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November 08, 2010

Local Government Energy Program
Energy Audit Final Report

City of Orange Township

Washington Street Fire House
261 Washington Street
Orange, NJ 07050

Project Number: LGEA68

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EXECUTIVE SUMMARY

The two-story, 10,328 square feet Washington Street Fire House Building was originally constructed in 1884 with an addition in 1969. The following chart provides an overview of current energy usage in the building based on the analysis period of March 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	45,716	11,360	$20,628	125.1	1,292
Proposed	40,635	11,161	$19,397	121.2	1,255
Savings	5,081	199	$1,231*	3.9	37
% Savings	11%	2%	6%	3%	3%

*Cost savings include avoided operations and maintenance costs

There may be energy procurement opportunities for the City of Orange Township Washington Street Fire House to reduce annual electric utility costs, which are $960 higher, when compared to the average estimated NJ commercial electric utility rates.

SWA has also entered energy information about the Washington Street Fire House in the U.S. Environmental Protection Agency's (EPA) *ENERGY STAR® Portfolio Manager* energy benchmarking system. This fire house is comprised of non-eligible ("Other") space type. Because it is an "Other" space type, there is no rating available. Consequently, the Washington Street Fire House is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 125.1 kBtu/ft^2-yr compared to the national average of "Other" space type fire stations consuming 78.0 kBtu/ft^2-yr. See ECM section for guidance on how to improve the building's rating.

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	$791	2.2	$1,715	4,958
5-10 Year	$440	9.2	$4,026	1,156
>10 year	$0	0.0	$0	0
Total	$1,231	4.7	$5,741	6,114

SWA estimates that implementing the recommended ECMs is equivalent to removing approximately 1 cars from the roads each year or avoiding the need of 15 trees to absorb the annual CO_2 generated.

Other recommendations to increase building efficiency pertaining to operations and maintenance and capital improvements are listed below. This is an abbreviated list with only a few select highly recommended improvements. For the full list see the Proposed Further Recommendations section.

Further Recommendations:

- Capital Improvements
  - Replace roof finish due to age and condition adding a minimum of R-19 insulation.
  - Hot water and heating pipe insulation
  - Replace all original, single-glazed windows and frames with historically and architecturally accurate low-E, double glazed type.
- Operations and Maintenance
  - Apply water sealer to moldy/leaking, below-grade slab.
  - Repair and maintain damaged door units.
  - Install and maintain weather-stripping around all exterior doors and roof hatches.
  - Repair/seal wall cracks and penetrations

The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for City of Orange Township. Based on the requirements of the LGEA program, City of Orange Township 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 $926.50.

Financial Incentives and Other Program Opportunities

There are various incentive programs that the City of Orange Township could apply for that could also help lower the cost of installing the ECMs. Please refer to Appendix F for details. The table below summarizes the recommended next steps that the City of Orange Township can take to achieve greater energy efficiency and reduce operating expenses.

Table 3: Next Steps for the Municipal Building

Recommended ECMs	Incentive Program (Please refer to Appendix F for details)
Install ten (10) new CFL fixtures	None Available
Install three (3) digital programmable thermostat to control all unit heaters	SmartStart
Install one (1) VendingMiser™ device on the refrigerated vending machine	Direct Install
Install five (5) new occupancy sensors	Smart Start, Direct Install
Install TRVs on all steam radiators	None Available
Install one (1) new pulse start metal halide fixture	Smart Start, Direct Install
Replace one (1) large refrigerator with an ENERGY STAR® model	None Available
Install twenty-nine (29) new T8 fluorescent fixtures	Smart Start, Direct Install
Replace one (1) window air conditioning unit with ENERGY STAR® efficient type	None Available

There are various incentive programs that the City of Orange could apply for that could help lower the cost of installing the ECMs. For the Municipal Building, and contingent upon available funding, SWA recommends the following incentive programs:

Smart Start: A majority of energy saving equipment such as lighting and HVAC measures have moderate incentives under this program.

Direct Install: A majority of energy saving equipment such as lighting and HVAC measures have incentives under this program. Direct Install can typically help offset 60% of the installed cost of prescriptive measures.

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 Washington Street Fire House at 261 Washington Street. The process of the audit included facility visits on March 19 and April 22, 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 Orange Township to make decisions regarding the implementation of the most appropriate and most cost-effective energy conservation measures for the Washington Street Fire House.

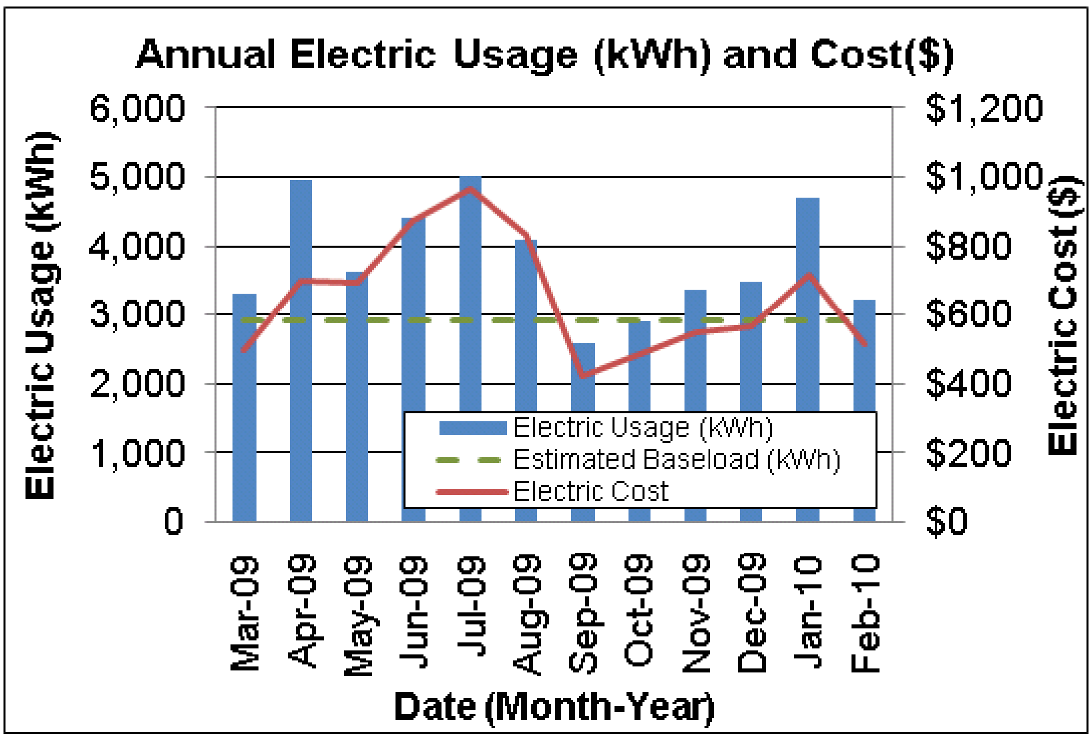
HISTORICAL ENERGY CONSUMPTION

Energy usage, load profile and cost analysis

SWA reviewed utility bills from March 2008 through February 2010 that were received from the utility companies supplying the Washington Street Fire House with electric and natural gas. A 12 month period of analysis from March 2009 through February 2010 was used for all calculations and for purposes of benchmarking the building.

