ROXBURY TOWNSHIP
CHEMICAL ENGINE COMPANY NO. 3
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

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CHA PROJECT NO. 20556

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1.0 INTRODUCTION & BACKGROUND

This report summarizes the energy audit for the Roxbury Township Chemical Engine Company No. 3 (Fire Company No. 3) facility. The single story, approximately 5,850 square foot building houses volunteer fire company vehicles, offices, and equipment.

New Jersey's Clean Energy Program, funded by the New Jersey Board of Public Utilities, supports energy efficiency and sustainability for Municipal and Local Government Energy Audits. Through the support of a utility trust fund, New Jersey is able to assist state and local authorities in reducing energy consumption while increasing comfort.

2.0 EXECUTIVE SUMMARY

This report details the results of the energy audit for the Roxbury Township Fire Engine Company No. 3 (Fire Company No. 3) facility in Roxbury, New Jersey. The building houses volunteer fire company vehicles, offices, and equipment. The following areas were evaluated for energy conservation measures:

- Lighting replacement with occupancy sensors
- Door seal replacement
- Energy management control system
- Window replacement

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Measures which are recommended for implementation have a payback of 10 years or less. This threshold is considered a viable return on investment. Potential annual savings of $4,000 for the recommended ECMs may be realized with a payback of 3.4 years.

The ECMs identified in this report will allow for the building to reduce its energy usage and if pursued has the opportunity to qualify for the New Jersey SmartStart Buildings Program. A summary of the costs, savings, and paybacks for the recommended ECMs follows:

ECM-1c Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
5,600	2.0	3,130	0	600	0.6	800	9.3	8.0

*Incentive is based on the New Jersey Smart Start Prescriptive Lighting Measures.

ECM-2 Install Door Seals

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
500	0	130	120	250	4.4	NA	2.0	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

ECM-4c Energy Management Control System

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
500	0.0	1,900	1,300	2,400	65.9	NA	0.2	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

ECM-5 Install New Furnaces

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
8,200	0	0	400	800	0.9	NA	10.3	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

3.0 EXISTING CONDITIONS

3.1 Building General

3.1.1 Structure

The Fire Company No. 3 facility was constructed in 1958, and is an approximately 5,850 square foot building consisting of a vehicle garage, offices, storage rooms, kitchen, front meeting room, and rear recreation room.

The exterior is composed of face brick and concrete masonry unit (CMU) blocks built on a concrete foundation. The interior walls are constructed of CMU and gypsum board. The windows and doors are single pane glass with wood frames. The building has one main entrance adjacent to the meeting room, and three emergency exit doors around the perimeter. The roof system is a pitched asphalt shingles, and is in good condition based on visual observation.

3.1.2 Operating Hours

The building houses a volunteer fire company; therefore, is unoccupied for most of the time during the week. Based on discussions with township personnel, it is typically occupied Wednesday evenings, Saturdays, and as required by the township's volunteer fire fighters.

3.2 Utility Usage

The building uses electricity, no. 2 fuel oil, well water, and is connected into the township's sewage system.

Electricity is purchased and delivered by Jersey Central Power & Light (JCP&L), and no. 2 fuel oil purchased and delivered by Finch Fuel Oil Company. For 2008, the building had an annual electricity consumption of 18,330 kWh at a cost of $3,400, and fuel oil purchases of approximately 3,010 gallons at a cost of $8,000. Total utility charges for 2008 were $11,400.

The largest portion of energy usage is for electricity and the average blended rate was $0.186 per kWh. The electricity usage trend shows higher consumption during the winter months. The building had a maximum kW demand of 14.1 kW and a minimum kW of 12.0 kW in 2008. The monthly average over the observed 12-month period was 13.3 kW.

The majority of fuel oil is used for building heating as indicative of the higher usage trend during the colder months. The average blended rate for fuel oil was $2.66 per gallon.

Since the building uses well water, water usage and cost information was not available. Water conservation measures were not considered due to the low building occupancy.

Utility data is provided in Appendix A.

3.3 HVAC Systems

3.3.1 Central System

The building has two original 250,000 Btu/hr no. 2 fuel oil Heil Quaker furnaces which distribute warm air throughout the building; Appendix B provides an Equipment Inventory. Central cooling is provided to the front meeting area and adjacent kitchen space, which comprise approximately 30% of the building, by one York 5-ton condensing unit with a direct expansion (DX) coil located inside one of the Heil Quaker furnace units. The unit was installed in 2002. The other furnace serves the remainder of the building, which is not centrally cooled.

3.3.2 Window Air Conditioners

The building utilizes one small window air conditioning unit located in the rear recreation room. The unit provides approximately 10,000 Btuh of cooling and is controlled by an individual thermostat.

3.3.3 Hot Water Heating Systems

Hot water is produced by one A.O. Smith electric hot water tank located in the men's restroom. The tank has a capacity of 80 gallons and utilizes 9 kW of electricity when both elements are energized. The unit was installed in 1985 and is nearing its useable life expectancy.

3.3.4 Controls

The building does not have a direct digital control (DDC) system to monitor the building's heating, air conditioning, and ventilating systems. A DDC system would provide the building with a central user interface used to schedule the HVAC equipment to turn off or provide temperature setback during unoccupied hours.

Two wall mounted thermostats control the space temperature provided by the two furnaces. One thermostat is programmable and located in the front meeting room; the other is a standard non-programmable dial-type unit located in the vehicle garage.

3.4 Lighting/Electrical Systems

The interior lighting within the building is comprised of mainly inefficient T-12 fluorescent light fixtures. The T-12s are original to building construction and are a mixture of 4' and 8' as well as 2' u-tube fixtures. Lighting is controlled by individual switches in each space. The lighting within the building remains in use with occupancy.

The exit signs are not illuminated, and consist of paper-type signage that is original to the building. It is recommended that exit signs be illuminated using energy efficient LED type signs, or self-luminous exit signs. LED signs do not require light bulbs for illumination. Self-luminous signs, which use a self-contained illumination source such as tritium, are advantageous when electrical wiring installation is not feasible.

The building's exterior lighting consists of a mixture of quartz tungsten, incandescent, and compact fluorescent fixtures that utilize bulbs ranging from 13 to 150 watts. The exterior lighting is controlled by a timer or switches within the building.

3.5 Plumbing Systems

The plumbing system consists of domestic well water, sanitary, and vent piping. Domestic hot water is generated by one electric hot water heater with a storage capacity of 80 gallons. Plumbing fixtures include urinals, toilets, sinks, showers, and floor drains.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1a Lighting Replacements

A comprehensive fixture survey was conducted of the entire building. Each switch and circuit was identified, and the number of fixtures, locations, and existing wattage established. Most of the lighting consists of T-12 fluorescent fixtures with magnetic ballasts, which are regarded as inefficient by today's standards.

Overall energy consumption can be reduced by retrofitting approximately 20 4' T-12 fixtures with more efficient T-8 fluorescent lamps. Existing T-12 lamps and ballasts of each fixture can be replaced with electronic ballasts and two or four 4' or 2', T-8 fluorescent lamps as required. The garage is equipped with approximately 17 T-12 fixtures which contain two 8' lamps each. While these fixtures are approximately 10% less efficient than comparable T-8s, the garage is only used approximately 500 hours per year. Therefore, replacing the fixtures would not be a viable energy saving option, and was not further evaluated.

This measure will allow the building to stock only T-8 4' lamps in the future. Presently the building has a mixture of T-12 and T-8 lamps with multiple ballast combinations. The building should only purchase low wattage T-8s and ballasts such as the low wattage 4' 28 watt units. These lamps may be directly installed into any existing 34 watt fixture when lamps fail. Over time, the most efficient lighting system available will be consistent throughout the building.

The fluorescent lighting retrofits have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 28,500 kWh and $6,000.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-1a Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
3,700	2.0	1,910	0	400	0.5	500	9.3	8.0

*Incentive is based on the New Jersey Smart Start Prescriptive Lighting Measures.

This measure is recommended when combined with ECM-1b; see ECM-1c.

4.2 ECM-1b Install Occupancy Sensors

It is proposed that occupancy sensors be installed in selected rooms to turn off lights when the area is unoccupied. A lighting survey was conducted of all fixtures to determine the average time lights are presently on in each space. Occupancy sensors were not considered in mechanical areas, garage areas, and hallways due to safety concerns. Other areas were not considered due to the proposed location of occupancy sensors. If a sensor does not have a clear view of the area, it may darken even with people in the space, creating an unsafe condition.

Lighting fixtures throughout the building are manually turned on and off at switches located within the spaces. The lights are operational as needed based on occupancy of the facility. Each interior building light is assumed to be operated approximately 20 hours per week.

Typical traffic patterns for each space were then taken into account to approximate the actual occupancy hours per day. Approximately nine occupancy sensors and some standard electrical work are required for this measure.

Lighting controls have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 27,800 kWh, and $4,500.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-1b Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,800	0.0	1,850	0	300	1.7	300	6.0	5.0

*Incentive is based on the New Jersey Smart Start Prescriptive Lighting Measures.

This measure is recommended when combined with ECM-1a; see ECM-1c.

