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Local Government Energy Program
Energy Audit Final Report

City of Elizabeth

Miller Evans Logan Recreation Center
161 First Street
Elizabeth, NJ 07206

Project Number: LGEA57

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EXECUTIVE SUMMARY

The City of Elizabeth Miller Evans Logan Recreational Center is a two-story, slab on grade building comprising a total conditioned floor area of 17,680 square feet. The original structure was built in 1978. In 2008, the second floor was refinished. The building houses classrooms, a nurse's station, a gymnasium and game room. The following chart provides an overview of current energy usage in the building based on the analysis period of February 2009 through February 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	148,656	13,433	44,719	104	1,851
Proposed	146,506	10,864	39,509	89	1,587
Savings	2,150	2,569	5,210	15	264
% Savings	1	19	12	14	14

*The Solar Photovoltaic system recommendation is excluded from this table

**Total Annual Cost savings are equal to energy cost savings plus incurred operations and maintenance savings

Table 2: Proposed Photovoltaic System

Initial Investment, $	Total Recommended System Capacity (kW)	Electricity Generated, (kWh/year)	Demand Reduction (kW)	SRECs earned (SRECs/year)	Total Revenue ($/year)
11,500	2.3	2,482	2.1	2	1,649

*Revenue generated from producing electricity and collecting Solar Renewable Energy Credits (SRECs) has been factored into the total revenue

There may be energy procurement opportunities for the City of Elizabeth Miller Evans Logan Recreation Center to reduce annual utility costs, which are $461 higher, when compared to the average estimated NJ commercial utility rates.

SWA has also entered energy information about the Miller Evans Logan Recreation Center in the U.S. Environmental Protection Agency's (EPA) *ENERGY STAR® Portfolio Manager* energy benchmarking system. The Recreation Center is comprised of non-eligible ("Social/Meeting") space type and as a result of being a "non-eligible" space type; a performance score could not be generated. Although a performance score could not be generated, the software was able to generate site energy use intensity. Compared to a typical Social/Meeting-related building that uses 52.0 kBtu/sqft-yr, the City of Elizabeth Miller Evans Logan Recreation Center used 104.0 kBtu/sqft-yr.

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 and Table 2. The measures are categorized by payback period in Table 3 below:

Table 3: Energy Conservation Measure Recommendations

ECMs	First Year Savings ($)	Simple Payback Period (years)	Initial Investment, $	CO2 Savings, lbs/yr
0-5 Year	380	2.5	945	2,569
5-10 Year	129	5.6	730	1,280
>10 year	4,701	24.1	113,253	28,318
Solar PV	1,649	7.0	11,500	4,444
Total	6,859	18.4	126,428	36,612

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 3 cars from the roads each year or avoiding the need of 89 trees to absorb the annual CO_2 generated.

The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for City of Elizabeth. Based on the requirements of the LGEA program, City of Elizabeth must commit to implementing some of these measures, and must submit paperwork to the Local Government Energy Audit program within one year of this report's approval to demonstrate that they have spent, net of other NJCEP incentives, at least 25% of the cost of the audit (per building). The minimum amount to be spent, net of other NJCEP incentives, is $1,087.00.

Financial Incentives and Other Program Opportunities

There are various incentive programs that the City of Elizabeth could apply for that could help lower the cost of installing the ECMs. Please refer to Appendix F for details.

SWA recommends that the City of Elizabeth implement all recommended Energy Conservation Measures at the Miller Evans Logan Recreation Center. SWA recommends that the City of Elizabeth first address all lighting upgrades including occupancy sensors since these will ultimately affect the heating load within the building. Once lighting upgrades are complete, the City of Elizabeth should implement all HVAC related measures including the boiler replacement with outdoor air reset control. Larger measures such as upgrade of toilet fixtures should also be considered. Although upgrading plumbing fixtures will not have an energy savings, cost savings can be achieved through the reduction of water usage. The roof should undergo a structural analysis before the installation of the Solar PV system. Further funding opportunities are currently available for implementation of this scope of work through the NJ Office of Clean Energy's SmartStart and Direct Install programs.

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.

For this project, PMK Group, Inc., a business unit of Birdsall Services Group (BSG-PMK), worked as a sub-contractor in conjunction with Steven Winter Associates, Inc. (SWA).

SWA and PMK Group, Inc., performed an energy audit and assessment for the Miller Evans Logan Recreation Center at 161 First Street, Elizabeth, NJ. The process of the audit included facility visits on 3/17 and 3/18, 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 City of Elizabeth to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Miller Evans Logan Recreation Center.

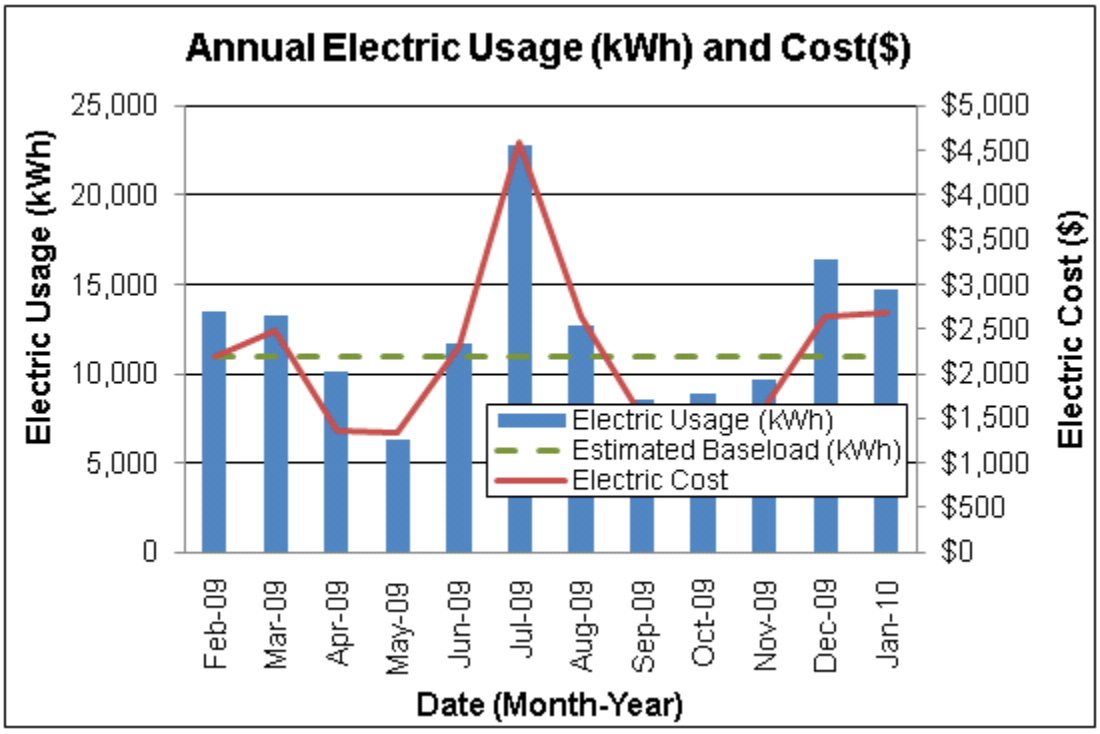
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from February 2008 through February 2010 that were received from the utility companies supplying the Miller Evans Logan Recreation Center with electric and natural gas. A 12 month period of analysis from February 2009 through February 2010 was used for all calculations and for purposes of benchmarking the building.

