdays.

Equipment

The building contains a mix of split air conditioning units, gas fired furnaces, steam and hot water boilers, roof top packaged units, and ventilation fans. A comprehensive Equipment List can be found in Appendix A.

The Borough Hall offices consist of Tax office, Health office, Treasurer office, Violations office, Borough office, and Court. Originally, these offices were not cooled, and provided steam heat only through steam radiators, which remain original to the building. Despite their age, most steam radiators appeared to be in working condition except the one installed in the Treasurer's office, which was disconnected and not in use. The steam radiators are equipped with VariValve Quick-Vent manufactured by Heat Timer which are manually adjustable. Steam is provided by a 707MBH Peerson Boiler that was installed in 2009 and is in excellent condition. The boiler has about 92% of its service life remaining. The Tax and Health office are provided cooling by a York make split system air conditioner that was installed in 2009, and has about 93% of service life remaining. The heating in the Treasurer office is now supplied by a split system heat pump, which also provided cooling during summer. The heat pump is manufactured by Fujitsu and was installed in 2008. It appeared to be in good condition. There is an estimated 1.5 ton rated thru' the wall packaged air conditioner serving the Violations office. Finally, the Borough office itself is cooled by means of a 2 ton, Weather Maker, split system air conditioner installed in 2000. This unit is located in the attic space above the lobby.

Treasurer office disconnected radiator, Vari-Valve, and Steam boiler

The Police Department is air conditioned by means of a Carrier roof top packaged unit that was installed in 2000. The unit is rated for 5 tons of cooling and 115 MBH gas fired heating. It was in working condition, although there were a few rusted parts; however, the unit still has about 33% of service life remaining.

The Fire Department consists of a Hook & Ladder room, an Engine 1 room, and the Garage. This part of the building is heated with hot water baseboards located around the perimeter walls. Hot water is provided by a 200MBH Valliant make hot water boiler that was installed around 1994. It looked to be in good condition and has about 36% of its service life remaining. The Hook & Ladder and Engine 1 rooms are cooled by two split systems air conditioning units respectively. The condensing units for these rooms are mounted outside, high up on the wall on steel frames. These units appeared to be in good condition with 33% of service life remaining. The Garage is only heated – by two ceiling hung gas fired unit heaters that are operating beyond their service lives of 15 years each.

Police department RTU and Fire department boiler

The Fire Marshall's room/Office of Emergency Management is located just outside the Fire Department and consists of a Sunbeam make window air conditioner for cooling, and a Janitrol make gas fired unit heater for heating.

The Library is air conditioned by means of a Trane roof top packaged unit that was installed in 2010 and is in excellent condition. Additionally, the Library Research area is

heated/cooled by a Trane condensing furnace. The heating efficiency of the unit is high as 94%. It still has about 20% of service life remaining and appears to be in good condition.


Library RTU (inaccessible) and Senior Center RTU (old and rusted)

The Senior Center is air conditioned by means of an old roof top packaged unit which was found to be in bad condition, and is estimated to have been installed around 1980. Additionally, there are two Lennox condensing furnaces to provide heating/cooling in the peripheral areas. The heating efficiency of the units is high as 94%. They still have about 13% of service life remaining and appear to be in good condition.

The Violations office consist of two, wall mounted, sheet metal propeller fans which are both switch operated respectively. The fans are interlocked with the motorized dampers which prevent the ingress of outdoor air when the fan is off. The dampers are not completely air tight and the facility personnel had to cover the fan up with plastic to avoid heat loss, as seen in the picture below.

The Fire Department consists of two small kitchens and a bathroom, which are ventilated by individual roof mounted mushroom type fans, which are switch operated and/or interlocked with the light switch. Further, there is a tail pipe exhaust fan for the Garage, which automatically activates on detecting the smoke in the tail pipe.

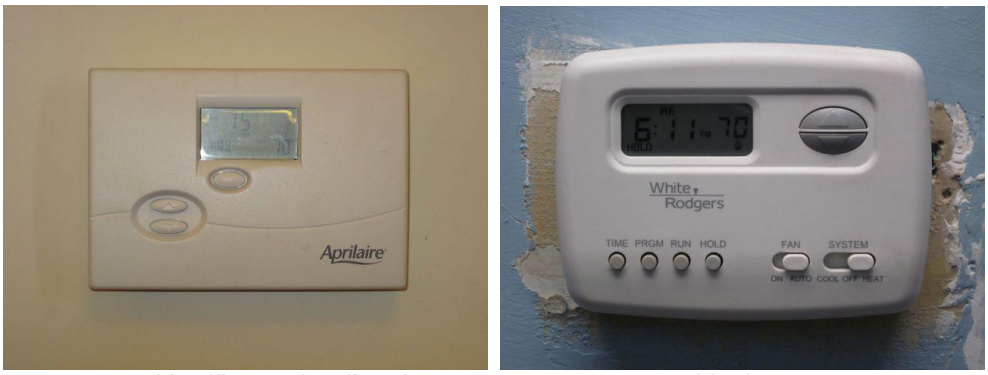

Condensing units on grade and a Fan covered with a plastic

Controls

There is no central building management system at the building – respective building types are independently managed from a mix of manual and programmable thermostats.

The steam radiators in the Borough Hall offices are centrally controlled from a single sensor located in the Tax office. The sensor communicates with a programmable thermostat located in the boiler room. This thermostat schedules the boiler for unoccupied modes, and shuts down the boiler if the demand is met.

The Tax and Health office unit, York split system air conditioner, is controlled by two programmable thermostats, one for each zone. Also, the heat pump in the Treasurer office is controlled by a programmable thermostat. The Borough Hall office unit, WeatheMaker split a/c, is also controlled by a programmable thermostat.



Health office and Police department – programmable thermostats

The Police Department roof top packaged unit is controlled from a White Rodgers make programmable thermostat, shown above.

Fire department (manual and programmable thermostats)
and Fire Marshall office manual thermostat

The Fire Department consists of hot water baseboards and a split system air conditioning units respectively. The baseboard are controlled via a manual thermostat in each room, and the split unit is controlled by a programmable thermostat. The Fire Marshall office is controlled by a manual thermostat.

The Library has many installed programmable thermostats – however, only one is in working condition which controls the new roof top packaged unit. The Senior Center contains one programmable thermostat to control the roof top packaged unit and two manual thermostats to control the heating/cooling furnaces.

Domestic Hot Water

There are three domestic water heaters in the building – two electric and one gas. The Police department and the Senior center are electric domestic water heaters with 40 and 50 gallons storage capacity respectively. The Fire department has a gas fired heater with 40 gallons storage. All the heaters appeared to be in good condition and had more than 30% of service life remaining.

Police Department and Senior Center DHW – excellent condition

Electrical systems

Lighting

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

As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps will no longer be produced for commercial and industrial applications. Also, many T12 lamps will be phased out of production starting July 2012.

Interior Lighting - The administration, senior center and library sections currently contains mostly efficient T8 fixtures and chandeliers with compact fluorescent (CFL) self-ballast bulbs. There are no vastly over-illuminated areas.


Chandeliers with CFL bulbs located in the administration offices


T8 light fixtures located in the tax office and library

Ceiling mounted T8 fixtures in fire station

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

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of incandescent and flood lamps. Exterior lighting is controlled by photocell/timers.

Exterior flood lights. Note the light on the right (on fire station) is illuminated during daytime

Appliances and process

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

Non ENERGY STAR® Refrigerators found in the administrative office and police station

Elevators

The Municipal Complex has an elevator serving the 1st floor library and administrative offices, and the 2nd floor senior center, other administrative offices and court.

Other electrical systems

There are currently a few other significant energy-impacting electrical systems installed at the Municipal Complex. These appliances include refrigerators and vending machines that run continuously 24 hours a day 7 days a week. There is also a 60kW Kohler emergency generator mainly serving the police department emergency lights.

Snack and beverage vending machines that operate 24/7 in the fire station

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

Renewable energy is defined as any power source generated from sources which are naturally replenished, such as sunlight, wind and geothermal. Technology for renewable energy is improving and the cost of installation is decreasing due to both demand and the availability of government-sponsored funding. Renewable energy reduces the need for using either electricity or fossil fuel, therefore lowering costs by reducing the amount of energy purchased from the utility company. Solar photovoltaic panels and wind turbines use natural resources to generate electricity. Geothermal systems offset the thermal loads in a building by using water stored in the ground as either a heat sink or heat source. Cogeneration or Combined Heat and Power (CHP) allows for heat recovery during electricity generation.

Existing systems

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

Evaluated Systems

Solar Photovoltaic

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

Based on utility analysis and a study of roof conditions, the Municipal Complex is a good candidate for a 20 kW Solar Panel installation. See ECM# 8 for details.

Solar Thermal Collectors

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

Wind

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

Geothermal

The Municipal Complex is not a good candidate for geothermal installation since it would require replacement of the major portions of existing HVAC system and installation of cooling systems where no cooling exists now.