4.3 ECM-1c Lighting Replacements with Occupancy Sensors

This measure is a combination of ECMs 1a and 1b to allow for maximum energy and demand reduction. Due to interactive effects, the energy and cost savings for occupancy sensors and lighting upgrades are not cumulative.

The lighting retrofits and controls have an expected lifetime of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 46,500 kWh, and $9,000.

The implementation cost and savings related to this ECM are presented in Appendix C and summarized below:

ECM-1c Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,600	2.0	3,130	0	600	0.6	800	9.3	8.0

*Incentive is based on the New Jersey Smart Start Prescriptive Lighting Measures.

This measure is recommended.

4.4 ECM-2 Install Door Seals

The doors are original to the building's construction and the gaps around the perimeters result in air infiltration. Installing door seals will reduce infiltration and save energy. This measure determined the perimeter length and gap spacing of the doors; garage doors were not included. Infiltration reductions and associated energy savings were then calculated by using weather bin heating and cooling hour data.

Door seals have an expected life of 10 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 1,300 kWh, 1,200 therms and $2,500.

The implementation cost and savings related to this ECM are presented in Appendix D and summarized below:

ECM-2 Install Door Seals

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
500	0	130	120	250	4.4	NA	2.0	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

This measure is recommended.

4.5 ECM-3 Window Replacements

The windows, single pane glass and original to building construction, incur infiltration, cold drafts, and heat loss. This ECM evaluates replacement with new energy efficient windows.

This measure was calculated by determining the square footage and perimeter length of the single pane windows. The building has approximately 190 square feet of window area. Weather bin data determined heating and cooling hours and associated energy savings. Window replacement is not recommended due to the long payback, additional considerations may be improved comfort and appearance.

Windows have an expected life of 20 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 1,400 kWh, 10,000 therms and $20,000.

The implementation cost and savings related to this ECM are presented in Appendix E and summarized below:

ECM-3 Window Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
18,100	0.02	70	500	1,000	0.1	NA	18.1	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

This measure is not recommended.

4.6 ECM-4a Night Setback Controls

The building's HVAC systems have one existing programmable thermostat and one nonprogrammable thermostat for controlling space temperature; however, temperature setback is not utilized. This measure proposes that new programmable thermostats be installed and programmed for night setback of the heating and cooling space temperatures. As part of this measure, all air cooled condensers should be cleaned to reduce the operating head pressure of the compressors, improving system efficiency.

It should be noted that the Township of Roxbury could achieve similar energy savings without installation of new programmable thermostats if the one existing programmable thermostat was programmed for a night setback of 80°F for unoccupied summer cooling, and 60°F for unoccupied winter heating. The programmable thermostat would need to be secured so that occupants could not change the programmed night setback. In addition, a programmable thermostat would need to be installed in place of the nonprogrammable unit located in the vehicle garage.

Programmable thermostats have an expected lifetime of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 16,500 kWh, 19,500 therms and $40,500.

The implementation cost and savings related to this ECM are presented in Appendix F and summarized as follows:

ECM-4a Night Setback Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
500	0.0	1,100	1,300	2,700	74.2	NA	0.2	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

This measure is recommended when combined with ECM-4b; see ECM-4c.

4.7 ECM-4b Night Shutdown

As noted, one existing programmable thermostat and one nonprogrammable thermostat for controlling space temperature exists; however, night shut down is not utilized. This measure proposes that the programmable thermostats be installed and programmed for night shutdown. This measure calculates energy savings based on shutting down electric components such as furnace fans.

Programmable thermostats have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 13,500 kWh and $3,000.

The implementation cost and savings related to this ECM are presented in Appendix G and summarized as follows:

ECM-4b Night Shutdown

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
500	0.0	900	0	200	3.6	NA	2.5	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

It should be noted that the Township of Roxbury could achieve similar energy savings without the installation of programmable thermostats. Local controls or timeclocks could achieve the same effect at lower cost.

This measure is recommended when combined with ECM-4a; see ECM-4c.

4.8 ECM-4c Energy Management Control System

This measure proposes to install programmable thermostats which would control space temperature from a single location. This measure combines ECM-4a and b into an integrated control system. Implementing these measures would result in annual savings since less energy will be required to heat and cool the outside air. Utilizing programmable thermostats will also provide occupant comfort.

The programmable thermostats have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 28,500 kWh, 19,500 therms and $36,000.

The implementation cost and savings related to this ECM are presented in Appendix H and summarized below:

ECM-4c Energy Management Control System

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
500	0.0	1,900	1,300	2,400	65.9	NA	0.2	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

This measure is recommended.

4.9 ECM-5 Install New Furnaces

The building has two original 250,000 Btu/hr no. 2 fuel oil Heil Quaker furnaces which distribute warm air throughout the building and are estimated to be 75% efficient. There are currently more efficient units that can provide efficiencies of up to 83%. The energy saved is determined by comparing the difference in the energy used by the existing furnaces and proposed new furnaces. Modifications to the existing ductwork, electrical wiring, and flue stacks would also be required.

The high efficiency furnace has an expected life of 20 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 8,000 therms, and $16,000.

The implementation cost and savings related to this ECM are presented in Appendix I and summarized below:

ECM-5 Install New Furnaces

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
8,200	0	0	400	800	0.9	NA	10.3	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

This measure is recommended.

5.0 POTENTIAL INCENTIVES

5.1 Incentives Overview

The Fire Company No. 3 facility energy conservation project may be eligible for incentives by the New Jersey Office of Clean Energy. The largest incentives available will be for the New Jersey Pay for Performance (P4P) Program. The P4P program is designed for qualified energy conservation projects in facilities that consume a minimum annual peak electric demand of 200 kW per month (building is eligible if the demand in any of the preceding 12 months exceeds 200kW). Facilities that meet this criterion must also achieve a minimum performance target of 15% by using an approved simulation modeling tool before and after construction. To utilize this program, a P4P Partner would need to be engaged.

Incentives for the P4P program include the following:

- Incentive #1: The P4P Program pays $0.05 per square foot to a maximum of $50,000 or 50% of building annual energy cost for the P4P Partner to develop an Energy Reduction Plan (ERP). This incentive is paid after approval of the ERP and signed Installation Agreement. Applicant must agree to commit to implementation of the ERP within 6 months or the incentive must be returned to the state.

- Incentive #2: Paid after installation of recommended measures; base incentives deliver $0.11/kWh and $1.10/therm not to exceed 30% of total project cost.

- Incentive #3: Paid after acceptance of Post-Construction Benchmarking Report showing energy savings over one year utilizing the approved simulation modeling tool and EPA Portfolio Manager. Incentive #3 base incentives deliver $0.07/kWh and $0.70/therm not to exceed 20% of total project cost.

Combining Incentives #2 and #3 will deliver a total of $0.18/ kWh and $1.80/therm not to exceed 50% of total project cost. Incentives for #2 and #3 are increased by $0.005/kWh and $0.05/therm for each percentage increase above the minimum performance target calculated with the approved simulation modeling tool, not to exceed 50% of total project cost.

A new incentive structure has been announced for projects exceeding 20% in energy savings utilizing the required EPA portfolio manager benchmarking tool. The new incentive structure will double incentives #2 and #3 therefore producing a total of $0.36/kWh and a $3.60/ therm for those projects exceeding 20%. Incentive #1 for application preparation and energy reduction plan development has not changed however the maximum incentive has now been raised to 80% of project costs. The 200 kW/month minimum annual peak electric demand has been dropped so any structure can apply. This incentive structure will be in effect until December 31, 2010.

Incentives are also available for prescriptive measures for various types of equipment under the New Jersey SmartStart Buildings incentive program. This program provides incentives dependent upon the existing equipment type and proposed equipment retrofit measure. Prescriptive measures under this program are paid after installation and no energy savings verification will be required. If applicable, incentives from this program are reflected in the ECM summaries and attached appendices. If the building qualifies and enters into the New Jersey P4P Program, all energy savings from recommended ECMs are included in the total building energy usage and savings to be applied towards the P4P incentive, including any ECMs that may have incentives available in the SmartStart Buildings program. A project is not applicable for incentives in both programs.

5.2 Building Incentives

5.2.1 New Jersey P4P Program

The building is eligible for incentives under the New Jersey P4P Program. For the 5,850 square foot building, Incentive #1 corresponds to approximately $300. Since the overall energy reduction for the building is estimated to exceed the 15% minimum, the building is eligible for Incentives #2 and #3. When calculating the total Incentive #2 and #3 for the New Jersey P4P Program, all energy conservation measures are included as the amount received is based on building wide energy improvements. If all the energy conservation measures analyzed in this report are implemented, the total available incentive is up to $22,500.

5.2.2 New Jersey SmartStart Buildings Program

The building is also eligible for incentives under the New Jersey SmartStart Buildings Program for the Lighting Replacements with Occupancy Sensors energy conservation measures (ECM-1c) suggested in this study. The total amount of all qualified incentives is about $800.