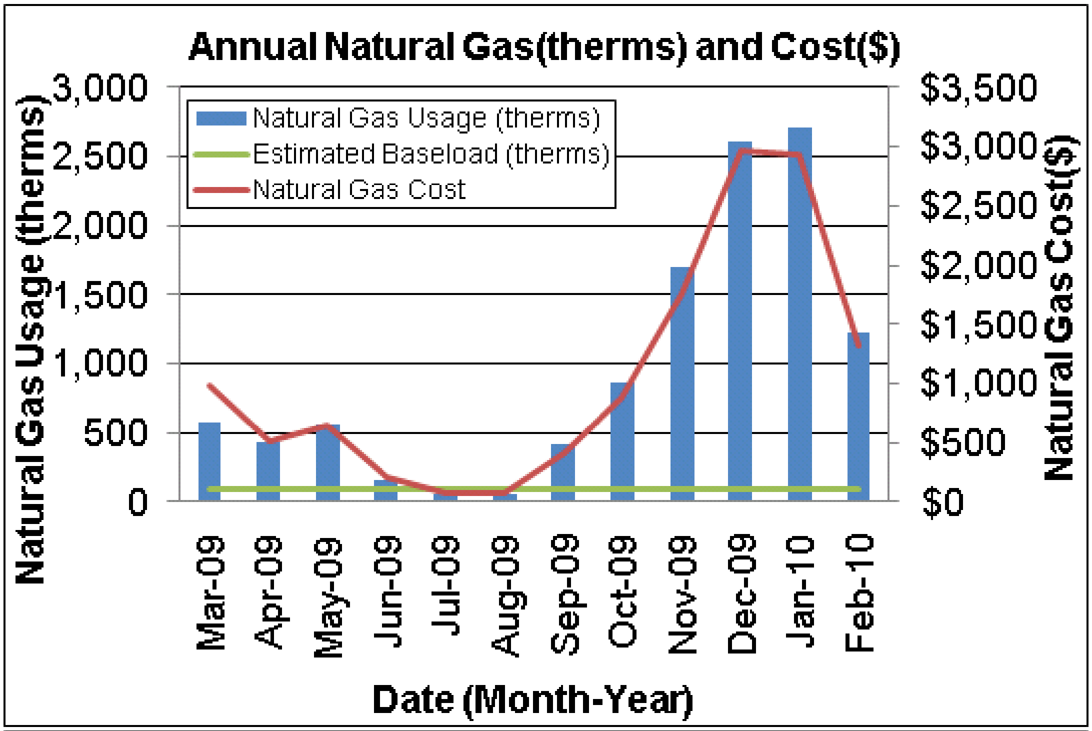
Electricity - The Washington Street Fire House is currently served by two electric meters. The Washington Street Fire House currently buys electricity from PSE&G at **an average aggregated rate of $0.171/kWh**. The Washington Street Fire House purchased **approximately 45,716 kWh, or $7,820 worth of electricity,** in the previous year. The average monthly demand was 7.7 kW and the annual peak demand was 11.3 kW.

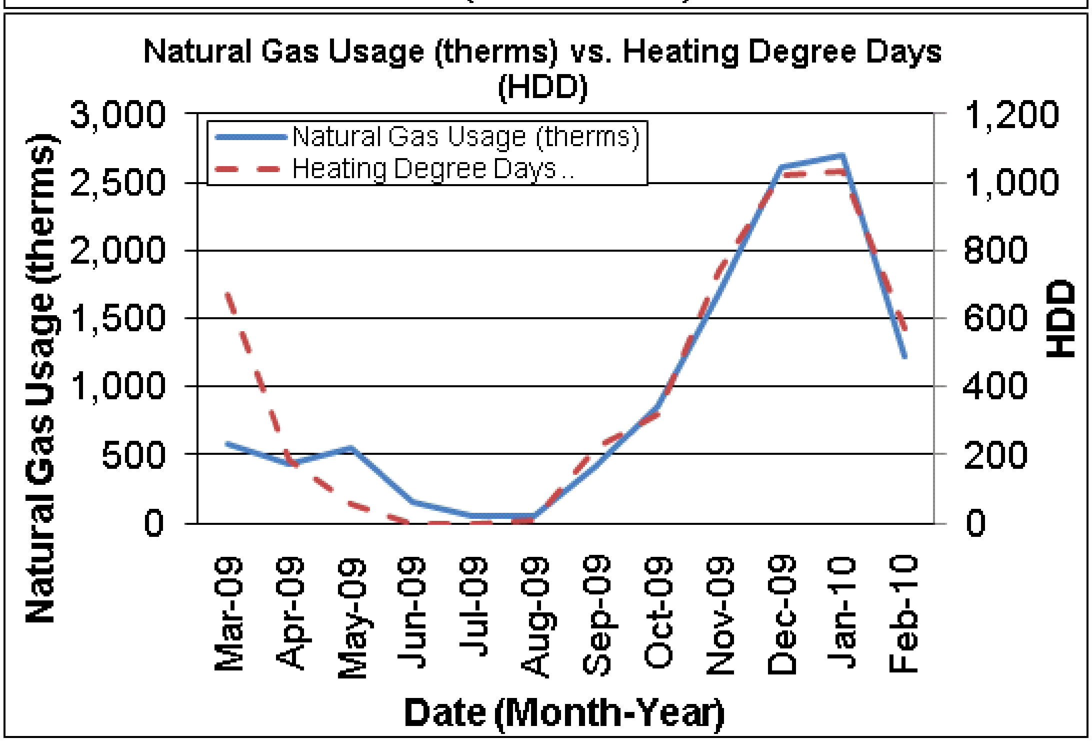
The chart below shows the monthly electric usage and costs. The dashed green line represents the approximate baseload or minimum electric usage required to operate the Washington Street Fire House.



Natural gas - The Washington Street Fire House is currently served by one meter for natural gas. The Washington Street Fire House currently buys natural gas from PSE&G at **an average aggregated rate of $1.127/therm**. The Washington Street Fire House purchased **approximately 11,360 therms, or $12,808 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 Washington Street Fire House.

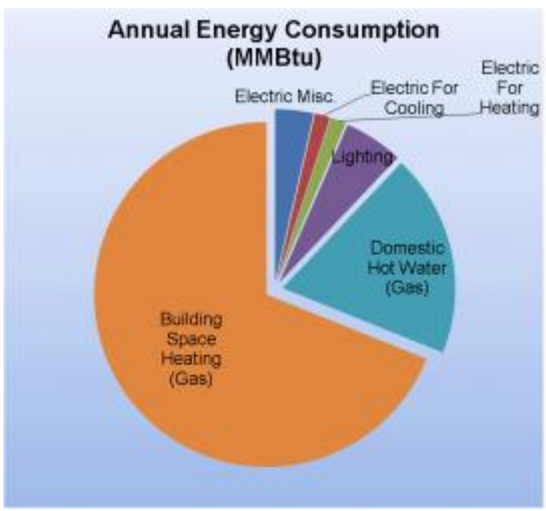


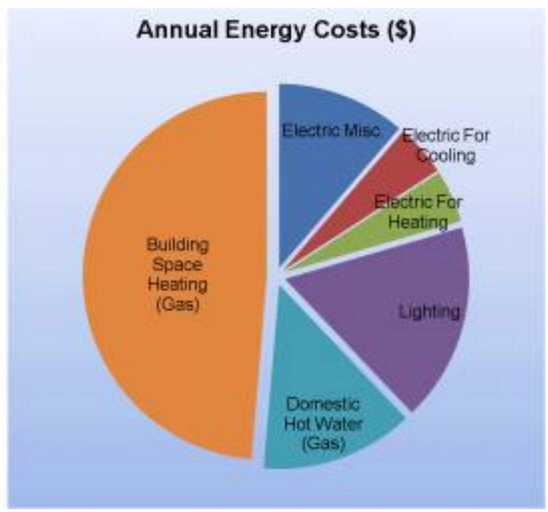


The chart above shows the monthly natural gas usage along with the heating degree days or HDD. Heating degree days is the difference of the average daily temperature and a base temperature, on a particular day. The heating degree days are zero for the days when the average temperature exceeds the base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

The following graphs, pie charts, and table show energy use for the Washington Street Fire House based on utility bills for the 12 month period. Note: electrical cost at $50/MMBtu of energy is almost 5 times as expensive as natural gas at $11/MMBtu.

