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Local Government Energy Program
Energy Audit Final Report

Borough of Manasquan

Borough Hall
201 East Main Street
Manasquan, NJ 08736

Project Number: LGEA81

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EXECUTIVE SUMMARY

The Manasquan Borough Hall is a two-story building with a basement comprising a total conditioned floor area of 13,680 square feet. The original structure was built in the 1960s, and there have been several renovations/additions since then, the latest in 2001. The following chart provides an overview of current energy usage in the building based on the analysis period of July 2009 through June 2010:

Table 1: State of Building - Energy Usage

	Electric Usage, kWh/yr	Gas Usage, therms/yr	Current Annual Cost of Energy, $	Site Energy Use Intensity, kBtu/sq ft yr	Joint Energy Consumption, MMBtu/yr
Current	185,365	3,348	$36,951	71.0	967
Proposed	169,705	3,268	$33,465	66.5	906
Savings	15,660	80	$3,486*	4.5	61
% Savings	8%	2%	9%	6%	6%
Proposed Renewables	51,278	Includes SRECs	$29,822	13.7	175
*Includes operation and maintenance savings					

There may be energy procurement opportunities for the Manasquan Borough Hall to reduce annual electricity utility costs, which are $4,257 higher, when compared to the average estimated NJ commercial utility rates.

SWA has also entered energy information about the Borough Hall in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager Energy benchmarking system. This mixed use building is comprised of non-eligible ("Other") space type. The resulting Site Energy Use Intensity is 71.0kBtu/sq ft yr, which is better than the average comparable building by 32%.

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

Table 2: Energy Conservation Measure Recommendations

ECMs	First Year Savings ($)	Simple Payback Period (years)	Initial Investment, $	CO2 Savings, lbs/yr
0-5 Year	$3,102	1.9	$6,028	25,160
5-10 Year	$384	6.2	$2,400	3,758
Total	$3,486	2.4	$8,428	28,918
Renewables	$29,822	6.9	$196,692	91,812

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 2 cars from the roads each year or avoiding the need of 70 trees to absorb the annual CO_2 generated.

Further Recommendations: Other recommendations to increase building efficiency pertaining to capital improvements and operations and maintenance are (with additional information in the Proposed Further Recommendations section):

- Capital Improvements
  - Install NEMA premium motors when replacements are required.
  - Replace original windows and doors in the Police Department with the next major renovation.

    - Engage a structural engineer to determine the cause and propose fix to the basement lower wall structural hairline cracks and moisture infiltration.

- Operations and Maintenance
    - Insulate exposed DHW piping to prevent heat losses and provide hot water where needed faster.
    - Install batt fiberglass insulation evenly on the attic floor and seal thoroughly all penetrations to the 2nd floor.
    - Install/repair and maintain gutters, downspouts and downspout deflectors to minimize uncontrolled roof water run-off causing exterior wall damage.

The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for the Manasquan Borough Hall. Based on the requirements of the LGEA program, the Manasquan Borough Hall 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 Manasquan Borough Hall should spend a minimum of $1,873 (or 25% of $7,491) worth of ECMs, net of other NJCEP incentives, to fulfill the obligations.

Financial Incentives and Other Program Opportunities

The table below summarizes the recommended next steps that the Borough of Manasquan can take to achieve greater energy efficiency and reduce operating expenses.

Table 3: Next Steps for the Borough Hall

Recommended ECMs	Incentive Program (Please refer to Appendix F for details)
Upgrade (12) Incandescent Fixtures to CFLs	Direct Install
Install (1) Programmable Thermostat in the Basement	Direct Install
Upgrade (1) T12 Fixture to a T8 fixture	Direct Install, SmartStart
Install 7.5 kW Wind Rooftop System	REIP

There are various incentive programs that the Borough of Manasquan could apply to lower the installed ECM costs. SWA recommends the following programs, contingent upon available funding:

- **Direct Install 2010 Program**: Commercial buildings with peak electric demand below 200kW can receive up to 60% of installed cost of energy saving upgrades.
- **Smart Start**: Most of energy savings equipment and design measures have moderate incentives under this program.
- **Renewable Energy Incentive Program**: Receive up to $0.80/Watt toward installation cost for PV panels upon available funding. For each 1,000 kWh generated by PV renewable energy, receive a credit between $475 and $600. Also, receive up to $3.20/kWh toward installation cost for a Wind System.
- **Utility Sponsored Programs**: See available programs with NJ Natural Gas http://www.njng.com/save-energy-money/special_offers.asp and JCP&L http://www.firstenergycorp.com/Residential_and_Business/Products_and_Services/index.html
- **Energy Efficiency and Conservation Block Grant Rebate Program**: Provides up to $20,000 per local government toward energy saving measures; http://njcleanenergy.com/EECBG

Please refer to Appendix F for further details.

INTRODUCTION

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

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

SWA performed an energy audit and assessment for the Borough Hall at 201 East Main Street, Manasquan, NJ 08736. The process of the audit included a facility visit on September 2, 2010 benchmarking and energy bills analysis, assessment of existing conditions, energy modeling, energy conservation measures and other recommendations for improvements. The scope of work includes providing a summary of current building conditions, current operating costs, potential savings, and investment costs to achieve these savings. The facility description includes energy usage, occupancy profiles and current building systems along with a detailed inventory of building energy systems, recommendations for improvement and recommendations for energy purchasing and procurement strategies.

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

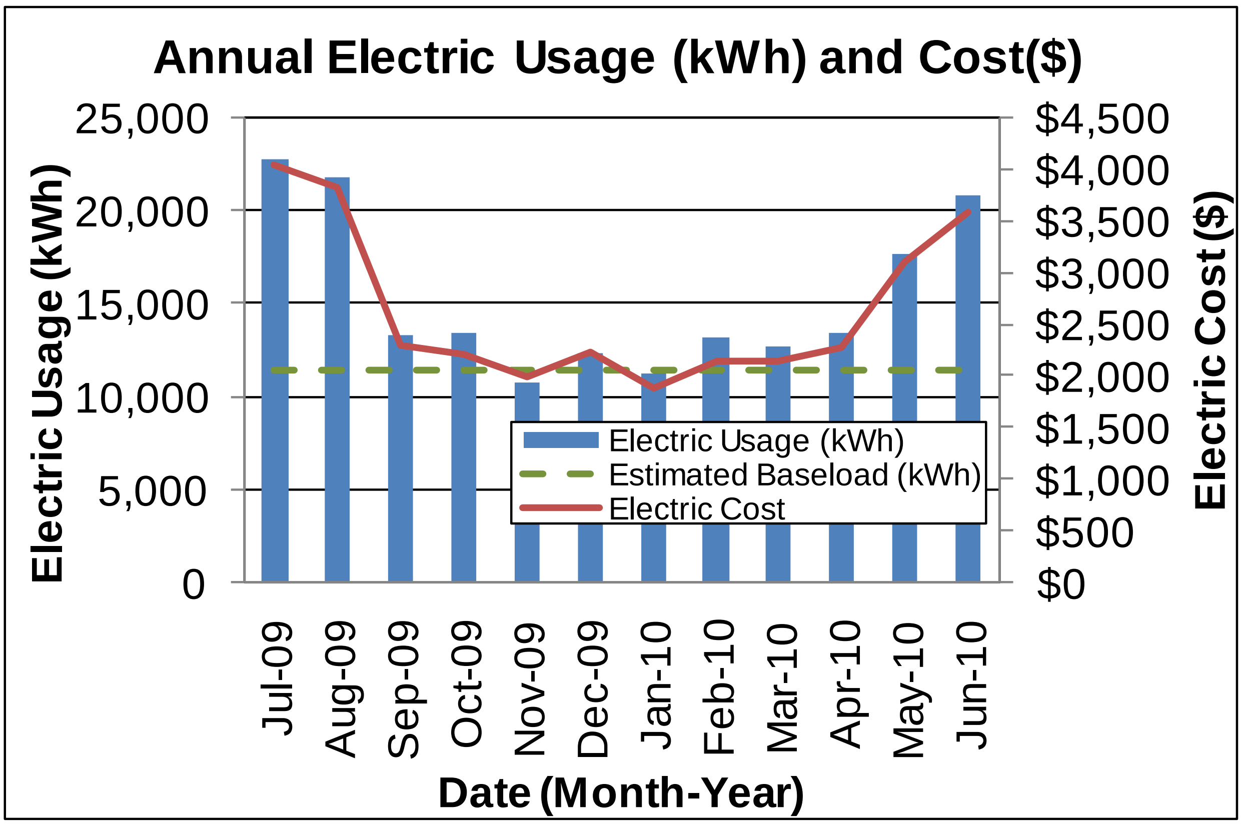
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from January 2009 through June 2010 that were received from the utility companies supplying the Borough Hall with electricity and natural gas. A 12 month period of analysis from July 2009 through June 2010 was used for all calculations and for purposes of benchmarking the building.

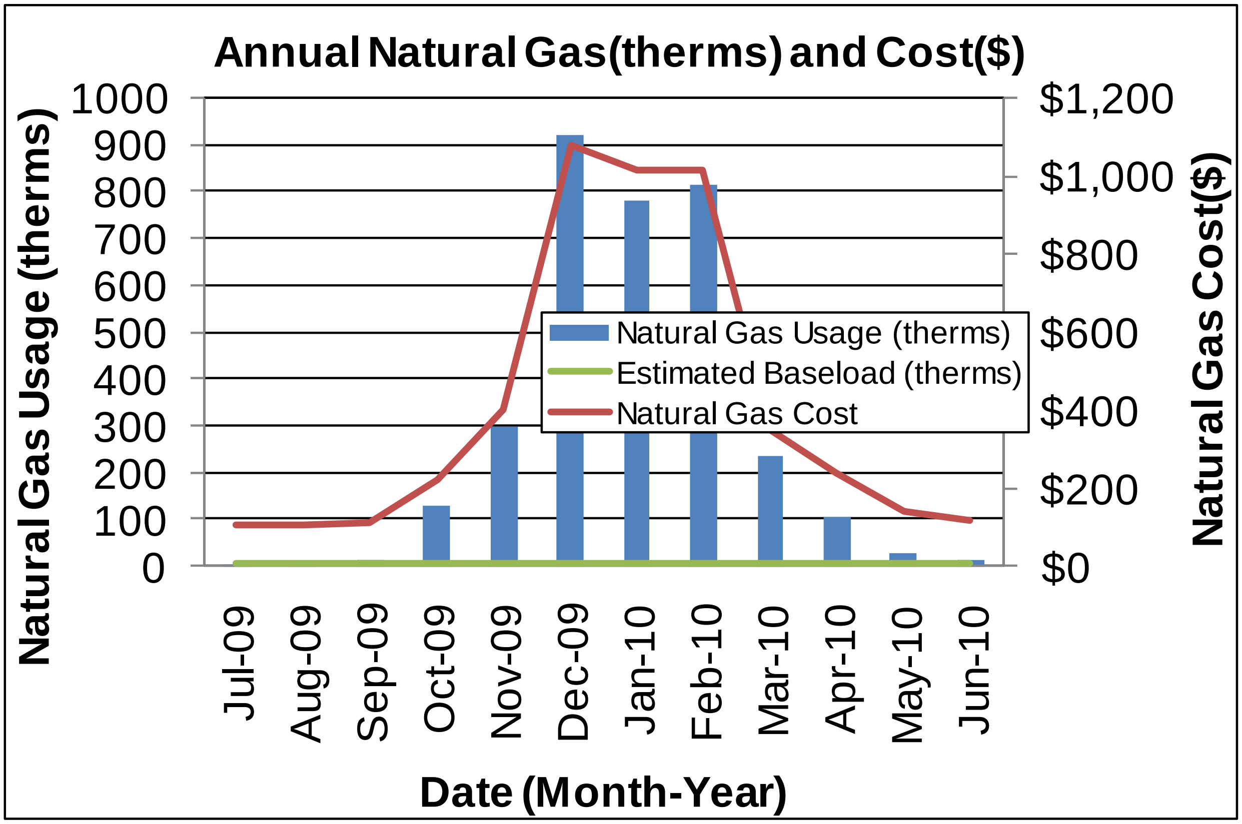
Electricity - The Borough Hall is currently served by one electric meter. The Borough Hall currently buys electricity from JCP&L at **an average aggregated rate of $0.173/kWh**. The Borough Hall purchased **approximately 185,365 kWh, or $32,061 worth of electricity,** in the previous year. The average monthly demand was 62.0 kW and the annual peak demand was 67.0 kW.