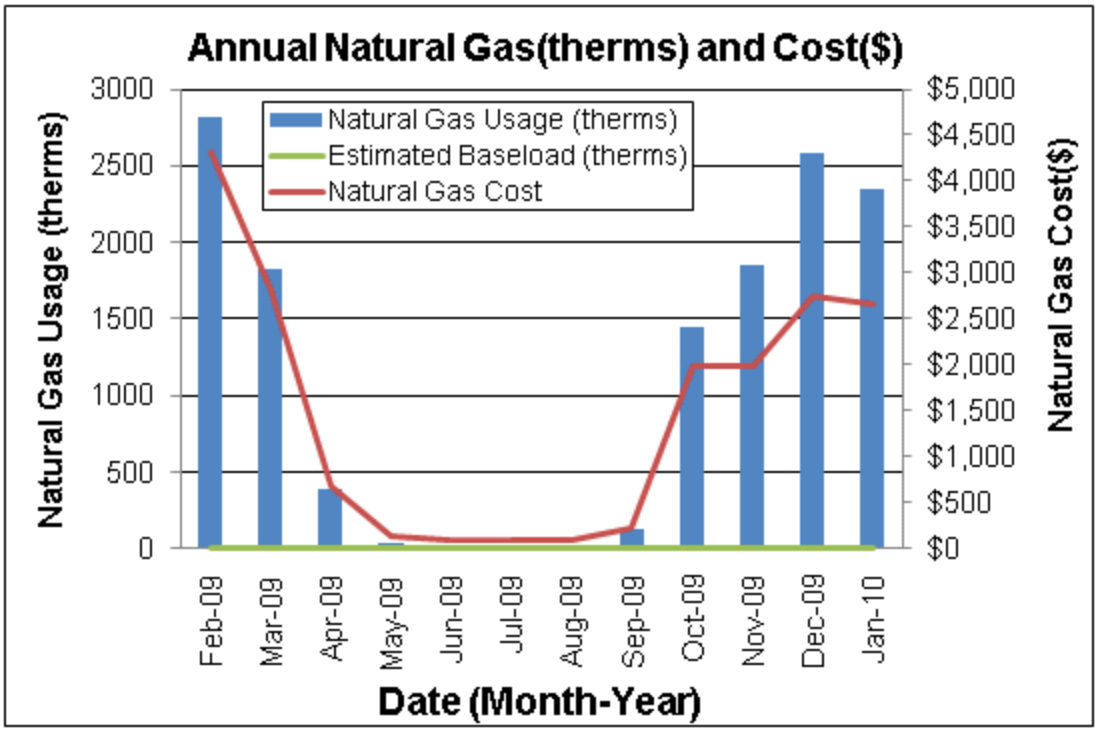
Electricity - The Miller Evans Logan Recreation Center is currently served by two electric meters. The building currently buys electricity from PSE&G at **an average aggregated rate of $0.181/kWh**. The Miller Evans Logan Recreation Center purchased **approximately 148,656 kWh, or $26,891 worth of electricity,** in the previous year. The average monthly demand was 37.7 kW and the annual peak demand was 67.3 kW.

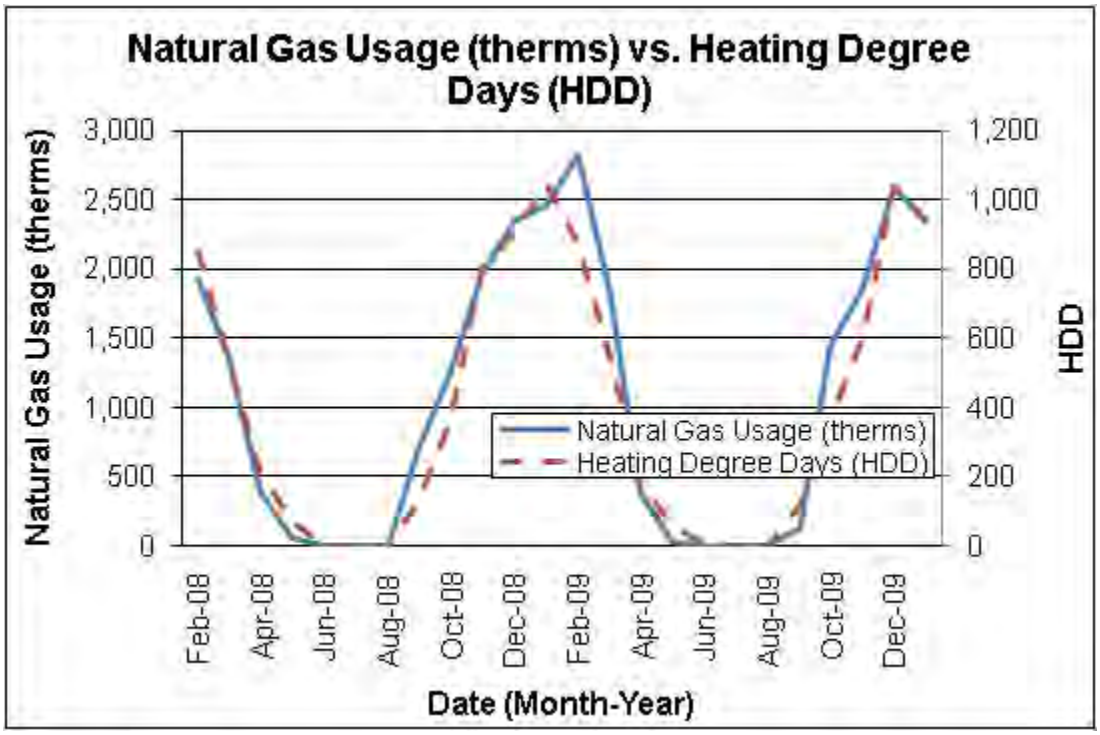
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the Miller Evans Logan Recreation Center.



Natural gas - The Miller Evans Logan Recreation Center is currently served by one meter for natural gas. The building currently buys natural gas from Elizabethtown Gas at **an average aggregated rate of $1.327/therm**. The Miller Evans Logan Recreation Center purchased **approximately 13,433 therms, or $17,828 worth of natural gas,** in the previous year.

The chart below shows the monthly natural gas usage and costs. The green line represents the approximate baseload or minimum natural gas usage required to operate the Miller Evans Logan Recreation Center.

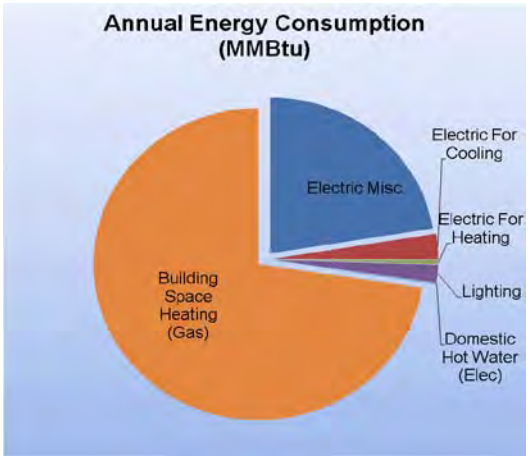


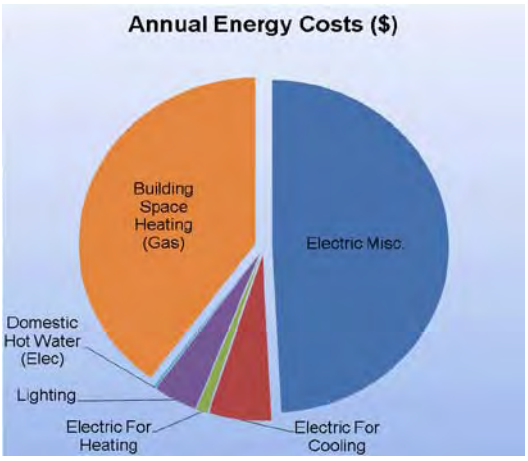


The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base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

The following graphs, pie charts, and table show energy use for the Miller Evans Logan Recreation Center based on utility bills for the 12 month period. Note: electrical cost at $53/MMBtu of energy is almost 4 times as expensive as natural gas at $13/MMBtu

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	415	22%	$21,995	49%	53
Electric For Cooling	48	3%	$2,563	6%	53
Electric For Heating	8	0%	$444	1%	53
Lighting	34	2%	$1,809	4%	53
Domestic Hot Water (Elec)	1	0%	$79	0%	53
Building Space Heating	1,343	73%	$17,823	40%	13
Totals	1,850	100%	$44,714	100%	
Total Electric Usage	507	27%	$26,891	60%	53
Total Gas Usage	1,343	73%	$17,828	40%	13
Totals	1,851	100%	$44,719	100%	