Combined Heat and Power

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

PROPOSED ENERGY CONSERVATION MEASURES

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

Recommendations: Energy Conservation Measures

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	Retrofit (1) refrigerated vending machine with a VendingMiser™ device
2	Upgrade (30) Incandescent to CFL
3	Retrofit (1) vending machine with a SnackMiser™ device
4	Install programmable thermostats with controller etc.
	Description of Recommended 5-10 Year Payback ECMs
5	Replace (1) old Municipal Complex refrigerator with 16 cu ft Energy Star model
6	Replace (1) old Municipal Complex refrigerator with 18 cu ft Energy Star model
7	Install (26) occupancy sensors
8	Install (20) kW Solar Photovoltaic system
	Description of Recommended >10 Year Payback ECMs
9	Upgrade (1) Metal Halide fixture with Pulse Start Metal Halide Type
10	Replace the Fire department boiler

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

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

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

Installation cost:
Net estimated installed cost: $199 (includes $20 of labor)
Source of cost estimate: www.usatech.com and established costs

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
199	1,941	0	0	0.4	349	699	12	8,385	0.3	4,113	343	351	6,467	3,475

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA assumes energy savings based on modeling calculator found at www.usatech.com or http://www.usatech.com/energy_management/energy_calculator.php.

Rebates/financial incentives:
- This measure does not qualify for a rebate or other financial incentive at this time.

Please see Appendix G for more information on Incentive Programs.

ECM#2: Upgrade (30) incandescent fixtures to CFLs

During the field audit, SWA completed a building lighting inventory (see Appendix B). The existing lighting contains some inefficient incandescent lamps. SWA recommends that each incandescent lamp is replaced with a more efficient, Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power when compared to incandescent, halogen and Metal Halide fixtures. CFL bulbs produce the same lumen output with less wattage than incandescent bulbs and last up to five times longer. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:
Net estimated installed cost: $866 (includes $120 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

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
866	4,993	1	0	1.0	107	1,006	5	5,029	0.9	481	96	114	3,599	8,941

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA also assumed an aggregated 2 hrs/yr to replace aging burnt out lamps vs. newly installed.

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

Please see Appendix G for more information on Incentive Programs.

ECM#3 Retrofit (1) vending machine with a SnackMiser™ device

SnackMiser™ devices are now available for conserving energy used by vending machines. It is not necessary to purchase new machines to reduce operating costs and greenhouse gas emissions. When equipped with the SnackMiser™ devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines.

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

Installation cost:
Net estimated installed cost: $180 (includes $20 of labor)
Source of cost estimate: www.usatech.com and established costs

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
180	466	0	0	0.1	0	84	12	1,006	2.1	459	38	46	625	834

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA assumes energy savings based on modeling calculator found at www.usatech.com or http://www.usatech.com/energy_management/energy_calculator.php.

Rebates/financial incentives:

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

Please see Appendix G for more information on Incentive Programs.

ECM#4: Install (4) New Thermostats along with Controller

The Fire Department consists of hot water baseboards which are controlled with manual thermostats. The Fire Marshall office is controlled by a manual thermostat. The Senior Center contains two manual thermostats to control the heating/cooling furnaces. The manual thermostats can only be set to maintain a particular temperature and have to be manually turned by people leaving last. Also, in the winter months, there is no capability to set back the temperature settings.

Further, the Fire Marshall office and the Senior Center, both have a variable occupancy pattern. The zones are open to public for most of the days; however, the occupancy levels are inconsistent. There are extended hours without occupancy, and a few hours of high occupancy during the evening hours. SWA proposes occupancy sensor based temperature settings to cut down energy usage.

SWA proposes that the building install (4) new programmable thermostats, a new central controller that can be programmed infinitely from a computer, four occupancy sensors, an outside air stat, and new control wiring. In the new proposed settings, the HVAC packaged units mentioned above would operate at minimum settings and remain off during unoccupied hours in summer and shoulder seasons. Existing programmable thermostats would be wired into the controller and receive their schedules from here as well. These settings would revert to occupied mode settings on receiving an occupancy signal, and remain in the setting when the occupants are detected.

The proposed temperature settings are as follows:

	Summer		Winter		Shoulder	
	Occupied	**Unoccupied**	**Occupied**	**Unoccupied**	**Occupied**	**Unoccupied**
Proposed settings	78F	Off	68F	62F	72F	Off

Installation cost:
Estimated installed cost: $4,200 (includes $2,200 of labor)
Source of cost estimate: Manufacturer’s data and similar projects

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
4,120	3,350	0.1	367	2.7	0	1,027	15	15,400	4.0	274	18	24	7,714	10,046

Assumptions: SWA calculated the savings for this measure using nameplate data taken and using the billing analysis. SWA estimated 5% savings in equipment hours of operation resulting in heating and cooling electric savings.

Rebates/financial incentives:

- *NJ Clean Energy – Occupancy and motion sensors ($20 per control) - Maximum incentive amount is $80*

Please see Appendix G for more information on Incentive Programs.

ECM#5: Replace (1) Old 16 cu. ft. Refrigerator with ENERGY STAR® Efficient Type

During the field audit, SWA inspected old refrigerators which were not ENERGY STAR® rated (using approximately 1,329 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 old 16 cu. ft. refrigerator with an ENERGY STAR® type, of the same size, using approximately 1,019 kWh/yr, or equivalent. Besides saving energy, the replacement will also keep the surrounding area 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.

On April 28, 2008, the ENERGY STAR® criteria changed for all full-size refrigerators. All refrigerators greater than 7.75 cubic feet must be at least 20% more efficient than the federal standard. Before April 28, 2008, refrigerators needed to be at least 15% more efficient than the federal standard. The criteria for freezers and compact refrigerators and freezers did not change.

Installation cost:
Net estimated installed cost: $625 (includes $100 of labor)
Source of cost estimate: Manufacturer and Store established costs, NJ Clean Energy Program

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
625	310	0	0	0.1	50	106	12	1,269	5.9	103	9	13	403	555

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA assumed annual labor and parts insurance for old refrigerators.

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

Please see Appendix G for more information on Incentive Programs.

ECM#6: Replace (1) Old 18 cu. ft. Refrigerator with ENERGY STAR® Efficient Type

During the field audit, SWA inspected old refrigerators which were not ENERGY STAR® rated (using approximately 1,445 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 old refrigerator with a 19 cu. ft. ENERGY STAR® top freezer refrigerator, using approximately 1,062 kWh/yr, or equivalent. Besides saving energy, the replacement will also keep the surrounding area 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.

On April 28, 2008, the ENERGY STAR® criteria changed for all full-size refrigerators. All refrigerators greater than 7.75 cubic feet must be at least 20% more efficient than the federal standard. Before April 28, 2008, refrigerators needed to be at least 15% more efficient than the federal standard. The criteria for freezers and compact refrigerators and freezers did not change.

Installation cost:
Net estimated installed cost: $725 (includes $100 of labor)
Source of cost estimate: Manufacturer and Store established costs, NJ Clean Energy Program

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
725	383	0	0	0.1	50	119	12	1,427	6.1	97	8	12	431	686

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA assumed annual labor and parts insurance for old refrigerators.

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

Please see Appendix G for more information on Incentive Programs.

ECM#7: Upgrade Lighting With (26) Occupancy Sensors

During the field audit, SWA completed a building lighting inventory (see Appendix B). SWA observed that the existing lighting has minimal to no control via occupancy sensors. SWA identified a number of areas that could benefit from the installation of occupancy sensors. SWA recommends installing occupancy sensors in areas that are occupied only part of the day and the payback on savings is justified. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advance micro-phonic lighting sensors include sound detection as a means to control lighting operation. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:
Net estimated installed cost: $5,200 (includes $1,560 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
5,200	4,248	1	0	0.8	0	765	15	11,469	6.8	121	8	12	3,679	7,605

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

Rebates/financial incentives:
- NJ Clean Energy – Wall-mounted occupancy sensors ($20 per occupancy sensor).

Please see Appendix G for more information on Incentive Programs.

ECM#8: Install a 20 kW solar photovoltaic rooftop system

Currently, the building does not use any renewable energy systems. Renewable energy systems such as photovoltaic (PV) panels can be mounted on the building roof facing south which 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, electric demand at a power station is high, due to the amount of air conditioners, lights, and other equipment being used within the region. Demand charges increase to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems offset the amount of electricity used by a building and help to reduce the building's electric demand, resulting in a higher cost savings. Installing a PV system will offset electric demand and reduce annual electric consumption, while utilizing available state incentives. PV systems are modular and readily allow for future expansions.

The size of the system was determined considering the available roof surface area, without compromising service space for roof equipment and safety, as well as the facilities' annual base load and mode of operation, especially during the peak summer months when the school is generally closed. A PV system could be installed on a portion of the roof with panels facing south. A commercial multi-crystalline 230 watt panel has 17.5 square feet of surface area (providing 13.1 watts per square foot). A 20 kW system needs approximately 87 panels which would take up 1,600 square feet. SWA found the available roof area for solar panels to be much more than 1,600 square feet and could easily accommodate the recommended size.

A PV system would reduce the building's electric load and allow more capacity for surrounding buildings as well as serve as an example of energy efficiency for the community. The building is not eligible for a residential 30% federal tax credit. The building owner 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.

Please note that this analysis did not consider the structural capability of the existing building to support the above recommended system. SWA recommends that the school contract with a structural engineer to determine if additional building structure is required to support the recommended system and what costs would be associated with incorporating the additional supports prior to system installation. Should additional costs be identified, the school should include these costs in the financial analysis of the project.