Annual Energy Consumption / Costs					
	MMBtu	% MMBtu	$	% $	$/MMBtu
Electric Miscellaneous	47	4%	$2,335	11%	50
Electric For Cooling	19	1%	$935	5%	50
Electric For Heating	19	1%	$955	5%	50
Lighting	72	6%	$3,594	17%	50
Domestic Hot Water (Gas)	246	19%	$2,771	13%	11
Building Space Heating	890	69%	$10,037	49%	11
Totals	1,292	100%	$20,629	100%	
Total Electric Usage	156	12%	$7,820	38%	50
Total Gas Usage	1,136	88%	$12,808	62%	11
Totals	1,292	100%	$20,629	100%	

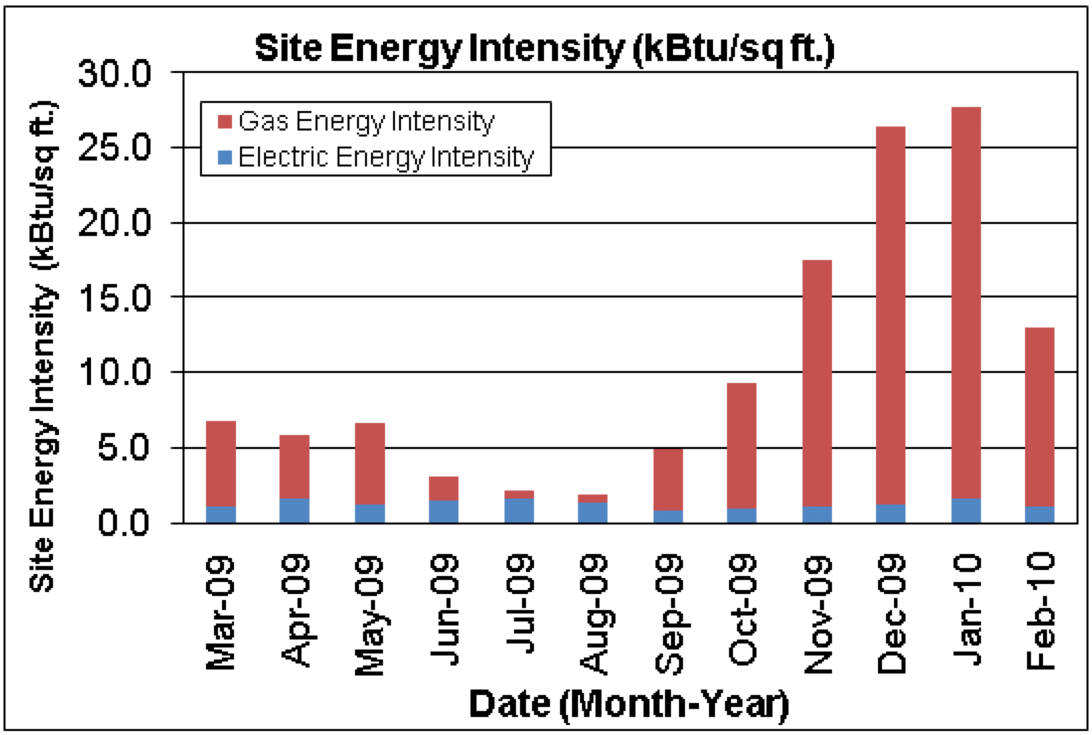




Energy benchmarking

SWA has also entered energy information about the Washington Street Fire House in the U.S. Environmental Protection Agency's (EPA) *ENERGY STAR® Portfolio Manager* energy benchmarking system. This fire house is comprised of non-eligible ("Other") space type. Because it is an "Other" space type, there is no rating available. Consequently, the Washington Street Fire House is not eligible to receive a national energy performance rating at this time. The Site Energy Use Intensity is 125.1 kBtu/ft^2-yr compared to the national average of "Other" space type fire stations consuming 78.0 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 "Other" space types is very subjective, and is not an absolute bellwether for gauging performance. Additionally, should the City of Orange Township 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 Orange Township to create an *ENERGY STAR® Portfolio Manager* account and share the Washington Street Fire House 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 Orange Township [redacted]

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.

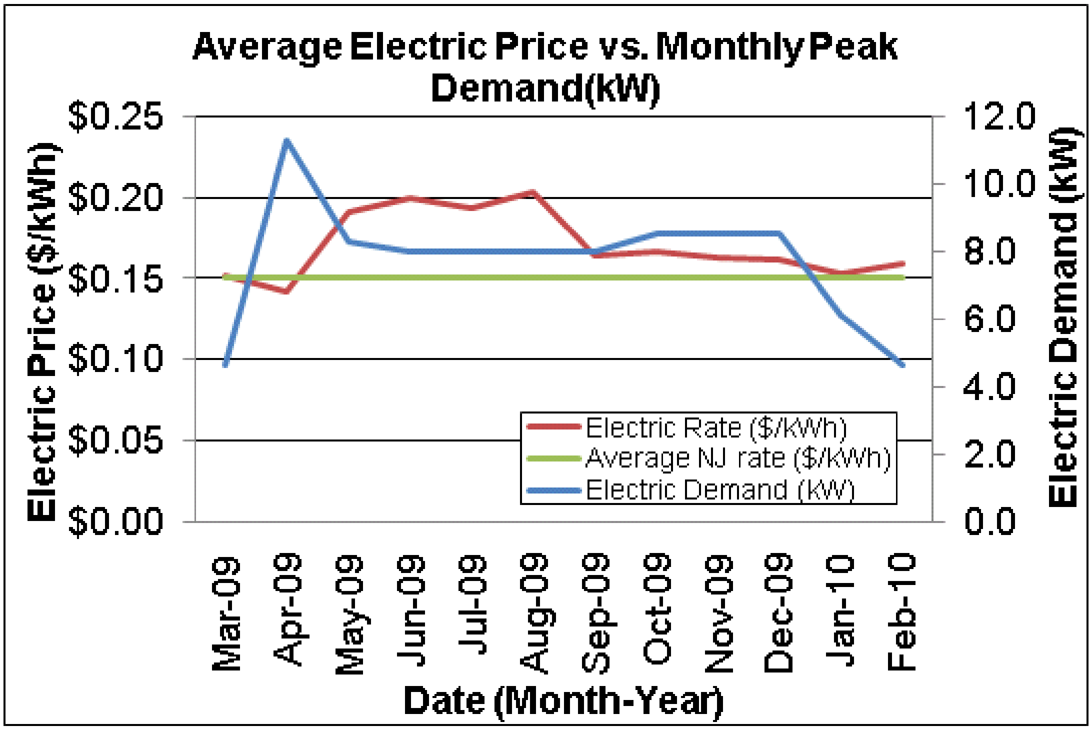
Tariff analysis is performed to determine if the rate that a City of Orange Township is contracted to pay with each utility provider is the best rate possible resulting in the lowest costs for electric and gas provision. Typically, the natural gas prices increase during the heating months when natural 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 condensing units and air handlers.

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 Orange Township 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. There general service rate for electric charges are market-rate based on use. Demand prices are reflected in the utility bills and can be verified by observing the price fluctuations throughout the year.

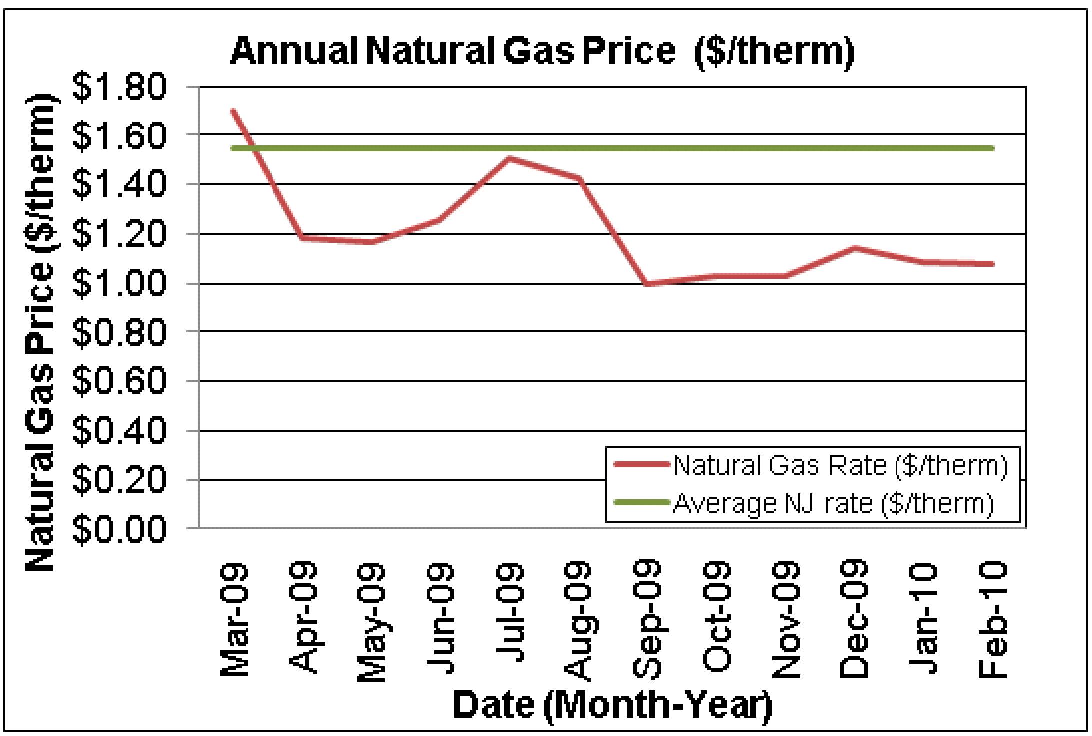
Energy Procurement strategies

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 Washington Street Fire House pays a rate of $0.171/kWh. The Washington Street Fire House annual electric utility costs are $960 higher, when compared to the average estimated NJ commercial utility rates. Electric bill analysis shows fluctuations up to 30% over the most recent 12 month period.