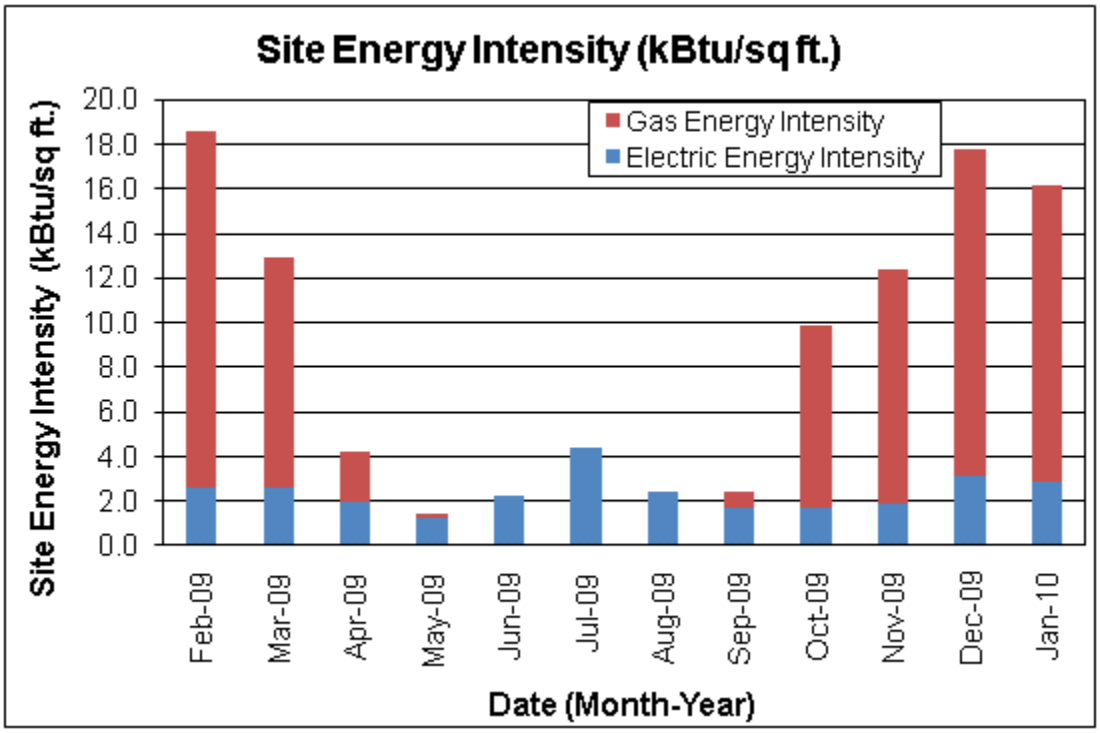


Energy benchmarking

SWA has entered energy information about the Miller Evans Logan Recreation Center in the U.S. Environmental Protection Agency's (EPA) *ENERGY STAR® Portfolio Manager* energy benchmarking system. This recreation facility is categorized as a non-eligible ("Social/Meeting") space type. Because it is a "Social/Meeting" space type, there is no rating available. Consequently, the Recreation Center is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 104.0 kBtu/ft^2-yr compared to the national average of a typically Social/Meeting building consuming 52.0 kBtu/ft^2-yr. See ECM section for guidance on how to improve the building's rating.

Due to the nature of its calculation based upon a survey of existing buildings of varying usage, the national average for "Social/Meeting" space types is very subjective, and is not an absolute bellwether for gauging performance. Additionally, should the City of Elizabeth desire to reach

this average there are other large scale and financially less advantageous improvements that can be made, such as envelope window, door and insulation upgrades that would help the building reach this goal.



Per the LGEA program requirements, SWA has assisted the City of Elizabeth to create an *ENERGY STAR® Portfolio Manager* account and share the Miller Evans Logan Recreational Center 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 City of Elizabeth (user name of "CityofElizabeth" with a password of *"CITYOFELIZABETH")* 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 a municipality 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 hot water boiler units. Some high gas price per therm fluctuations in the summer may be due to high energy costs that recently occurred and low use caps for the non-heating months. Typically, electricity prices also increase during the cooling months when electricity is used by the HVAC package unit with DX.

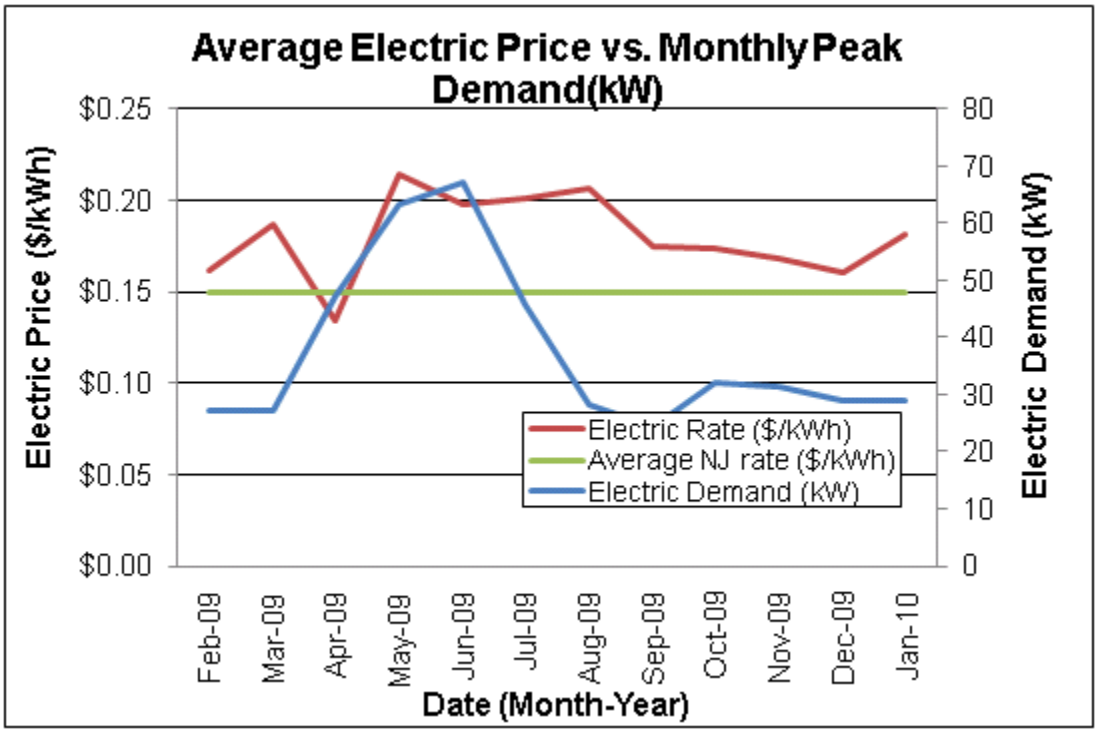
The supplier charges a market-rate price based on use, and the billing does not break down demand costs for all periods because usage and demand are included in the rate. Currently, the City of Elizabeth is paying a general service rate for natural gas. Demand is not broken out in the bill. Thus the 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.

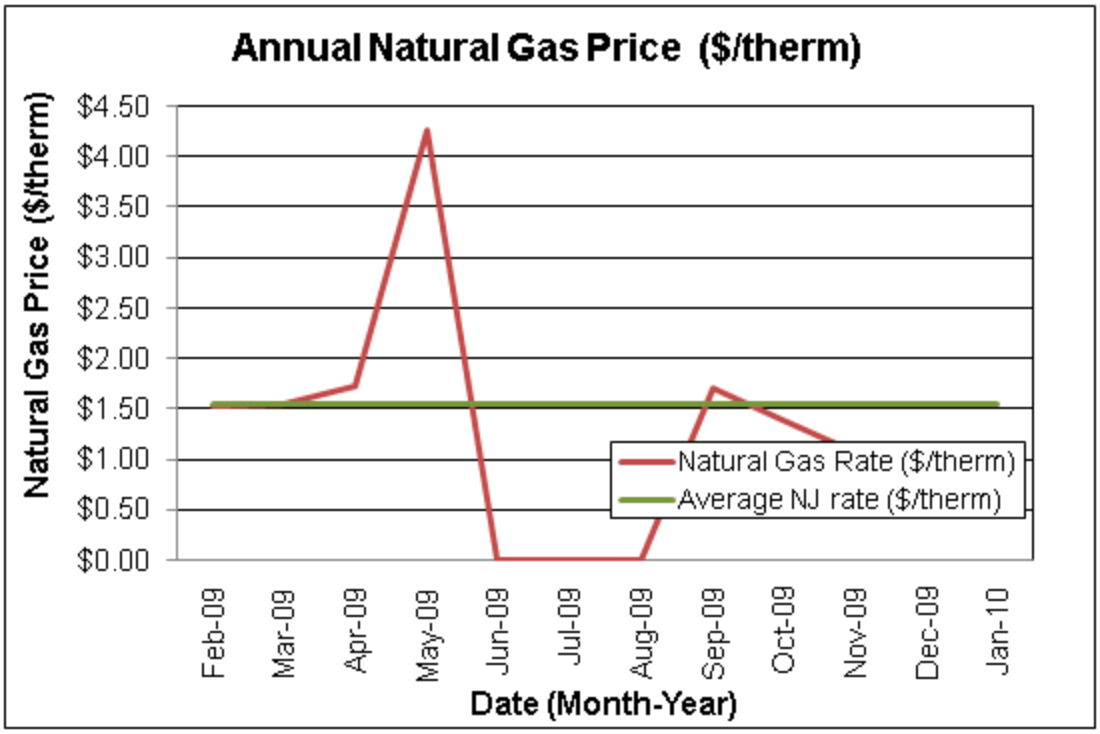
Energy Procurement strategies

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 the Miller Evans Logan Recreation Center pays a rate of $0.181/kWh. The Miller Evans Logan Recreation Center annual electric utility costs are $461 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 37% over the most recent 12 month period.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while the Miller Evans Logan Recreation Center pays a rate of $1.327/therm. Natural gas bill analysis shows fluctuations up to 75% 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.