Installation cost:

Estimated installed cost: $140,000 (including $61,480 total labor cost)
Source of cost estimate: Similar projects

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
140,000	23,600	20.0	0	4.6	0	18,047	25	451,172	7.8	222	9	10	91,778	42,256

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 - Solar Renewable Energy Certificate Program. Each time a solar electric system generates 1,000kWh (1MWh) of electricity, a SREC is issued which can then be sold or traded separately from the power. The buildings must also become net-metered in order to earn SRECs as well as sell power back to the electric grid. A total annual SREC credit of $13,800 has been incorporated in the above costs however it requires proof of performance, application approval and negotiations with the utility.

Annual Solar PV Cost Savings Breakdown

Rated Capacity (kW)	20.0
Rated Capacity (kWh)	23,600
Annual Capacity Loss	0%

Year	kWh Capacity	Installed Cost	Incentives	Electric Savings ($)
0		$140,000	$15,000	
1	23,600		$13,800	$4,247
2	23,600		$13,800	$4,247
3	23,600		$13,800	$4,247
4	23,600		$13,800	$4,247
5	23,600		$13,800	$4,247
6	23,600		$13,800	$4,247
7	23,600		$13,800	$4,247
8	23,600		$13,800	$4,247
9	23,600		$13,800	$4,247
10	23,600		$13,800	$4,247
11	23,600		$13,800	$4,247
12	23,600		$13,800	$4,247
13	23,600		$13,800	$4,247
14	23,600		$13,800	$4,247
15	23,600		$13,800	$4,247
16	23,600		$0	$4,247
17	23,600		$0	$4,247
18	23,600		$0	$4,247
19	23,600		$0	$4,247
20	23,600		$0	$4,247
21	23,600		$0	$4,247
22	23,600		$0	$4,247
23	23,600		$0	$4,247
24	23,600		$0	$4,247
25	23,600		$0	$4,247
	kWh	Cost	Saving	
Lifetime Total	**590,000**	**($140,000)**	**$222,000**	**$106,172**

Please see Appendix G for more information on Incentive Programs.

ECM#9: Upgrade (1) Metal Halide fixture with Pulse Start Metal Halide Type

During the field audit, SWA completed a building interior as well as exterior lighting inventory (see Appendix B). The existing lighting contains one standard probe start Metal Halide (MH) fixture. SWA recommends replacing the higher wattage MH fixture with a pulse start MH type which offers the advantages of standard probe start MH fixtures, but minimize the disadvantages. They produce higher light output both initially and over time, operate more efficiently, produce whiter light, and turn on and re-strike faster. Due to these characteristics, energy savings can be realized via one-to-one substitution of lower-wattage systems, or by taking advantage of higher light output and reducing the number of fixtures required in the space. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:
Net estimated installed cost: $700(includes $150 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

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
700	315	0	0	0.1	0	57	15	851	12	22	1	3	-31	565

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

Rebates/financial incentives:
- NJ Clean Energy - SmartStart - Metal Halide with pulse start ($25 per fixture) - Maximum incentive amount is $25

Please see Appendix G for more information on Incentive Programs.

ECM #10: Replace Existing Gas Boilers with Condensing Boilers

The Fire Department is heated with hot water baseboards and the hot water is provided by a 200MBH Valliant make hot water boiler with an estimated efficiency of about 78%. The boiler has about 36% of service life remaining. SWA analyzed the economics of replacing and upgrading the boiler with new condensing technology. Condensing boilers allow condensation of moisture in flue gases resulting in lower flue gas temperatures with increased efficiencies up to 95%. The new high efficiency condensing boilers should have a guaranteed minimum thermal efficiency of 85% and efficiencies of up to 95% achievable during condensing mode at lower return water temperatures. The new boiler should be rated for 200MBH as well.

Installation cost

Estimated installed cost: $9,100 (estimated labor cost of $2,900)
Source of cost estimate: RS Means and similar projects

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
8,700	0	0.0	420	0.7	200	685	25	17,117	12.7	97	4	6	2,869	4,630

Assumptions: SWA assumed the efficiency of the new condensing boilers as 92% for calculating the therms saved, and that of the existing boiler as 65%. Lastly, SWA assumed 10 hours worth of annual savings in maintenance time from new boilers.

Rebates/financial incentives:

- NJ Clean Energy - Gas-fired boilers ≤ 300 MBH ($2.00 per MBH) – Maximum incentive amount is $400

Please see Appendix G for more information on Incentive Programs.

PROPOSED FURTHER RECOMMENDATIONS

Capital Improvements

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

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

- Conduct a structural revaluation for the whole building - The Borough hall office building had major fire around 1930's and since then a tie rod was put in place to support the exterior walls. The tie rod is still in place and may pose an imminent danger. SWA recommends a full scale structural review highlighting the safety of the occupants.

- Replace the steam system - The Borough Hall offices consist of Tax office, Health office, Treasurer office, Violations office, Borough office, and Court. Originally, these offices were not cooled, and provided steam heat only through steam radiators, which remain original to the building. Despite their age, most steam radiators appeared to be in working condition except the one installed in the Treasurer's office, which was disconnected and not in use. Steam systems are generally not as efficient as hot water systems – SWA recommends that the building switch over to hot water system heating at the next available opportunity. The savings alone would not justify the replacement as the first cost will be high.

- Replace windows – There are a few single pane windows with wood frames that do not prevent the cold air drafts. SWA recommends that the Borough of Bogota replace all single pane windows with double pane windows.

- Replace Senior Center package unit – The Senior Center roof top packaged unit was old and operating beyond its service life. The nameplate of the unit was not available and rusted. SWA recommends that this unit be replaced at the earliest, before it completely stops operating due to an impending malfunction.

Operations and Maintenance

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

- Caulk/seal exterior wall penetrations.

- Install/repair roof and ceiling holes – The Attic door in the Borough office spews out cold air all through the winter. SWA inspected the area and found some air leakages that should be closed out.

- The Balcony outside the Borough hall office does not have an electric receptacle for putting Christmas lights or other such engagements. SWA recommends the maintenance personnel to extend the electricity to the balcony.

- Install/repair and maintain gutters, downspouts and downspout deflectors to minimize uncontrolled roof water run-off causing exterior wall damage.

- Clear roof surfaces of debris to reduce the chance of clogged roof drains.

- Hot water pipes in various sections of the building including mechanical rooms were not insulated. SWA recommends insulating all hot water pipes – insulation not only prevents scalding but also conserves energy that is otherwise wasted.

- Install/replace and maintain weather-stripping around all exterior doors.

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

- Replace roof insulation with asbestos-free material.

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

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

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

Note: The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for Borough of Bogota. Based on the requirements of the LGEA program, Borough of Bogota must commit to implementing some of these measures, and must submit paperwork to the Local Government Energy Audit program within one year of this report’s approval to demonstrate that they have spent, net of other NJCEP incentives, at least 25% of the cost of the audit (per building). The minimum amount to be spent, net of other NJCEP incentives, is $1,780.

APPENDIX A: EQUIPMENT LIST

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
Cooling	Fan coil unit of the Split System Heat Pump, R22 refrigerant, 5 tons cooling, 208/3/60, 4.5FLA - two zones ducting	Tax Office closet	York, Model F2FP060N06B, S/N XCNS069609	Elec.	Tax Office and Health Office	2009	93%
Cooling	Condensing unit, 5 tons cooling, est.10SEER MCA37.4	Outside, on grade	York, Model AC060X1233A, S/N WANM047636	Elec.	Tax Office and Health Office	2009	93%
HVAC	Split heat pump unit, 11800Btu/hr cooling, 140000 Btu/hr heating, MCA15, R-22, est. 13 SEER	Indoor unit in Treasurer office, outdoor unit on PD Roof	Fujitsu, S/N 63728	Elec.	Treasurer	2008	87%
Ventilation	Wall mounted propellor fan, sheet metal, covered with black plastic, NIU, switch operated	Violations	Nameplate N/A	Elec.	Violations	est. 1990	0%
Ventilation	Wall mounted propellor fan, sheet metal, switch operated	Storage	Nameplate N/A	Elec.	Storage	est. 1990	0%
Heating	Steam boiler, est. 707MBH input, 5 sections heating,Beckitt Burner model CF800, S/N 090127-89343, 5.5GPH,	Boiler Room, Police department	Pearson Boilers, Model LC-05R, S/N NJ112370-10H	Fuel Oil	Municipal offices/Borough Hall	2009	92%
DHW	Domestic water heater, 4.5kW, 40 gallons tank, 208/1/60	Boiler Room, Police department	Rheem, Model 82V40-2, S/N RH 0604B04296	Elec.	Police department	2004	54%
Cooling	Split system air conditioner, est. 5 tons cooling, 10 SEER unit	Hook and Ladder, and Enginer Room 1; and condensing unit outdoor on steel frame on wall	MultiAqua indoor unit, Fedders outdoor unit, model CT060CBD3V; nameplates bleached out	Elec.	Hook and Ladder fire fighter's room, and Engine Room 1 respectively	est. 2000	33%
Heating	Hot water boiler, 200MBH input, est. 80% eff., atmospheric	Boiler Room, Fire department	Valliant, GA92-200, S/N 320-1008	Gas	Fire Department	est. 1994	36%
Heating	Unit heater, est. 40MBH input, 2 nos., 80% eff.	Fire Department Garage	Reznor, nameplate N/A	Gas	Fire Department Garage	est. 1990	0%
Heating	Unit heater, 85/68 MBH in/out, est. 80% eff.	Office of Emergency Management	Janitrol, Model UCS85-55	Gas	Office of Emergency Management	est. 1994	0%
Cooling	Split system air conditioner, 115/1/60, 6.8A, est. 2 tons cooling, 10SEER	Borough Office	WeatherKing, Model WBHA-24A00NFAAI, S/N M4600 03872	Elec.	Attic above 2nd floor lobby	2000	33%
HVAC	Roof top packaged unit, est. 15 tons cooling, brand new, no other details available	Roof - above Violations	Trane Voyager, Nameplate N/A	Gas/Elec.	Library	2010	93%
HVAC	Roof top packaged unit, est. 15 tons cooling, very old, no other details available	Roof - above Violations	Nameplate N/A	Gas/Elec.	Sr. Center	est. 1980	0%
HVAC	Roof top packaged unit, 5 tons cooling, 10SEER, 208/1/60, MCA43.3; heating 115/92MBH in/out, est. 78% eff.	Police department	Carrier, Model 48TJE006- 311, S/N 3000G21063	Gas/Elec.	Roof - Police deparmtment	2000	33%