As mentioned previously, a project cannot apply for incentives from both the P4P Program and the SmartStart Buildings Program for the same project. See Appendix J for calculations.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

Geothermal heat pumps (GHP) transfer heat between the constant temperature of the earth and the building to maintain the building's interior space conditions. Below the surface of the earth throughout New Jersey the temperature remains in the low 50°F range throughout the year. This stable temperature provides a source for heat in the winter and a means to reject excess heat in the summer. With GHP systems, water is circulated between the building and the piping buried in the ground. The ground heat exchanger in a GHP system is made up of a closed or open loop pipe system. Most common is the closed loop in which high density polyethylene pipe is buried horizontally at 4-6 feet deep or vertically at 100 to 400 feet deep. These pipes are filled with an environmentally friendly antifreeze/water solution that acts as a heat exchanger. In the summer, the water picks up heat from the building and moves it to the ground. In the winter the system reverses and fluid picks up heat from the ground and moves it to the building. Heat pumps make collection and transfer of this heat to and from the building possible.

The Fire Company No. 3 facility has two original 250,000 Btu #2 oil Heil Quaker furnaces distributing warm air throughout the building. Cooling is provided by (1) York five ton condensing unit with a DX coil inside one furnace unit that serves the meeting and kitchen area. One window unit serves an office in the apparatus bay. To take advantage of a GHP system, the building would have to install a low temperature closed loop water source heat pump system to realize the benefit of the consistent temperature of the ground. This will also include the removal of the existing heating and cooling system.

This measure is not recommended due to the high cost to replace the existing systems.

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The building was evaluated for the potential to install rooftop photovoltaic (PV) solar panels for power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC current is converted to alternating current (AC) with the use of an electrical device known as an inverter. The building's roof has sufficient room to install a large solar cell array. A structural analysis would be required to determine if the roof framing could support a cell array.

The PVWATTS solar power generation model was utilized to calculate PV power generation. The New Jersey Clean Power Estimator provided by the New Jersey Clean Energy Program is presently being updated; therefore, the site recommended use of the PVWAT solar grid analyzer version 1. The closest city available in the model is Newark, New Jersey and a fixed tilt array type was utilized to calculate energy production. The PVWAT solar power generation model is provided in Appendix K.

The State of New Jersey incentives for non-residential PV applications is $1.00/watt up to 50 kW of installed PV array. Federal tax credits are also available for renewable energy projects up to 30% of installation cost. Municipalities do not pay federal taxes; therefore, would not be able to utilize the federal tax credit incentive.

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission

producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. The cost of the ACP penalty for 2009 is $689; this is the amount that must be paid per SERC by the high emission producers. The expected dollar amount that will be paid to the PV producer for 2009 is expected to be $600/SREC credit. Payments that will be received from the PV producer will change from year to year dependent upon supply and demand. Renewable Energy Consultants is a third party SREC broker that has been approved by the New Jersey Clean Energy Program. As stated above there is no definitive way to calculate an exact price that will be received by the PV producer per SREC over the next 15 years. Renewable Energy Consultants estimated an average of $487/ SERC per year and this number was utilized in the cash flow for this report.

The Fire Company No. 3 facility had a maximum kW demand of 14.1 kW and a minimum kW of 12.0 kW over the 12 months considered in this study. The monthly average over the observed 12 month period was 13.3 kW. The building's existing load should justify the use of a 4 kW of installed PV solar array; therefore, a 4 kW system size was selected for the calculations. The building's roof has only limited southern exposure and would not support a larger system. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Agency) estimates of total cost of system installation. It should be noted that the cost of installation is currently $10 per watt or $10,000 per kW of installed system. This has increased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

ECM – S1 Photovoltaic (PV) Rooftop Solar Power Generation – 4 kW System

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive*	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		Natural gas	Total					
$	kW	kWh	Therms	$	$	$	$	Years	Years
40,000	0	4,730	0	900	900	4,000	2,300	>30	11.3

*Incentive based on New Jersey Renewable Energy Program for non-residential applications of $1.00 per Watt of installed capacity
** Estimated Solar Renewable Energy Certificate Program (SREC) for 15 years at $487/1000 kWh

This measure is not recommended at this time due to the long payback period; however, it could be a potentially viable renewable measure to be considered in the future if electricity rates continue to increase and if PV installation costs decline below $10 per watt.

6.2.2 Solar Thermal Domestic Hot Water Plant

Active solar thermal systems use solar collectors to gather the sun's energy to heat water, another fluid, or air. An absorber in the collector converts the sun's energy into heat. The heat is then transferred by circulating water, antifreeze, or sometimes air to another location for immediate use or storage for later utilization. Applications for active solar thermal energy include providing hot water, heating swimming pools, space heating, and preheating air in residential and commercial buildings.

A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed

on the roof of the building, oriented south, and tilted around the site's latitude, to maximize the amount of radiation collected on a yearly basis.

Several options exist for using active solar thermal systems for space heating. The most common method involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system). The most practical system for the site would transfer the heat from the panels to thermal storage tanks and transfer solar produced thermal energy to use for domestic hot water production.

As of the writing of this report, there are no incentives available for installation of thermal solar systems. Presently there is a federal tax credit of 30% of installation cost for the thermal applications, however the Township of Roxbury does not pay federal taxes and, therefore, would not benefit from this program.

The implementation cost and savings related to this ECM are presented in Appendix L and summarized as follows:

ECM – S2 Solar Thermal Domestic Hot Water Plant

Budgetary	Annual Utility Savings				Total	New Jersey Renewable	Payback	Payback
Cost					Savings	Energy Incentive	(without incentive)	(with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
5,700	0	160	0	100	100	NA	>30	NA

* No incentive is available in New Jersey at this time.

This measure is not recommended.

6.3 Wind

Small wind turbines use a horizontal axis propeller, or rotor, to capture the kinetic energy of the wind and convert it into rotary motion to drive a generator which usually is designed specifically for the wind turbine. The rotor consists of two or three blades, usually made from wood or fiberglass. These materials give the turbine the needed strength and flexibility, and have the added advantage of not interfering with television signals. The structural backbone of the wind turbine is the mainframe, and includes the slip-rings that connect the wind turbine, which rotates as it points into changing wind directions, and the fixed tower wiring. The tail aligns the rotor into the wind.

To avoid turbulence and capture greater wind energy, turbines are mounted on towers. Turbines should be mounted at least 30 feet above any structure or natural feature within 300 feet of the installation. Smaller turbines can utilize shorter towers. For example, a 250-watt turbine may be mounted on a 30-50 foot tower, while a 10 kW turbine will usually need a tower of 80-120 feet. Tower designs include tubular or latticed, guyed or self-supporting. Wind turbine manufacturers also provide towers.

The New Jersey Clean Energy Program for small wind installations has designated numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine installations are based on kilowatt hours saved in the first year. Systems sized under 16,000 kWh per year of production will receive a $3.20 per kWh incentive. Systems producing over 16,000 kWh will receive $51,200 for the first 16,000 kWh of production with an additional $0.50 per kWh up to a maximum cap of 750,000 kWh per year. Federal tax credits are also available for renewable energy projects up to 30% of installation cost for systems less than 100 kW. However, as noted previously, municipalities do not pay federal taxes and are, therefore, not eligible for the tax credit incentive.

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. In the Roxbury New Jersey area, the map indicates a mean annual wind speed of below 10 miles per hour. For the building, there are site restrictions. Parking lots, radio communication towers, trees, and local residential housing would greatly affect a tower location.

An aerial satellite image of the site and wind speed map is included in Appendix M.

This measure is not recommended due to the low mean annual wind speed.

6.4 Combined Heat and Power Generation (CHP)

Combined heat and power, cogeneration, is self-production of electricity on-site with beneficial recovery of the heat byproduct from the electrical generator. Common CHP equipment includes reciprocating engine-driven, micro turbines, steam turbines, and fuel cells. Typical CHP customers include industrial, commercial, institutional, educational institutions, and multifamily residential facilities. CHP systems that are commercially viable at the present time are sized approximately 50 kW and above, with numerous options in blocks grouped around 300 kW, 800 kW, 1,200 kW and larger. Typically, CHP systems are used to produce a portion of the electricity needed by a building some or all of the time, with the balance of electric needs satisfied by purchase from the grid.

Any proposed CHP project will need to consider many factors, such as existing system load, use of thermal energy produced, system size, natural gas fuel availability, and proposed plant location.

The Fire Company No. 3 facility has sufficient need for electrical generation and the ability to use most of the thermal byproduct during the winter. Thermal usage during the summer months is low, and thermal energy produced by the CHP plant will be wasted. An absorption chiller could be installed to utilize the heat to produce chilled water; however, there is no chilled water distribution system in the building.

The most viable option for a CHP plant would be a reciprocating engine natural gas-fired unit. However, since the building does not have natural gas service, this option is not viable.

This measure is not recommended due to not having access to natural gas and limited use of summertime heat.

6.5 Biomass Power Generation

Biomass power generation is a process in which waste organic materials are used to produce electricity or thermal energy. These materials would otherwise be sent to the landfill or expelled to the atmosphere. To participate in NJCEP's Customer On-Site Renewable Energy program, participants must install an on-site sustainable biomass or fuel cell energy generation system. Incentives for bio-power installations are available to support up to 1MW-dc of rated capacity.