SWA recommends that the Miller Evans Logan Recreation Center 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 City of Elizabeth. Appendix C contains a complete list of third-party energy suppliers for the City of Elizabeth 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, March 16, 2010 and Wednesday, March 17, 2010 the following data was collected and analyzed.

Building Characteristics

The two-story, (slab on grade), 17,680 square feet Miller Evans Recreation Building was originally constructed in 1978. In 2008 the second floor was refinished. The building houses class rooms, a nurse's station, a gymnasium and game room.

Front and Left Side Façade

Partial Left Side Façade

Front and Left Side Façade

Right Side Façade

Building Occupancy Profiles

Its occupancy is approximately 110 throughout the day from 10am to 10pm, Monday to Friday.

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.

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

Exterior Walls

The exterior wall envelope is mostly constructed of exposed CMU (Concrete Masonry Unit) and some stone accents, over concrete block with 3 inches of assumed fiberglass batt cavity insulation. The interior is mostly painted gypsum wallboard or painted CMU. .

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

Exterior and interior wall surfaces were inspected during the field audit. They were found to be in overall acceptable, age-appropriate condition with some signs of uncontrolled moisture, air-leakage and other energy-compromising issues.

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

Rusted/deteriorated steel lintel and efflorescence on brick and masonry walls indicate moisture presence within the wall cavity

Mold and water stains on brick and masonry walls indicate possible moisture presence within the wall cavity.

Un-caulked/un-sealed exterior wall penetrations were found and noted by the field auditors

Roof

The building's roof is predominantly a flat and parapet type over steel decking, with a built-up asphalt finish and reflective stone ballast and coating. It is original and has never been replaced but patched. Zero inches of detectable attic/ceiling insulation, and two inches of foam board roof insulation were recorded.

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

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

The following specific roof problem spots were identified:

Glass, rocks or other sharp objects on roof surface and delaminating roof membrane patches

The roofing material has reached the end of its useful lifespan

Signs of mold and water damage on interior finishes.

Base

The building's base is composed of a slab-on-grade floor with a perimeter foundation and no detectable 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/ age appropriate condition with no signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues neither visible on the interior nor exterior.

Windows

The building contains basically two type of windows:

1. Double-hung and fixed type windows with a wood frame clear double glazing and some interior but no exterior shading devices. The windows are located on the main floor and are original.

2. Double-hung type windows with a vinyl clad frame, clear/gas-filled, double glazing. The windows are located on the second floor and were replaced approximately 2 years ago.

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 acceptable/ age appropriate condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific window problem spot was identified:

Windows left open unintentionally

Exterior doors

The building contains only one type of exterior door:

1. Glass and solid with aluminum/steel frame type exterior doors. They are located throughout the building and are original.

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

The following specific door problem spot was identified:

Damaged and aged door frame with missing 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

Heating is provided by a 998.3 MBH, 80% efficient HB Smith gas-fired, hot water boiler installed in 1978. This unit feeds hot water to five (5) Nesbitt unit ventilators located in the multi purpose room, and classrooms, one fin tube baseboard in the 2nd floor office, as well as seven (7) Nesbitt cabinet heaters located at each entrance lobby, connecting hallways, and one in each 2nd floor men's and woman's restrooms. In addition the boiler feeds five (5) variable-air-volume (VAV) boxes reheat coils that provide reheat and heating to the 2nd floor classrooms, health office, and Art room. The boiler hot water is circulated throughout the building by two (2) Armstrong hot water circulation pumps that are 100% redundant and can be changed over in a lead lag sequence. Heating is also provided by two (2) McQuay packaged rooftop DX units: RTU-1, installed in 2003, provides 625 MBH of gas heating to the gym, 1st-floor multi-purpose room and classrooms at 80% efficiency; and RTU-2, installed in 2008, which provides 250 MBH of gas heating to the 2nd floor at 80% efficiency.

HB Smith Boiler

Cooling

Cooling is provided by two packaged rooftop DX units: RTU-1, installed in 2003, provides 50 tons of cooling to the gym, 1st-floor multi-purpose room and classrooms, and has an Energy Efficiency Ratio (EER) of 10; and RTU-2, installed in 2008, provides the 2nd floor with 15 tons of cooling, and has an EER of 10. Both units were found to be in operation and in good condition. The units are too new to be replaced for energy or operational savings.


McQuay 50-ton packaged DX rooftop unit

Ventilation

Both McQuay roof top units provide a maximum of 2200 cfm of outside air to the building for ventilation and exhaust make up. Ventilation is also provided by five (5) roof exhaust fans. Mechanical room exhaust is vented by two Penn Ventilator wall-mounted exhaust fans, installed in 2007. Two (2) roof-mounted exhaust fans, installed in 1978, serve the 1st-floor restrooms. A Penn Ventilator roof-mounted exhaust fan, installed in 2008 and rated at ¼ HP and 1,550 RPM, serves the 2nd-floor restrooms. Each fan was found operating and in good condition.

Domestic Hot Water

Domestic hot water is provided by a 50 gallon, 4.5 kW AO Smith water heater, installed in 2009. The hot water is circulated throughout the building by a small 1/25 HP, 3,250 RPM Taco pump.

Electrical systems

Lighting

A complete inventory of all interior, exterior, and exit sign light fixtures were examined and documented in Appendix B of this report including an estimated total lighting power consumption. The lighting consists primarily of T8 fluorescent fixtures, but there are also several T12 fixtures which should be retrofit with T8 lamps and electronic ballast. Common fixtures include 2x4 T8 and T12 fixtures, both wall-mounted and recessed. A detailed list of the recommended upgrades is provided in Appendix B.

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.

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. When compared to the average electrical consumption of older equipment, Energy Star equipment results in a large savings. Building management should select Energy Star label appliances and equipment when replacing: refrigerators, printers, computers, copy machines, etc.

More information can be found in the “Products” section of the Energy Star website at: http://www.energystar.gov. The building is currently equipped with energy vending miser devices for conserving energy usage by Drinks and Snacks vending machines. When equipped with the vending miser devices, vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR qualified machines.

In this facility there is a Welbilt microwave and a Whirlpool refrigerator in the game room; a Kenmore refrigerator, an Emerson microwave, and a GE water cooler in the art room; and a Frigidaire refrigerator and a Goldstar microwave in the 2nd-floor daycare room. There is also a toaster, a printer, a computer, and a television at this facility. Each is listed with their respective manufactured dates for in the Equipment List for consideration under the 10 year replacement strategy.

Emergency Generator - A Kohler Power Systems 60 kW backup generator, installed in 2001, is located on-grade in the side parking lot, the generator was observed to be in good condition.

Elevators

There is one (1) two stop hydraulic Dover elevator in this facility that was found to be recently upgraded and operating properly.

Other electrical systems

There are not currently any other significant energy-impacting electrical systems installed at the Miller Evans Logan Recreation Center.

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 Miller Evans Logan Recreation Center is a good candidate for a 2.3 kW Solar Panel installation. See ECM #3 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

Wind power production is not appropriate for this location because the available wind energy resource is very low. Also, the positioning of high tension wires and other obstructions would require a wind turbine to be taller than the high tension towers.

Geothermal

The Miller Evans Logan Recreation Center is not a good candidate for geothermal installation since it would require replacement and re-design of the entire existing HVAC system.