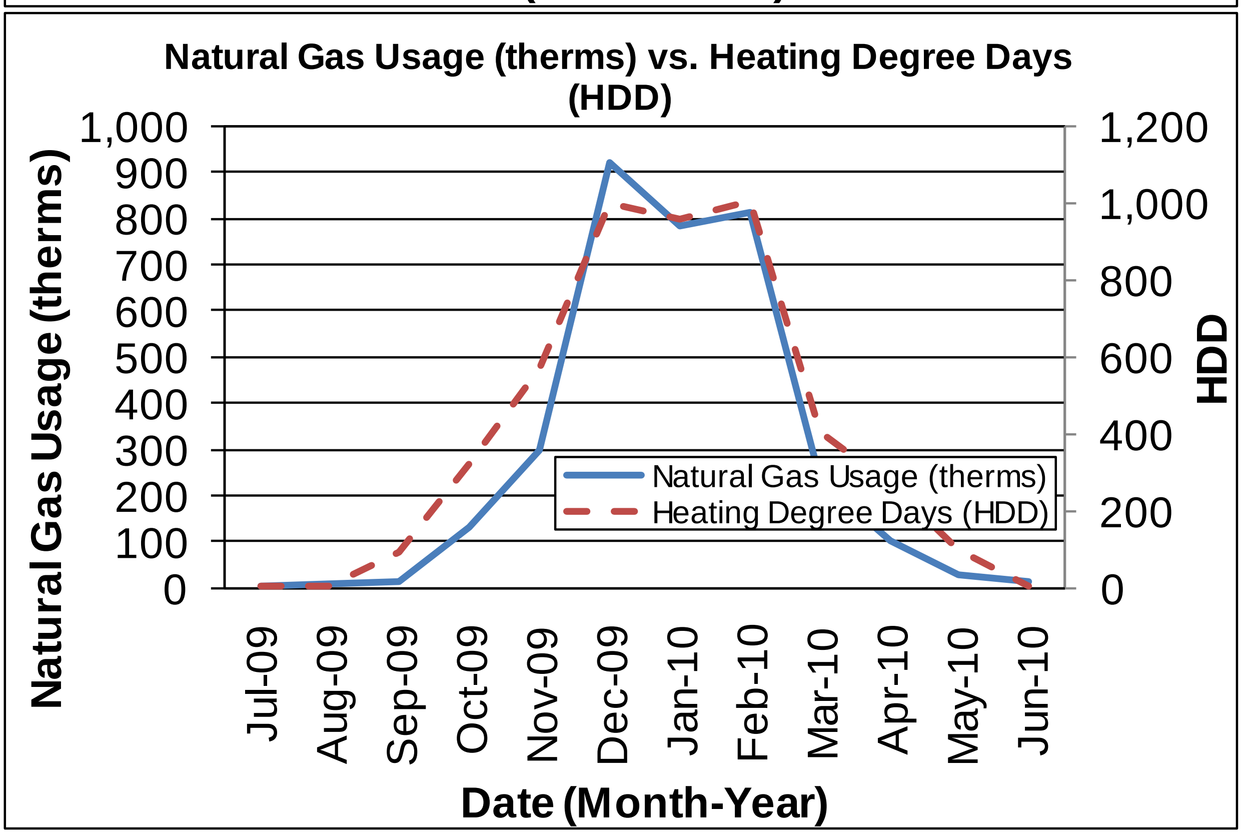
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate base-load or minimum electric usage required to operate the Borough Hall.



Natural gas - The Borough Hall is currently served by one meter for natural gas. The Borough Hall currently buys natural gas from NJ Natural Gas Co. at **an average aggregated rate of $1.461/therm**. The Borough Hall purchased **approximately 3,348 therms, or $4,890 worth of natural gas,** in the previous year.

The following chart shows the monthly natural gas usage and costs. The green line represents the approximate base-load or minimum natural gas usage required to operate the Borough Hall.

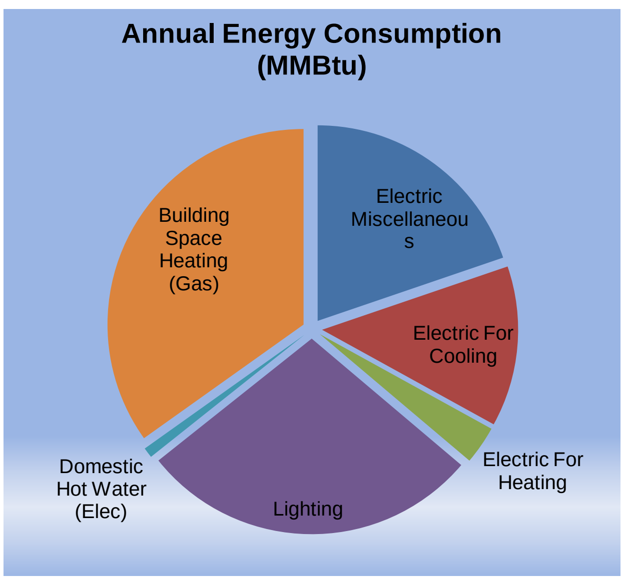

Annual Natural Gas(therms) and Cost($)
Natural Gas Usage (therms)
Natural Gas Cost($)
1000
900
800
700
600
500
400
300
200
100
0
$1,200
$1,000
$800
$600
$400
$200
$0
Natural Gas Usage (therms)
Estimated Baseload (therms)
Natural Gas Cost
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Date (Month-Year)

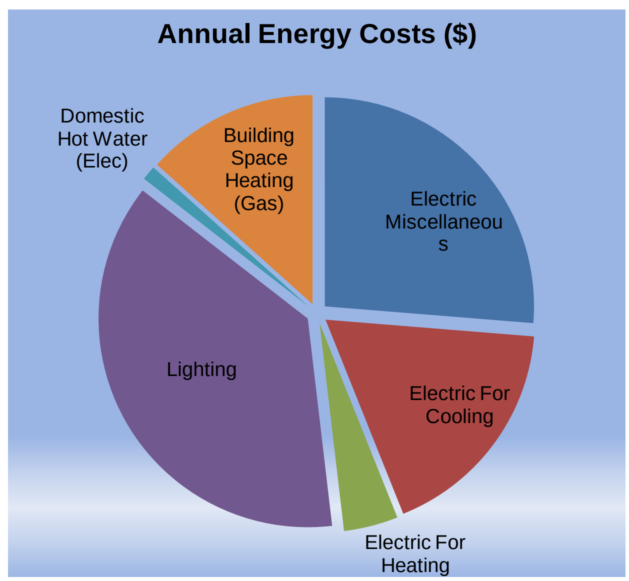

Natural Gas Usage (therms) vs. Heating Degree Days (HDD)
Natural Gas Usage (therms)
HDD
1,000
900
800
700
600
500
400
300
200
100
0
1,200
1,000
800
600
400
200
0
Natural Gas Usage (therms)
Heating Degree Days (HDD)
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Date (Month-Year)

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

The following table and pie charts show energy use for the Borough Hall based on utility bills for the 12 month period. Note: electrical cost at $50/MMBtu of energy is more than 3 times as expensive as natural gas at $15/MMBtu. Electrical Miscellaneous includes heat pumps operating all throughout the year.

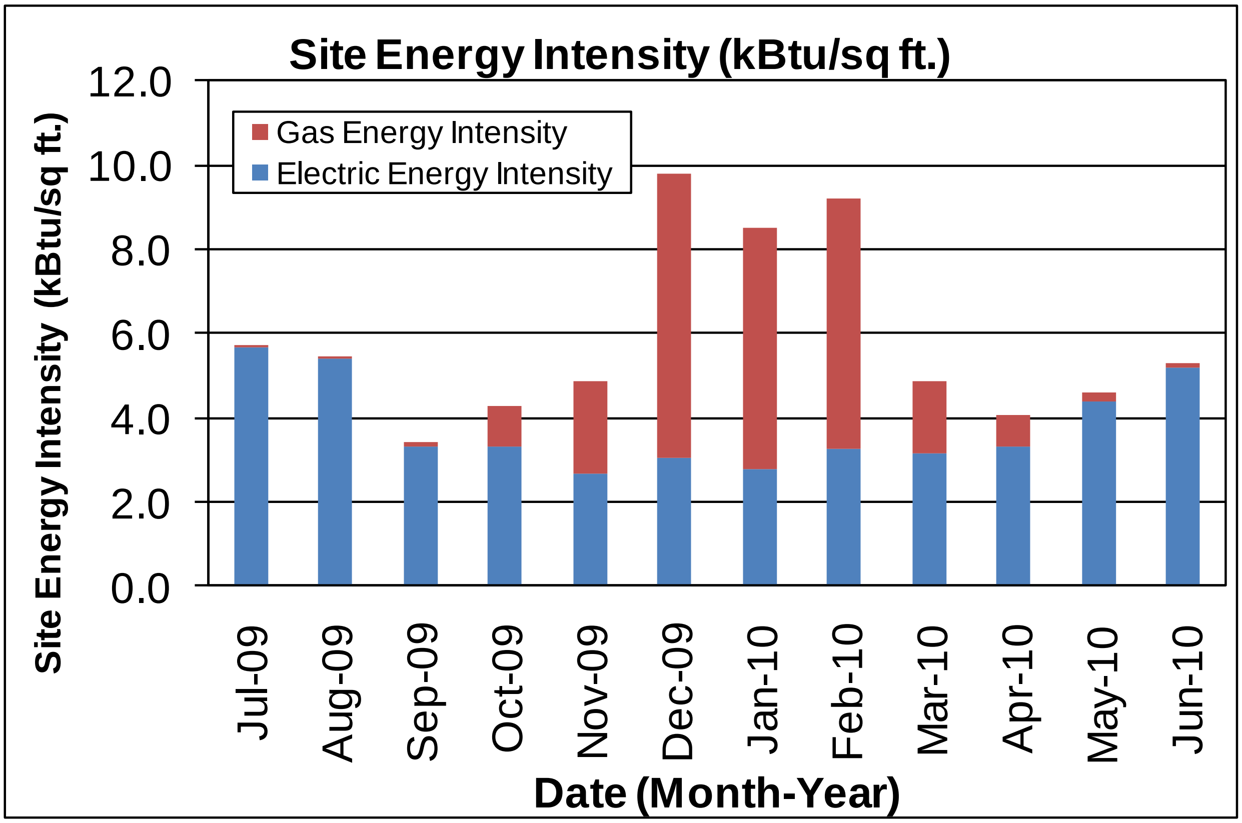
Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	197	20%	$9,864	27%	50
Electric For Cooling	127	13%	$6,389	17%	50
Electric For Heating	30	3%	$1,519	4%	50
Lighting	270	28%	$13,522	37%	50
Domestic Hot Water (Elec)	8	1%	$407	1%	50
Building Space Heating (Gas)	335	35%	$4,890	13%	15
Totals	967	100%	$36,591	100%	
Total Electric Usage	633	65%	$31,701	87%	50
Total Gas Usage	335	35%	$4,890	13%	15
Totals	967	100%	$36,591	100%	





Energy benchmarking

SWA has entered energy information about the Borough Hall in the U.S. Environmental Protection Agency's (EPA) ENERGY STAR® Portfolio Manager Energy benchmarking system. This mixed use building is categorized as a non-eligible ("Other") space type. Because it is an "Other" space type, there is no rating available. Consequently, the Borough Hall is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 71.0kBtu/sq ft yr compared to the national average of a building consuming 104.0kBtu/sq ft yr. See ECM section for guidance on how to improve the building's rating.