Building System	Description	Location	Model#	Fuel	Space served	Year Equip Installed	Remaining useful life %
Ventilation	Tail Pipe exhaust fan, c/w Baldor Electric motor, 3HP, 115/1/60, 3450 rpm	Fire Department Garage	Model AF-12,	Elec.	Outside, on wall	est. 1990	0%
DHW	Domestic water heater, 40MBH input, est. 80% eff., 40 gallons tank	Fire Department	Bradford White Corporation, Model MI40T6FBN, S/N EH11014859	Gas	Fire Department	est. 2001	31%
HVAC	Furnace, heating input 100MBH, est. 94% eff. c/w with a DX cooling section, R-22	Sr. Center	Lennox, Furnace Model G21Q4/5-100-3, S/N 5896F 44786; Evaporator model C3-51/65FC-1, S/N 6096L23687	Gas/Elec.	Sr. Center	1997	13%
Cooling	Condensing unit, est. 5 tons cooling, R-22, 208/3/60, MCA 23.5	Outdoor, on grade	Lennox, Model HS26-060-2Y, S/N 5897A 06732	Elec.	Sr. Center	1997	13%
HVAC	Furnace, heating input 60MBH, est. 94% eff. c/w with a DX cooling section, R-22	Sr. Center	Lennox, Furnace Model G21Q3-60-1, S/N 5896D 26790; Evaporator model C23-41WFC-1, S/N 6097844675	Gas/Elec.	Sr. Center	1997	13%
Cooling	Condensing unit, est. 3 tons cooling, R-22, 208/1/60, MCA 21.2	Outdoor, on grade	Lennox, Model HS26-036-2P, S/N 5897B 15287	Elec.	Sr. Center	1997	13%
DHW	Domestic water heater, 4.5kW, 208/1/160, 50 gallons tank	Sr. Center	Rheem, Model 82VF2-2, S/N RH 0608252273	Elec.	Sr. Center	2008	85%
Cooling	Heating furnace, split DX cooling; est. 80MBH input at 94% eff., and 3 tons cooling at 10 SEER, R-22	Library closet	Trane, XE90, Model TUX080C942B4, S/N N172LXU7G	Elec.	Library - Research area	1998	20%
Cooling	Condensing unit, est. 3 tons cooling, R-22, 208/1/60, MCA 22	Outdoor, on grade	Trane, Model TTB036, XB1000, S/N N1520A	Elec.	Library - Research area	1998	20%
Ventilation	Mushroom type roof mounted exhaust fans, 3 nos., est. 1/6hp motor, switch operated	Kitchen for Hook and Ladder and for Engine Room 1 respectively, and for bathroom	Nameplate N/A	Elec.	Roof of Fire Department	est. 1990	0%