*Class I organic residues are eligible for funding through the NJCEP CORE program. Class I wastes include the following renewable supply of organic material:

- Wood wastes not adulterated with chemicals, glues or adhesives
- Agricultural residues (corn stover, rice hulls or nut shells, manures, poultry litter, horse manure, etc) and/or methane gases from landfills
- Food wastes

- Municipal tree trimming and grass clipping wastes

- Paper and cardboard wastes
- Non adulterated construction wood wastes, pallets

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

- Digestion of sewage sludge
- Landfill gas facilities
- Combustion of wood wastes to steam turbine
- Gasification of wood wastes to reciprocating engine
- Gasification or pyrolysis of bio-solid wastes to generation equipment

* from NJOCE Website

This measure is not recommended because the site does not have room to store the waste organic materials, noise issues, and potential zoning issues.

6.6 Demand Response Curtailment

Presently, the Fire Company No. 3 facility has electricity delivered and supplied by Jersey Central Power and Lighting Corporation (JCP&L). Utility curtailment is an agreement with the regional transmission organization and an approved Curtailment Service Providers (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a building utilizing an emergency generator, therefore reducing the electrical demand on the utility grid. PJM is the regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia including the State of New Jersey.

This program is to benefit the utility company during high demand periods and PJM offers incentives to the CSP to participate in this program. Enrolling in the program will require program participants to drop electrical load or turn on their emergency generators during high electrical demand conditions or during emergencies. Part of the program also will require that program participants reduce their required load or run their emergency generators with notice to test the system. A minimum of 100 kW of curtailable load is required to enter the program. Discussions with the EnerNoc Corporation, an approved CSP, indicate that existing emergency generators will not pass the emissions requirements to enter the program.

Presently, the building operates a 30 kW Kohler liquid propane back-up generator, and has an average kW demand during the observed period is 13.3 kW per month.

This measure is not recommended because the building does not have the ability to shed the required minimum load reduction.

7.0 EPA PORTFOLIO MANAGER

The United State Energy Protection Agency (EPA) is a federal agency in charge of regulating environment waste and policy in the United States. The EPA has released the EPA Portfolio Manager for public use. The program is designed to allow property owners and managers to share, compare and improve upon their building's energy consumption. Inputting such parameters at electricity, heating fuel, building characteristics and location into the website based program generates a naturalized energy rating score out of 100. Once an account is registered, monthly utility data can be entered to track the savings progress and retrieve an updated energy rating score on a monthly basis.

The building includes office areas, vehicle garage and equipment storage. Since more than 10% of the space is Other (i.e., Fire Station/Police Station), the building does not fall under the listed space description categories needed to generate a full report and provide an energy star rating. The portfolio manager did provide energy intensity ratings of a site intensity of 82 kBtu/ft^2.

The building's performance, however, can be compared to national site and source EUI averages. With a Source Energy Intensity of 82.1 kBTU/ft^2/year, the building is considered a moderate energy consumer per the Portfolio Manager. Reducing energy loss associated with lighting retrofit, occupancy sensor installation, door seals, applying night setback and shutdown, and furnace replacement will result in a more favorable score. If all the measures recommended in this report are fully implemented, it is projected that a Source Energy Usage Index of 47.8 kBTU/ft^2/year can be obtained.

A full EPA Energy Star Portfolio Manager Report is located in Appendix N. The user name and password was provided to Valarie Wyble, Executive Assistant, Township of Roxbury.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Roxbury Township Fire Engine Company No. 3 in Roxbury, New Jersey identified potential ECMs for lighting replacement with occupancy sensors, door seal replacement, and an energy management control system. Potential annual savings of $4,000 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-1c Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,600	2.0	3,130	0	600	0.6	800	9.3	8.0

*Incentive is based on the New Jersey Smart Start Prescriptive Lighting Measures.

ECM-2 Install Door Seals

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
500	0	130	120	250	4.4	NA	2.0	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

ECM-4c Energy Management Control System

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
500	0.0	1,900	1,300	2,400	65.9	NA	0.2	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

ECM-5 Install New Furnaces

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
8,200	0	0	400	800	0.9	NA	10.3	NA

* There is no incentive available through the New Jersey Smart Start program for this ECM.

APPENDIX A

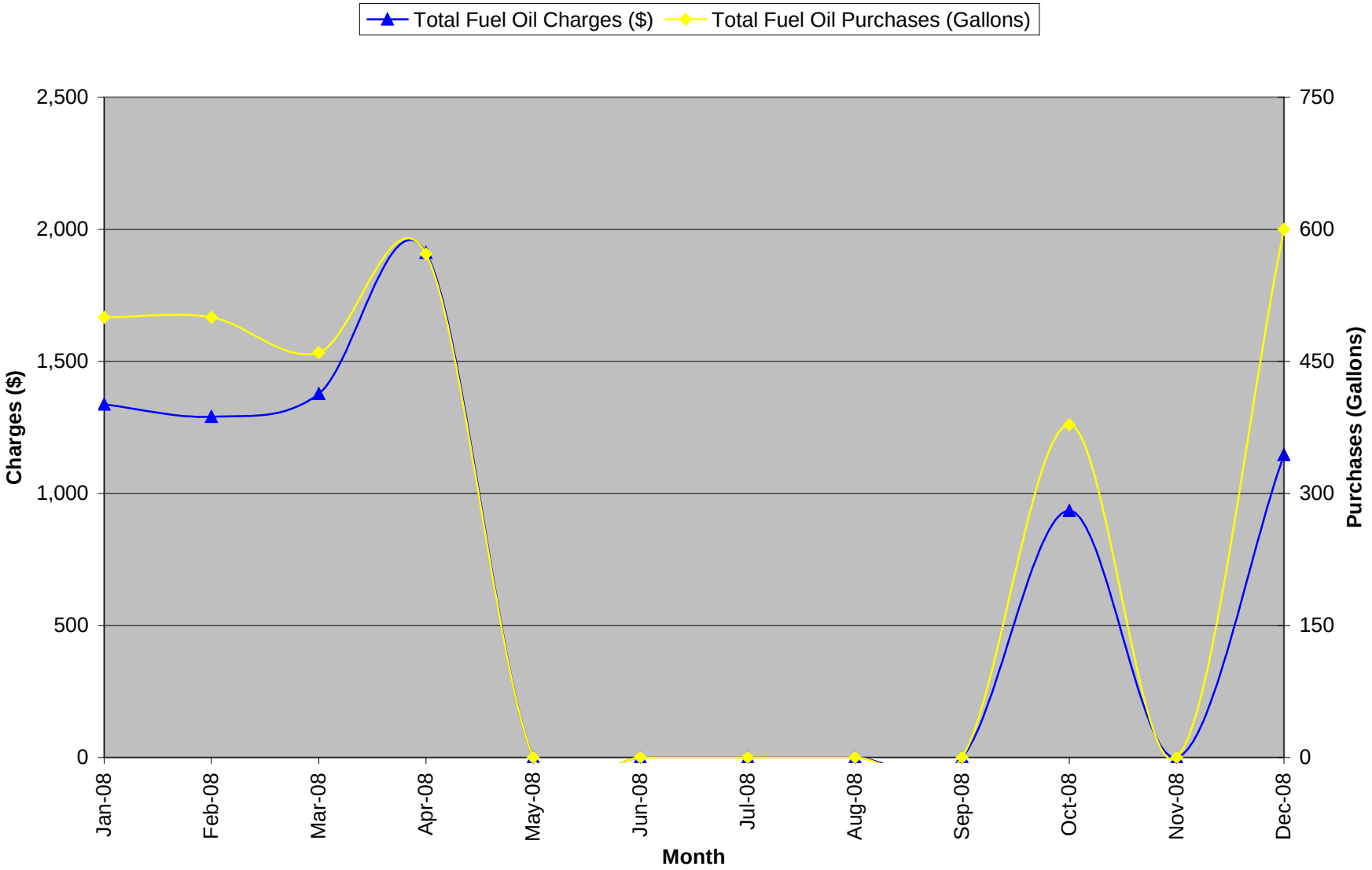
Utility Usage Analysis

New Jersey BPU Energy Audit Program
CHA #20556
Township of Roxbury Chemical Engine Company No. 3

Fuel Oil - Finch Fuel Oil Compny

	Date	Charge ($)	Total Gallons	$/Gal
1	January-08	1,337	500	**$2.67**
2	February-08	1,290	500	**$2.58**
3	March-08	1,378	460	**$2.99**
4	April-08	1,911	572	**$3.34**
5	May-08	0	0	**$0.00**
6	June-08	0	0	**$0.00**
7	July-08	0	0	**$0.00**
8	August-08	0	0	**$0.00**
9	September-08	0	0	**$0.00**
10	October-08	934	378	**$2.47**
11	November-08	0	0	**$0.00**
12	December-08	1,146	600	**$1.91**
	Total	$ 7,996	3,010	**$2.66**