Combined Heat and Power

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

PROPOSED ENERGY CONSERVATION MEASURES

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

Recommendations: Energy Conservation Measures

ECM#	Description of Highly Recommended 0-5 Year Payback ECMs
1	Lighting Upgrades
	Description of Recommended 5-10 Year Payback ECMs
2	Lighting Occupancy Sensors
3	Install 2.3 kW roof-mounted Solar PV system
	Description of Recommended >10 Year Payback ECMs
4	Upgrade Plumbing fixtures
5	Install High Efficiency Boilers with Outdoor Air Reset Control

ECM#1: *Lighting Upgrades*

On the days of the site visits, SWA/BSG-PMK completed a lighting inventory of the City of Elizabeth Miller Evans Logan Recreation Center building (see Appendix B). The existing lighting consists primarily of standard-efficiency fixtures with T12 lamps and magnetic ballasts, high-efficiency fixtures with T8 lamps with electronic ballasts, and incandescent lamps. There are also metal halide fixtures hanging from the gym's ceiling. SWA/BSG-PMK recommends retrofitting the T12 fixtures with T8 lamps and electronic ballasts as well as incandescent fixtures with compact fluorescent lamps. The labor in all these installations was evaluated using prevailing electrical contractor wages. The City of Elizabeth may decide to perform this work with in-house resources from its Maintenance Department on a scheduled, longer timeline than otherwise performed by a contractor, to obtain savings.

Installation cost:

Estimated installed cost: $945 (Estimated labor of $330)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

ECM	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
1	945	1,435	1.2	0	0.3	120	380	15	5,696	2.5	503%	34%	40%	3,523	2,569

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. The replacements for each lighting fixture, the costs to replace or retrofit each one, and the rebates and wattages for each fixture are located in Appendix B.

Rebates/financial incentives:

- *NJ Clean Energy – T8 fluorescent fixture ($15 per fixture)*

Please see Appendix F for more information on Incentive Programs.

ECM#2: *Lighting Occupancy Sensors*

Lighting at the Miller Evans Logan Recreation Center primarily consists of standard-efficiency fixtures with T12 lamps and magnetic ballasts. There were 5 areas located in or near private offices that were identified that contain lighting that is left on for long periods of time with no occupancy. SWA/BSG-PMK recommends that occupancy sensors are installed in these areas in order to limit the time that lights are left on unnecessarily.

Installation cost:

Estimated installed cost: $730 (Includes $230 in labor costs)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

ECM	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
2	730	715	0.6	0	0.1	0	129	10	1,294	5.6	77%	8%	12%	363	1,280

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. The replacements for each lighting fixture, the costs to replace or retrofit each one, and the rebates and wattages for each fixture are located in Appendix B.

Rebates/financial incentives:

- *NJ Clean Energy – SmartStart – Wall-mounted occupancy sensors ($20 per sensor)*

Please see Appendix F for more information on Incentive Programs.

ECM#3: *Install roof-mounted 54.7 kW roof-mounted Solar PV system*

Currently, the Miller Evans Logan Recreation Center does not use any renewable energy systems. Renewable energy systems, such as photovoltaic panels, can be mounted on the roof of the facility and can offset a significant portion of the purchased electricity for the building. Power stations generally have two separate electrical charges: usage and demand. Usage is the amount of electricity in kilowatt-hours that a building uses from month to month. Demand is the amount of electrical power that a building uses at any given instance in a month period. During the summer periods, when electric demand at a power station is high due to the amount of air conditioners, lights, equipment, etc. being used within the region, demand charges go up to offset the utility's cost to provide enough electricity at that given time. Photovoltaic systems not only offset the amount of electricity use by a building, but also reduce the building's electrical demand, resulting in a higher cost savings as well. SWA/BSG-PMK presents below the economics of installing a 2.3-kW PV system to offset electrical demand for the building and reduce the annual net electric consumption for the building. A system of 238 commercial multi-crystalline 230 watt panels would generate 2,482 kWh of electricity per year, or 2% of Miller Evans Logan Recreation Center's annual electric consumption.

Installation cost:

Estimated installed cost: $11,500; (Includes $6,900 in labor)
Source of cost estimate: Similar Projects

ECM	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
3	11,500	2,482	2.1	0	0.5	0	1,649	25	41,231	7.0	259%	10%	12%	10,272	4,444

*SREC revenue included in "Total 1st Year Savings"

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. Cost of installation was estimated using data from similar projects, at approximately $7,000 per kW. Annual energy savings were calculated using PV WATTS, an online tool administered by the National Renewable Energy Laboratory (NREL).

Rebates/financial incentives:

- *NJ Clean Energy – Renewable Energy Incentive Program (REIP) ($1/Watt installed)*

This ECM is eligible for New Jersey's Solar Renewable Energy Certificates (SREC). SRECs are marketable certificates issued to the owner of a PV system for each 1,000 kWh (1MWh) of electricity generated. SRECs are sold or traded separately from the power generated; the income from the sale of the SREC can be used to offset the cost of the system by applying the revenue to a loan payment or debt service. The value of the SREC is market driven, and is controlled by the amount of the Solar Alternative Compliance Payment (SACP) which is set by the NJBPU. The SREC market is derived from New Jersey's Renewable Portfolio Standard (RPS), which requires that all licensed energy suppliers in the state invest in energy generated from renewable sources, with specific requirements for solar power. If a supplier does not invest by purchasing SRECs, the supplier must pay the SACP for a percentage of the total annual power produced. Since SRECs typically trade just below the SACP, there is an incentive for the supplier to buy SRECs. The SREC Program provides a market for SRECs to be created and verified on the owner's behalf. The New Jersey Clean Energy program facilitates the sale of SRECs to New Jersey electric suppliers. PV system owners in New Jersey with a grid-connected PV system are eligible to participate in New Jersey's SREC Program.

The NJBPU has stated its intention to continue to operate a program of rebates and SRECs, On September 12, 2007, the NJBPU approved an SREC only pilot incentive program. The program set the SACP at an initial value of $711, decreasing annually for an eight (8) year period. SRECs would be generated for fifteen (15) years (referred to as the Qualification Life), and have a two (2) year trading life. The NJBPU believes that to achieve an internal rate of return of twelve (12) percent, the target SREC price would be $611, reducing by three (3) percent per year for the same eight (8) year period that the SACP is set.

Please see Appendix F for more information on Incentive Programs.

ECM#4: *Upgrade Plumbing fixtures*

In the Miller Evans Logan Recreation Center restrooms, there are a total of 6 toilets, 3 urinals, and 5 sinks that should be upgraded to units that use less water per use. The current toilets are rated at 3.5 gal/flush, the current urinals are rated at 3 gal/flush, and the current sinks are rated at 2.5 gal/min. Low-flow sinks and toilets are available at 1.5 gal/min for sinks and 1.6 gal/flush for toilets, and waterless urinals are also available.

Installation cost:

Estimated installed cost: $15,000 (Estimated labor of $5,000)
Source of cost estimate: Similar Projects

ECM	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
4	15,000	0	0.0	0	0.0	932	932	20	18,640	16.1	24%	1%	2%	-1,387	0

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. The cost per gallon of water is approximately $0.0075/gal. All toilets and urinals are estimated to be used twice per hour of operation; the building is in use 48 hours per week. It was assumed that there is one 30-second use of a sink for each use of a toilet or urinal.

Rebates/financial incentives:

- *None*

Please see Appendix F for more information on Incentive Programs.

ECM#5: *Install High Efficiency Boilers with Outdoor Air Reset Control*

Heating is provided by an HB Smith 998.3 MBH, natural gas, hot water boiler, installed in 1978. The unit has passed the end its 25-year useful life, and should be replaced. Higher-efficiency condensing boilers are now available, which are up to 95% efficient. The current units were 80% efficient at the time of their purchase, but due to their age and condition, their efficiency was estimated to decrease by 10%, to 70%. High-efficiency boilers are only available in smaller sizes, so two or three modulating boilers will be required, depending on the sizes the selected manufacturer has available; such high-efficiency modulating boilers are manufactured by Slant/Fin, Burnham, and Peerless, among others. Hot water outdoor air reset control (OAR) should also be installed. These controllers reduce the maximum boiler water temperature depending on the outside air temperature; for instance, if the outside air temperature is 0°F, the boiler temperature will be 180°F, but if the outside air temperature is 40°F, the boiler temperature will only need to be 130°F.Outdoor air reset generally decreases heating costs by 8-15%.