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

Appendix B: Lighting Study

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	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	2	Lobby	Chandelier	S	CFL	1	3	26	Sw	8	261	0	78	163	Chandelier	CFL	S	Sw	1	3	26	8	261	0	78	163	0	0	0
2	2	Court Room	Chandelier	S	CFL	2	9	13	Sw	4	261	0	234	244	Chandelier	CFL	S	Sw	2	9	13	4	261	0	234	244	0	0	0
3	2	Court Room	Sconce	S	CFL	6	1	13	Sw	4	261	0	78	81	Sconce	CFL	S	Sw	6	1	13	4	261	0	78	81	0	0	0
4	2	Court Room	Ceiling Suspended	S	CFL	1	3	13	Sw	4	261	0	39	41	Ceiling Suspended	CFL	S	Sw	1	3	13	4	261	0	39	41	0	0	0
5	2	Court Room	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
6	2	Bathroom	Ceiling Mounted	S	CFL	1	3	13	Sw	6	261	0	39	61	Ceiling Mounted	CFL	S	Sw	1	3	13	6	261	0	39	61	0	0	0
7	2	Meeting Rm	Parabolic Ceiling Mounted	E	4'T8	1	3	32	Sw	8	261	15	111	294	Parabolic Ceiling Mounted	4'T8	E	OS	1	3	32	6	261	15	111	221	0	58	74
8	2	Building Dept	Chandelier	S	CFL	2	9	13	Sw	8	261	0	234	489	Chandelier	CFL	S	Sw	2	9	13	8	261	0	234	489	0	0	0
9	2	Building Dept	Ceiling Suspended	S	CFL	1	3	13	Sw	8	261	0	39	81	Ceiling Suspended	CFL	S	Sw	1	3	13	8	261	0	39	81	0	0	0
10	2	Administrator	Parabolic Ceiling Mounted	E	4'T8	1	3	32	Sw	8	261	15	111	294	Parabolic Ceiling Mounted	4'T8	E	Sw	1	3	32	8	261	15	111	294	0	0	0
11	1	Clerk	Chandelier	S	CFL	8	3	13	Sw	8	261	0	312	651	Chandelier	CFL	S	Sw	8	3	13	8	261	0	312	651	0	0	0
12	1	Bathroom	Ceiling Mounted	S	CFL	1	3	13	Sw	6	261	0	39	61	Ceiling Mounted	CFL	S	OS	1	3	13	5	261	0	39	46	0	15	15
13	1	Lobby	Chandelier	S	CFL	1	3	13	Sw	8	261	0	39	81	Chandelier	CFL	S	Sw	1	3	13	8	261	0	39	81	0	0	0
14	1	Vestibule	Chandelier	S	CFL	1	3	13	Sw	8	261	0	39	81	Chandelier	CFL	S	Sw	1	3	13	8	261	0	39	81	0	0	0
15	1	Lobby	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
16	1	Tax Collector	Chandelier	S	CFL	4	3	13	Sw	8	261	0	156	326	Chandelier	CFL	S	OS	4	3	13	6	261	0	156	244	0	81	81
17	1	Tax Collector	Wall Mounted	S	Inc	1	1	60	Sw	8	261	0	60	125	Wall Mounted	CFL	S	Sw	1	1	20	8	261	0	20	42	84	0	84
18	1	Treasurer	Chandelier	S	CFL	3	3	13	Sw	8	261	0	117	244	Chandelier	CFL	S	OS	3	3	13	6	261	0	117	183	0	61	61
19	1	Lobby	Ceiling Mounted	S	CFL	2	2	13	Sw	8	261	0	52	109	Ceiling Mounted	CFL	S	Sw	2	2	13	8	261	0	52	109	0	0	0
20	1	Storage Rm	Parabolic Ceiling Mounted	E	4'T8	4	2	32	Sw	8	261	10	296	702	Parabolic Ceiling Mounted	4'T8	E	OS	4	2	32	6	261	10	296	526	0	155	175
21	1	Office	Parabolic Ceiling Mounted	E	4'T8	4	3	32	Sw	8	261	15	444	1,178	Parabolic Ceiling Mounted	4'T8	E	OS	4	3	32	6	261	15	444	883	0	232	294
22	1	Storage Rm	Parabolic Ceiling Mounted	E	4'T8	4	2	32	Sw	8	261	10	296	702	Parabolic Ceiling Mounted	4'T8	E	OS	4	2	32	6	261	10	296	526	0	155	175
23	1	Vestibule	Parabolic Ceiling Mounted	E	4'T8	1	3	32	Sw	8	261	15	111	294	Parabolic Ceiling Mounted	4'T8	E	OS	1	3	32	6	261	15	111	221	0	58	74
24	1	Office	Parabolic Ceiling Mounted	E	4'T8	1	3	32	Sw	8	261	15	111	294	Parabolic Ceiling Mounted	4'T8	E	OS	1	3	32	6	261	15	111	221	0	58	74
25	Bsmt	Staircase	Parabolic Ceiling Mounted	E	2'T8	1	2	17	Sw	8	261	4	38	88	Parabolic Ceiling Mounted	2'T8	E	OS	1	2	17	6	261	4	38	66	0	20	22
26	Bsmt	Meter Room	Ceiling Mounted	S	CFL	1	1	13	Sw	2	261	0	13	7	Ceiling Mounted	CFL	S	Sw	1	1	13	2	261	0	13	7	0	0	0
27	Bsmt	Storage Rm	Ceiling Mounted	S	Inc	5	1	60	D	24	365	0	300	2,628	Ceiling Mounted	CFL	S	D	5	1	20	24	365	0	100	876	1752	0	1752
28	Bsmt	Hallway	Parabolic Ceiling Mounted	E	2'T8	1	2	17	Sw	24	365	4	38	368	Parabolic Ceiling Mounted	2'T8	E	Sw	1	2	17	24	365	4	38	368	0	0	0
29	Bsmt	Hallway	Parabolic Ceiling Mounted	E	4'T8	1	2	32	Sw	24	365	10	74	736	Parabolic Ceiling Mounted	4'T8	E	Sw	1	2	32	24	365	10	74	736	0	0	0
30	Bsmt	Breakroom	Parabolic Ceiling Mounted	E	4'T8	2	2	32	Sw	24	365	10	148	1,472	Parabolic Ceiling Mounted	4'T8	E	OS	2	2	32	18	365	10	148	1104	0	324	368
31	Bsmt	Breakroom	Recessed Parabolic	E	4'T8	2	2	32	Sw	24	365	10	148	1,472	Recessed Parabolic	4'T8	E	OS	2	2	32	18	365	10	148	1104	0	324	368
32	Bsmt	Hallway	Recessed Parabolic	E	4'T8	2	2	32	Sw	24	365	10	148	1,472	Recessed Parabolic	4'T8	E	Sw	2	2	32	24	365	10	148	1472	0	0	0
33	Bsmt	Hallway	Exit Sign	E	LED	3	1	5	N	24	365	1	17	145	Exit Sign	LED	E	N	3	1	5	24	365	1	17	145	0	0	0
34	Bsmt	Dispatch	Recessed Parabolic	E	4'T8	2	2	32	Sw	24	365	10	148	1,472	Recessed Parabolic	4'T8	E	Sw	2	2	32	24	365	10	148	1472	0	0	0
35	Bsmt	Dispatch	Recessed Parabolic	E	4'T8	5	2	32	Sw	24	365	10	370	3,679	Recessed Parabolic	4'T8	E	Sw	5	2	32	24	365	10	370	3679	0	0	0
36	Bsmt	Holding Cell	Ceiling Mounted	S	Inc	1	1	60	Sw	6	365	0	60	131	Ceiling Mounted	CFL	S	Sw	1	1	20	6	365	0	20	44	88	0	88
37	Bsmt	Bathroom	Recessed Parabolic	E	4'T8	2	2	32	Sw	6	365	10	148	368	Recessed Parabolic	4'T8	E	Sw	2	2	32	6	365	10	148	368	0	0	0
38	Bsmt	Interogation	Recessed Parabolic	E	4'T8	2	2	32	Sw	4	365	10	148	245	Recessed Parabolic	4'T8	E	Sw	2	2	32	4	365	10	148	245	0	0	0
39	Bsmt	Hallway	Recessed Parabolic	E	4'T8	2	2	32	Sw	24	365	10	148	1,472	Recessed Parabolic	4'T8	E	Sw	2	2	32	24	365	10	148	1472	0	0	0
40	Bsmt	Office	Recessed Parabolic	E	4'T8	2	3	32	Sw	10	365	15	222	1,029	Recessed Parabolic	4'T8	E	Sw	2	3	32	10	365	15	222	1029	0	0	0
41	Bsmt	Chief of Police	Recessed Parabolic	E	4'T8	2	3	32	Sw	10	365	15	222	1,029	Recessed Parabolic	4'T8	E	Sw	2	3	32	10	365	15	222	1029	0	0	0
42	Bsmt	Captain	Recessed Parabolic	E	4'T8	1	3	32	Sw	10	365	15	111	515	Recessed Parabolic	4'T8	E	Sw	1	3	32	10	365	15	111	515	0	0	0
43	Bsmt	Janitor's Closet	Ceiling Mounted	S	Inc	1	1	60	Sw	2	365	0	60	44	Ceiling Mounted	CFL	S	Sw	1	1	20	2	365	0	20	15	29	0	29
44	Bsmt	Office	Recessed Parabolic	E	4'T8	2	2	32	Sw	24	365	10	148	1,472	Recessed Parabolic	4'T8	E	OS	2	2	32	18	365	10	148	1104	0	324	368
45	Bsmt	Locker Room	Recessed Parabolic	E	4'T8	2	2	32	Sw	24	365	10	148	1,472	Recessed Parabolic	4'T8	E	OS	2	2	32	18	365	10	148	1104	0	324	368
46	Bsmt	Fire Marshal	Ceiling Mounted	E	4'T8	4	1	32	Sw	24	365	5	148	1,296	Ceiling Mounted	4'T8	E	OS	4	1	32	18	365	5	148	972	0	324	324
47	Bsmt	Storage Rm	Recessed Parabolic	E	4'T8	4	2	32	OS	2	365	10	296	245	Recessed Parabolic	4'T8	E	OS	4	2	32	2	365	10	296	245	0	0	0
48	Bsmt	Storage Rm	Ceiling Mounted	E	4'T8	2	2	32	Sw	2	365	10	148	123	Ceiling Mounted	4'T8	E	Sw	2	2	32	2	365	10	148	123	0	0	0
49	Bsmt	Vestibule	Recessed	E	4'T8	4	1	32	Sw	4	365	5	148	216	Recessed	4'T8	E	Sw	4	1	32	4	365	5	148	216	0	0	0
50	Bsmt	Records	Ceiling Mounted	S	Inc	1	1	75	Sw	2	261	0	75	39	Ceiling Mounted	CFL	S	Sw	1	1	25	2	261	0	25	13	26	0	26
51	Bsmt	Records	Ceiling Mounted	S	CFL	1	1	13	Sw	2	261	0	13	7	Ceiling Mounted	CFL	S	Sw	1	1	13	2	261	0	13	7	0	0	0
52	Bsmt	Bathroom	Parabolic Ceiling Mounted	E	2'T8	1	4	17	Sw	4	261	8	76	104	Parabolic Ceiling Mounted	2'T8	E	OS	1	4	17	3	261	8	76	78	0	20	26
53	1	Garage	Ceiling Mounted	E	4'T8	33	2	32	Sw	4	345	10	2,442	3,825	Ceiling Mounted	4'T8	E	OS	33	2	32	3	345	10	2442	2869	0	842	956
54	1	Garage	Wall Mounted	E	4'T8	2	2	32	Sw	24	365	10	148	1,472	Wall Mounted	4'T8	E	OS	2	2	32	18	365	10	148	1104	0	324	368
55	1	Bathroom	Recessed Parabolic	E	2'T8	2	3	17	Sw	2	345	6	114	95	Recessed Parabolic	2'T8	E	OS	2	3	17	2	345	6	114	71	0	20	24
56	1	Garage	Recessed Parabolic	E	2'T8	1	3	17	Sw	2	345	6	57	48	Recessed Parabolic	2'T8	E	OS	1	3	17	2	345	6	57	36	0	10	12
57	1	Bathroom	Recessed Parabolic	E	2'T8	2	3	17	Sw	2	345	6	114	95	Recessed Parabolic	2'T8	E	OS	2	3	17	2	345	6	114	71	0	20	24
58	1	Lounge	Recessed Parabolic	E	4'T8	3	3	32	Sw	8	345	15	333	1,167	Recessed Parabolic	4'T8	E	OS	3	3	32	6	345	15	333	876	0	230	292
59	1	Lounge	Recessed	S	CFL	7	1	13	Sw	8	345	0	91	251	Recessed	CFL	S	Sw	7	1	13	8	345	0	91	251	0	0	0