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

Tariff analysis

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

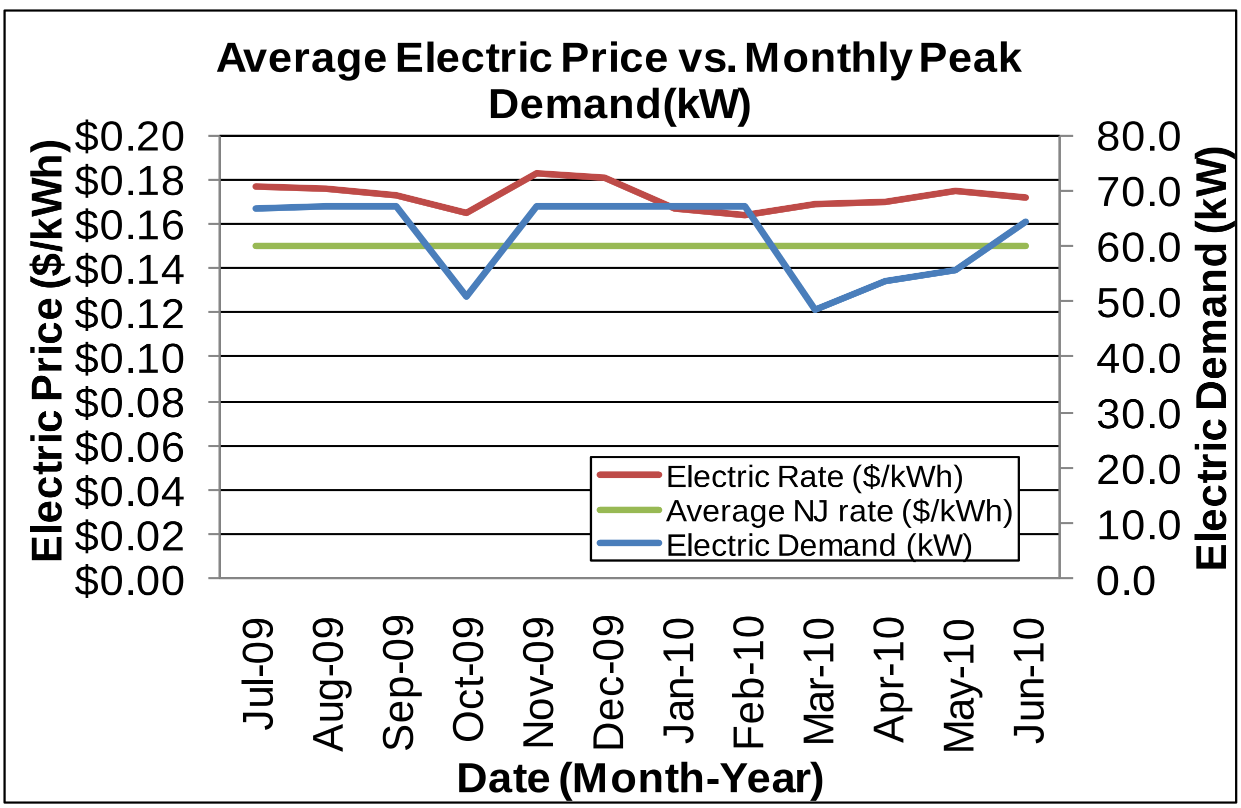
Tariff analysis is performed to determine if the rate that the Borough of Manasquan is contracted to pay with each utility provider is the best rate possible resulting in the lowest costs for electric and gas provision. Typically, the natural gas prices increase during the heating months when natural gas is used by the furnaces. Some high gas price per therm fluctuations in the summer may be due to high energy costs that recently occurred and low use caps for the non-heating months. Typically, electricity prices also increase during the cooling months when electricity is used for cooling.

The supplier charges a market-rate price based on use, and the billing does not break down demand costs for all periods because usage and demand are included in the rate. Currently, the Borough of Manasquan is paying a general service rate for natural gas. Demand charges are not broken out in the bill. Thus the building pays for fixed costs such as meter reading charges during the summer months. The building is direct metered and currently purchases electricity at a general service rate for usage with an additional charge for electrical demand factored into each monthly bill. The general service rate for electric charges is market-rate based on usage and demand. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

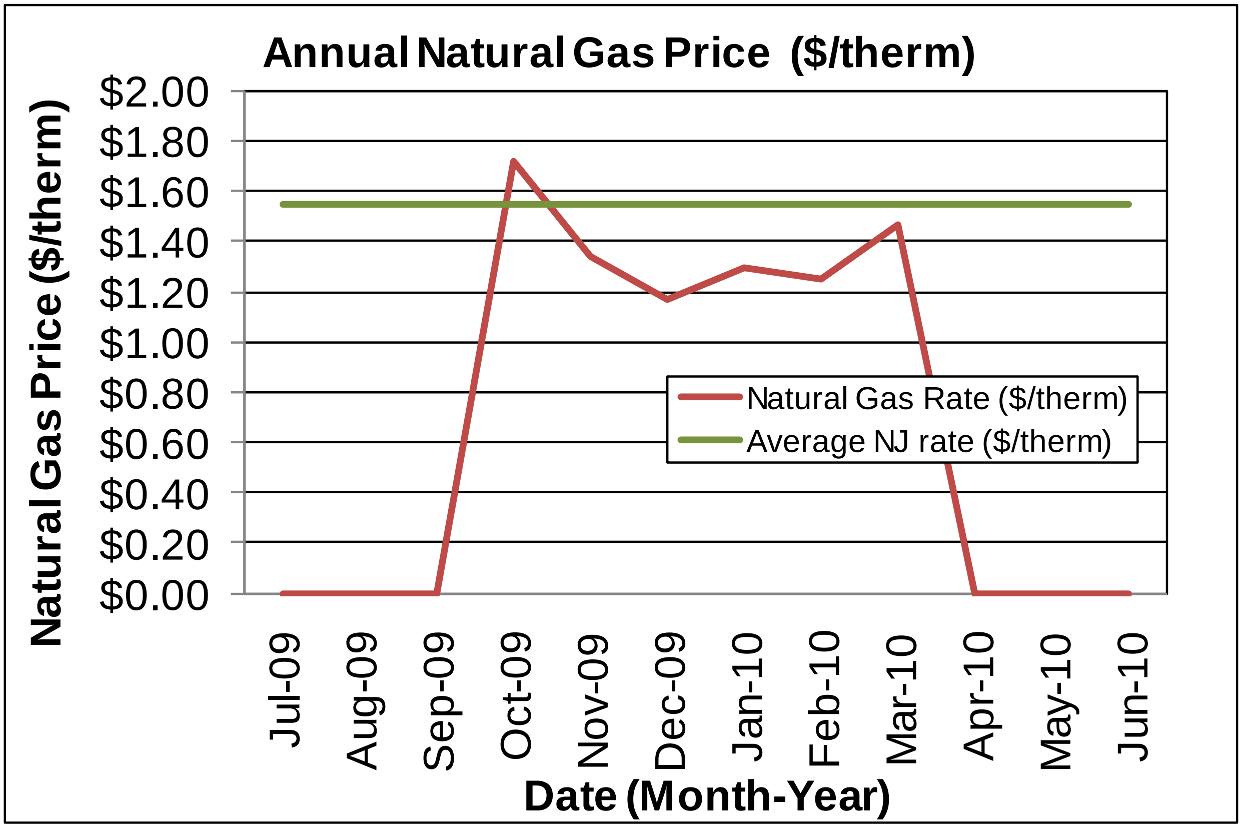
Energy Procurement strategies

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

The average estimated NJ commercial utility rates for electric are $0.150/kWh, while Borough Hall pays a rate of $0.173/kWh. The Borough Hall annual electric utility costs are $4,257 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 74% over the most recent 12 month period.



The average estimated NJ commercial utility rates for natural gas are $1.550/therm, while Borough Hall pays a competitive rate of $1.461/therm. Natural gas bill analysis shows fluctuations up to 93% 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. High gas rates in the summer months are also attributable to low therms usage and fixed meter charges.

As of early 2010, the Borough of Manasquan joined the Sustainable Energy Meeting (SEM) consortium together with 250-300 other municipalities to be able to obtain improved utility rates and terms. SWA recommends that the Borough of Manasquan further explore opportunities of purchasing both natural gas and electricity from third-party suppliers in order to reduce rate fluctuation and ultimately reduce the annual cost of energy for the Borough Hall. Appendix C contains a complete list of third-party energy suppliers for the Manasquan 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 Tuesday, September 2, 2010, the following data was collected and analyzed.

Building Characteristics

The two-story (including a basement), 13,680 square foot Manasquan Borough Hall was originally built in the 1960s as a Provident bank. The Borough of Manasquan has bought the property since and renovated it, as well as added to the building in 2001. The reduced bank space which is attached to the Borough Hall has separate utility meters.

The building houses in the basement: storage spaces, mechanical rooms, a Police Department ammunition room, a shower, women's and men's locker rooms; on the 1st floor: a waiting area, the Finance Department, the CFO's office, the Police Department, records storage, a dispatch room, a janitor's closet, women's and men's bathrooms; on the 2nd floor: Court/Council chambers, Court Administration, Judge's chambers, storage spaces, a break room, Municipal Administration, Construction Administration, a Clerk's office, a Mayor's office, a Borough Administrator's office a janitor's closet, women's and men's bathrooms.

Front Façade and Main Entrance


North-West Façade


South-West Façade


South-East Façade and Rear Entrance

Building Occupancy Profiles

There are approximately 35 occupants in the building on weekdays (which could go up to 150 on Court days). Municipal Administration employees work Monday through Friday 8:30am to

4:00pm. The Police Department has 17 officers. The Police Department is located on the 1st floor and part of the basement. The Police Department daytime occupancy is approximately 3-5 employees Monday through Friday 8:30am to 4:00pm. The Police Department has three core shifts - 8 hours/shift. There are 2-3 Police Department employees in/out on night shifts and weekends. The Police Dispatch is a 24 hour, 7 day operation. Court room office hours are Monday through Friday 8:30am to 4:00pm. The Court is in session two days/week (Tuesday for Brielle and Wednesday for Manasquan) 9:00am-5:00pm. There is night court every other week. The Court has a regular schedule during the summer and the fall however it does not meet weekly in the winter. The Borough Council meets in the Court room and there are Planning Board and other evening meetings two to three nights/week.

Building Envelope

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

Exterior Walls

The exterior wall envelope is mostly constructed of cedar clapboard siding, over concrete block with R-19 batt insulation. Other areas are constructed of cedar clapboard siding with some accents over brick and concrete blocks with an unconfirmed level of R-19 batt insulation. The interior is mostly painted gypsum wallboard and painted CMU (Concrete Masonry Unit).

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

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall good condition with no signs of uncontrolled moisture, air-leakage or other energy-compromising issues detected on all facades.