Installation cost:

Estimated installed cost: $98,253 (Estimated labor of $38,200)
Source of cost estimate: Similar Projects

ECM	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
5	98,253	0	0.0	2,569	14.5	360	3,769	25	94,227	26.1	-4%	0%	0%	-34,061	28,318

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. The cost per therm of natural gas that was used, taken from twelve months of Miller Evans Logan Recreation Center's energy bills, was $1.33. Also taken from the energy bills was the number of heating degree-days for one year, 4,730. Due to the fact that Miller Evans Logan Recreation Center only operates 48 out of a possible 168 hours every week, only $\frac{48}{168}$ of the heating degree days were used for these calculations. Per ASHRAE the outdoor drybulb temperature is above 10°F 99.6% percent of a year, and the desired indoor temperature was estimated to be 68°F. The savings were calculated using the following equations:

$$\frac{\text{Capacity}\times\text{Degree-Days}\times 24}{\text{Efficiency}_{current}\times(\text{Temp.}_{indoor}-\text{Temp.}_{99.6\%})}\times\frac{1\text{ therm}}{100{,}000.4\text{ BTU}}\times\frac{(\text{Weekly Operating Hours})}{24\times 7}=\text{Current Gas Input (therms)}$$

$$\text{Gas Output (therms)}=\text{Current Gas Input}\times\text{Efficiency}_{current}$$

$$\text{Proposed Gas Input (therms)} = \frac{\text{Gas Output}}{\text{Efficiency}_{proposed}}$$

Savings (therms)=Current Gas Input-Proposed Gas Input

Rebates/financial incentives:

- *NJ Office of Clean Energy – SmartStart – Natural Gas boilers ($1.75 per MBH)*

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 Miller Evans Logan Recreation Center:

- Replace the unit ventilators and cabinet heaters, which have all reached the end of their useful lifetimes.

- Rusted/deteriorated steel lintels need to be repaired or replaced before water or moisture can penetrate further into the wall cavity.

- Replace roofing material. SWA observed that the roofing material at the Miller Evans Logan Recreation Center has reached the end of its useful lifetime and should be replaced. SWA recommends replacing this roof material and also adding 6" of rigid insulation in order to increase the insulation values to a minimum of R-30. Adding insulation will also allow the roof surface to have a large gradient, allowing water to drain from the roof correctly.

Operations and Maintenance

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

- Caulk unsealed exterior wall penetrations – SWA observed that there were several areas along the exterior façade of the building that contained penetrations for plumbing, electrical, etc. that should be caulked to reduce air infiltration and thermal bridging.

- Maintain roofs - SWA recommends regular maintenance to verify water is draining correctly. The roofs also contained many sharp objects that have been tarred over and have become part of the roof. These objects, such as glass and sharp stones, cause holes in the roof surface which allow water to leak in.

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

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

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

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

Note: The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for the City of Elizabeth. Based on the requirements of the LGEA program, the City of Elizabeth must commit to implementing some of these measures, and must submit paperwork to the Local Government Energy Audit program within one year of this report's approval to demonstrate that they have spent, net of other NJCEP incentives, at least 25% of the cost of the audit (per building). The minimum amount to be spent, net of other NJCEP incentives, is $1,087.00.

APPENDIX A: EQUIPMENT LIST

Miller Evans Logan Recreation Center							
Building System	Description	Locations	Model #	Fuel	Space Served	Year Installed	Estimated. Remaining Useful Life %
Heating	Hot water boiler, 998.3 MBH, 80% efficient, set below 120°F	Mechanical room	HB Smith, M# 2500L, S# HSB-5689	Natural Gas	Unit ventilators	1978	0%
	Burner, 1/2 HP, 1,470 RPM		Gordon-Piatt, M# R8-G-05	Electricity	Boiler	1995	0%
	Burner motor, 1/2 HP, 3,450 RPM		Magnetek, M# 8-182573-20, Cat.# H254	Electricity	Burner		
	(2) hot water circulation pumps		Armstrong	Electricity	Boiler	1995	20%
Heating/ Cooling	(2) unit ventilators	Game Room	Nesbitt, M# TOW 1250 A	Electricity / H.W.	Game Room	1978	10%
Heating/ Cooling	Unit ventilator	Art room	Nesbitt, M# TOW 1250 A, S # 4S9 02736	Electricity / H.W.	Art room	1978	10%
Heating/ Cooling	RTU-1: Packaged rooftop unit, 50 tons, 10 EER; 625 MBH heating, 80% efficiency	Roof	McQuay, M# RPS050CLA, M# 050AEC (furnace), S# FB0U03020090602	Electricity, Natural Gas	Gym, first floor multi purpose and classrooms	2003	53%
Heating/ Cooling	RTU-2: Packaged rooftop unit, 15 tons, 10 EER; 250 MBH, 80% efficient	Roof	McQuay, M# RPS015CSA, M# 020SEB (furnace), S# FB0U08010082100	Electricity, Natural Gas	2nd floor	2008	87%
Heating/ Cooling	Unit ventilator	Ceiling	Nesbitt (no nameplate)	Electricity / H.W.	East Entry lobby	1978	10%
Heating/ Cooling	Unit ventilator	Dance room	Nesbitt, M# TOW 1250, S# 78124S902736	Electricity / H.W.	Dance room	1978	10%
Heating/ Cooling	Cabinet heaters	Ceiling	Nesbitt (no nameplate)	Electricity / H.W.	Main Entry lobby	1978	10%
Heating/ Cooling	Cabinet heaters	Ceiling	Nesbitt (no nameplate)	Electricity / H.W.	1st floor Stair landing	1978	10%

Heating/ Cooling	Cabinet heaters	Ceiling	Nesbitt (no nameplate)	Electricity / H.W.	lst floor Women's room	1978	10%
Heating/ Cooling	Cabinet heaters	Ceiling	Nesbitt (no nameplate)	Electricity / H.W.	1st floor mens room	1978	10%
Heating/ Cooling	Cabinet heaters	Ceiling	Nesbitt (no nameplate)	Electricity / H.W.	South Entry lobby	1978	10%
Heating/ Cooling	Cabinet heaters	Ceiling	Nesbitt (no nameplate)	Electricity / H.W.	South Stair landing	1978	10%
Heating/ Cooling	Cabinet heaters	Ceiling	Nesbitt (no nameplate)	Electricity / H.W.	2nd Floor elevator lobby	1978	10%
Heating/ Cooling	VAV 1 Rh box, 1980 cfm	Ceiling	Enviro Tech SDR-WC12	Electricity / H.W.	2nd floor Multi Purpose room	2007	40%
Heating/ Cooling	VAV 2 Rh box, 220 cfm	Ceiling	Enviro Tech SDR-WC4	Electricity / H.W.	Office # 1	2007	40%
Heating/ Cooling	VAV 3 Rh box, 1100 cfm	Ceiling	Enviro Tech SDR-WC10	Electricity / H.W.	Classroom 2nd floor	2007	40%
Heating/ Cooling	VAV 4 Rh box, 700 cfm	Ceiling	Enviro Tech SDR-WC8	Electricity / H.W.	Reading Room 2nd floor	2007	40%
Heating/ Cooling	VAV 5 Rh box, 240 cfm	Ceiling	Enviro Tech SDR-WC4	Electricity / H.W.	Office # 2	2007	40%
Ventilation	TEF - #7 Exhaust fan, 1/4 HP, 1,550 RPM	Roof	Penn Ventilator, Tag# TEF-7, M# DX06B, S# D08AR97690	Electricity	2nd-floor restrooms	2008	95%
Ventilation	Exhaust fan	Roof	No nameplate	Electricity	1st floor restrooms	1978	10%
Ventilation	Exhaust fan	Roof	No nameplate	Electricity	1st floor Classrooms	1978	10%
Ventilation	(2) wall-mounted exhaust fans	Mechanical Room Exhaust	Penn Ventilator, Cat. # Z-12	Electricity	Mechanical Room Exhaust	2007	10%
DHW	Water heater, 50 gallons, 4.5 kW	Mechanical room	AO Smith, M# ECS 50 200, S# 0914A014772	Electricity	Entire building	2009	92%
	DHW pump, 1/25 HP, 3,250 RPM		Taco, M# 007F5	Electricity	Water heater		
Appliances	Microwave	Game Room	Welbilt, M# MR 63T, S# 91119118	Electricity	Game Room	1989	0%
Appliances	Refrigerator	Game Room	Whirlpool, M# EDT-202ZK	Electricity	Game Room	Not available	0%

Appliances	Refrigerator	Art room	Kenmore, M# 253.6480240D, S# BA82612780	Electricity	Art room	2008	89%
Appliances	Microwave	Art room	Emerson, M# MW8627W, S# 10303411SP	Electricity	Art room	2001	50%
Appliances	Water cooler	Art room	GE, M# GXCF20E S# 0312	Electricity	Art room	2001	50%
Appliances	Refrigerator	Upstairs - daycare	Frigidaire, M# GLFC1526FW, S# WB70120828	Electricity	Upstairs - daycare	2007	84%
Appliances	Microwave	Upstairs - daycare	Goldstar, M# KMA6512W, S# 206TA35924	Electricity	Upstairs - daycare	2002	47%

Note: The remaining useful life of a system (in %) is the relationship between the system manufactured and/or installed date and the standard life expectancy of similar equipment based on ASHRAE (2003), ASHRAE Handbook: HVAC Applications, Chapter 36.