Location			Existing Fixture Information												Retrofit Information												Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	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)
60	1	Lounge	Recessed	S	CFL	3	1	13	Sw	2	345	0	39	27	Recessed	CFL	S	Sw	3	1	13	2	345	0	39	27	0	0	0
61	1	Lounge	Exit Sign	E	LED	1	1	5	N	24	365	1	6	48	Exit Sign	LED	E	N	1	1	5	24	365	1	6	48	0	0	0
62	1	Kitchen	Parabolic Ceiling Mounted	E	4'T8	1	3	32	Sw	2	345	15	111	97	Parabolic Ceiling Mounted	4'T8	E	OS	1	3	32	2	345	15	111	73	0	19	24
63	1	Kitchen	Wall Mounted	E	4'T8	1	1	32	Sw	2	345	5	37	26	Wall Mounted	4'T8	E	OS	1	1	32	2	345	5	37	19	0	6	6
64	1	Hallway	Recessed	S	CFL	2	1	13	Sw	2	345	0	26	18	Recessed	CFL	S	Sw	2	1	13	2	345	0	26	18	0	0	0
65	1	Lounge	Recessed	S	CFL	12	1	26	Sw	2	345	0	312	215	Recessed	CFL	S	Sw	12	1	26	2	345	0	312	215	0	0	0
66	1	Lounge	Recessed Parabolic	S	CFL	3	2	13	Sw	2	345	0	78	54	Recessed Parabolic	CFL	S	Sw	3	2	13	2	345	0	78	54	0	0	0
67	1	Lounge	Recessed	S	CFL	1	1	13	Sw	24	345	0	13	108	Recessed	CFL	S	Sw	1	1	13	24	345	0	13	108	0	0	0
68	1	Lounge	Exit Sign	E	LED	1	1	5	N	24	365	1	6	48	Exit Sign	LED	E	N	1	1	5	24	365	1	6	48	0	0	0
69	1	Kitchen	Recessed Parabolic	E	4'T8	2	2	32	Sw	2	345	10	148	116	Recessed Parabolic	4'T8	E	OS	2	2	32	2	345	10	148	87	0	26	29
70	1	Kitchen	Recessed Parabolic	E	2'T8	1	2	17	Sw	2	345	4	38	29	Recessed Parabolic	2'T8	E	OS	1	2	17	2	345	4	38	22	0	7	7
71	1	Boiler Closet	Wall Mounted	E	4'T8	1	1	32	Sw	1	345	5	37	13	Wall Mounted	4'T8	E	Sw	1	1	32	1	345	5	37	13	0	0	0
72	1	Hallway	Ceiling Mounted	S	CFL	2	1	13	Sw	2	345	0	26	18	Ceiling Mounted	CFL	S	Sw	2	1	13	2	345	0	26	18	0	0	0
73	1	Hallway	Exit Sign	E	LED	1	1	5	N	24	365	1	6	48	Exit Sign	LED	E	N	1	1	5	24	365	1	6	48	0	0	0
74	1	Boiler Rm	Wall Mounted	S	CFL	1	1	13	Sw	2	345	0	13	9	Wall Mounted	CFL	S	Sw	1	1	13	2	345	0	13	9	0	0	0
75	1	Lounge	Wall Mounted	S	Inc	4	1	60	Sw	2	345	0	240	166	Wall Mounted	CFL	S	Sw	4	1	20	2	345	0	80	55	110	0	110
76	1	Attic	Ceiling Mounted	S	CFL	2	1	13	Sw	2	345	0	26	18	Ceiling Mounted	CFL	S	Sw	2	1	13	2	345	0	26	18	0	0	0
77	2	Bathroom Men	Recessed Parabolic	E	4'T8	1	2	32	OS	6	261	10	74	132	Recessed Parabolic	4'T8	E	OS	1	2	32	6	261	10	74	132	0	0	0
78	2	Bathroom Women	Recessed Parabolic	E	4'T8	1	2	32	OS	6	261	10	74	132	Recessed Parabolic	4'T8	E	OS	1	2	32	6	261	10	74	132	0	0	0
79	2	Elevator Mech. Rm	Wall Mounted	E	4'T8	1	2	32	OS	2	261	10	74	44	Wall Mounted	4'T8	E	OS	1	2	32	2	261	10	74	44	0	0	0
80	2	Recreation Rm	Recessed Parabolic	E	4'T8	24	4	32	Sw	6	261	20	3,552	7,817	Recessed Parabolic	4'T8	E	Sw	24	4	32	6	261	20	3552	7817	0	0	0
81	2	Recreation Rm	Recessed Parabolic	E	4'T8	1	2	32	Sw	6	261	10	74	132	Recessed Parabolic	4'T8	E	Sw	1	2	32	6	261	10	74	132	0	0	0
82	2	Recreation Rm	Recessed Parabolic	E	4'T8 U-Shaped	3	2	32	Sw	6	261	10	222	395	Recessed Parabolic	4'T8 U-Shaped	E	Sw	3	2	32	6	261	10	222	395	0	0	0
83	2	Recreation Rm	Exit Sign	E	LED	2	1	5	N	24	365	1	11	96	Exit Sign	LED	E	N	2	1	5	24	365	1	11	96	0	0	0
84	2	Storage Closet	Recessed Parabolic	E	4'T8	1	2	32	OS	6	261	10	74	132	Recessed Parabolic	4'T8	E	OS	1	2	32	6	261	10	74	132	0	0	0
85	2	Kitchen	Recessed Parabolic	E	4'T8	4	2	32	Sw	8	261	10	296	702	Recessed Parabolic	4'T8	E	OS	4	2	32	6	261	10	296	526	0	155	175
86	2	Mechanical Rm	Recessed Parabolic	E	4'T8	1	4	32	OS	2	261	20	148	109	Recessed Parabolic	4'T8	E	OS	1	4	32	2	261	20	148	109	0	0	0
87	2	Bathroom Women	Recessed Parabolic	E	4'T8	1	4	32	Sw	4	261	20	148	217	Recessed Parabolic	4'T8	E	OS	1	4	32	3	261	20	148	163	0	39	54
88	2	Bathroom Men	Recessed Parabolic	E	4'T8	1	4	32	Sw	4	261	20	148	217	Recessed Parabolic	4'T8	E	OS	1	4	32	3	261	20	148	163	0	39	54
89	2	Office	Recessed Parabolic	E	4'T8	2	4	32	Sw	4	261	20	296	434	Recessed Parabolic	4'T8	E	OS	2	4	32	3	261	20	296	326	0	77	109
90	2	Storage Rm	Recessed Parabolic	E	4'T8	2	4	32	Sw	2	261	20	296	217	Recessed Parabolic	4'T8	E	Sw	2	4	32	2	261	20	296	217	0	0	0
91	2	Hallway	Recessed Parabolic	E	4'T8	4	4	32	Sw	8	261	20	592	1,737	Recessed Parabolic	4'T8	E	Sw	4	4	32	8	261	20	592	1737	0	0	0
92	2	Hallway	Exit Sign	E	LED	1	1	5	N	24	365	1	6	48	Exit Sign	LED	E	N	1	1	5	24	365	1	6	48	0	0	0
93	2	Hallway	Recessed Parabolic	E	4'T8	2	2	32	Sw	8	261	10	148	351	Recessed Parabolic	4'T8	E	M	2	2	32	6	261	10	148	263	0	77	88
94	2	Hallway	Exit Sign	E	LED	1	1	5	N	24	365	1	6	48	Exit Sign	LED	E	N	1	1	5	24	365	1	6	48	0	0	0
95	2	Staircase	Recessed Parabolic	E	4'T8	2	2	32	Sw	8	261	10	148	351	Recessed Parabolic	4'T8	E	Sw	2	2	32	8	261	10	148	351	0	0	0
96	1	Library	Recessed Parabolic	E	2'T8	4	3	17	Sw	9	345	6	228	857	Recessed Parabolic	2'T8	E	Sw	4	3	17	9	345	6	228	857	0	0	0
97	1	Library	Recessed Parabolic	E	2'T8	1	3	17	Sw	9	345	6	57	214	Recessed Parabolic	2'T8	E	Sw	1	3	17	9	345	6	57	214	0	0	0
98	1	Library	Recessed Parabolic	E	4'T8	49	2	32	Sw	9	345	10	3,626	12,780	Recessed Parabolic	4'T8	E	Sw	49	2	32	9	345	10	3626	12780	0	0	0
99	1	Library	Recessed	S	CFL	14	2	13	Sw	9	345	0	364	1,130	Recessed	CFL	S	Sw	14	2	13	9	345	0	364	1130	0	0	0
100	1	Vestibule	Recessed	S	CFL	4	2	13	Sw	16	345	0	104	574	Recessed	CFL	S	Sw	4	2	13	16	345	0	104	574	0	0	0
101	1	Circulation Desk	Recessed Parabolic	E	4'T8	2	2	32	Sw	9	345	10	148	522	Recessed Parabolic	4'T8	E	Sw	2	2	32	9	345	10	148	522	0	0	0
102	1	Circulation Desk	Recessed Parabolic	E	2'T8	1	3	17	Sw	9	345	6	57	214	Recessed Parabolic	2'T8	E	Sw	1	3	17	9	345	6	57	214	0	0	0
103	1	Library	Exit Sign	E	LED	3	1	5	N	24	345	1	17	137	Exit Sign	LED	E	N	3	1	5	24	345	1	17	137	0	0	0
104	1	Research	Recessed Parabolic	E	4'T8	10	2	32	Sw	24	345	10	740	6,955	Recessed Parabolic	4'T8	E	OS	10	2	32	18	345	10	740	5216	0	1532	1739
105	1	Research	Exit Sign	E	LED	2	1	5	N	24	345	1	11	91	Exit Sign	LED	E	N	2	1	5	24	345	1	11	91	0	0	0
106	1	Storage Rm	Recessed Parabolic	E	4'T8	2	2	32	Sw	9	345	10	148	522	Recessed Parabolic	4'T8	E	OS	2	2	32	7	345	10	148	391	0	115	130
107	1	Storage Rm	Wall Mounted	E	4'T8	1	2	32	OS	2	345	10	74	58	Wall Mounted	4'T8	E	OS	1	2	32	2	345	10	74	58	0	0	0
108	1	Staircase	Wall Mounted	E	4'T8	1	2	32	Sw	16	345	10	74	464	Wall Mounted	4'T8	E	Sw	1	2	32	16	345	10	74	464	0	0	0
109	1	Bathroom	Wall Mounted	E	2'T8	1	2	17	Sw	9	345	4	38	130	Wall Mounted	2'T8	E	Sw	1	2	17	9	345	4	38	130	0	0	0
110	1	Lounge	Recessed	S	Hal	6	1	50	Sw	2	261	11	366	191	Recessed	CFL	S	Sw	6	1	15	2	261	0	90	47	144	0	144
111	1	Lounge	Sconce	S	Inc	4	1	15	Sw	2	261	0	60	31	Sconce	CFL	S	Sw	4	1	5	2	261	0	20	10	21	0	21
112	Ext	Exterior	Wall Mounted	S	CFL	3	1	13	PC	12	365	0	39	171	Wall Mounted	CFL	S	PC	3	1	13	12	365	0	39	171	0	0	0
113	Ext	Exterior	Wall Mounted	S	Hal	2	2	75	PC	12	365	33	366	1,892	Wall Mounted	CFL	S	PC	2	2	25	12	365	0	100	438	1165	0	1454
114	Ext	Exterior	Wall Mounted	S	Inc	2	1	60	PC	12	365	0	120	526	Wall Mounted	CFL	S	PC	2	1	20	12	365	0	40	175	350	0	350
115	Ext	Exterior	Wall Mounted	S	Hal	1	2	75	PC	12	365	33	183	946	Wall Mounted	CFL	S	PC	1	2	25	12	365	0	50	219	583	0	727
116	Ext	Exterior	Wall Mounted	S	Hal	1	1	75	PC	12	365	17	92	401	Wall Mounted	CFL	S	PC	1	1	25	12	365	0	25	110	291	0	291
117	Ext	Exterior	Wall Mounted	S	Inc	1	1	60	PC	24	365	0	60	526	Wall Mounted	CFL	S	PC	1	1	20	24	365	0	20	175	350	0	350
118	Ext	Exterior	Wallpack	S	MH	1	1	150	PC	12	365	42	192	841	Wallpack	PSMH	S	PC	1	1	100	12	365	20	120	526	315	0	315
Totals:						**372**	**253**	**3,295**				**841**	**24,815**	**81,532**					**372**	**253**	**2,720**			**726**	**23312**	**68,829**	**5,309**	**6,069**	**12,702**