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

Damaged exterior wall finishes

Warped siding

Roof

The building's roof is predominantly a medium-pitch gable type over a wood structure, with an asphalt shingle finish. It was constructed in 2001 over the existing roof. There is some attic/ceiling insulation in places however it is not uniform. Other parts of the building are also covered by a medium-pitch gable type over a wood structure with a metal panel finish. Again, there is some attic/ceiling insulation in places however it is not uniform. This roof is original and has never been replaced.

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

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

Base

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

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

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

The following specific base problem spots were identified:


Some structural hairline cracks detected in the foundation wall and moisture on walls popping out the wall finish in the basement

Windows

The building contains several different types of windows:

- The majority of the windows are fixed type windows with an insulated aluminum frame, low-E coated/gas-filled, double-glazed and interior roller shades. The windows are located throughout the building and are original to the 2001 addition and have never been replaced

Windows, shading devices, sills, related flashing and caulking were inspected as far as accessibility allowed for signs of moisture, air-leakage and other energy compromising issues. Overall, the windows were found to be in good condition with only a few signs (in the

Police Department area) of uncontrolled moisture, air-leakage and/or other energy-compromising issues.

Exterior doors

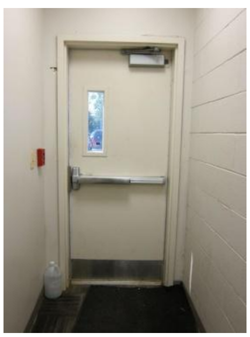
The building contains two different types of exterior doors:

- 4 glass with aluminum/steel frame type exterior doors. They are located in the front and rear of the building and are original/have never been replaced.

- 1 aluminum type exterior door. It is located in the rear of the building and is original/has never have been replaced.

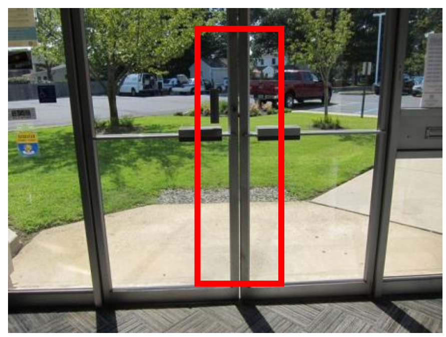
All exterior doors, thresholds, related flashing, caulking and weather-stripping were inspected for signs of moisture, air-leakage and other energy-compromising issues. Overall, the doors were found to be in poor condition with some signs of uncontrolled moisture, air-leakage and/or other energy-compromising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

The following specific door problem spots were identified:



Damaged/warped door frame

Close up of photo on the left side



Missing/worn weather-stripping

Building air-tightness

Overall the field auditors found the building to be reasonably air-tight with only a few 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 Manasquan Borough Hall is heated and cooled by twelve (12) furnaces located in the attic (except for one condensing furnace located in the basement mechanical room). Each furnace has a cooling DX coil in its discharge duct where supply air is cooled (during the cooling season) by refrigerant compressed in the associated condenser located at ground level next to the building.

Equipment

Condensing Furnaces with DX Cooling Coils

The building has twelve (12) furnaces installed in 2001. The furnaces are located in the attic space above the 2nd floor ceiling (except for the one condensing furnace located in the basement mechanical room) with externally insulated distribution flex and fixed ductwork. Each furnace has a supply fan assembly, a filter, controls and cooling DX coil in the discharge duct. These furnaces are ducted and draw in air directly from the spaces they serve and mix it with fresh air (controlled by dampers), condition the air and discharge it back into the rooms via distributed ductwork and diffusers. Each unit is controlled by a programmable thermostat located in the space that it serves. When the unit is in cooling mode, it passes air over a DX coil and rejects heat to an associated air cooled condenser, thus cooling the room air that is drawn through it by the fan.

The furnaces are manufactured by Carrier. Their thermal efficiency is 80% (except for the one condensing furnace located in the basement mechanical room which is 90.5%). Please see Appendix A for more details. This equipment is in good condition and has approximately 40% remaining service life.

Typical attic furnace installed in a horizontal position (left and center)

Condensing furnace located in the basement mechanical room (right)


Condensers

The building is cooled with the aid of twelve (12) Carrier condensers, each associated with a furnace/DX coil (located in the attic and one in the basement mechanical room). Each unit contains a compressor and a fan to reject (R-22 refrigerant) compression heat. The condensers are located at grade level facing the back parking lot and next to the building. Their efficiency is approximately 9.0 to 9.5 EER which may have degraded slightly since the 2001 installation. The condensers are in good condition and have approximately 40% of remaining service life.

Typical condensers next to bldg. facing the parking lot

Note: Refrigerant lines lying on the grass are showing signs of insulation degradation (right). These lines should be run in a protective conduit to prevent cooling losses

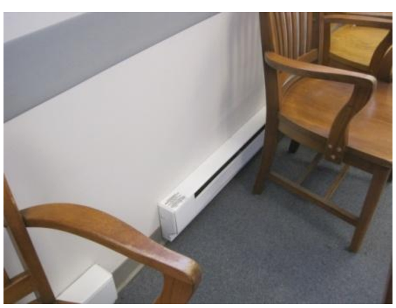


Ventilation

Supply air is delivered to the building via the furnaces (air handlers). The building has approximately nine exhaust fans driven by fractional horsepower motors, direct coupled, located in the attic. They appear in good condition with approximately 40% of remaining service life. The fans exhaust toilet spaces, locker rooms, the Court room, jail cells and mechanical rooms.

Small Heaters

There are four small electric heaters in the building used to heat spaces seasonally and keep above freezing, such as electric baseboard heaters with integral manual set thermostats for the staircases, hallways and vestibules. In general these heaters appear in satisfactory condition with approximately 40% of remaining service life.



Typical baseboard electric unit heaters; Unit heater temperature control knob (right)

Distribution Systems

A typical building furnace arrangement draws in fresh air and brings it into a mixing box, where it is combined with return air from the building. A small portion of the space air is purged and vented outside via separate exhaust fans. The mixed air inside the furnace is sent through a filter before passing through a natural gas heating section (winter use) and a cooling coil (summer use). The furnace blower then pushes the air through distributed fixed ductwork, air trunks and diffusers into the building spaces. Each of the twelve (12) furnaces has its associated ductwork.

Controls

The twelve (12) building temperature zones are controlled by programmable thermostats (except for a manual basement thermostat) left to be programmed according to area occupants. During the audit the Court room was unoccupied and temperature set at 71F. The auditors were advised by several building users that the ambient temperature is generally satisfactory except for a couple of areas in the Police Department that become drafty during the winter (possibly due to insufficient sealing/insulation around windows and doors). SWA was told that at least two occupants use electric portable heaters under desks during the winter.

Basement manual thermostat (left)

Typical building programmable thermostat (center)

Court room programmable thermostat (right) with instructions below for people desiring to make adjustments

Domestic Hot Water

The domestic hot water (DHW) for the Borough Hall is provided by an electric A O Smith EES80 920 heater, with 80 gal storage capacity. It is rated at using an average of 5,227 kWh/yr (on a scale from 4,624 to 5,352) with a 0.89 Energy Factor. It appears in satisfactory condition with approximately 25% of remaining service life. When it will need replacement, SWA recommends that a gas fired condensing model be considered.

Borough Hall electric DHW heater - distribution piping should be insulated

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 Borough Hall currently contains mostly T8 fixtures and recessed self ballasted fixtures. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas. Bathroom lighting is controlled by occupancy sensors.

Typical T8 and recessed halogen fixtures

Typical bathroom occupancy sensor

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

Typical LED Exit Signs

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


Metal Halide parking lot lights and CFL fixtures above the entrances

Appliances and process

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

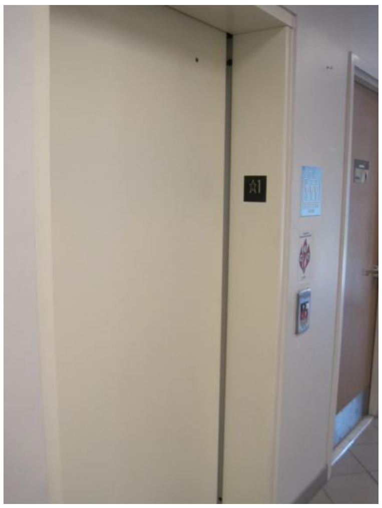
Sump and Ejector Pumps

There is one sump pump in the basement as well as duplex ejector pumps to handle just the basement wastewater. The pumps are in satisfactory condition with approximately 40% of remaining service life.

Elevators

The Borough Hall has one 2,500 lb capacity hydraulic Otis elevator which does not go to the basement. It was installed in 2001 and has approximately 65% of remaining service life. The hydraulic pump driven by a 20 HP motor generates 425 psi hydraulic pressure to keep the elevator moving. The elevator equipment appears in satisfactory condition.

The Borough also has an ADA chair lift (seldom used) on the 2nd floor where there is a small transition in elevation. The Garaventa Genesis lift has a 750 lb capacity. It appears in satisfactory condition and has approximately 65% of remaining service life.



Otis elevator (above), outside (left) and inside (center) and hydraulic system (right)

Garaventa Genesis chair lift (below), lower level (left) and higher level (center) and lifting mechanism (right)

Other electrical systems

Except for a Kohler 55 kW/69 kVA natural gas generator for emergency backup, there are not currently any other significant energy-impacting electrical systems installed at the

Borough Hall. The generator appears in satisfactory condition with approximately 60% of remaining service life.

Kohler 55 kW generator

RENEWABLE AND DISTRIBUTED ENERGY MEASURES

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

Existing systems

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

Evaluated Systems

Solar Photovoltaic

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

Based on utility analysis and a study of roof conditions, the Borough Hall is a good candidate for a 30 kW Solar Panel installation. See ECM#7 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 Borough Hall may be a potential candidate for wind power generation due to general wind conditions in this area of New Jersey and available roof space. Wind energy can contribute up to 8.6% of the current annual electric usage based on a 7.5 kW Wind turbine installation. See ECM#4 for details.

Geothermal

The Borough Hall is not a good candidate for geothermal installation since it would require replacement of the entire existing HVAC system, of which major components still have 40% remaining useful lives.

Combined Heat and Power

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

PROPOSED ENERGY CONSERVATION MEASURES

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

Recommendations: Energy Conservation Measures

ECM#	Description of Recommended 0-5 Year Payback ECMs
1	Upgrade (12) Incandescent Flood Light Fixtures to CFLs
2	Install (1) Programmable Thermostat in the Basement
3	Upgrade (1) T12 Fixture to a T8 Fixture
4	Install 7.5 kW Wind Rooftop System
5	Install (28) Occupancy Sensors
ECM#	**Description of Recommended 5-10 Year Payback ECMs**
6	Install a Demand Control System in the Court Room
7	Install 30 kW Solar Photovoltaic system

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: Upgrade (12) Incandescent Flood Light Fixtures to CFLs

During the field audit, SWA completed a building lighting inventory (see Appendix B). The existing lighting also contains 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:

Estimated installed cost: $108 (includes $60 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

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
108	none at this time	108	5,254	1	0	1	47	956	5	8,297	0.1	5,376	1,075	1,095	7,175	9,408

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

Rebates/financial incentives:

- There is no incentive available for this measure at this time.

Please see Appendix F for more information on Incentive Programs.