Fuel Oil Usage - Township of Roxbury Chemical Engine Company No. 3



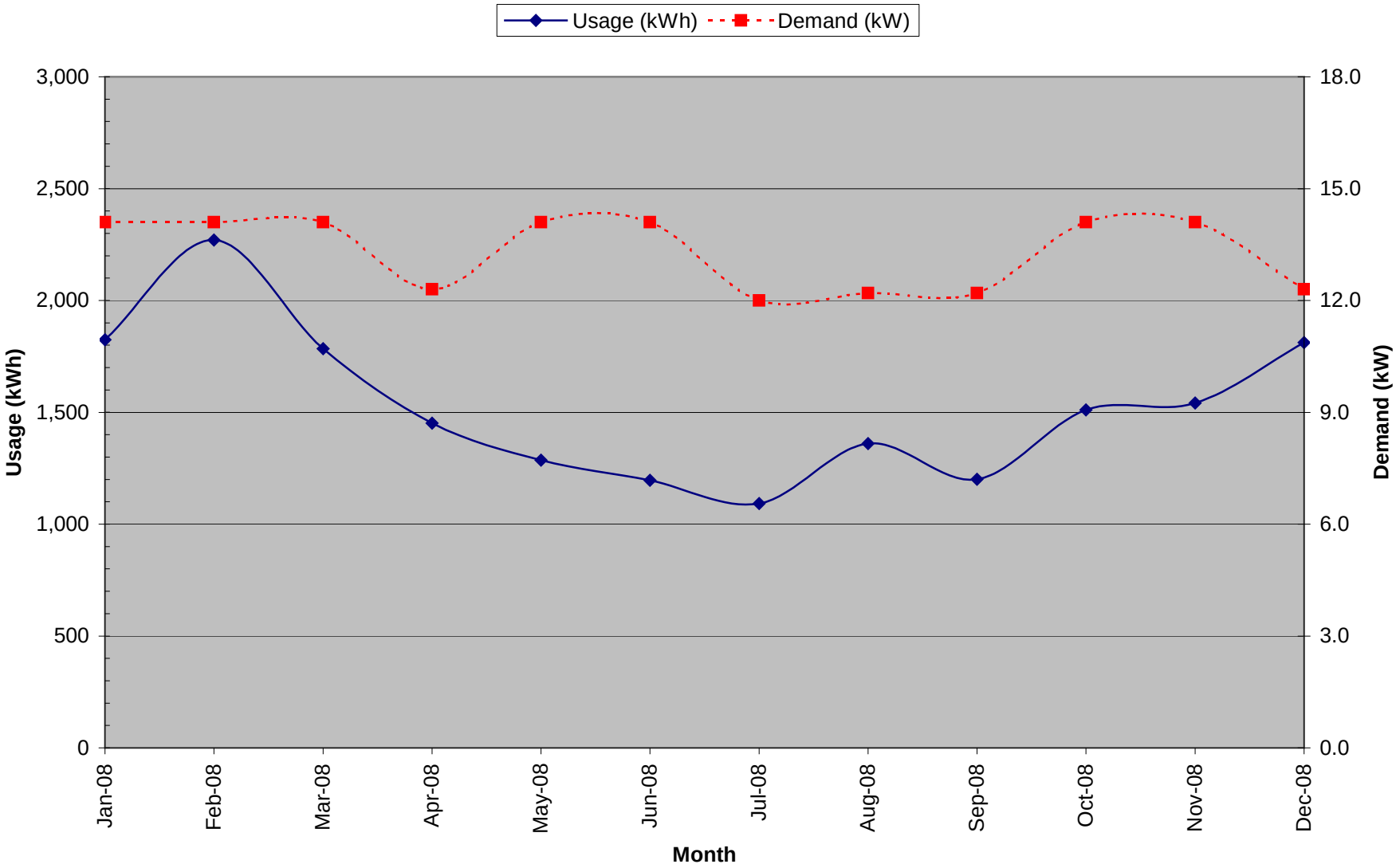
Utility Data - RoxburyFireHouse(Rev1).xls
Fuel Oil Chart

New Jersey BPU Energy Audit Program
CHA #20556
Township of Roxbury Chemical Engine Company No. 3

Account Number: 10 00 01 4250 8 9
Jersey Central Power and Lighting

	Electricity							Electricity										
	Period	Supply kWH	Delivery KW	Cost ($)	Blended Rate ($/kWH)	Unit Cost ($/kWH)	Unit Cost ($/kW)	Customer Charge	Energy Charge	Transmission Charge	Reconciliation Charge	Delivery Charge kWH	Delivery Charge kW	Non-Utility Gen. Chg	Societal Benefit	Transitional Assessment Charge	System Control	Total
1	1/1/2008	1,824	14.1	312.47	0.1713	0.1642	0.92	$3.25	$172.32	$9.21	$6.44	$61.46	$12.96	$30.94	$10.41	$5.34	$0.14	$312.47
2	2/1/2008	2,270	14.1	369.99	0.1630	0.1573	0.92	$3.25	$214.46	$11.51	$5.86	$63.67	$12.96	$38.50	$12.95	$6.65	$0.18	$369.99
3	3/1/2008	1,785	14.1	293.79	0.1646	0.1573	0.92	$3.25	$168.64	$9.05	-$7.20	$61.26	$12.96	$30.27	$10.19	$5.23	$0.14	$293.79
4	4/1/2008	1,451	12.3	253.58	0.1748	0.1645	1.21	$3.25	$137.08	$7.36	-$5.85	$59.61	$14.88	$24.61	$8.28	$4.25	$0.11	$253.58
5	5/1/2008	1,286	14.1	264.10	0.2054	0.1953	0.92	$3.25	$149.87	$6.52	-$4.94	$63.42	$12.96	$21.81	$7.34	$3.77	$0.10	$264.10
6	6/1/2008	1,196	14.1	264.75	0.2214	0.2105	0.92	$3.25	$152.20	$6.06	-$3.39	$62.97	$12.96	$20.28	$6.83	$3.50	$0.09	$264.75
7	7/1/2008	1,092	12.0	249.05	0.2281	0.2154	1.16	$3.25	$138.97	$5.54	-$3.09	$62.46	$13.88	$18.52	$6.23	$3.20	$0.09	$249.05
8	8/1/2008	1,360	12.2	292.38	0.2150	0.2038	1.25	$3.25	$173.07	$6.90	-$4.81	$63.78	$15.27	$23.07	$7.76	$3.98	$0.11	$292.38
9	9/1/2008	1,201	12.2	233.05	0.1940	0.1822	1.17	$3.25	$130.67	$6.13	-$10.43	$58.37	$14.23	$20.37	$6.85	$3.52	$0.09	$233.05
10	10/1/2008	1,511	14.1	274.68	0.1818	0.1732	0.92	$3.25	$164.40	$8.08	-$13.12	$59.90	$12.96	$25.63	$9.04	$4.42	$0.12	$274.68
11	11/1/2008	1,542	14.1	281.13	0.1823	0.1739	0.92	$3.25	$167.77	$8.25	-$11.88	$60.06	$12.96	$26.15	$9.94	$4.51	$0.12	$281.13
12	12/1/2008	1,812	12.3	324.44	0.1791	0.1750	0.59	$3.25	$197.15	$10.00	-$2.49	$61.40	$7.27	$30.73	$11.68	$5.31	$0.14	$324.44
Total		18,330	14.1	$ 3,413	0.1862	0.1777	0.98	$39.00	$1,966.60	$94.61	-$54.90	$738.36	$156.25	$310.88	$107.50	$53.68	$1.43	

Electric Usage - Township of Roxbury Chemical Engine Company No. 3



Utility Data - RoxburyFireHouse(Rev1).xls
Electricity Chart

APPENDIX B

Equipment Inventory

New Jersey BPU Energy Audit Program
CHA #20556
Township of Roxbury
Equipment Inventory - Volunteer Chemical Engine Company No. 3

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Areas Served	Date Installed	Useable Life Expectancy (years)	Other Info.
Furnace #1	Heil-Quaker	N/A	No. 2 Fuel Oil Furnace	250,000 Btu/hr	Utility Room	Meeting Room, Kitchen, Office	1958 est	Nearing useful life expectancy	
Furnace #2	Heil-Quaker	N/A	No. 2 Fuel Oil Furnace	250,000 Btu/hr	Utility Room	Garage	1958 est	Nearing useful life expectancy	
Split System	York	H4DH060S06A (S/N WFLM022330)	Split System AC Condensing Unit	Cooling - 5 Ton	Outside Kitchen	Meeting Room, Kitchen, Office	Jun-02	7	R-22: 7lb, 13oz SEER 12
		G2FD060H24A (S/N (S)XDLS077621)	Split System AC Coil		Utility Room	Meeting Room, Kitchen, Office	Apr-02	7	
Window AC	Kenmore	N/A	Window AC	10,000 BTU	Recreation Room	Recreation Room	N/A	N/A	
Hot Water Heater	A.O. Smith Water Products Co.	KEN 80 912 (S/N MJ85-47714-912)	HW Heater/Tank (electric)	80 gallons @ max - 4,500 watts (upper and lower)	Men's washroom	Entire Building	Jan-85	Nearing useful life expectancy	Electric unit
Emergency Generator	Kohler	30ERS (S/N 2121399)	Emergency Generator	30 kW	Outside	Lights, doors	unknown	unknown	LP fired
Kitchen Exhaust Fan	N/A	N/A	Belt Drive Exhaust Fan	N/A	Kitchen	Kitchen Stove	unknown	unknown	