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

Proposed Lighting Summary Table			
Total Gross Floor Area (SF)	17,538		
Average Power Cost ($/kWh)	0.1800		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	5,302	1,813	**3,489**
Exterior Power (watts)	1,052	394	**658**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	76,230	67,016	**9,213**
Lighting Power (watts)	23,764	22,918	**846**
Lighting Power Density (watts/SF)	1.35	1.31	**0.05**
Estimated Cost of Fixture Replacement ($)	841		
Estimated Cost of Controls Improvements ($)	5,200		
Total Consumption Cost Savings ($)	**1,827**		

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

APPENDIX C: UPCOMING EQUIPMENT PHASEOUTS

LIGHTING:

- As of **July 1, 2010** magnetic ballasts most commonly used for the operation of T12 lamps will no longer be produced for commercial and industrial applications.

- As of **January 1, 2012** 100 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- Starting **July 2012** many non energy saver model T12 lamps will be phased out of production.

- As of **January 1, 2013** 75 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- As of **January 1, 2014** 60 and 40 watt incandescent bulbs will be phased out in accordance with the Energy Independence and Security Act of 2007.

- Energy Independence and Security Act of 2007 incandescent lamp phase-out exclusions:
  1. Appliance lamp (e.g. refrigerator or oven light)
  2. Black light lamp
  3. Bug lamp
  4. Colored lamp
  5. Infrared lamp
  6. Left-hand thread lamp
  7. Marine lamp
  8. Marine signal service lamp
  9. Mine service lamp
  10. Plant light lamp
  11. Reflector lamp
  12. Rough service lamp
  13. Shatter-resistant lamp (including a shatter-proof lamp and a shatter-protected lamp)
  14. Sign service lamp
  15. Silver bowl lamp
  16. Showcase lamp
  17. 3-way incandescent lamp
  18. Traffic signal lamp
  19. Vibration service lamp
  20. Globe shaped “G” lamp (as defined in ANSI C78.20-2003 and C79.1-2002 with a diameter of 5 inches or more
  21. T shape lamp (as defined in ANSI C78.20-2003 and C79.1-2002) and that uses not more than 40 watts or has a length of more than 10 inches
  22. A B, BA, CA, F, G16-1/2, G-25, G30, S, or M-14 lamp (as defined in ANSI C79.1-2002 and ANSI C78.20-2003) of 40 watts or less
  23. Candelabra incandescent and other lights not having a medium Edison screw base.

- When installing compact fluorescent lamps (CFLs), be advised that they contain a very small amount of mercury sealed within the glass tubing and EPA guidelines concerning cleanup and safe disposal of compact fluorescent light bulbs should be followed. Additionally, all

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

HCFC (Hydrochlorofluorocarbons):

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

- As of **January 1, 2015,** No production and no importing of any HCFCs, except for use as refrigerants in equipment manufactured before January 1, 2010.

- As of **January 1, 2020** No production and no importing of R-142b and R-22.

APPENDIX D: THIRD PARTY ENERGY SUPPLIERS

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

Third Party Electric Suppliers for PSEG Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
American Powernet Management, LP 437 North Grove St. Berlin, NJ 08009	(877) 977-2636 www.americanpowernet.com
BOC Energy Services, Inc. 575 Mountain Avenue Murray Hill, NJ 07974	(800) 247-2644 www.boc.com
Commerce Energy, Inc. 4400 Route 9 South, Suite 100 Freehold, NJ 07728	(800) 556-8457 www.commerceenergy.com
ConEdison Solutions 535 State Highway 38 Cherry Hill, NJ 08002	(888) 665-0955 www.conedsolutions.com
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.com
Credit Suisse, (USA) Inc. 700 College Road East Princeton, NJ 08450	(212) 538-3124 www.creditsuisse.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
FirstEnergy Solutions 300 Madison Avenue Morristown, NJ 07926	(800) 977-0500 www.fes.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
Integrys Energy Services, Inc. 99 Wood Ave, South, Suite 802 Iselin, NJ 08830	(877) 763-9977 www.integrysenergy.com
Liberty Power Delaware, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(866) 769-3799 www.libertypowercorp.com
Liberty Power Holdings, LLC Park 80 West Plaza II, Suite 200 Saddle Brook, NJ 07663	(800) 363-7499 www.libertypowercorp.com

Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Dominion Retail, Inc. 395 Highway 170, Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com

Hudson Energy Services, LLC 545 Route 17 South Ridgewood, NJ 07450	(877) 483-7669 www.hudsonenergyservices.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002	(877) 797-8786 www.systrumenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	(800) 646-6457 www.stuyfuel.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX E: GLOSSARY AND METHOD OF CALCULATIONS

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

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

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

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

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

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

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

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

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

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

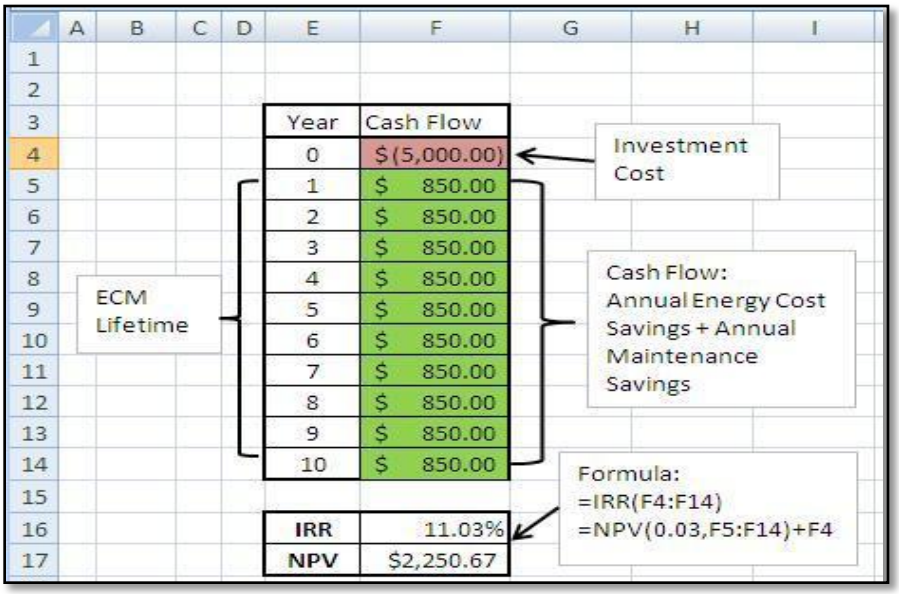
Calculation References

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

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

Excel NPV and IRR Calculation

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



Solar PV ECM Calculation

There are several components to the calculation:

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

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

ECM and Equipment Lifetimes

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

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

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

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

New Jersey Clean Energy Program Commercial Equipment Life Span

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

APPENDIX F: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough of Bogota - Municipal Complex

Building ID: 2672684
For 12-month Period Ending: February 28, 2011[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: June 01, 2012

Facility
Borough of Bogota - Municipal Complex
375 Larch Avenue
Bogota, NJ 07603

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1895
Gross Floor Area (ft²): 17,538

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	766,924
Fuel Oil (No. 2) (kBtu)	228,874
Natural Gas (kBtu)[4]	840,767
Total Energy (kBtu)	1,836,565

Energy Intensity[4]

Site (kBtu/ft²/yr)	105
Source (kBtu/ft²/yr)	209

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	170

Electric Distribution Utility
Public Service Electric & Gas Co

National Median Comparison

National Median Site EUI	70
National Median Source EUI	127
% Difference from National Median Source EUI	65%
Building Type	Other

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[5] **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. Values represent energy intensity, annualized to a 12-month period.
5. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

EPA Form 5900-16

APPENDIX G: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

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

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

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

Direct Install 2010 Program*

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC, and other equipment with energy efficient alternatives. The program pays **up to 60%** of the retrofit costs, including equipment cost and installation costs.