ECM#2: Install (1) Programmable Thermostat in the Basement

During the field audit, SWA completed a building HVAC controls analysis and observed spaces in the building where temperature is manually controlled without setbacks to reduce energy consumption during unoccupied periods of time, such as evenings and weekends. Programmable thermostats offer an easy way to save energy when correctly used. By turning the thermostat setback 8 to 10 degrees F for eight hours at a stretch (at night), the heating bill can be reduced substantially (by a minimum of 10% per year). In the summer, the cooling bill can be reduced by keeping the conditioned space warmer when unoccupied, and cooling it down only when using the space. The savings from using a programmable thermostat is greater in milder climates than in more extreme climates. 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. The fitness center air handling unit, AHU-1, serves several VAV boxes but does not have programmable thermostats for evening setbacks. The financial calculations below are for converting four manual thermostats to a programmable type. It is assumed that there will be evening setbacks for 8 hours a day for which the setpoint adjusts from 70 deg to 62 deg in the winter and 78 deg in the summer.

Installation cost:

Estimated installed cost: $167 (Includes $75 of labor)
Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program

Economics:

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
167	none at this time	167	886	0	27	0	583	775	12	9,304	0.2	5,471	456	464	7,228	1,879

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 17 hrs/yr to make manual adjustments vs. an installed programmable thermostat. SWA assumed that temperatures would be setback based on the operation schedule of the building and used Energy Star site: http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=TH , Excel spreadsheet for Savings Calculator

Rebates/financial incentives:

- There is no incentive available for this measure at this time.

Please see Appendix F for more information on Incentive Programs.

ECM#3: Upgrade (1) T12 Fixture to a T8 fixture

During the field audit, SWA completed a building lighting inventory (see Appendix B). The existing lighting contains one inefficient T12 fluorescent fixture with magnetic ballast in the elevator cabin. SWA recommends replacing each existing T12 fixture with more efficient, T8 fluorescent fixtures with electronic ballasts. T8 fixtures with electronic ballasts provide equivalent or better light output while reducing energy consumption by 30% when compared to T12 fixtures with magnetic ballasts. T8 fixtures also provide better lumens for less wattage when compared to incandescent, halogen and Metal Halide fixtures. The labor for the recommended installations is evaluated using prevailing electrical contractor wages. The building owner may decide to perform this work with in-house resources from the Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor.

Installation cost:

Estimated installed cost: $210 (includes $127 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

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
168	15	153	201	0	0	0	30	65	15	972	2.4	534	36	42	591	361

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 3/4 hrs/yr to replace aging burnt out lamps/ballasts vs. newly installed.

Rebates/financial incentives:

- NJ Clean Energy - Smart Start - T8 fixtures with electronic ballasts ($15 per fixture) - Maximum incentive amount is $15.

Please see Appendix F for more information on Incentive Programs.

. ECM#4: Install 7.5 kW Wind Rooftop System

Wind power production may be applicable for the Borough Hall location, because of the thermal winds generated in the area. Currently, the Borough Hall does not use any renewable energy systems. Updated renewable energy systems such as “magnetic” vertical axis wind turbines (MVAWT) can be mounted on building roofs offset a portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc… being used within the region, demand charges go up to offset the utility’s cost to provide enough electricity at that given time. Wind systems not only offset the amount of electricity use by a building, but also reduce the building’s electrical demand, resulting in a higher cost savings as well. SWA presents below the economics of installing a 7.5 kW Wind system to offset electrical demand for the building and reduce the annual net electric consumption for the building, however there are insufficient guaranteed incentives for NJ rebates at this time for this investment. The Borough Hall is not eligible for a 30% federal tax credit. The Borough Hall may consider applying for a grant and/or engage a Wind Power generator/leaser who would install the Wind system and then sell the power at a reduced rate.

There are many possible locations for a 7.5kW Wind system installation on top of the building ample roof area. The supplier would need to first determine via recorded analysis at the proposed location(s) consistency and wind speeds available. Area winds of 10 mph will run turbines smoothly and capture the needed power. This is a roof-mounted wind turbine (used for generating electricity) that spins around a vertical axis like a merry-go-round instead of like a windmill, as do more traditional horizontal axis wind turbines (HAWTs). A typical 7.5 kW MVAWT wind system has a 20 ft diameter turbine by 10 ft tall.

The installation of a renewable Wind power generating system could serve as a good educational tool and exhibit for the community. **It is very important that Wind measurements and recordings are taken at the chosen location for at least a couple of months to assure that sufficient wind and speed is available for proper operation and to meet incentive requirements. Also, roof structural support should be checked by a structural engineer to ensure that it is adequate for a Wind System installation.**

Installation cost:

Estimated installed cost: $60,000 (includes $15,000 of labor)
Source of cost estimate: Similar projects

Economics (with incentives):

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
60,000	50,808	9,192	15,878	8	0	5	0	2,699	25	67,479	3.4	634	25	29	35,638	28,429

Assumptions: SWA estimated the cost and savings of the system based on past wind projects. SWA projected physical dimensions based on a 7.5 kW-Enviro Energies turbine system. **SWA assumes that the relatively low height (~43 ft) compared to the taller horizontal axis turbines is acceptable to the NJ BPU as long as the average documented annual wind speed is 11 mph at the hub.**

Rebates/financial incentives:

NJ Clean Energy - Renewable Energy Incentive Program, Incentive at this time only for vertically spinning high altitude turbines
http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program

NJ Clean Energy - Wind Upfront Incentive Program, Expected performance buy-down (EPBB) is modeled on an annual kWh production of 1-16,000 kWh for a $3.20/kWh upfront incentive level. This has been incorporated in the above costs however it requires proof of performance, application approval and negotiations with the utility.

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

ECM#5: Install (28) 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:

Estimated installed cost: $5,600 (includes $3,360 of labor)
Source of cost estimate: Similar projects

Economics (with incentives):

est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
6,160	560	5,600	7,547	2	0	2	0	1,306	15	19,590	4.3	250	17	22	9,465	13,513

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

Rebates/financial incentives:

- NJ Clean Energy - SmartStart - Wall-mounted occupancy sensors ($20 per occupancy sensor) - Maximum incentive amount is $560.

Please see Appendix F for more information on Incentive Programs.

ECM#6: Install Court Room Demand-Controlled Ventilation System

On the day of the site visit, SWA observed that there were not any air flow controls based on occupancy. SWA recommends that carbon dioxide sensors be installed (in return air ducts) in the larger spaces to sense occupancy and improve Indoor Air Quality (IAQ). Signals from these sensors need to be taken back to the HVAC air flow controls for programming to regulate the amount of cooling and heating for these spaces and vary air flows according to occupancy. Thus, many a time when these spaces are sparsely occupied, savings will be realized in the heating and cooling of these spaces, by bringing into the spaces the right amount of fresh air (rather than too much unconditioned air).

Demand controlled ventilation (DCV) is the process of automatically modulating the rate of outdoor air supply (i.e., rate of ventilation) as the "demand" or need for ventilation varies. The objective is to keep ventilation rates at or above design specifications and code requirements and also to save energy by avoiding excessive ventilation rates, as energy is normally required to heat, cool, and dehumidify the ventilation air supplied to buildings. The need for ventilation is increased when the rate of air pollutant generation from indoor sources is high. People and their activities are among the important indoor pollutant sources and in many indoor spaces occupant density is highly variable. Thus, DCV is most often implemented in spaces with sometimes high and temporally variable occupant density, for example meeting rooms and theatres. In the usual application of DCV, ventilation rates are automatically modulated based on measured indoor concentrations of carbon dioxide (CO_2), as CO_2 is emitted by people as a metabolic by product and more easily measured than other air pollutants resulting from occupancy. When the indoor occupant density is increased, the indoor concentration of CO_2 increases, unless the ventilation rate also increases. Carbon dioxide is not generally considered a directly harmful air pollutant at the concentrations found indoors - rather the concentration of CO_2 is considered a proxy for the concentration of a variety of other odorous or potentially harmful pollutants emitted by people or their activities. A typical DCV system is designed to modulate ventilation rates over time so that indoor carbon dioxide concentrations do not exceed a set point, or target, value. The set point CO_2 concentration is typically between 800 and 1,000 parts per million with outside CO_2 levels typically at low concentrations of around 400 to 450 ppm. SWA considered DCV opportunities for the three building package units serving the Recreation room and Banquet Hall areas.

Building codes require that a minimum amount of fresh air be provided to ensure adequate air quality. To comply, ventilation systems often operate at a fixed rate based on an assumed occupancy (e.g., 15 cfm per person multiplied by the maximum design occupancy). The result is there often is much more fresh air coming into buildings than is necessary. That air must be conditioned, resulting in higher energy consumption and costs than is necessary with appropriate ventilation. ANSI/ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality, sets minimum ventilation rates and other requirements for commercial and institutional buildings, besides state and local building codes.

Installation cost:

Estimated installed cost: $2,400 (includes $720 of labor)
Source of cost estimate: RS Means; Published and established costs; Similar projects

Economics:

est. installed cost, $	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
2,400	none at this time	2,400	1,772	0	53	1	0	384	12	4,608	6.2	92	8	12	1,335	3,758

Assumptions: SWA assumed thermal savings based on heating and cooling loads calculated using the billing analysis. In order to estimate savings for this measure, SWA calculated energy reductions equivalent to the ratio of the energy saved to the total heating and cooling used by the size of the space(s), occupancy and utilization according to known schedules (in view that some of the spaces are rarely used at the full designed capacity) and compared it to 10% heating/cooling reduction and used the more conservative estimate.

Rebates/financial incentives:

- There is no incentive available for this measure at this time.

Please see Appendix F for more information on Incentive Programs.

ECM#7: Install a 30 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. 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 30 kW system needs approximately 130 panels which would take up 2,280 square feet.

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. However, this option is not available from the local utility. Please see below for more information.

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 Borough of Manasquan 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 Borough of Manasquan should include these costs in the financial analysis of the project, as well as any roof covering and insulation upgrades.

Installation cost:

Estimated installed cost: $187,500 (includes $120,000 of labor)
Source of cost estimate: Similar projects

Economics (with incentives):

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
210,000	22,500	187,500	35,400	30	0	9	0	27,123	25	678,073	6.9	262	10	12	158,808	63,384

Cash flow:

Annual Solar PV Cost Savings Breakdown

Rated Capacity (kW)	30.0
Rated Capacity (kWh)	35,400
Annual Capacity Loss	0%

Year	kWh Capacity	Installed Cost	Incentives	Electric Savings ($)
0		$210,000	$22,500	
1	35,400		$21,000	$6,129
2	35,400		$21,000	$6,129
3	35,400		$21,000	$6,129
4	35,400		$21,000	$6,129
5	35,400		$21,000	$6,129
6	35,400		$21,000	$6,129
7	35,400		$21,000	$6,129
8	35,400		$21,000	$6,129
9	35,400		$21,000	$6,129
10	35,400		$21,000	$6,129
11	35,400		$21,000	$6,129
12	35,400		$21,000	$6,129
13	35,400		$21,000	$6,129
14	35,400		$21,000	$6,129
15	35,400		$21,000	$6,129
16	35,400		$0	$6,129
17	35,400		$0	$6,129
18	35,400		$0	$6,129
19	35,400		$0	$6,129
20	35,400		$0	$6,129
21	35,400		$0	$6,129
22	35,400		$0	$6,129
23	35,400		$0	$6,129
24	35,400		$0	$6,129
25	35,400		$0	$6,129
	kWh	Cost	Saving	
Lifetime Total	**885,000**	**($210,000)**	**$337,500**	**$153,237**

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 - Renewable Energy Incentive Program, Incentive based on $0.75 / watt Solar PV application for systems 30 kW or less. Incentive amount for this application is $22,500 for the proposed option. http://www.njcleanenergy.com/renewable-energy/programs/renewable-energy-incentive-program

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

Options for funding ECM:

This project may benefit from enrolling in NJ SmartStart program with Technical Assistance to offset a portion of the cost of implementation.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

Please see Appendix F 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 Borough Hall:

- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives.
- Replace original windows and doors in the Police Department with the next major renovation.
- Engage a structural engineer to determine the cause and propose fix to the basement lower wall structural hairline cracks and moisture infiltration.