The average estimated NJ commercial utility rates for gas are $1.550/therm, while the Washington Street Fire House pays a rate of $1.127/therm. Natural gas bill analysis shows fluctuations up to 29% 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 Washington Street Fire House 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 Washington Street Fire House. Appendix C contains a complete list of third-party energy suppliers for the City of Orange Township 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 April 22, 2010, the following data was collected and analyzed.

Building Characteristics

The two-story, (slab on grade with basement crawl space), 10,328 square feet Washington Street Fire House Building was originally constructed in 1884 with additions1969. It houses garage bays, office areas, bathrooms, storage rooms and a kitchen area.

Front Façade

Right Side Façade

Rear Façade

Left Side Façade

Building Occupancy Profiles

Its occupancy is approximately five employees daily from 8:00am to 6:00pm and three employees overnight.

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 18 inches of solid brick with no insulation. The 1969 addition is constructed of stucco over concrete block with no insulation. The interior is mostly painted CMU (Concrete Masonry Unit) and painted gypsum wallboard on the second floor.

Note: Wall insulation levels could not be verified in the field and are based on reports from building management.

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

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

Overgrown ground vegetation covering exterior wall surfaces

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

Cracked/deteriorated mortar joints; potential structural damage

Roof

The building's roof is predominantly a flat, no parapet type over wood framing, with a built-up asphalt finish. It was replaced at least 20 years ago. There was no of visible ceiling insulation, and two inches of assumed roof insulation.
Note: Roof insulation levels could visually be verified in the field by non-destructive methods.

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

The following specific roof problem spots were identified:

Sagging/water damaged ceiling tiles in many areas due to roof leaks

Sagging/water damaged ceiling tiles in many areas due to roof leaks

Sagging/water damaged ceiling tiles in many areas due to roof leaks

Missing attic insulation between wooden rafters

Base

The building's base is composed of a slab-on-grade floor for most of the building, with a small crawl space under wood joist, with a perimeter footing with stone foundation walls 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 acceptable condition with only a few signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues detected in some areas inside.

The following specific base problem spots were identified:

Water/moisture seepage through cracks detected in the slab

Water/moisture seepage through cracks detected in the slab

Windows

The building contains several different types of windows:

1. 14 double-hung type windows with a non-insulated aluminum frame, clear single glazing and interior roller blinds on the second floor. The windows are located throughout the building and were replaced at least 20 years ago.

2. 5 double-hung type windows with a wood frame, clear single glazing and no interior or exterior shading devices. The windows are located on the main floor and were replaced at least 20 years ago.

3. 4 fixed type windows with a non-insulated aluminum frame, single pane, wire mesh safety glazing and interior roller blinds. The windows are located on the second floor and were replaced at least 20 years ago.

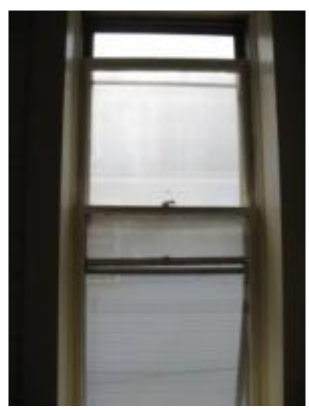
4. 2 awning type windows with a non-insulated aluminum frame, clear single glazing and interior roller blinds. The windows are located on the second floor and were replaced at least 20 years ago.

5. 2 double-hung type windows with an insulated aluminum frame, clear double glazing and no interior or exterior shading devices. The windows are located on the second floor and were replaced recently.

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 poor condition with some signs of uncontrolled moisture, air-leakage and/ or other energy-compromising issues.

The following specific window problem spots were identified:

Exterior mold/water damage signs on areas around windows



Single-glazed window with ineffective frame

Missing/ineffectively-applied caulk around frame or sill on the exterior

Single-glazed window with ineffective frame

Damaged/aged window frame

Exterior doors

The building contains several different types of exterior doors:

1. Two aluminum type garage doors with several insulated glass lights in each. They are located in the front of the building and were replaced at least 20 years ago.

2. Three wood type exterior doors. They are located on the right side and back of the building and were replaced at least 20 years ago.

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

The following specific door problem spots were identified:

Exterior mold/water damage signs on areas around doors

Missing/worn weather-stripping

Building air-tightness

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

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

Mechanical Systems

Heating, Ventilation, and Air Conditioning

The Washington Street Fire House operates during typical fire department hours. The building is staffed full time during the day and has a reduced staff at night. It is important that the fire house is fully operable 24 hours per day, in order to react to emergency calls. As such, occupancy in areas such as the bunk room varies based on call volume. All controls in the building are manual and adjusted based on occupant comfort. The entire building is heated, however there is no central cooling system. Area specific cooling is provided by window air conditioning units. Ventilation is provided mostly naturally by operable windows, with exhaust fans helping to induce flow of fresh air into the building.

Equipment

The Washington Street Fire House is heated by a combination a steam boiler, gas-fired unit heaters and electric baseboard heaters. The original building was intended to be heated entirely by steam, however as the building was renovated and added on to, new heating systems were installed to supplement the heat load of the entire building.

Williamson steam boiler with un-insulated pipe

The garage areas of the building are heated using a total of 3 ceiling-mounted, gas-fired unit heaters. These heaters are currently operated using a manual thermostat directly wired to each unit heater. The smaller garage on the right side when facing the building, is heated by one 100,000 Btuh unit heater with a thermal efficiency of 80%. The larger garage on the left side when facing the building, is heated by two 75,000 Btuh unit heaters, each with a thermal efficiency of 80%. All unit heaters are approaching the end of their useful lifetime; however they appear in good condition with a minimal loss in efficiency.

Typical convective unit heater in garage

The first floor, larger bunk room and rear side of the building are heated using cast iron radiators fed from the steam boiler. The Williamson steam boiler has a total heating capacity of 175,000 Btuh and a thermal efficiency of 81.9% AFUE. The boiler is turned on for the heating season and then operated based pressures and temperature of the steam loop.

The smaller bunk room contains additional heating from electric baseboards. These baseboards are controlled by a manual, wall-mounted Bryant thermostat. Typically these electric heaters are left at the same temperature throughout the heating season, until an occupant adjusts the thermostat based on comfort.

The building contains no central cooling system, however cooling is provided to the Kitchen area, the Recreational room and both dorm areas. The Airtemp air conditioner that cools the Kitchen area was the only observed window AC that is Energy Star compliant.

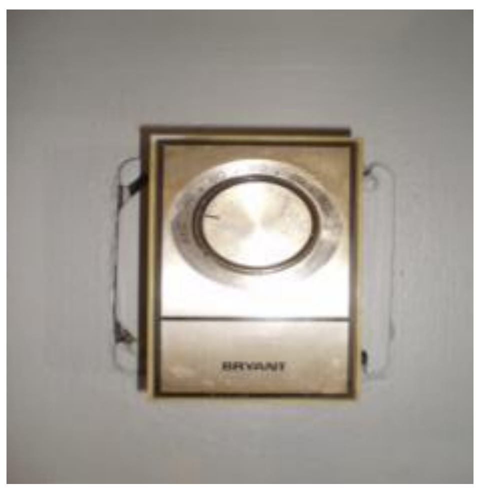
Distribution Systems

Heat is distributed in the first floor, larger bunk room and rear side of the building though cast iron radiators fed from the steam boiler. Heat in the garage is distributed convectively through gas fired units heaters. In the smaller bunk room heat is distributed convectively through electric baseboard units. The building contains no central cooling system, however there is conductive cooling from the through the window air conditioners.