APPENDIX C

ECM-1a Lighting Replacements

ECM-1b Install Occupancy Sensors

ECM-1c Lighting Replacements with Occupancy Sensors

Energy Audit of Roxbury Township

CHA Project No. 20556 - Fire Company No. 3

Existing Lighting

Cost of Electricity: **$0.178 $/kWh**

$0.98 $/kW

			EXISTING CONDITIONS									
		Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Retrofit Control**	**Annual kWh**	
	Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	Retrofit control device	(kW/space) * (Annual Hours)	Notes
Outdoor Lights	**209**	Above Front Garage Door	2	SP 13 W CF 2	CFQ13/2-L	28	0.1	SW	500	None	28	On switch, assume 20 hrs/wk
	242	Above Front Garage Door	1	SP85QZ1	QL85/1	85	0.1	Timer	4368	None	371	
	109	Above Front Entrance Door	1	SP I 150	I150/1	150	0.2	SW	500	None	75	On switch, assume 20 hrs/wk
	109	Above Side Garage Door	2	SP I 150	I150/1	150	0.3	SW	500	None	150	On switch, assume 20 hrs/wk
	242	Above Side Garage Door	6	SP85QZ1	QL85/1	85	0.5	Timer	4368	None	2,228	
	242	Rear Spot Lights	2	SP85QZ1	QL85/1	85	0.2	Timer	4368	None	743	
	109	Above Rear Entrance Doors	2	SP I 150	I150/1	150	0.3	SW	500	None	150	On switch, assume 20 hrs/wk
Indoor Lights	**191**	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	None	185	
	191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	None	185	
	191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	None	185	
	191	Side Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	None	185	
	191	Side Garage Bay	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	SW	500	None	123	
	191	Side Garage Bay	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	SW	500	None	123	
	191	Side Garage Bay	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	500	None	62	
	65	Front Entrance	2	I 100	I100/1	100	0.2	SW	1040	None	208	
	65	Boiler Room	1	I 100	I100/1	100	0.1	SW	1040	None	104	
	77	Boiler Room	1	I 150	I150/1	150	0.2	SW	1040	None	156	
	65	Central Hallway	2	I 100	I100/1	100	0.2	SW	1040	None	208	
	65	Central Hallway	1	I 100	I100/1	100	0.1	SW	1040	None	104	
	6	Reception/Conference Room	8	T 34 R F 4 (MAG)	F44EE	144	1.2	SW	1040	C-OCC	1,198	
	6	Reception/Conference Room	6	T 34 R F 4 (MAG)	F44EE	144	0.9	SW	1040	C-OCC	899	
	6	Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	1040	OCC	150	
	2	Storage Room	1	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.1	SW	500	None	40	
	65	Kitchen	1	I 100	I100/1	100	0.1	SW	1040	OCC	104	
	65	Kitchen Range Hood	2	I 100	I100/1	100	0.2	SW	1040	None	208	
	191	Kitchen	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	1040	OCC	128	
	191	Kitchen	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	1040	OCC	128	
	65	Storage	1	I 100	I100/1	100	0.1	SW	500	None	50	
	3	Storage	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	500	None	22	
	2	Women's Bathroom	1	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.1	SW	500	OCC	40	
	2	Men's Bathroom	2	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.2	SW	500	None	80	
	4	Lounge Room	3	2T 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	1040	OCC	225	
	4	Lounge Room	3	2T 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	1040	OCC	225	
	111	Lounge Room	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	1040	None	45	
		Total	**73**				**8.1**				**9,110**	

Energy Audit of Roxbury Township

CHA Project No. 20556 - Fire Company No. 3 **Cost of Electricity:** **$0.178 $/kWh**

ECM-1a Lighting Replacements **$0.98 $/kW**

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual kW Saved**	**Annual $ Saved**	**Retrofit Cost**	**NJ Lighting Incentive**	**Simple Payback With Out Incentive**	**Simple Payback**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
209	Above Front Garage Door	2	SP 13 W CF 2	CFQ13/2-L	28	0.1	SW	500	28	2	SP 13 W CF 2	CFQ13/2-L	28	0.1	SW	500	28	-	-	$ -	$ -	$0		
242	Above Front Garage Door	1	SP85QZ1	QL85/1	85	0.1	Timer	4368	371	1	SP85QZ1	QL85/1	85	0.1	Timer	4,368	371	-	-	$ -	$ -	$0		
109	Above Front Entrance Door	1	SP I 150	I150/1	150	0.2	SW	500	75	1	SP I 150	I150/1	150	0.2	SW	500	75	-	-	$ -	$ -	$0		
109	Above Side Garage Door	2	SP I 150	I150/1	150	0.3	SW	500	150	2	SP I 150	I150/1	150	0.3	SW	500	150	-	-	$ -	$ -	$0		
242	Above Side Garage Door	6	SP85QZ1	QL85/1	85	0.5	Timer	4368	2,228	6	SP85QZ1	QL85/1	85	0.5	Timer	4,368	2,228	-	-	$ -	$ -	$0		
242	Rear Spot Lights	2	SP85QZ1	QL85/1	85	0.2	Timer	4368	743	2	SP85QZ1	QL85/1	85	0.2	Timer	4,368	743	-	-	$ -	$ -	$0		
109	Above Rear Entrance Doors	2	SP I 150	I150/1	150	0.3	SW	500	150	2	SP I 150	I150/1	150	0.3	SW	500	150	-	-	$ -	$ -	$0		
191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	-	-	$ -	$ -	$0		
191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	-	-	$ -	$ -	$0		
191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	-	-	$ -	$ -	$0		
191	Side Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	-	-	$ -	$ -	$0		
191	Side Garage Bay	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	SW	500	123	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	SW	500	123	-	-	$ -	$ -	$0		
191	Side Garage Bay	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	SW	500	123	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	SW	500	123	-	-	$ -	$ -	$0		
191	Side Garage Bay	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	500	62	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	500	62	-	-	$ -	$ -	$0		
65	Front Entrance	2	I 100	I100/1	100	0.2	SW	1040	208	2	CF 26	CFQ26/1-L	27	0.1	SW	1,040	56	152	0.1	$ 28.70	$ 40.50	$0	1.4	1.4
65	Boiler Room	1	I 100	I100/1	100	0.1	SW	1040	104	1	CF 26	CFQ26/1-L	27	0.0	SW	1,040	28	76	0.1	$ 14.35	$ 20.25	$0	1.4	1.4
77	Boiler Room	1	I 150	I150/1	150	0.2	SW	1040	156	1	CF 26	CFQ26/1-L	27	0.0	SW	1,040	28	128	0.1	$ 24.18	$ 20.25	$0	0.8	0.8
65	Central Hallway	2	I 100	I100/1	100	0.2	SW	1040	208	2	CF 26	CFQ26/1-L	27	0.1	SW	1,040	56	152	0.1	$ 28.70	$ 40.50	$0	1.4	1.4
65	Central Hallway	1	I 100	I100/1	100	0.1	SW	1040	104	1	CF 26	CFQ26/1-L	27	0.0	SW	1,040	28	76	0.1	$ 14.35	$ 20.25	$0	1.4	1.4
6	Reception/Conference Room	8	T 34 R F 4 (MAG)	F44EE	144	1.2	SW	1040	1,198	8	T 28 R F 4	F44SSILL	96	0.8	SW	1,040	799	399	0.4	$ 75.48	$ 1,050.00	$160	13.9	11.8
6	Reception/Conference Room	6	T 34 R F 4 (MAG)	F44EE	144	0.9	SW	1040	899	6	T 28 R F 4	F44SSILL	96	0.6	SW	1,040	599	300	0.3	$ 56.61	$ 787.50	$120	13.9	11.8
6	Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	1040	150	1	T 28 R F 4	F44SSILL	96	0.1	SW	1,040	100	50	0.0	$ 9.44	$ 131.25	$20	13.9	11.8
2	Storage Room	1	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.1	SW	500	40	1	T 28 R F 2	F42SSILL	48	0.0	SW	500	24	16	0.0	$ 3.22	$ 187.50	$25	58.2	50.5
65	Kitchen	1	I 100	I100/1	100	0.1	SW	1040	104	1	CF 26	CFQ26/1-L	27	0.0	SW	1,040	28	76	0.1	$ 14.35	$ 20.25	$0	1.4	1.4
65	Kitchen Range Hood	2	I 100	I100/1	100	0.2	SW	1040	208	2	CF 26	CFQ26/1-L	27	0.1	SW	1,040	56	152	0.1	$ 28.70	$ 40.50	$0	1.4	1.4
191	Kitchen	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	1040	128	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	1,040	128	-	-	$ -	$ -	$0		
191	Kitchen	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	1040	128	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	1,040	128	-	-	$ -	$ -	$0		
65	Storage	1	I 100	I100/1	100	0.1	SW	500	50	1	CF 26	CFQ26/1-L	27	0.0	SW	500	14	37	0.1	$ 7.34	$ 20.25	$0	2.8	2.8
3	Storage	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	500	22	1	W 28 W F 1	F41SSILL	26	0.0	SW	500	13	9	0.0	$ 1.71	$ 175.00	$25	102.3	87.7
2	Women's Bathroom	1	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.1	SW	500	40	1	T 28 R F 2	F42SSILL	48	0.0	SW	500	24	16	0.0	$ 3.22	$ 187.50	$25	58.2	50.5
2	Men's Bathroom	2	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.2	SW	500	80	2	T 28 R F 2	F42SSILL	48	0.1	SW	500	48	32	0.1	$ 6.44	$ 375.00	$50	58.2	50.5
4	Lounge Room	3	2T 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	1040	225	3	2T 17 R F 2 (ELE)	F22ILL	33	0.1	SW	1,040	103	122	0.1	$ 23.00	$ 303.75	$30	13.2	11.9
4	Lounge Room	3	2T 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	1040	225	3	2T 17 R F 2 (ELE)	F22ILL	33	0.1	SW	1,040	103	122	0.1	$ 23.00	$ 303.75	$30	13.2	11.9
111	Lounge Room	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	1040	45	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	1,040	45	-	-	$ -	$ -	$0		
	Total	**73**				**8.1**			**9,110**	**73**			**2,623**	**6**			**7,197**	**1,912**	**2.0**	**$363**	**$3,724**	**$485**		
																	Demand Savings			**2.0**	**$23**			
																	kWh Savings			**1,912**	**$340**			
																	Total savings				**$363**		**10.3**	**8.9**