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.

- Lock all programmable thermostats and allow only Maintenance to perform programming functions. All others can override set temperatures for short periods of time via buttons on the front cover of the thermostats.
- Insulate exposed DHW piping to prevent heat losses and provide hot water where needed faster.
- Install batt fiberglass insulation evenly on the attic floor and seal thoroughly all penetrations to the 2nd floor.
- Install/repair and maintain gutters, downspouts and downspout deflectors to minimize uncontrolled roof water run-off causing exterior wall damage.
- Repair weather-stripping/air-sealing - The exterior doors were inspected and observed to be in satisfactory/age appropriate condition. The weather-stripping is starting to show wear-and-tear allowing air infiltration. SWA recommends resealing these doors with new weather-stripping on all four edges in order to decrease the amount of conditioned air that is lost around each door, checking the weather-stripping at each door regularly, and replacing any broken seals. Tight seals around doors will help to ensure the building is kept continuously insulated. Simply air-sealing the conditioned building envelope can reduce annual heating and cooling costs up to 15%.
- 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 replace 2.2 gallon per minute (gpm) faucet aerators with 0.5 gallon per minute (gpm) faucet aerators and/or low-flow fixtures to reduce water consumption. There are many retrofit options, which can be installed now or incorporated as equipment is replaced. Routine maintenance practices that identify and quickly address water leaks are a low-cost way to save water and energy. Retrofitting with more efficient water-consumption fixtures/appliances will reduce energy consumption for water heating, while also decreasing water/sewer bills.

- SWA recommends that the Borough of Manasquan consider 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. Savings of up to 30% in electric usage is possible depending on the performance of the selected ENERGY STAR® appliance.

- 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/

- Change filters in furnace/air handling units monthly to ensure efficient operation of the blower and ensure adequate air delivery to the space.

- Tighten belts on furnace supply blowers every three to six months - Tightening belts on belt-driven fans/blowers can maximize the overall efficiency of the equipment.

- Inspect Dx coils for dirt buildup or coil freeze-up every three to six months. These conditions should be rectified if found because they will cause inefficient operation and possibly damage to the equipment.

The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for the Manasquan Borough Hall. Based on the requirements of the LGEA program, the Manasquan Borough Hall 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 Manasquan Borough Hall should spend a minimum of $1,873 (or 25% of $7,491) worth of ECMs, net of other NJCEP incentives, to fulfill the obligations.

APPENDIX A: EQUIPMENT LIST

Inventory

Building System	Description, % eff	Model # / Serial #	Fuel	Location	Space Served	Date Installed	Estimated Remaining Useful Life %
Heating/ Cooling	split system - ACC-1, 3 ton cooling, R-22, 9.2 EER condenser; GF-1, 34 MBH heating, 80% AFUE furnace, 1/2 HP blower	Carrier cond 38CKC036510 , Serial #4701E02469; furnace 58ZAV096-16; evap CK3A-036	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	1st Floor Processing, Patrol, Captain offices, Jail cells and Hallway	2001	40
Heating/ Cooling	split system - ACC-2, 3 ton cooling, R-22, 9.2 EER condenser; GF-2, 34.2 MBH heating, 80% AFUE furnace, 1/2 HP blower	Carrier cond 38CKC036510 , Serial #4501E11811; furnace 58ZAV096-16; evap CK3A-036	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	1st Floor Detective Bureau, Sergeant, Chief offices and Records Bureau	2001	40
Heating/ Cooling	split system - ACC-3, 3 ton cooling, R-22, 9.2 EER condenser; GF-3, 34.4 MBH heating, 80% AFUE furnace, 1/2 HP blower	Carrier cond 38CKC036510 , Serial #1301E15196; furnace 58ZAV096-16; evap CK3A-036	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	1st Floor Bathrooms, Hallway, Tax/ Water/ Finance spaces	2001	40
Heating/ Cooling	split system - ACC-4, 2 ton cooling, R-22, 9.15 EER condenser; GF-4, 22.4 MBH heating, 80% AFUE furnace, 1/5 HP blower	Carrier cond 38CKC024510 , Serial #1901E10879; furnace 58ZAV070-08; evap CK3A-024	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	1st Floor Dispatch and Hallway	2001	40
Heating/ Cooling	split system - ACC-5, 2.5 ton cooling, R-22, 9.1 EER condenser; GF-5, 26 MBH heating, 80% AFUE furnace, 1/3 HP blower	Carrier cond 38CKC030330 , Serial #3701E09071; furnace 58ZAV070-12; evap CK3A-030	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	2nd Floor Mayor’s office and conf. room next to it	2001	40
Heating/ Cooling	split system - ACC-6, 2.5 ton cooling, R-22, 9.1 EER condenser; GF-6, 26 MBH heating, 80% AFUE furnace, 1/3 HP blower	Carrier cond 38CKC030500 , Serial #4200E03318; furnace 58ZAV070-12; evap CK3A-030	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	2nd Floor Borough Administra-tor and Clerk offices	2001	40
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Building System	**Description, % eff**	**Model # / Serial #**	**Fuel**	**Location**	**Space Served**	**Date Installed**	**Estimated Remaining Useful Life %**
Heating/ Cooling	split system - ACC-7, 4 ton cooling, R-22, 9.3 EER condenser; GF-7, 45 MBH heating, 80% AFUE furnace, ¾ HP blower	Carrier cond 38CKC048560 , Serial #4301E07020; furnace 58ZAV115-20; evap CK3A-048	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	2nd Floor Borough Administration (Code and Bldg Depts) space and Break room	2001	40
Heating/ Cooling	split system - ACC-8, 4 ton cooling, R-22, 9.3 EER condenser; GF-8, 45 MBH heating, 80% AFUE furnace, ¾ HP blower	Carrier cond 38CKC048560 , Serial #3301E15551; furnace 58ZAV115-20; evap CK3A-048	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	2nd Floor Court Administration and Hallway	2001	40
Heating/ Cooling	split system - ACC-9, 5 ton cooling, R-22, 9.5 EER condenser; GF-9, 57.3 MBH heating, 80% AFUE furnace, ¾ HP blower	Carrier cond 38CKC060540 , Serial #4101E02997; furnace 58ZAV115-22; evap CK3A-060	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	2nd Floor Court Room South end	2001	40
Heating/ Cooling	split system - ACC-10, 5 ton cooling, R-22, 9.5 EER condenser; GF-10, 57 MBH heating, 80% AFUE furnace, ¾ HP blower	Carrier cond 38CKC060540 , Serial #4101E03055; furnace 58ZAV096-16; evap CK3A-060	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	2nd Floor Court Room North end	2001	40
Heating/ Cooling	split system - ACC-11, 3.5 ton cooling, R-22, 9.0 EER condenser; GF-11, 40 MBH heating, 90.5% AFUE furnace, 3/4 HP blower	Carrier cond 38CKC042530 , Serial #2801E10653; furnace 58ZAV080-20; evap CK3A-042	Electric/ Natural Gas	Ground level Condenser; Furnace in the Basement Mech Room	Basement	2001	40
Heating/ Cooling	split system - ACC-12, 3 ton cooling, R-22, 9.2 EER condenser; GF-12, 34 MBH heating, 80% AFUE furnace, 1/2 HP blower	Carrier cond 38CKC036510 , Serial #4501E11783; furnace 58ZAV096-16; evap CK3A-036	Electric/ Natural Gas	Ground level Condenser; Furnace in the Attic	2nd Floor Construction Administration	2001	40
Heating	Baseboard Electric heaters, EBB-1 through 4, 0.75 & 2 kW	QMARK, QMKC-2513W-3" and 2548W-8"	Electric	Hallways, Stairs and Vestibules	Hallways, Stairs and Vestibules	2001	40
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Building System	**Description, % eff**	**Model # / Serial #**	**Fuel**	**Location**	**Space Served**	**Date Installed**	**Estimated Remaining Useful Life %**
Ventilation	EF-1, 396 Watt motor, 300 cfm	Greenheck CSP-252	Electric	Attic	2nd Floor Toilets	2001	40
Ventilation	EF-2, 452 Watt motor, 600 cfm	Greenheck CSP-258	Electric	Attic	Basement Locker Rms	2001	40
Ventilation	EF-3, 396 Watt motor, 300 cfm	Greenheck CSP-252	Electric	Attic	Elevator Mech Rm	2001	40
Ventilation	EF-4, 137 Watt motor, 75 cfm	Greenheck SP-7	Electric	Attic	Judge's Toilets	2001	40
Ventilation	EF-5, 452 Watt motor, 500 cfm	Greenheck CSP-258	Electric	Attic	Court Rm	2001	40
Ventilation	EF-6, 452 Watt motor, 500 cfm	Greenheck CSP-258	Electric	Attic	Court Rm	2001	40
Ventilation	EF-7, 137 Watt motor, 75 cfm	Greenheck SP-7	Electric	Attic	1st Floor Unisex Bathroom	2001	40
Ventilation	EF-8, 396 Watt motor, 300 cfm	Greenheck CSP-252	Electric	Attic	Jail Cells	2001	40
Ventilation	EF-9, 396 Watt motor, 350 cfm	Greenheck CSP-252	Electric	Attic	1st Floor Toilets	2001	40
Thermostats	Programmable Thermostats	Carrier 33CS	Electric	Borough Hall	Borough Hall	2001	25
Domestic Hot Water (DHW) Heating	(1) electric DHW heater with 80 gal storage, upper coil - 3,375 Watts & lower coil - 3,375 Watts, 208 VAC, rated 5,227 kWh/yr (on scale 4,624 to 5,352), EF=0.89	A O Smith EES80 920, Part # EES-80-M2021720000	Electric	Basement Mech Rm	Borough Hall	2001	25
Sump Pump	One in basement pit	Missing nametag	Electric	Basement Mech Rm	Borough Hall	2001	40
Generator	55 kW/69 KVA emergency generator	Kohler 50RZG, Serial # 0713238	Electric/ Natural Gas	Ground level facing parking lot	Borough Hall	2001	60
Ejector Pumps	Basement Ejector Pumps, 2” solids-handling, ½ HP	Liberty LE50-Series	Electric	Basement Locker Rm	Basement Wastewater - Bath-rooms/ Shower	2001	40
Lighting	See Appendix B	See Appendix B	Electric	Borough Hall	Borough Hall	varies	Avg - 40%