Eligibility:

- Existing small and mid-sized commercial and industrial facilities with peak electrical demand **below 100 kW** within 12 months of applying
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies

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

Smart Start

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

There are a number of improvement options for commercial, industrial, institutional, government, and agricultural projects throughout New Jersey. Alternatives are designed to enhance quality while

building in energy efficiency to save money. Project categories included in this program are New Construction and Additions, Renovations, Remodeling and Equipment Replacement.

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

Renewable Energy Incentive Program*

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

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

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

Utility Sponsored Programs

Check with your local utility companies for further opportunities **t**hat may be available.

Energy Efficiency and Conservation Block Grant Rebate Program

The Energy Efficiency and Conservation Block Grant (EECBG) Rebate Program provides supplemental funding up to $50,000 for eligible New Jersey local government entities to lower the cost of installing energy conservation measures. Funding for the EECBG Rebate Program is provided through the American Recovery and Reinvestment Act (ARRA).

For the most up to date information on how to participate in this program, go to: http://njcleanenergy.com/EECBG.

Other Federal and State Sponsored Programs

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

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

APPENDIX H: ENERGY CONSERVATION MEASURES

ECM #	ECM description	est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
1	Retrofit 1 refrigerated vending machine with a VendingMiser™ device	199	0	199	1,941	0.0	0	0.4	349	699	12	8,385	0.3	4,113	343	351	6,467	3,475
2	Upgrade (30) Incandescent to CFL	866	none at this time	866	4,993	1.0	0	1.0	107	1,006	5	5,029	0.9	481	96	114	3,599	8,941
3	Retrofit 1 vending machine with a SnackMiser™ device	180	0	180	466	0.0	0	0.1	0	84	12	1,006	2.1	459	38	46	625	834
4	Install programmalbe thermostats with controller etc.	4,200	80	4,120	3,350	0.1	367	2.7	0	1,027	15	15,400	4.0	274	18	24	7,714	10,046
5	Replace 1 old Municipal Complex refrigerator with 16 cu ft Energy Star model	700	75	625	310	0.0	0	0.1	50	106	12	1,269	5.9	103	9	13	403	555
6	Replace 1 old Municipal Complex refrigerator with 18 cu ft Energy Star model	800	75	725	383	0.0	0	0.1	50	119	12	1,427	6.1	97	8	12	431	686
7	Install 26 occupancy sensors	5,720	520	5,200	4,248	0.9	0	0.8	0	765	15	11,469	6.8	121	8	12	3,679	7,605
8	Install 20 kW Solar Photovoltaic system	140,000	0	140,000	23,600	20.0	0	4.6	0	18,047	25	451,172	7.8	222	9	10	91,778	42,256
9	1 New PSMH fixtures to be installed with incentives	725	25	700	315	0.1	0	0.1	0	57	15	851	12.3	22	1	3	-31	565
10	Replace the Fire department boiler	9,100	400	8,700	0	0.0	420	0.7	200	685	25	17,117	12.7	97	4	6	2,869	4,630
	TOTAL	**162,490**	**1,175**	**161,315**	**39,607**	**22.2**	**787**	**10.5**	**756**	**22,593**	**-**	**513,124**	**7.1**	**-**	**-**	**-**	**117,533**	**79,593**

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

APPENDIX I: UTILITY BILLING TABLES

The monthly usage and cost analyzed by SWA and utilized to develop charts used in the report are shown below. Values shown in red were not available via hard copy bills from the utility provider and were thus estimated by SWA in order to generate an EPA Portfolio Manager Statement of Energy.

Account # 6722266605 - Gas				
From	**To**	**CCF**	**Usage (therms)**	**Gas Cost**
3/13/2010	4/13/2010	57.68	59.30	$69.76
4/14/2010	5/13/2010	29.35	30.14	$39.30
5/14/2010	6/11/2010	18.22	18.64	$28.66
6/12/2010	7/13/2010	36.43	37.20	$47.97
7/14/2010	8/11/2010	32.38	33.19	$45.87
8/12/2010	9/10/2010	33.40	34.25	$45.01
9/11/2010	10/11/2010	34.41	35.30	$44.15
10/12/2010	11/9/2010	56.67	58.09	$68.46
11/10/2010	12/10/2010	155.85	159.23	$184.53
12/11/2010	1/12/2011	255.02	260.38	$300.60
1/13/2011	2/10/2011	256.04	261.93	$304.35
2/11/2011	3/14/2011	142.69	146.26	$170.30

Account # 6749891209 - Electric and Gas							
From	**To**	**Usage (kWh)**	**Demand (kW)**	**Electric Cost**	**CCF**	**Usage (therms)**	**Gas Cost**
3/13/2010	4/13/2010	13,020	56.7	$2,140.23	255.28	261.30	$310.90
4/13/2010	5/13/2010	9,840	40.8	$1,692.08	108.28	111.21	$117.52
5/13/2010	6/11/2010	15,900	76.2	$3,265.67	7.08	7.25	$17.37
6/11/2010	7/13/2010	21,030	82.2	$4,190.36	1.01	1.03	$11.35
7/13/2010	8/11/2010	19,530	69.0	$3,852.57	0.00	0.00	$10.52
8/11/2010	9/10/2010	15,240	65.1	$3,260.55	1.01	1.04	$11.50
9/10/2010	10/11/2010	12,930	55.2	$2,293.21	12.14	12.46	$22.41
10/11/2010	11/9/2010	10,800	42.3	$1,867.47	185.20	189.83	$209.06
11/9/2010	12/10/2010	15,180	41.4	$2,380.11	364.32	372.34	$401.48
12/10/2010	1/12/2011	19,560	40.5	$2,892.75	502.46	513.83	$577.04
1/12/2011	2/10/2011	16,890	39.9	$2,638.03	640.60	655.33	$752.59
2/10/2011	3/14/2011	16,200	42.3	$2,651.83	471.59	483.38	$548.82

Account # 6650378518 - Electric and Gas							
From	**To**	**Usage (kWh)**	**Demand (kW)**	**Electric Cost**	**CCF**	**Usage (therms)**	**Gas Cost**
3/12/2010	4/13/2010	2,850	12.4	$490.49	47.56	362.04	$381.25
4/13/2010	5/12/2010	2,376	12.4	$430.69	42.50	207.87	$209.34
5/12/2010	6/11/2010	4,224	15.9	$815.84	44.02	40.30	$150.68

6/11/2010	7/11/2010	6,150	16.6	$1,123.29	45.54	80.59	$92.01
7/11/2010	8/11/2010	5,454	17.0	$1,018.23	45.54	25.41	$77.38
8/11/2010	9/10/2010	5,910	17.3	$1,111.93	45.54	50.83	$62.75
9/10/2010	10/11/2010	2,274	13.0	$449.51	44.53	68.53	$75.89
10/11/2010	11/9/2010	2,130	17.9	$431.42	44.53	260.36	$273.87
11/9/2010	12/10/2010	2,190	9.5	$403.35	50.60	561.61	$603.12
12/10/2010	1/12/2011	2,208	8.5	$402.44	51.61	1171.71	$1,323.05
1/12/2011	2/10/2011	2,148	10.1	$409.77	47.56	1146.05	$1,301.85
2/10/2011	3/14/2011	2,118	9.3	$414.66	43.52	750.39	$889.99

Total Billing for Municipal Complex Accounts

From	To	Usage (kWh)	Demand (kW)	Electric Cost	CCF	Usage (therms)	Gas Cost
3/12/2010	4/13/2010	15,870	69.1	$2,630.72	360.53	682.64	$761.91
4/13/2010	5/12/2010	12,216	53.2	$2,122.77	180.14	349.21	$366.16
5/12/2010	6/11/2010	20,124	92.1	$4,081.51	69.32	66.18	$196.71
6/11/2010	7/11/2010	27,180	98.8	$5,313.65	82.98	118.82	$151.33
7/11/2010	8/11/2010	24,984	86.0	$4,870.80	77.92	58.61	$133.77
8/11/2010	9/10/2010	21,150	82.4	$4,372.48	79.95	86.11	$119.26
9/10/2010	10/11/2010	15,204	68.2	$2,742.72	91.08	116.29	$142.45
10/11/2010	11/9/2010	12,930	60.2	$2,298.89	286.40	508.28	$551.39
11/9/2010	12/10/2010	17,370	50.9	$2,783.46	570.77	1093.17	$1,189.13
12/10/2010	1/12/2011	21,768	49.0	$3,295.19	809.09	1945.92	$2,200.69
1/12/2011	2/10/2011	19,038	50.0	$3,047.80	944.20	2063.31	$2,358.79
2/10/2011	3/14/2011	18,318	51.6	$3,066.49	657.80	1380.03	$1,609.11

APPENDIX J: METHOD OF ANALYSIS

Assumptions and tools

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

Disclaimer

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

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