Energy Audit of Roxbury Township

CHA Project No. 20556 - Fire Company No. 3 **Cost of Electricity:** **$0.178 $/kWh**

ECM-1b Install Occupancy Sensors **$0.98 $/kW**

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual kW Saved**	**Annual $ Saved**	**Retrofit Cost**	**NJ Lighting Incentive**	**Simple Payback With Out Incentive**	**Simple Payback**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
209	Above Front Garage Door	2	SP 13 W CF 2	CFQ13/2-L	28	0.1	SW	500	28.0	2	SP 13 W CF 2	CFQ13/2-L	28	0.1	None	500	28.0	0.0	0.0	$0.00	$0.00	$0.00		
242	Above Front Garage Door	1	SP85QZ1	QL85/1	85	0.1	Timer	4368	371.3	1	SP85QZ1	QL85/1	85	0.1	None	4368	371.3	0.0	0.0	$0.00	$0.00	$0.00		
109	Above Front Entrance Door	1	SP I 150	I150/1	150	0.2	SW	500	75.0	1	SP I 150	I150/1	150	0.2	None	500	75.0	0.0	0.0	$0.00	$0.00	$0.00		
109	Above Side Garage Door	2	SP I 150	I150/1	150	0.3	SW	500	150.0	2	SP I 150	I150/1	150	0.3	None	500	150.0	0.0	0.0	$0.00	$0.00	$0.00		
242	Above Side Garage Door	6	SP85QZ1	QL85/1	85	0.5	Timer	4368	2,227.7	6	SP85QZ1	QL85/1	85	0.5	None	4368	2,227.7	0.0	0.0	$0.00	$0.00	$0.00		
242	Rear Spot Lights	2	SP85QZ1	QL85/1	85	0.2	Timer	4368	742.6	2	SP85QZ1	QL85/1	85	0.2	None	4368	742.6	0.0	0.0	$0.00	$0.00	$0.00		
109	Above Rear Entrance Doors	2	SP I 150	I150/1	150	0.3	SW	500	150.0	2	SP I 150	I150/1	150	0.3	None	500	150.0	0.0	0.0	$0.00	$0.00	$0.00		
191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	184.5	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	None	500	184.5	0.0	0.0	$0.00	$0.00	$0.00		
191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	184.5	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	None	500	184.5	0.0	0.0	$0.00	$0.00	$0.00		
191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	184.5	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	None	500	184.5	0.0	0.0	$0.00	$0.00	$0.00		
191	Side Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	184.5	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	None	500	184.5	0.0	0.0	$0.00	$0.00	$0.00		
191	Side Garage Bay	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	SW	500	123.0	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	None	500	123.0	0.0	0.0	$0.00	$0.00	$0.00		
191	Side Garage Bay	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	SW	500	123.0	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	None	500	123.0	0.0	0.0	$0.00	$0.00	$0.00		
191	Side Garage Bay	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	500	61.5	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	None	500	61.5	0.0	0.0	$0.00	$0.00	$0.00		
65	Front Entrance	2	I 100	I100/1	100	0.2	SW	1040	208.0	2	I 100	I100/1	100	0.2	None	1040	208.0	0.0	0.0	$0.00	$0.00	$0.00		
65	Boiler Room	1	I 100	I100/1	100	0.1	SW	1040	104.0	1	I 100	I100/1	100	0.1	None	1040	104.0	0.0	0.0	$0.00	$0.00	$0.00		
77	Boiler Room	1	I 150	I150/1	150	0.2	SW	1040	156.0	1	I 150	I150/1	150	0.2	None	1040	156.0	0.0	0.0	$0.00	$0.00	$0.00		
65	Central Hallway	2	I 100	I100/1	100	0.2	SW	1040	208.0	2	I 100	I100/1	100	0.2	None	1040	208.0	0.0	0.0	$0.00	$0.00	$0.00		
65	Central Hallway	1	I 100	I100/1	100	0.1	SW	1040	104.0	1	I 100	I100/1	100	0.1	None	1040	104.0	0.0	0.0	$0.00	$0.00	$0.00		
6	Reception/Conference Room	8	T 34 R F 4 (MAG)	F44EE	144	1.2	SW	1040	1,198.1	8	T 34 R F 4 (MAG)	F44EE	144	1.2	C-OCC	350	403.2	794.9	0.0	$141.25	$202.50	$35.00	1.4	1.2
6	Reception/Conference Room	6	T 34 R F 4 (MAG)	F44EE	144	0.9	SW	1040	898.6	6	T 34 R F 4 (MAG)	F44EE	144	0.9	C-OCC	350	302.4	596.2	0.0	$105.94	$202.50	$35.00	1.9	1.6
6	Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	1040	149.8	1	T 34 R F 4 (MAG)	F44EE	144	0.1	OCC	728	104.8	44.9	0.0	$7.98	$237.50	$40.00	29.7	24.7
2	Storage Room	1	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.1	SW	500	40.0	1	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.1	None	500	40.0	0.0	0.0	$0.00	$0.00	$0.00		
65	Kitchen	1	I 100	I100/1	100	0.1	SW	1040	104.0	1	I 100	I100/1	100	0.1	OCC	728	72.8	31.2	0.0	$5.54	$237.50	$40.00	42.8	35.6
65	Kitchen Range Hood	2	I 100	I100/1	100	0.2	SW	1040	208.0	2	I 100	I100/1	100	0.2	None	1040	208.0	0.0	0.0	$0.00	$0.00	$0.00		
191	Kitchen	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	1040	127.9	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	OCC	728	89.5	38.4	0.0	$6.82	$237.50	$40.00	34.8	29.0
191	Kitchen	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	1040	127.9	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	OCC	728	89.5	38.4	0.0	$6.82	$237.50	$40.00	34.8	29.0
65	Storage	1	I 100	I100/1	100	0.1	SW	500	50.0	1	I 100	I100/1	100	0.1	None	500	50.0	0.0	0.0	$0.00	$0.00	$0.00		
3	Storage	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	500	21.5	1	W 34 W F 1 (MAG)	F41EE	43	0.0	None	500	21.5	0.0	0.0	$0.00	$0.00	$0.00		
2	Women's Bathroom	1	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.1	SW	500	40.0	1	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.1	OCC	350	28.0	12.0	0.0	$2.13	$237.50	$40.00	111.4	92.6
2	Men's Bathroom	2	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.2	SW	500	80.0	2	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.2	None	500	80.0	0.0	0.0	$0.00	$0.00	$0.00		
4	Lounge Room	3	2T 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	1040	224.6	3	2T 34 R F 2 (u) (MAG)	FU2EE	72	0.2	OCC	350	75.6	149.0	0.0	$26.48	$118.75	$20.00	4.5	3.7
4	Lounge Room	3	2T 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	1040	224.6	3	2T 34 R F 2 (u) (MAG)	FU2EE	72	0.2	OCC	350	75.6	149.0	0.0	$26.48	$118.75	$20.00	4.5	3.7
111	Lounge Room	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	1040	44.7	1	W 34 W F 1 (MAG)	F41EE	43	0.0	None	1040	44.7	0.0	0.0	$0.00	$0.00	$0.00		
	Total	**73**				**8.1**			**9,110**	**73**				**8**			**7,256**	**1,854**	**0**	**329**	**$1,830**	**310**		
																	Demand Savings			**0.0**	**$0**			
																	kWh Savings			**1,854**	**$329**			
																	Total Savings				**$329**		**5.6**	**4.6**