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

Appendix B: Lighting Study

Location			Existing Fixture Information												Retrofit Information													Annual Savings		
Marker	Floor	Room Identification	Fixture Type	Ballast	Lamp Type	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Controls	Operational Hours per Day	Operational Days per Year	Ballast Wattage	Total Watts	Energy Use kWh/year	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
1	2	Caucus Room	Recessed Parabolic	E	4'T8	4	3	32	Sw	8	261	5	404	844	C	Recessed Parabolic	4'T8	E	OS	4	3	32	6	261	5	404	633	0	211	211
2	2	Caucus Room	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
3	2	Mayor's Office	Recessed Parabolic	E	4'T8	4	3	32	Sw	8	261	5	404	844	C	Recessed Parabolic	4'T8	E	OS	4	3	32	6	261	5	404	633	0	211	211
4	2	Business Admin Office	Recessed Parabolic	E	4'T8	4	3	32	Sw	8	261	5	404	844	C	Recessed Parabolic	4'T8	E	OS	4	3	32	6	261	5	404	633	0	211	211
5	2	Borough Clerk Office	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	5	202	422	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	261	5	202	316	0	105	105
6	2	Building Dept/Code Dept	Recessed Parabolic	E	4'T8	22	3	32	Sw	8	261	5	2,222	4,640	C	Recessed Parabolic	4'T8	E	OS	22	3	32	6	261	5	2222	3480	0	1160	1160
7	2	Building Dept/Code Dept	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
8	2	Public Waiting Room	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	5	202	422	N/A	Recessed Parabolic	4'T8	E	Sw	2	3	32	8	261	5	202	422	0	0	0
9	2	Public Waiting Room	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
10	2	Stairs to Caucus Room	Recessed Parabolic	E	4'T8	1	3	32	Sw	8	261	5	101	211	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	8	261	5	101	211	0	0	0
11	2	Council Chamer/Court Room	Recessed Parabolic	E	4'T8	9	3	32	Sw	8	261	5	909	1,898	N/A	Recessed Parabolic	4'T8	E	Sw	9	3	32	8	261	5	909	1898	0	0	0
12	2	Council Chamer/Court Room	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
13	2	Entrance to Court	Recessed Parabolic	E	4'T8	3	3	32	Sw	8	261	5	303	633	N/A	Recessed Parabolic	4'T8	E	Sw	3	3	32	8	261	5	303	633	0	0	0
14	2	Hallway	Recessed Parabolic	E	4'T8	6	3	32	Sw	16	261	5	606	2,531	N/A	Recessed Parabolic	4'T8	E	Sw	6	3	32	16	261	5	606	2531	0	0	0
15	2	Bathroom Men	Recessed Parabolic	E	4'T8	2	4	32	OS	8	261	5	266	555	N/A	Recessed Parabolic	4'T8	E	OS	2	4	32	8	261	5	266	555	0	0	0
16	2	Bathroom Women	Recessed Parabolic	E	4'T8	2	4	32	OS	8	261	5	266	555	N/A	Recessed Parabolic	4'T8	E	OS	2	4	32	8	261	5	266	555	0	0	0
17	2	Coffee Breakroom	Recessed Parabolic	E	4'T8 U-Shaped	2	3	32	Sw	8	261	5	202	422	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	2	3	32	6	261	5	202	316	0	105	105
18	2	Court Office	Recessed Parabolic	E	4'T8	8	3	32	Sw	8	261	5	808	1,687	C	Recessed Parabolic	4'T8	E	OS	8	3	32	6	261	5	808	1265	0	422	422
19	2	Judge's Chambers	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	5	202	422	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	261	5	202	316	0	105	105
20	2	Bathroom	Recessed Parabolic	E	4'T8	1	2	32	Sw	8	261	5	69	144	C	Recessed Parabolic	4'T8	E	OS	1	2	32	6	261	5	69	108	0	36	36
21	2	Storage Closet	Recessed Parabolic	E	4'T8	1	3	32	Sw	2	261	5	101	53	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	2	261	5	101	53	0	0	0
22	2	Utility Closet	Ceiling Mounted	S	CFL	1	1	13	Sw	2	261	0	13	7	N/A	Ceiling Mounted	CFL	S	Sw	1	1	13	2	261	0	13	7	0	0	0
23	2	Hallway	Recessed Parabolic	E	4'T8 U-Shaped	4	3	32	Sw	16	261	5	404	1,687	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	4	3	32	16	261	5	404	1687	0	0	0
24	2	Hallway	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
25	2	Hallway	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
26	1	Chief's Office	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	365	5	202	590	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	365	5	202	442	0	147	147
27	1	Sergant's Office	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	365	5	202	590	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	365	5	202	442	0	147	147
28	1	Detective Bureau	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	365	5	202	590	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	365	5	202	442	0	147	147
29	1	Detective Bureau Closet	Recessed Parabolic	E	4'T8	1	2	32	Sw	8	365	5	69	201	C	Recessed Parabolic	4'T8	E	OS	1	2	32	6	365	5	69	151	0	50	50
30	1	Records Bureau	Recessed Parabolic	E	4'T8	5	3	32	Sw	24	365	5	505	4,424	C	Recessed Parabolic	4'T8	E	OS	5	3	32	18	365	5	505	3318	0	1106	1106
31	1	Hallway	Recessed Parabolic	E	4'T8	5	3	32	Sw	24	365	5	505	4,424	N/A	Recessed Parabolic	4'T8	E	Sw	5	3	32	24	365	5	505	4424	0	0	0
32	1	Hallway	Recessed Parabolic	E	4'T8 U-Shaped	3	3	32	Sw	24	365	5	303	2,654	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	3	3	32	24	365	5	303	2654	0	0	0
33	1	Hallway	Exit Sign	S	LED	3	1	5	N	24	365	1	17	145	N/A	Exit Sign	LED	S	N	3	1	5	24	365	1	17	145	0	0	0
34	1	Jail Cell Hallway	Recessed Parabolic	S	LED	3	3	4	Sw	12	365	0	37	163	N/A	Recessed Parabolic	LED	S	Sw	3	3	4	12	365	0	37	163	0	0	0
35	1	Jail Cell 1	Recessed Parabolic	E	4'T8	1	3	32	Sw	12	365	5	101	442	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	12	365	5	101	442	0	0	0
36	1	Jail Cell 2	Recessed Parabolic	E	4'T8	1	3	32	Sw	12	365	5	101	442	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	12	365	5	101	442	0	0	0
37	1	Jail Cell 3	Recessed Parabolic	E	4'T8	1	3	32	Sw	12	365	5	101	442	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	12	365	5	101	442	0	0	0
38	1	Bathroom	Recessed Parabolic	E	4'T8	1	3	32	Sw	8	365	5	101	295	C	Recessed Parabolic	4'T8	E	OS	1	3	32	6	365	5	101	221	0	74	74
39	1	Dispatch Room	Recessed Parabolic	E	4'T8	4	3	32	Sw	24	365	5	404	3,539	N/A	Recessed Parabolic	4'T8	E	Sw	4	3	32	24	365	5	404	3539	0	0	0
40	1	Captain's Office	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	365	5	202	590	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	365	5	202	442	0	147	147
41	1	Patrol Office	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	365	5	202	590	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	365	5	202	442	0	147	147
42	1	Interview/ Processing Room	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	365	5	202	590	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	365	5	202	442	0	147	147
43	1	CFO Office	Recessed Parabolic	E	4'T8	2	3	32	Sw	8	261	5	202	422	C	Recessed Parabolic	4'T8	E	OS	2	3	32	6	261	5	202	316	0	105	105
44	1	Tax Water Finance	Recessed Parabolic	E	4'T8	7	3	32	Sw	8	261	5	707	1,476	C	Recessed Parabolic	4'T8	E	OS	7	3	32	6	261	5	707	1107	0	369	369
45	1	Main Lobby	Recessed Parabolic	E	4'T8 U-Shaped	4	3	32	Sw	8	365	5	404	1,180	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	4	3	32	8	365	5	404	1180	0	0	0
46	1	Main Lobby	Exit Sign	S	LED	2	1	5	N	24	365	1	11	96	N/A	Exit Sign	LED	S	N	2	1	5	24	365	1	11	96	0	0	0
47	1	Open Area	Recessed Parabolic	E	2'T8	1	3	17	Sw	8	261	2	53	111	N/A	Recessed Parabolic	2'T8	E	Sw	1	3	17	8	261	2	53	111	0	0	0
48	1	Open Area	Recessed Parabolic	E	4'T8	1	3	32	Sw	8	261	5	101	211	N/A	Recessed Parabolic	4'T8	E	Sw	1	3	32	8	261	5	101	211	0	0	0
49	1	Public Entrance	Recessed	S	Inc	4	1	150	Sw	8	261	0	600	1,253	CFL	Recessed	CFL	S	Sw	4	1	50	8	261	0	200	418	835	0	835
50	1	Bathroom Men	Recessed Parabolic	E	4'T8	2	2	32	OS	8	261	5	138	288	N/A	Recessed Parabolic	4'T8	E	OS	2	2	32	8	261	5	138	288	0	0	0
51	1	Bathroom Women	Recessed Parabolic	E	4'T8	2	2	32	OS	8	261	5	138	288	N/A	Recessed Parabolic	4'T8	E	OS	2	2	32	8	261	5	138	288	0	0	0
52	1	Server Closet	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	261	5	69	36	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	261	5	69	36	0	0	0
53	1	Hallway to Lobby	Recessed Parabolic	E	4'T8	2	3	32	Sw	9	261	5	202	474	N/A	Recessed Parabolic	4'T8	E	Sw	2	3	32	9	261	5	202	474	0	0	0
54	1	Hallway to Lobby	Recessed Parabolic	E	4'T8 U-Shaped	1	3	32	Sw	9	261	5	101	237	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	1	3	32	9	261	5	101	237	0	0	0
55	1	Hallway to Lobby	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
56	1	Shared Public Entrance Rear	Recessed	S	Inc	5	1	150	Sw	24	365	0	750	6,570	CFL	Recessed	CFL	S	Sw	5	1	50	24	365	0	250	2190	4380	0	4380
57	Bsmt	Hallway	Recessed Parabolic	E	4'T8	3	3	32	Sw	8	365	5	303	885	N/A	Recessed Parabolic	4'T8	E	Sw	3	3	32	8	365	5	303	885	0	0	0
58	Bsmt	Hallway	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
59	Bsmt	Utility Rm	Recessed Parabolic	E	4'T8	4	2	32	Sw	2	261	5	276	144	N/A	Recessed Parabolic	4'T8	E	Sw	4	2	32	2	261	5	276	144	0	0	0
60	Bsmt	Utility Closet	Recessed Parabolic	E	4'T8	1	2	32	Sw	2	261	5	69	36	N/A	Recessed Parabolic	4'T8	E	Sw	1	2	32	2	261	5	69	36	0	0	0

Location			Existing Fixture Information											
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
61	Bsmt	Records Storage	Recessed Parabolic	E	4'T8	4	3	32	Sw	8	261	5	404	844
62	Bsmt	Police Breakroom	Recessed Parabolic	E	4'T8	6	3	32	Sw	24	365	5	606	5,309
63	Bsmt	Police Breakroom	Exit Sign	S	LED	1	1	5	N	24	365	1	6	48
64	Bsmt	Locker Room Women	Recessed Parabolic	E	4'T8	2	2	32	Sw	8	365	5	138	403
65	Bsmt	Lockers	Recessed Parabolic	E	4'T8	4	2	32	Sw	8	365	5	276	806
66	Bsmt	Bathroom Women	Recessed Parabolic	E	4'T8 U-Shaped	1	3	32	Sw	8	365	5	101	295
67	Bsmt	Bathroom Men	Recessed Parabolic	E	4'T8 U-Shaped	1	3	32	Sw	8	365	5	101	295
68	Bsmt	Locker Room Men	Recessed Parabolic	E	4'T8	5	2	32	Sw	8	365	5	345	1,007
69	Bsmt	Unisex Showers	Recessed	S	Inc	2	1	40	Sw	1	261	0	80	21
70	Bsmt	Unisex Shower Vestibule	Recessed	S	Inc	1	1	150	Sw	1	261	0	150	39
71	Bsmt	Gun Room	Recessed Parabolic	E	4'T8	2	2	32	Sw	12	365	5	138	604
72	Str	Staircase Front	Recessed Parabolic	E	4'T8	3	3	32	Sw	24	365	5	303	2,654
73	Str	Staircase Front	Recessed Parabolic	E	4'T8 U-Shaped	2	3	32	Sw	24	365	5	202	1,770
74	Str	Staircase Rear	Recessed Parabolic	E	4'T8 U-Shaped	2	3	32	Sw	24	365	5	202	1,770
75	Str	Staircase Rear	Recessed Parabolic	E	4'T8	3	3	32	Sw	24	365	5	303	2,654
76	Ext	Exterior	Wall Mounted	S	CFL	5	1	26	PC	12	365	0	130	569
77	Ext	Exterior	Wall Mounted	S	MH	1	1	150	PC	12	365	42	192	841
78	Ext	Exterior	Pole Mounted Off Building	S	MH	5	1	150	PC	12	365	42	960	4,205
79	Ext	Exterior	Wall Mounted	S	CFL	3	1	26	PC	12	365	0	78	342
80	1	Elevator	Ceiling Mounted	M	4'T12	1	2	40	Sw	24	365	12	92	806
Totals:						227	190	2,795				389	20,535	79,048