LIGHTING ANALYSIS

Township of Elizabeth
Miller Evans Logan Rec. Ctr.
161 First Street

BIRDSALL SERVICES GROUP
ENGINEERS & CONSULTANTS

Upgrade Code	Upgrade Description	Existing Fixture	Existing Watts	Proposed Fixture	Proposed Watts	Lighting Total # of Upgrades	Lighting Cost per Upgrade ($)	Lighting SmartStart Rebate per Upgrade
1	Retrofit the 2x2 Recessed Fixture by replacing the T12 U-Tube Lamps and Magnetic Ballastwith T8 Lamps and an Electronic Ballast	2L22" STD/STD	94	2L22"	62	14	$50.00	$15.00
2	Replace the 1000W Metal Halide Lamps with T5 Fluorescent Fixtures with Electronic Ballasts.	1000W MH/BALLAST	1070	No Upgrade	1070	15	$0.00	$0.00
3	Retrofit the 4' Surface Mounted Fixture by replacing the T12 Lamps and Magnetic Ballast with T8 Lamps and an Electronic Ballast	2L4' EE/STD	80	2L4' T8/ELEC	61	5	$60.00	$15.00
4	Surface Mounted Fluorescent Fixture with T8 Lamps and an Electronic Ballast	2L4' T8/ELEC	61	No Upgrade	61	2	$0.00	$0.00
5	Recessed Fluorescent Fixture with T8 Lamps and an Electronic Ballast	3L4' T8/ELEC	89	No Upgrade	89	12	$0.00	$0.00
6	Retrofit the Wall Mounted Fixture by replacing the T12 Lamps and Magnetic Ballast with T8 Lamps and an Electronic Ballast	2L4' EE/STD	80	2L4' T8/ELEC	61	4	$60.00	$15.00
7	2' Surface Mounted Fluorescent Fixture with a 20W T12 lamp and a Magnetic Ballast / Retrofit with a T8 Lamp and Electronic Ballast	(1) F20T12/HPFMAG	32	(1) FO17T8/ELEC	18	2	$40.00	$15.00
8	Wall Mounted Fluorescent Fixture with T8 Lamps and an Electronic Ballast	2L4' T8/ELEC	61	No Upgrade	61	21	$0.00	$0.00
9	Recessed Fluorescent Fixture with T8 U-Tube Lamps and an Electronic Ballast	2L22"	62	No Upgrade	62	13	$0.00	$0.00
10	Hanging Fluorescent Fixture with T8 Lamps and an Electronic Ballast	2L4' T8/ELEC	61	No Upgrade	61	65	$0.00	$0.00
11	Hanging Wrap Around Fluorescent Fixture with T8 Lamps and an Electronic Ballast	4L4' T8/ELEC	110	No Upgrade	110	1	$0.00	$0.00
12	LED Exit Sign	LED	2	No Upgrade	2	12	$0.00	$0.00

Summary

	Lighting (Only)	Sensors (Only)	Complete Lighting Upgrade
Cost	$1,320.00	$1,240.00	$2,560.00
Rebate	$375.00	$510.00	$885.00
Net Cost	$945.00	$730.00	$1,675.00
Savings (kWh)	1,435	715	2,129
Savings ($)	$387.58	$193.04	$574.93
Payback	2.4	3.8	2.9

Variables:

$0.27	Avg. Electric Rate ($/kWh)
	Avg. Demand Rate ($/kW)
2496	Operating Hours/Year
9	Operating Hours/Work Day

Assumptions:

25%	Occupancy Sensor Savings (Avg)
40%	Occupancy Sensor Savings(>Avg)

Notes:

Seq. #	Upgrade Code	Room/Area	Hrs/ Work Day	Hrs/ Year	Existing Fixture	Existing Qty.	Existing Watts	Existing Foot Candles	Proposed Fixture	Proposed Qty.	Proposed Watts	kW Reduction	Lighting Energy Savings, kWh	Lighting Cost ($)	Lighting Savings ($)	Lighting Payback (yrs)	Controls Type	Controls Qty.	Occupancy Sensors (ONLY) Energy Savings, kWh	Occupancy Sensors (ONLY) Cost ($)	Occupancy Sensors (ONLY) Savings ($)	Occupancy Sensors (ONLY) Payback (yrs)	SmartStart Rebate Lighting	SmartStart Rebate Sensors	Lighting & Occupancy Sensors Energy Savings, kWh	Lighting & Occupancy Sensors Post-Rebate Cost ($)	Lighting & Occupancy Sensors Savings ($)	Lighting & Occupancy Sensors Payback (yrs)
		Totals:			25526						24879	0.647	1435	$1,320.00	$387.58	3.4			715	$1,240.00	$193.04	6.4	$375.00	$510.00	2129	$1,675.00	$574.93	2.9
1	1	Ent/Exit	8	2218.67	2L22" STD/STD	2	188		2L22"	2	124	0.064	142	$100.00	$38.34	2.6			0	$0.00	$0.00		$30.00	$0.00	142	$70.00	$38.34	1.8
2	1	Lobby and Hall	8	2218.67	2L22" STD/STD	12	1128		2L22"	12	744	0.384	852	$600.00	$230.03	2.6			0	$0.00	$0.00		$180.00	$0.00	852	$420.00	$230.03	1.8
3	2	Gym	8	2218.67	1000W MH/BALL	15	16050		No Upgrade	15	16050	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
4	3	Mens Room	8	2218.67	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	42	$60.00	$11.38	5.3	OSR	1	44	$260.00	$11.98	21.7	$15.00	$35.00	76	$270.00	$20.52	13.2
5	4	Office	8	2218.67	2L4' T8/ELEC	1	61		No Upgrade	1	61	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
6	3	Womens Room	8	2218.67	2L4' EE/STD	1	80		2L4' T8/ELEC	1	61	0.019	42	$60.00	$11.38	5.3	OSR	1	44	$260.00	$11.98	21.7	$15.00	$35.00	76	$270.00	$20.52	13.2
7	5	Fitness Room	8	2218.67	3L4' T8/ELEC	6	534		No Upgrade	6	534	0	0	$0.00	$0.00		OSR	1	296	$260.00	$79.97	3.3	$0.00	$210.00	296	$50.00	$79.97	0.6
8	5	Social Room	8	2218.67	3L4' T8/ELEC	6	534		No Upgrade	6	534	0	0	$0.00	$0.00		OSH	1	296	$260.00	$79.97	3.3	$0.00	$210.00	296	$50.00	$79.97	0.6
9	4	Office	8	2218.67	2L4' T8/ELEC	1	51		No Upgrade	1	51	0	0	$0.00	$0.00		OSW	1	34	$200.00	$9.14	21.9	$0.00	$20.00	34	$180.00	$9.14	19.7
10	10	Game Room	8	2218.67	2L4' T8/ELEC	19	1159		No Upgrade	19	1159	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
11	6	Stairway	8	2218.67	2L4' EE/STD	2	160		2L4' T8/ELEC	2	122	0.038	84	$120.00	$22.76	5.3			0	$0.00	$0.00		$30.00	$0.00	84	$90.00	$22.76	4.0
12	7	2nd Floor	8	2218.67	(1) F20T12/HPFM	1	32		(1) FO17T8/ELEC	1	18	0.014	31	$40.00	$8.39	4.8			0	$0.00	$0.00		$15.00	$0.00	31	$25.00	$8.39	3.0
13	8	Lobbby and Hall	8	2218.67	2L4' T8/ELEC	21	1281		No Upgrade	21	1281	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
14	9	Office	8	2218.67	2L22"	4	248		No Upgrade	4	248	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
15	9	Pantry	8	2218.67	2L22"	2	124		No Upgrade	2	124	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
16	10	Main Room	8	2218.67	2L4' T8/ELEC	22	1342		No Upgrade	22	1342	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
17	10	Stairway	8	2218.67	2L4' T8/ELEC	3	183		No Upgrade	3	183	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
18	9	Womens Room	8	2218.67	2L22"	2	124		No Upgrade	2	124	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
19	10	Classroom 2	8	2218.67	2L4' T8/ELEC	12	732		No Upgrade	12	732	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
20	10	Classroom 3	8	2218.67	2L4' T8/ELEC	9	549		No Upgrade	9	549	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
21	9	Nurse	8	2218.67	2L22"	5	310		No Upgrade	5	310	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	