Steam radiator (L); Electric baseboard under window (R)

Controls

Manual thermostats are being used to control the three ceiling-mounted, gas-fired unit heaters. The Williamson steam boiler is based on steam differential. Each radiator is equipped with a gate valve that can shut off supply to the radiator but does not modulate the amount of steam.   The electric baseboards are operated by a manual, wall-mounted Bryant thermostat. On the day of the site visit, the outside temperature was approximately 70ºF and the thermostat was shut completely off, however heat was still radiating from electric heaters. The air conditioner units are controlled by manual controls.



Bryant thermostat for electric heaters

Domestic Hot Water

The domestic hot water (DHW) for the Washington Street Fire House is provided by a natural gas fired A.O. Smith manufactured heater with a 40 gallon storage capacity and a 32.80 gallon per hour recovery ratings.


Atmospheric DHW heater

This heater has 53% estimated useful operating life remaining and appears in good condition. Hot water is distributed through copper piping which was observed to be uninsulated throughout the basement.

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.

Interior Lighting - The Washington Street Fire House currently contains mostly fixtures with electronically ballasted T12 lamps and self ballasted incandescent lamps. Based on measurements of lighting levels for each space, there are no vastly over-illuminated areas.

Exterior Lighting - The exterior lighting surveyed during the building audit was found to be a mix of incandescent lamp and High Pressure Sodium Lamp fixtures. Exterior lighting is controlled by photocells.

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.

Installed at the fire house is an older model non ENERGY STAR® rated refrigerated vending machine and an older model full size refrigerator.

Elevators

The Washington Street Fire House does not have an installed elevator.

Other electrical systems

There are not currently any other significant energy-impacting electrical systems installed at the Washington Street Fire House.

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 Washington Street Fire House is not a good candidate for a Solar Panel installation. There is insufficient roof space for panels to reasonably supplement the power consumption of the building and due to the intermittent use of the Firehouse building, there is not a consistent load in summer months to use the power generated from the solar panels.

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.

Geothermal

The Washington Street Fire House 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 between 20% and 80% remaining useful life.

Combined Heat and Power

The Washington Street Fire House 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#	0-5 Year Payback ECMs
1	Install ten (10) new CFL fixtures
2	Install one (1) digital programmable thermostat to control all unit heaters
3	Install one (1) VendingMiser™ device on the refrigerated vending machine
4	Install five (5) new occupancy sensors
	5-10 Year Payback ECMs
5	Install TRVs on all steam radiators
6	Install one (1) new pulse start metal halide fixture
7	Replace one (1) large refrigerator with an ENERGY STAR® model
8	Install twenty-nine (29) new T8 fluorescent fixtures
9	Replace one (1) window air conditioning unit with ENERGY STAR® efficient type

ECM#1: Install ten (10) new CFL fixtures

On the day of the site visit, SWA completed a lighting inventory of the City of Orange Washington Street Fire House (see Appendix B). The existing lighting inventory contained a total of ten inefficient incandescent lamps. SWA recommends that each of these lamps is replaced with a more efficient, Compact Fluorescent Lamp (CFL). CFLs are capable of providing equivalent or better light output while using less power.

Installation cost:

Estimated installed cost: $90 (includes $50 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

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
90	1,518	0.3	N/A	0.5	44	304	5	1,519	0.3	1,588	318	337	1,293	2,080

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 three (3) digital programmable thermostats to control all unit heaters

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). 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.

Installation cost:

Estimated installed cost: $426 (includes $90 of labor)
Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program, Similar projects

Economics (with 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
426	0	0.0	114	0.0	0	128	5	642	3.3	51	10	30	1,086	0

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

Rebates/financial incentives:

- NJ Clean Energy - Smart Start - Thermostats ($25 per fixture)
  Maximum Incentive Amount: $75

Please see Appendix F for more information on Incentive Programs.

ECM#3: Install one (1) VendingMiser™ device on the refrigerated vending machine

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

Installation cost:

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

Economics:

net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
199	365	0.1	N/A	0.1	0	62	5	312	3.2	57	11	17	85	500

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

Rebates/financial incentives:

- NJ Clean Energy – Direct Install program (Up to 60% of installed cost)

Please see Appendix F for more information on Incentive Programs.

ECM#4: Install five (5) new occupancy sensors

On the days of the site visits, SWA completed a lighting inventory of the City of Orange Washington Street Fire House (see Appendix B). The building contains four areas that could benefit from the installation of occupancy sensors. These areas consisted of various kitchens, dorm areas and locker rooms that are used sporadically throughout the day and could show energy savings by having the lights turn off after a period of no occupancy. Typically, occupancy sensors have an adjustable time delay that shuts down the lights automatically if no motion is detected within a set time period. Advanced micro-phonic lighting sensors include sound detection as a means to controlling lighting operation.

Installation cost:

Estimated installed cost: $1,000 (includes $150 of labor)
Source of cost estimate: RS *Means; Published and established costs, NJ Clean Energy Program*

Economics:

Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	Therms of Natural gas, 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
1,000	1,735	0.4	N/A	0.6	0	297	15	4,452	3.4	345	23	29	2,492	2,378

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:

- NJ Clean Energy – SmartStart – Wall-mounted Occupancy Sensors ($20 per control)
  Maximum Incentive Amount: $100

Please see Appendix F for more information on Incentive Programs.

ECM#5: Install TRVs on all steam radiators

The Washington Street fire house has steam radiators installed throughout the building. Most of the radiators are over 20 years old and have only simple on and off controllability. Thermostatic radiators valves, TRV's, are a simple, low cost, and effective method of controlling steam radiator heating. TRV's regulate the amount of steam through the radiator by controlling the venting of air. The valve is self-regulating, and consists of a valve and a sensor. As the space conditions change, the valve will respond to maintain the temperature set point. This avoids having to open windows to compensate for over-heating the space. The TRVs can be manually adjusted at the valve itself, or by a remote thermostat.

Given that the radiators are installed throughout the building it is not practical to install remote thermostats for each one, and the temperature set point should be relatively consistent during each season. Typically the valves have a set point range of 5˚C to 26˚C, but can be limited to a smaller range through a minor adjustment. Therefore SWA recommends installing manual TRV valves on the steam supply for each radiator. This control upgrade would only be effective if the steam traps are operating properly and therefore the float-thermostatic steam straps on each radiator should be serviced before the TRVs are installed.

Installation cost:

Estimated installed cost: $700 (includes $400 of labor)
Source of cost estimate: RS Means; Published and established costs

Net est. cost with incentives, $	kWh, 1st year savings	kW, demand reduction	Therms of Natural gas, 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
700	0	0.0	85	0.0	0	96	20	1,920	7.3	174	9	11	430	995

Assumptions: SWA calculated the savings for this measure assuming that all existing radiators will be retrofitted with TRV’s. It is also assumed that 0.75% of the heating cost can be saved by installing TRVs.

Rebates/financial incentives:

- None at this time

Please see Appendix F for more information on Incentive Programs.

ECM#6: Install one (1) new pulse start metal halide fixture

On the day of the site visit, SWA completed a lighting inventory of the City of Orange Washington Street Fire House (see Appendix B). The existing lighting inventory contained one fixture with inefficient high pressure sodium lamp. SWA recommends replacing them with more efficient, Pulse Start Metal Halide fixtures with electronic ballasts. Pulse Start Metal Halide fixtures with electronic ballasts provide equivalent or better light output while reducing energy consumption by 30% when compared to metal halide or high pressure sodium fixtures. .

Installation cost:

Estimated installed cost: $675 (includes $125 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

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
675	263	0.1	N/A	0.1	27	72	15	1,082	9.4	60	4	7	174	360

Assumptions: SWA calculated the savings for this measure using measurements taken the days of the field visits and using the billing analysis. SWA also assumed an aggregated 1 hr/yr to replace aging burnt out lamps vs. newly installed.