Marker	Retrofit Information													Annual Savings		
	Category	Fixture Type	Lamp Type	Ballast	Controls	# of Fixtures	# of Lamps per Fixture	Watts per Lamp	Operational Hours per Day	Operational Days per Year	Ballast Watts	Total Watts	Energy Use kWh/year	Fixture Savings (kWh)	Controls Savings (kWh)	Total Savings (kWh)
61	C	Recessed Parabolic	4'T8	E	OS	4	3	32	6	261	5	404	633	0	211	211
62	C	Recessed Parabolic	4'T8	E	OS	6	3	32	18	365	5	606	3981	0	1327	1327
63	N/A	Exit Sign	LED	S	N	1	1	5	24	365	1	6	48	0	0	0
64	C	Recessed Parabolic	4'T8	E	OS	2	2	32	6	365	5	138	302	0	101	101
65	C	Recessed Parabolic	4'T8	E	OS	4	2	32	6	365	5	276	604	0	201	201
66	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	1	3	32	6	365	5	101	221	0	74	74
67	C	Recessed Parabolic	4'T8 U-Shaped	E	OS	1	3	32	6	365	5	101	221	0	74	74
68	C	Recessed Parabolic	4'T8	E	OS	5	2	32	6	365	5	345	756	0	252	252
69	CFL	Recessed	CFL	S	Sw	2	1	15	1	261	0	30	8	13	0	13
70	CFL	Recessed	CFL	S	Sw	1	1	50	1	261	0	50	13	26	0	26
71	C	Recessed Parabolic	4'T8	E	OS	2	2	32	9	365	5	138	453	0	151	151
72	N/A	Recessed Parabolic	4'T8	E	Sw	3	3	32	24	365	5	303	2654	0	0	0
73	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	3	32	24	365	5	202	1770	0	0	0
74	N/A	Recessed Parabolic	4'T8 U-Shaped	E	Sw	2	3	32	24	365	5	202	1770	0	0	0
75	N/A	Recessed Parabolic	4'T8	E	Sw	3	3	32	24	365	5	303	2654	0	0	0
76	N/A	Wall Mounted	CFL	S	PC	5	1	26	12	365	0	130	569	0	0	0
77	MH	Wall Mounted	MH	S	PC	1	1	150	12	365	42	192	841	0	0	0
78	MH	Pole Mounted Off Building	MH	S	PC	5	1	150	12	365	42	960	4205	0	0	0
79	N/A	Wall Mounted	CFL	S	PC	3	1	26	12	365	0	78	342	0	0	0
80	T8	Ceiling Mounted	4'T8	E	Sw	1	2	32	24	365	5	69	604	201	0	201
Totals:						227	190	2,462			382	19,462	66,045	5,456	7,547	13,002

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

Proposed Lighting Summary Table			
Total Surface Area (SF)	13,680		
Average Power Cost ($/kWh)	0.1730		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	5,957	5,957	**0**
Exterior Power (watts)	1,360	1,360	**0**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	73,091	60,088	**13,002**
Lighting Power (watts)	19,175	18,102	**1,073**
Lighting Power Density (watts/SF)	1.40	1.32	**0.08**
Estimated Cost of Fixture Replacement ($)	261		
Estimated Cost of Controls Improvements ($)	5,600		
Total Consumption Annual Cost Savings ($)	**2,326**		

Legend								
Fixture Type		**Lamp Type**			**Control Type**	**Ballast Type**	**Retrofit Category**
Ceiling Suspended	Recessed	CFL	3'T12	8'T5	Auto. 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 (De-lamping)
Ceiling Mounted	Wall pack	1'T12 U-Shaped	4'T5 U-Shaped	Fl.	Dimmer (D)		C (Controls Only)
Chandelier		1'T5	6'T12	Hal	Motion Sensor (MS)		PSMH (Install new Pulse-Start Metal Halide)
Equipment / Fume Hood		1'T5 U-Shaped	6'T12 U-Shaped	Induction	Motion& Switch (MSw)		
Flood		1'T8	6'T5	Infrared	None (N)		
Landscape		1'T8 U-Shaped	6'T5 U-Shaped	LPS	Occupancy Sensor (OS)		
Low Bay		2'T12 U-Shaped	6'T8	Mixed Vapor	Occupancy Sensor - CM (OSCM)		
Parabolic Wall Mounted		2'T5	6'T8 U-Shaped	Neon	Photocell (PC)		
Pole Mounted		2'T5 U-Shaped	8'T12	Quartz Halogen	Switch (Sw)		
Pole Mounted Off Building		2'T8 U-Shaped	8'T12 U-Shaped				

APPENDIX C: THIRD PARTY ENERGY SUPPLIERS

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

Third Party Electric Suppliers for JCPL Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.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
Constellation NewEnergy, Inc. 900A Lake Street, Suite 2 Ramsey, NJ 07446	(888) 635-0827 www.newenergy.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
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
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 NJNG Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Metromedia Energy, Inc. 6 Industrial Way Eatontown, NJ 07724	(877) 750-7046 www.metromediaenergy.com
MxEnergy, Inc. 510 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
NJ Gas & Electric 1 Bridge Plaza, Fl. 2 Fort Lee, NJ 07024	(866) 568-0290 www.NewJerseyGasElectric.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX D: GLOSSARY AND METHOD OF CALCULATIONS

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

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

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

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

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

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

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

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

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

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

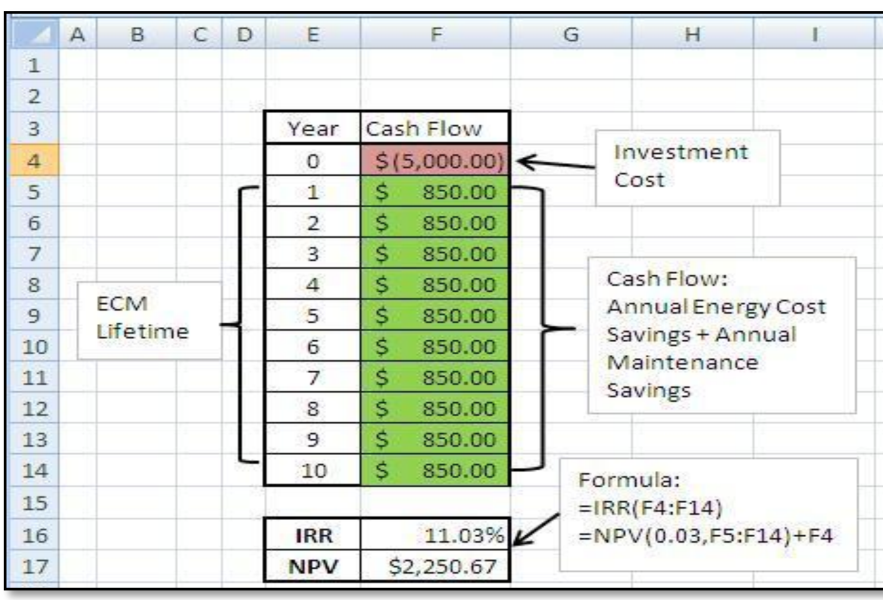
Calculation References

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

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

Excel NPV and IRR Calculation

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



Solar PV ECM Calculation

There are several components to the calculation:

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

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

ECM and Equipment Lifetimes

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

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

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

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

New Jersey Clean Energy Program Commercial & Industrial Lifetimes

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

APPENDIX E: STATEMENT OF ENERGY PERFORMANCE FROM ENERGY STAR®

OMB No. 2060-0347

ENERGY STAR

STATEMENT OF ENERGY PERFORMANCE
Borough of Manasquan - Borough Hall

Building ID: 2445805
For 12-month Period Ending: June 30, 2010[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: September 22, 2010

Facility
Borough of Manasquan - Borough Hall
201 East Main Street
Manasquan, NJ 08736

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 2001
Gross Floor Area (ft^2): 13,680

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	632,466
Natural Gas (kBtu)[4]	334,725
Total Energy (kBtu)	967,191
Energy Intensity[5]	
Site (kBtu/ft^2/yr)	71
Source (kBtu/ft^2/yr)	180
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	114
Electric Distribution Utility	
FirstEnergy - Jersey Central Power & Lt Co	
National Average Comparison	
National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	-15%
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.

Meets Industry Standards[6] for Indoor Environmental Conditions:

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

Certifying Professional
N/A

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

EPA Form 5900-16

APPENDIX F: INCENTIVE PROGRAMS

New Jersey Clean Energy Pay for Performance

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

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

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

Direct Install 2010 Program*

Direct Install is a division of the New Jersey Clean Energy Programs' Smart Start Buildings. It is a turn-key program for small to mid-sized facilities to aid in upgrading equipment to more efficient types. It is designed to cut overall energy costs by upgrading lighting, HVAC and other equipment with energy efficient alternatives. The program pays **up to 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 200 kW** within 12 months of applying
- Must be located in New Jersey
- Must be served by one of the state's public, regulated or natural gas companies
    - Electric: Atlantic City Electric, Jersey Central Power & Light, Orange Rockland Electric, PSE&G
    - Natural Gas: Elizabethtown Gas, New Jersey Natural Gas, PSE&G, South Jersey Gas

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

Smart Start

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

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

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

Renewable Energy Incentive Program*

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

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

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

Utility Sponsored Programs

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

Energy Efficiency and Conservation Block Grant Rebate Program

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

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

Other Federal and State Sponsored Programs

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

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

APPENDIX G: 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
0-5 Year Payback	1	(12) New CFL Fixtures	108	none at this time	108	5,254	1	0	1	47	956	5	8,297	0.1	5,376	1,075	1,095	7,175	9,408
0-5 Year Payback	2	Install (1) Programmable Thermostat in the Basement	167	0	167	886	0	27	0	583	775	12	9,304	0.2	5,471	456	464	7,228	1,879
0-5 Year Payback	3	(1) New T8 Fixture	168	15	153	201	0	0	0	30	65	15	972	2.4	534	36	42	591	361
0-5 Year Payback	4	Install 7.5 kW Wind Rooftop System (with $3.20/kWh upfront Incentive)	60,000	50,808	9,192	15,878	8	0	5	0	2,699	25	67,479	3.4	634	25	29	35,638	28,429
0-5 Year Payback	5	Install (28) Occupancy Sensors	6,160	560	5,600	7,547	2	0	2	0	1,306	15	19,590	4.3	250	17	22	9,465	13,513
5-10 Year Payback	6	Install a Demand Control System in the Court Room	2,400	none at this time	2,400	1,772	0	53	1	0	384	12	4,608	6.2	92	8	12	1,335	3,758
5-10 Year Payback	7	Install a 30 kW Solar Photovoltaic System	210,000	22,500	187,500	35,400	30	0	9	0	27,123	25	678,073	6.9	262	10	12	158,808	63,384

APPENDIX H: METHOD OF ANALYSIS

Assumptions and tools

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