Seq. #	Upgrade Code	Room/Area	Hrs/ Work Day	Hrs/ Year	Existing Fixture	Existing Qty.	Existing Watts	Existing Foot Candles	Proposed Fixture	Proposed Qty.	Proposed Watts	kW Reduction	Lighting Energy Savings, kWh	Lighting Cost ($)	Lighting Savings ($)	Lighting Payback (yrs)	Controls Type	Controls Qty.	Occupancy Sensors (ONLY) Energy Savings, kWh	Occupancy Sensors (ONLY) Cost ($)	Occupancy Sensors (ONLY) Savings ($)	Occupancy Sensors (ONLY) Payback (yrs)	SmartStart Rebate Lighting	SmartStart Rebate Sensors	Lighting & Occupancy Sensors Energy Savings, kWh	Lighting & Occupancy Sensors Post-Rebate Cost ($)	Lighting & Occupancy Sensors Savings ($)	Lighting & Occupancy Sensors Payback (yrs)
22	11	Custodial Closet	8	2218.67	4L4' T8/ELEC	1	110		No Upgrade	1	110	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	
23	6	Stairway	8	2218.67	2L4' EE/STD	2	160		2L4' T8/ELEC	2	122	0.038	84	$120.00	$22.76	5.3			0	$0.00	$0.00		$30.00	$0.00	84	$90.00	$22.76	4.0
24	7		8	2218.67	(1) F20T12/HPFM	1	32		(1) FO17T8/ELEC	1	18	0.014	31	$40.00	$8.39	4.8			0	$0.00	$0.00		$15.00	$0.00	31	$25.00	$8.39	3.0
25	3	Boiler Room	8	2218.67	2L4' EE/STD	3	240		2L4' T8/ELEC	3	183	0.057	126	$180.00	$34.15	5.3			0	$0.00	$0.00		$45.00	$0.00	126	$135.00	$34.15	4.0
26	12	Exit	24	8856	LED	12	24		No Upgrade	12	24	0	0	$0.00	$0.00				0	$0.00	$0.00		$0.00	$0.00	0	$0.00	$0.00	

APPENDIX C: THIRD PARTY ENERGY SUPPLIERS

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

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

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

Third Party Gas Suppliers for Elizabethtown Gas Co. Service Territory	Telephone & Web Site
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com
Glacial Energy of New Jersey, Inc. 207 LaRoche Avenue Harrington Park, NJ 07640	(877) 569-2841 www.glacialenergy.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
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 measure (such as LED lighting versus fluorescent) the operating savings will factor in the cost of replacing the units to match the lifetime of the ECM. In this case or in one where one-time repairs are made, the total replacement / repair sum is averaged over the lifetime of the ECM.

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

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

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

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

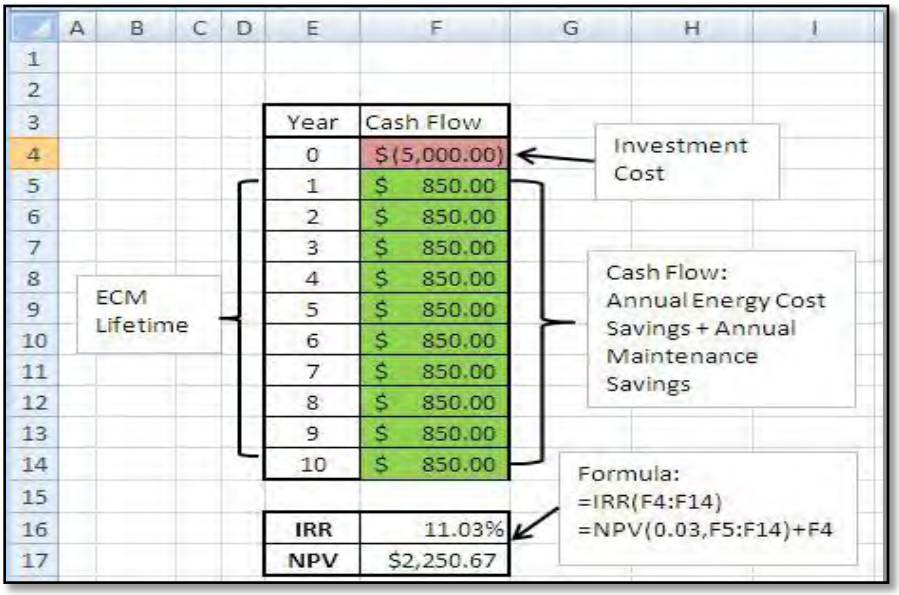
Calculation References

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

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

Excel NPV and IRR Calculation

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



Solar PV ECM Calculation

There are several components to the calculation:

Costs:	Material of PV system including panels, mounting and net-metering + Labor
Energy Savings:	Reduction of kWh electric cost for life of panel, 25 years
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

STATEMENT OF ENERGY PERFORMANCE
City of Elizabeth - Miller Evans Logan Recreation

Building ID: 2250444
For 12-month Period Ending: January 31, 2010[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: July 25, 2010

Facility
City of Elizabeth - Miller Evans Logan Recreation
161 First Street
Elizabeth, NJ 07206

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1978
Gross Floor Area (ft²): 17,680

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	482,506
Natural Gas (kBtu)[4]	1,348,209
Total Energy (kBtu)	1,830,715

Energy Intensity[5]

Site (kBtu/ft²/yr)	104
Source (kBtu/ft²/yr)	171

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	145

Electric Distribution Utility
Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	52
National Average Source EUI	102
% Difference from National Average Source EUI	68%
Building Type	Social/Meeting

Stamp of Certifying Professional

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

Certifying Professional
N/A

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

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

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

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

EPA Form 5900-16

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. Theincentives 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 80%** 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

Energy Conservation Measures																			
ECM #	ECM description	Cost Source	Est. installed cost, $	Est. incentives, $	Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	therms, 1st year savings	kBtu/sq ft, 1st year savings	Est. operating cost, 1st year savings, $	Total 1st year savings, $	Life of measure, years	Est. lifetime energy cost savings, $	Simple payback, years	Lifetime return-on-investment, %	Annual return-on-investment, %	Internal rate of return, %	Net present value, $	CO_2 reduced, lbs/year
1	Lighting Upgrades	RS Means	1,320	375	945	1,435	1.2	0	0.3	120	380	15	5,696	2.5	503%	34%	40%	3,523	2,569
2	Lighting Occupancy Sensors	RS Means	1,240	510	730	715	0.6	0	0.1	0	129	10	1,294	5.6	77%	8%	12%	363	1,280
3	Install 2.3 kW roof-mounted Solar PV system	Similar Projects	13,800	2,300	11,500	2,482	2.1	0	0.5	0	1,649	25	41,231	7.0	259%	10%	12%	10,272	4,444
4	Upgrade Plumbing fixtures	RS Means	15,000	0	15,000	0	0.0	0	0.0	932	932	20	18,640	16.1	24%	1%	2%	-1,387	0
5	Install High Efficiency Boilers with Outdoor Air Reset Control	Similar Projects	100,000	1,747	98,253	0	0.0	2,569	14.5	360	3,769	25	94,227	26.1	-4%	0%	0%	-34,061	28,318
	TOTALS		**131,360**	**4,932**	**126,428**	**4,632**	**3.9**	**2,569**	**15.4**	**1,412**	**6,859**	-	**161,088**	**18.4**	-	-	-	**-21,290**	**36,612**

APPENDIX H: METHOD OF ANALYSIS

Assumptions and tools

Energy modeling tool:	Established/standard industry assumptions, eQUEST
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.