Rebates/financial incentives:

- NJ Clean Energy - Smart Start - Pulse Start Metal Halide Fixtures ($25 per fixture)
  Maximum Incentive Amount: $25

Please see Appendix F for more information on Incentive Programs.

ECM#7: Replace one (1) large refrigerator with an ENERGY STAR® model

On the day of the site visit, SWA observed that there was an older large residential sized refrigerator, which was not Energy Star rated (using approximately 479 kWh/year). Appliances, such as refrigerators, that are over 10 years of age should be replaced with a newer efficient model with the Energy Star label. SWA recommends the replacement of the existing refrigerator with a 1 ENERGY STAR® rated refrigerator. Besides saving energy, the replacement will also keep their surroundings cooler. When compared to the average electrical consumption of older equipment, Energy Star equipment results in large savings. Look for the Energy Star label when replacing appliances and equipment, including: window air conditioners, refrigerators, printers, computers, copy machines, etc. More information can be found in the "Products" section of the Energy Star website at: http://www.energystar.gov.

Installation cost:

Estimated installed cost: $479 (Includes $50 in labor cost)
Source of cost estimate: Manufacturer and Store established costs

Economics:

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
479	289	0.1	N/A	0.1	0	49	12	593	9.7	24	2	6	103	396

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

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#8: Install twenty-nine (29) new T8 fluorescent fixtures

On the day of the site visit, SWA completed a lighting inventory of the Glen Ridge District Office (see Appendix B). The existing lighting inventory contained twenty-nine inefficient T12 fluorescent fixtures with magnetic ballasts. SWA recommends replacing each existing 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 a T12 fixture with magnetic ballast.

Installation cost:

Estimated installed cost: $1,567 (includes $855 of labor)
Source of cost estimate: RS Means; Published and established costs, NJ Clean Energy Program

Economics:

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
1,567	551	0.1	0	0.5	61	161	15	2,420	9.7	54	4	6	332	987

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:

- NJ Clean Energy - Smart Start - T8 fixtures with electronic ballasts ($15 per fixture)
  Maximum Incentive Amount: $435

Please see Appendix F for more information on Incentive Programs.

ECM#9: Replace one (1) window air conditioning unit with ENERGY STAR® efficient type

During the field audit, SWA completed the building HVAC equipment inventory and observed spaces cooled by window air conditioning units. Room air conditioners (sometimes referred to as window air conditioners) cool specific rooms rather than the entire building. If they provide cooling only where they're needed, room air conditioners are less expensive to operate than central units, even though their efficiency is generally lower than that of central air conditioners. A room air conditioner features a condenser on the end that faces the outside and a condenser fan behind it that blows air through it, helping to remove the heat from the condenser. On the end facing the room is the evaporator, with an evaporator fan behind that to push the cool air into the room. The filter is mounted in the front grill. When buying a new room air conditioner, look for units with an EER of 10.0 or above. Check the EnergyGuide label for the unit, and also look for room air conditioners with the ENERGY STAR® label. The labor for the recommended installations is evaluated using prevailing mechanical/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 Frigidaire manufactured window air conditioning unit located in the larger dorm area is operating near the end of its expected service life. It is also the only unit with an EER below 10 as it has an 8.5 EER.

Installation cost:

Estimated installed cost: $605 (includes $50 of labor)
Source of cost estimate: RS Means, Published and established costs, NJ Clean Energy Program, Similar projects

Economics (with 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
605	360	0.1	N/A	0.1	0	62	15	923	9.8	53	4	6	119	493

Assumptions: SWA calculated the savings for this measure using measurements taken during the field audit and using the billing analysis. SWA also used Energy Star site: http://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing Excel spreadsheet for Room Air Conditioners Savings Calculator.

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

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 Washington Street Fire House:

- Install premium motors when replacements are required - Select NEMA Premium motors when replacing motors that have reached the end of their useful operating lives.
- Overgrown ground vegetation should be removed to not touch or block exterior wall surfaces from access, ventilation and sunlight.
- Replace roof finish due to age and condition adding a minimum of R-19 insulation.
- Hot water and heating pipe insulation – Insulate all exposed steam heating supply piping and hot water supply piping with a minimum of R-4 insulation.
- SWA recommends professional inspection of base moisture seepage issues in sub basement.
- Replace all original, single-glazed windows and frames with historically and architecturally accurate low-E, double glazed type.

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.

- Replace broken/deteriorated bricks and re-point cracked mortar joints.
- Apply water sealer to moldy/leaking, below-grade slab.
- Repair and maintain damaged door units.
- Maintain roofs - SWA recommends regular maintenance to verify water is draining correctly.
- Maintain downspouts and cap flashing - Repair/install missing downspouts and cap flashing as needed to prevent water/moisture infiltration and insulation damage. SWA recommends round downspout elbows to minimize clogging.
- Provide weather-stripping/air-sealing - Doors and vestibules should be observed annually for deficient weather-stripping and replaced as needed. The perimeter of all window frames should also be regularly inspected, and any missing or deteriorated caulking should be re-caulked to

provide an unbroken seal around the window frames. Any other accessible gaps or penetrations in the thermal envelope penetrations should also be sealed with caulk or spray foam.

- Repair/seal wall cracks and penetrations - SWA recommends as part of the maintenance program installing weep holes, installing proper flashing and correct masonry efflorescence, and sealing wall cracks and penetrations wherever necessary in order to keep insulation dry and effective.

- 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.

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

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

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

Note: The recommended ECMs and the list above are cost-effective energy efficiency measures and building upgrades that will reduce operating expenses for City of Orange Township. Based on the requirements of the LGEA program, City of Orange Township 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 $926.50.

APPENDIX A: EQUIPMENT LIST

Inventory

Building System	Description	Location	Make/ Model	Fuel	Space Served	Date Installed	Estimated Remaining Useful Life %
Heating	Modine unit heater, 100,000 Btuh input, 80,000 Btuh output, 80% thermal efficiency	Right-side garage, ceiling-mounted	Modine, Model #PAE100AC0111, Serial #380810132958021	N. Gas	Right-side garage	1990	10%
Heating	Reznor unit heater, 75,000 Btuh input, 60,000 Btuh output, 80% thermal efficiency	Left-side garage, ceiling-mounted	Reznor, Model #F75-3, Serial #BDE31K5N21046X	N. Gas	Left-side garage	1990	10%
Heating	Reznor unit heater, 75,000 Btuh input, 60,000 Btuh output, 80% thermal efficiency	Left-side garage, ceiling-mounted	Reznor, Model #F75-3, Serial #BDE31K5N21051X	N. Gas	Left-side garage	1990	10%
Heating	Williamson steam boiler, 175,000 BTUH, 81.9% AFUE	Basement	Williamson, GSA, Model #GSA-175N-S, Series #1, Serial #NA	N. Gas	All Areas	2004	76%
Heating	Electric baseboard heaters, controlled by Bryant non-programmable thermostat	Smaller Dorm Area	No Nameplate Info	Electricity	Smaller Dorm Area	1969	20%
Cooling	Airtemp window AC unit, Energy Star, no nameplate info	Lunch Room/ Kitchen Area	Airtemp, Model #NA, Serial #NA	Electricity	Lunch Room/ Kitchen Area	2000	30%
Cooling	Frigidaire window AC unit, 28,500 Btuh, 8.5 EER	Larger Dorm Area	Frigidaire, Model #FAS296R2A, Serial #NA	Electricity	Larger Dorm Area	2000	30%
Cooling	GE window AC unit, 12,300 Btuh, 10.8 EER	Smaller Dorm Area	GE, Model #ASM12AKS1, Serial #AM451083	Electricity	Smaller Dorm Area	2007	80%
Cooling	Frigidaire window AC unit, 15,100 Btuh, 10.7 EER	Recreational Room	Frigidaire, Model #2235171480, Serial #EK3505400	Electricity	Rec. Room	2007	80%
Domestic Hot Water	AO Smith atmospheric water heater, 40 gallons, 32.80 gal/hr recovery, unit uses 268 therms/year	Basement	AO Smith, Energy Saver, Model #FSG 40 248, Serial #GK02-1022106-248	N. Gas	All Areas	2003	Domestic Hot Water
Appliances	Frigidaire refrigerator, uses 479 kWh/year	Lunch Room/ Kitchen Area	Frigidaire, Model #FRT18DRHWO, Serial #BA03124900	Electricity	Lunch Room/ Kitchen Area	2000	Appliances
Appliances	One refrigerated type, "drink" vending machine	Right-side garage	No nameplate info	Electricity	Right-side garage	2004	Appliances
Lighting	See Appendix A	-	-	-	-	-	Lighting

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	Bsmt	Utility Rm	Parabolic Ceiling Suspended	M	4'T12	2	2	40	Sw	2	365	12	184	134	T8	Parabolic Ceiling Suspended	4'T8	E	Sw	2	2	32	2	365	5	138	101	34	0	34
2	1	Truck Bay - New	Parabolic Ceiling Suspended	M	8'T12	6	2	80	Sw	12	365	20	1,080	4,730	T8	Parabolic Ceiling Suspended	8'T8	E	Sw	6	2	59	12	365	7	750	3285	1445	0	1445
3	1	Kitchen	Parabolic Ceiling Suspended	M	4'T12	4	4	40	Sw	9	365	12	688	2,260	T8	Parabolic Ceiling Suspended	4'T8	E	OS	4	4	32	7	365	5	532	1311	512	437	949
4	1	Truck Bay - Old	Recessed Parabolic	M	4'T12	4	4	40	Sw	9	365	12	688	2,260	T8	Recessed Parabolic	4'T8	E	Sw	4	4	32	9	365	5	532	1748	512	0	512
5	1	Bathroom	Recessed Parabolic	M	4'T12	1	2	40	Sw	9	365	12	92	302	T8	Recessed Parabolic	4'T8	E	Sw	1	2	32	9	365	5	69	227	76	0	76
6	1	Staircase	Recessed Parabolic	M	4'T12	1	1	40	Sw	16	365	12	52	304	T8	Recessed Parabolic	4'T8	E	Sw	1	1	32	16	365	5	37	216	88	0	88
7	2	Sleeping Quarters	Recessed Parabolic	M	4'T12	4	4	40	Sw	16	365	12	688	4,018	T8	Recessed Parabolic	4'T8	E	OS	4	4	32	12	365	5	532	2330	911	777	1688
8	2	Sleeping Quarters- Captain	Recessed Parabolic	M	4'T12	1	4	40	Sw	16	365	12	172	1,004	T8	Recessed Parabolic	4'T8	E	OS	1	4	32	12	365	5	133	583	228	194	422
9	2	Locker Room	Recessed Parabolic	M	4'T12	3	4	40	Sw	9	365	12	516	1,695	T8	Recessed Parabolic	4'T8	E	OS	3	4	32	7	365	5	399	983	384	328	712
10	2	Bathroom	Recessed Parabolic	M	4'T12	1	4	40	Sw	9	365	12	172	565	T8	Recessed Parabolic	4'T8	E	Sw	1	4	32	9	365	5	133	437	128	0	128
11	2	Bathroom	Recessed Parabolic	M	4'T12	1	1	40	Sw	9	365	12	52	171	T8	Recessed Parabolic	4'T8	E	Sw	1	1	32	9	365	5	37	122	49	0	49
12	2	Meeting Rm	Recessed Parabolic	M	4'T12	1	4	40	Sw	8	365	12	172	502	T8	Recessed Parabolic	4'T8	E	Sw	1	4	32	8	365	5	133	388	114	0	114
13	2	Meeting Rm	Recessed Parabolic	S	Inc	4	1	60	Sw	8	365	0	240	701	CFL	Recessed Parabolic	CFL	S	Sw	4	1	20	8	365	0	80	234	467	0	467
14	Ext	Exterior	Wall Mounted	S	Inc	6	1	60	PC	12	365	0	360	1,577	CFL	Wall Mounted	CFL	S	PC	6	1	20	12	365	0	120	526	1051	0	1051
15	Ext	Exterior	Wall Mounted	S	HPS	1	1	150	PC	12	365	30	180	788	PSMH	Wall Mounted	PSMH	S	PC	1	1	100	12	365	20	120	526	263	0	263
Totals:						40	39	790				182	5,336	21,012						40	39	551			82	3,745	13,014	6,263	1,735	7,998
Rows Highlighed Yellow Indicate an Energy Conservation Measure is recommended for that space																														

Proposed Lighting Summary Table			
Total Gross Floor Area (SF)	10,328		
Average Power Cost ($/kWh)	0.1710		
Exterior Lighting	**Existing**	**Proposed**	**Savings**
Exterior Annual Consumption (kWh)	2,365	1,051	**1,314**
Exterior Power (watts)	540	240	**300**
Total Interior Lighting	**Existing**	**Proposed**	**Savings**
Annual Consumption (kWh)	18,647	11,963	**6,684**
Lighting Power (watts)	4,796	3,505	**1,291**
Lighting Power Density (watts/SF)	0.46	0.34	**0.13**
Estimated Cost of Fixture Replacement ($)	4,871		
Estimated Cost of Controls Improvements ($)	1,000		
Total Consumption Cost Savings ($)	**1,540**		

Legend								
Fixture Type		**Lamp Type**			**Control Type**	**Ballast Type**	**Retrofit Category**
Ceiling Suspended	Recessed	CFL	3'T12	8'T5	Autom. Timer (T)	S (Self)	N/A (None)
Exit Sign	Sconce	Inc	3'T12 U-Shaped	8'T5 U-Shaped	Bi-Level (BL)	E (Electronic)	T8 (Install new T8)
High Bay	Spotlight	LED	3'T5	8'T8	Contact (Ct)	M (Magnetic)	T5 (Install new T5)
Parabolic Ceiling Mounted	Track	HPS	3'T5 U-Shaped	8'T8 U-Shaped	Daylight & Motion (M)		CFL (Install new CFL)
Parabolic Ceiling Suspended	Vanity	MH	3'T8	Circline - T5	Daylight & Switch (DLSw)		LEDex (Install new LED Exit)
Pendant	Wall Mounted	MV	3'T8 U-Shaped	Circline - T8	Daylight Sensor (DL)		LED (Install new LED)
Recessed Parabolic	Wall Suspended	1'T12	4'T5	Circline - T12	Delay Switch (DSw)		D (Delamping)
Ceiling Mounted	Wallpack	1'T12 U-Shaped	4'T5 U-Shaped	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 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

Third Party Electric Suppliers for PSEG Service Territory	Telephone & Web Site
Pepco Energy Services, Inc. 112 Main St. Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Strategic Energy, LLC 55 Madison Avenue, Suite 400 Morristown, NJ 07960	(888) 925-9115 www.sel.com
Suez Energy Resources NA, Inc. 333 Thornall Street, 6th Floor Edison, NJ 08837	(888) 644-1014 www.suezenergyresources.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Third Party Gas Suppliers for PSEG Service Territory	**Telephone & Web Site**
Cooperative Industries 412-420 Washington Avenue Belleville, NJ 07109	(800) 628-9427 www.cooperativenet.com
Direct Energy Services, LLC 120 Wood Avenue, Suite 611 Iselin, NJ 08830	(866) 547-2722 www.directenergy.com
Dominion Retail, Inc. 395 Highway 170, Suite 125 Lakewood, NJ 08701	(866) 275-4240 www.retail.dom.com
Gateway Energy Services Corp. 44 Whispering Pines Lane Lakewood, NJ 08701	(800) 805-8586 www.gesc.com
UGI Energy Services, Inc. 704 East Main Street, Suite 1 Moorestown, NJ 08057	(856) 273-9995 www.ugienergyservices.com
Great Eastern Energy 116 Village Riva, Suite 200 Princeton, NJ 08540	(888) 651-4121 www.greateastern.com

Third Party Gas Suppliers for PSEG Service Territory	Telephone & Web Site
Hess Corporation 1 Hess Plaza Woodbridge, NJ 07095	(800) 437-7872 www.hess.com
Hudson Energy Services, LLC 545 Route 17 South Ridgewood, NJ 07450	(877) 483-7669 www.hudsonenergyservices.com
Intelligent Energy 2050 Center Avenue, Suite 500 Fort Lee, NJ 07024	(800) 724-1880 www.intelligentenergy.org
Keil & Sons 1 Bergen Blvd. Fairview, NJ 07002	(877) 797-8786 www.systrumenergy.com
Metro Energy Group, LLC 14 Washington Place Hackensack, NJ 07601	(888) 536-3876 www.metroenergy.com
MxEnergy, Inc. 510 Thornall Street, Suite 270 Edison, NJ 08837	(800) 375-1277 www.mxenergy.com
NATGASCO (Mitchell Supreme) 532 Freeman Street Orange, NJ 07050	(800) 840-4427 www.natgasco.com
Pepco Energy Services, Inc. 112 Main Street Lebanon, NJ 08833	(800) 363-7499 www.pepco-services.com
PPL EnergyPlus, LLC 811 Church Road Cherry Hill, NJ 08002	(800) 281-2000 www.pplenergyplus.com
Sempra Energy Solutions 581 Main Street, 8th Floor Woodbridge, NJ 07095	(877) 273-6772 www.semprasolutions.com
South Jersey Energy Company One South Jersey Plaza, Route 54 Folsom, NJ 08037	(800) 756-3749 www.southjerseyenergy.com
Sprague Energy Corp. 12 Ridge Road Chatham Township, NJ 07928	(800) 225-1560 www.spragueenergy.com
Stuyvesant Energy LLC 10 West Ivy Lane, Suite 4 Englewood, NJ 07631	(800) 646-6457 www.stuyfuel.com
Woodruff Energy 73 Water Street Bridgeton, NJ 08302	(800) 557-1121 www.woodruffenergy.com

APPENDIX 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.

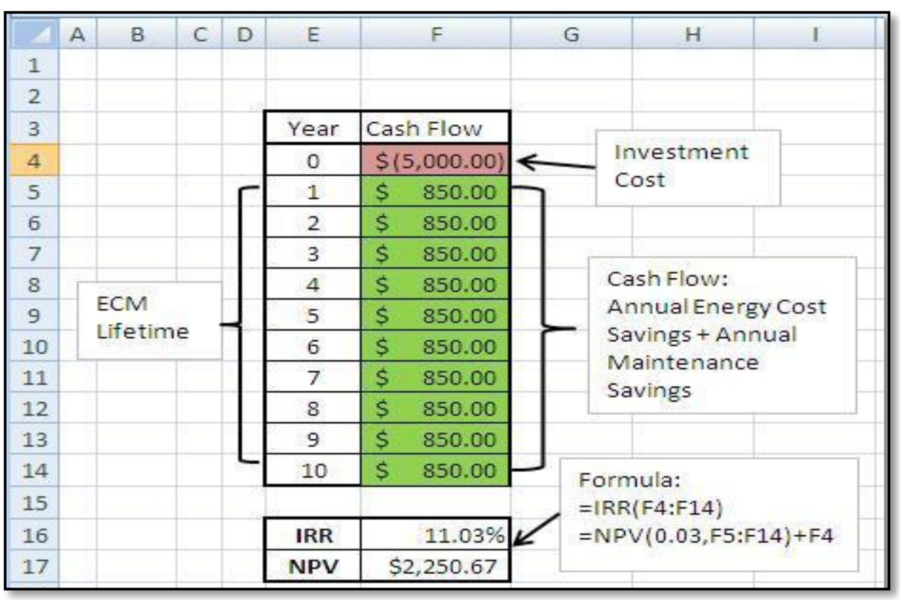
Calculation References

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

STATEMENT OF ENERGY PERFORMANCE
City of Orange Township - Washington Street Fire House

Building ID: 2337734
For 12-month Period Ending: February 28, 2010[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: September 14, 2010

Facility
City of Orange Township - Washington Street Fire House
261 Washington Street
Orange, NJ 07050

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1884
Gross Floor Area (ft^2): 10,328

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	155,996
Natural Gas (kBtu)[4]	1,136,049
Total Energy (kBtu)	1,292,045
Energy Intensity[5]	
Site (kBtu/ft^2/yr)	125
Source (kBtu/ft^2/yr)	166
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	84
Electric Distribution Utility	
Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	6%
Building Type	Fire Station/Police Station

Stamp of Certifying Professional

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

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/.

APPENDIX G: ENERGY CONSERVATION MEASURES

	ECM #	ECM description	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	**Install ten (10) new CFL fixtures**	None at this time	90	1,518	0.3	N/A	0.5	44	304	5	1,519	0.3	1,588	318	337	1,293	2,080
	2	**Install three (3) digital programmable thermostat to control all unit heaters**	75	426	0	0.0	114	1.1	0	128	5	642	3.3	51	10	30	1,086	0
	3	**Install one (1) VendingMiser™ device on the refrigerated vending machine**	None at this time	199	365	0.1	N/A	0.1	0	62	5	312	3.2	57	11	17	85	500
	4	**Install five (5) new occupancy sensors**	100	1,000	1,735	0.4	N/A	0.6	0	297	15	4,452	3.4	345	23	29	2,492	2,378

	ECM #	ECM description	est. incentives, $	net est. ECM cost with incentives, $	kWh, 1st yr savings	kW, demand reduction/mo	therms, 1st yr savings	kBtu/sq ft, 1st yr savings	est. operating cost, 1st yr savings, $	total 1st yr savings, $	life of measure, yrs	est. lifetime cost savings, $	simple payback, yrs	lifetime return on investment, %	annual return on investment, %	internal rate of return, %	net present value, $	CO_2 reduced, lbs/yr
5-10 Year Payback	5	**Install TRVs on all steam radiators**	None at this time	700	0	0.0	85	0.8	0	96	20	1,920	7.3	174	9	11	430	995
	6	**Install one (1) new pulse start metal halide fixture**	25	675	263	0.1	N/A	0.1	27	72	15	1,082	9.4	60	4	7	174	360
	7	**Replace one (1) large refrigerator with an ENERGY STAR® model**	None at this time	479	289	0.1	N/A	0.1	0	49	12	593	9.7	24	2	6	103	396
	8	**Install twenty-nine (29) new T8 fluorescent fixtures**	435	1,567	551	0.1	0	0.5	61	161	15	2,420	9.7	54	4	6	332	987
	9	**Replace one (1) window air conditioning unit with ENERGY STAR® efficient type**	None at this time	605	360	0.1	N/A	0.1	0	62	15	923	9.8	53	4	6	119	493

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

APPENDIX H: VendingMiser™ Energy Savings Calculator

EnergyMisers

VendingMiser® CoolerMiser™ SnackMiser™ PlugMiser™ VM2iQ® CM2iQ®

Savings Calculator

Please replace the default values in the table below with your location's unique information and then click on the "calculate savings" button.
Note: To calculate for CoolerMiser, use the equivalent VendingMiser results. To calculate for PlugMiser, use the equivalent SnackMiser results.

Energy Costs ($0.000 per kWh)	.171
Facility Occupied Hours per Week	84
Number of Cold Drink Vending Machines	1
Number of Non-refrigerated Snack Machines	0
Power Requirements of Cold Drink Machine (Watts; 400 typical)	100
Power Requirements of Snack Machine (Watts; 80 typical)	0
VendingMiser® Sale Price (for cold drink machines)	199
SnackMiser™ Sale Price (for snack machines)	0

Calculate Savings!

Results of your location's projected savings with VendingMiser® installed:

COLD DRINK MACHINES	Current	Projected	Total Savings	% Savings
kWh	874	510	364	42%
Cost of Operation	$149.39	$87.14	$62.24	42%

SNACK MACHINES	Current	Projected	Total Savings	% Savings
kWh	0	0	0	NaN%
Cost of Operation	$0	$0	$0	NaN%

Location's Total Annual Savings

	Current	Projected	Total Savings	% Savings
kWh	874	510	364	42%
Cost of Operation	$149.39	$87.14	$62.24	42%

Total Project Cost	Break Even (Months)
$199	38.37

Estimated Five Year Savings on ALL Machines = $311.22

APPENDIX I: METHOD OF ANALYSIS

Assumptions and tools

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

Disclaimer

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

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