Energy Audit of Roxbury Township

CHA Project No. 20556 - Fire Company No. 3

ECM-1c Lighting Replacements with Occupancy Sensors

Cost of Electricity: **$0.178 $/kWh**

$0.98 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	**Standard Fixture Code**	**Fixture Code**	**Watts per Fixture**	**kW/Space**	**Retrofit Control**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual kW Saved**	**Annual $ Saved**	**Retrofit Cost**	**NJ Lighting Incentive**	**Simple Payback With Out Incentive**	**Simple Payback**
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kWh Saved) * ($/kWh)	Cost for renovations to lighting system	Prescriptive Lighting Measures	Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
209	Above Front Garage Door	2	SP 13 W CF 2	CFQ13/2-L	28	0.1	SW	500	28	2	SP 13 W CF 2	CFQ13/2-L	28	0.1	None	500	28	-	-	$ -	$ -	$ -		
242	Above Front Garage Door	1	SP85QZ1	QL85/1	85	0.1	Timer	4368	371	1	SP85QZ1	QL85/1	85	0.1	None	4,368	371	-	-	$ -	$ -	$ -		
109	Above Front Entrance Door	1	SP I 150	I150/1	150	0.2	SW	500	75	1	SP I 150	I150/1	150	0.2	None	500	75	-	-	$ -	$ -	$ -		
109	Above Side Garage Door	2	SP I 150	I150/1	150	0.3	SW	500	150	2	SP I 150	I150/1	150	0.3	None	500	150	-	-	$ -	$ -	$ -		
242	Above Side Garage Door	6	SP85QZ1	QL85/1	85	0.5	Timer	4368	2,228	6	SP85QZ1	QL85/1	85	0.5	None	4,368	2,228	-	-	$ -	$ -	$ -		
242	Rear Spot Lights	2	SP85QZ1	QL85/1	85	0.2	Timer	4368	743	2	SP85QZ1	QL85/1	85	0.2	None	4,368	743	-	-	$ -	$ -	$ -		
109	Above Rear Entrance Doors	2	SP I 150	I150/1	150	0.3	SW	500	150	2	SP I 150	I150/1	150	0.3	None	500	150	-	-	$ -	$ -	$ -		
191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	None	500	185	-	-	$ -	$ -	$ -		
191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.3	None	500	150	35	0.1	$ 6.94	$ -	$ -	0.0	0.0
191	Front Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	None	500	185	-	-	$ -	$ -	$ -		
191	Side Garage Bay	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	SW	500	185	3	S 60 P F 2 (MAG) 8'	F82EE	123	0.4	None	500	185	-	-	$ -	$ -	$ -		
191	Side Garage Bay	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	SW	500	123	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	None	500	123	-	-	$ -	$ -	$ -		
191	Side Garage Bay	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	SW	500	123	2	S 60 P F 2 (MAG) 8'	F82EE	123	0.2	None	500	123	-	-	$ -	$ -	$ -		
191	Side Garage Bay	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	500	62	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	None	500	62	-	-	$ -	$ -	$ -		
65	Front Entrance	2	I 100	I100/1	100	0.2	SW	1040	208	2	CF 26	CFQ26/1-L	27	0.1	None	1,040	56	152	0.1	$ 28.70	$ 40.50	$ -	1.4	1.4
65	Boiler Room	1	I 100	I100/1	100	0.1	SW	1040	104	1	CF 26	CFQ26/1-L	27	0.0	None	1,040	28	76	0.1	$ 14.35	$ 20.25	$ -	1.4	1.4
77	Boiler Room	1	I 150	I150/1	150	0.2	SW	1040	156	1	CF 26	CFQ26/1-L	27	0.0	None	1,040	28	128	0.1	$ 24.18	$ 20.25	$ -	0.8	0.8
65	Central Hallway	2	I 100	I100/1	100	0.2	SW	1040	208	2	CF 26	CFQ26/1-L	27	0.1	None	1,040	56	152	0.1	$ 28.70	$ 40.50	$ -	1.4	1.4
65	Central Hallway	1	I 100	I100/1	100	0.1	SW	1040	104	1	CF 26	CFQ26/1-L	27	0.0	None	1,040	28	76	0.1	$ 14.35	$ 20.25	$ -	1.4	1.4
6	Reception/Conference Room	8	T 34 R F 4 (MAG)	F44EE	144	1.2	SW	1040	1,198	8	T 28 R F 4	F44SSILL	96	0.8	C-OCC	350	269	929	0.4	$ 169.65	$ 1,252.50	$ 195	7.4	6.2
6	Reception/Conference Room	6	T 34 R F 4 (MAG)	F44EE	144	0.9	SW	1040	899	6	T 28 R F 4	F44SSILL	96	0.6	C-OCC	350	202	697	0.3	$ 127.24	$ 990.00	$ 155	7.8	6.6
6	Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	1040	150	1	T 28 R F 4	F44SSILL	96	0.1	OCC	728	70	80	0.0	$ 14.76	$ 368.75	$ 60	25.0	20.9
2	Storage Room	1	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.1	SW	500	40	1	T 28 R F 2	F42SSILL	48	0.0	None	500	24	16	0.0	$ 3.22	$ 187.50	$ 25	58.2	50.5
65	Kitchen	1	I 100	I100/1	100	0.1	SW	1040	104	1	CF 26	CFQ26/1-L	27	0.0	OCC	728	20	84	0.1	$ 15.85	$ 257.75	$ 40	16.3	13.7
65	Kitchen Range Hood	2	I 100	I100/1	100	0.2	SW	1040	208	2	CF 26	CFQ26/1-L	27	0.1	None	1,040	56	152	0.1	$ 28.70	$ 40.50	$ -	1.4	1.4
191	Kitchen	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	1040	128	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	OCC	728	90	38	-	$ 6.82	$ 237.50	$ 40	34.8	29.0
191	Kitchen	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	SW	1040	128	1	S 60 P F 2 (MAG) 8'	F82EE	123	0.1	OCC	728	90	38	-	$ 6.82	$ 237.50	$ 40	34.8	29.0
65	Storage	1	I 100	I100/1	100	0.1	SW	500	50	1	CF 26	CFQ26/1-L	27	0.0	None	500	14	37	0.1	$ 7.34	$ 20.25	$ -	2.8	2.8
3	Storage	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	500	22	1	W 28 W F 1	F41SSILL	26	0.0	None	500	13	9	0.0	$ 1.71	$ 175.00	$ 25	102.3	87.7
2	Women's Bathroom	1	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.1	SW	500	40	1	T 28 R F 2	F42SSILL	48	0.0	OCC	350	17	23	0.0	$ 4.50	$ 425.00	$ 65	94.5	80.0
2	Men's Bathroom	2	T 34 R F 2 (MAG) RL/RB	F42ES	80	0.2	SW	500	80	2	T 28 R F 2	F42SSILL	48	0.1	None	500	48	32	0.1	$ 6.44	$ 375.00	$ 50	58.2	50.5
4	Lounge Room	3	2T 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	1040	225	3	2T 17 R F 2 (ELE)	F22ILL	33	0.1	OCC	350	35	190	0.1	$ 35.14	$ 422.50	$ 50	12.0	10.6
4	Lounge Room	3	2T 34 R F 2 (u) (MAG)	FU2EE	72	0.2	SW	1040	225	3	2T 17 R F 2 (ELE)	F22ILL	33	0.1	OCC	350	35	190	0.1	$ 35.14	$ 422.50	$ 50	12.0	10.6
111	Lounge Room	1	W 34 W F 1 (MAG)	F41EE	43	0.0	SW	1040	45	1	W 34 W F 1 (MAG)	F41EE	43	0.0	None	1,040	45	-	-	$ -	$ -	$ -		
	Total	**73**				**8.1**			**9,110**	**73**				**6.0**			**5,977**		**2.0**	**581**	**5,554**	**795**		
																	Demand Savings			**2.0**	**$24**			
																	kWh Savings			**3,133**	**$557**			
																	Total Savings				**$581**		**9.6**	**8.2**

Energy Audit of Roxbury Township
CHA Project No. 20556 - Fire Company No. 3
ECM-1 - Fixture and Control Replacement Cost Lighting Analysis

COST TABLE

Notes	Field Code	Standard Code	NYSERDA Code	Watts per fixture	Retrofit	Standard Code	NYSERDA Code	Watts per fixture	Lamps/Fix	Ball/Fix	Fixture Replacement			Ballast Replacement			Lamp Replacement			O.P.& D	NJ Incentive	Retrofit Cost (inc. O&P)
											Material	Labor	Disposal	Material	Labor	Disposal	Material	Labor	Disposal			
	2	T 34 R F 2 (MAG) RL/RB	F42ES	80	Replace	T 28 R F 2	F42SSILL	48	2	1	$100.00	$45.00	$5.00							$37.50	**$25.00**	**$187.50**
(1)	**3**	W 34 W F 1 (MAG)	F41EE	43	Replace	W 28 W F 1	F41SSILL	26	1	1	$90.00	$45.00	$5.00							$35.00	**$25.00**	**$175.00**
(2)	**4**	2T 34 R F 2 (u) (MAG)	FU2EE	72	Replace	2T 17 R F 2 (ELE)	F22ILL	33	2	1				$20.00	$45.00	INC	$5.00	$5.00	INC	$26.25	**$10.00**	**$101.25**
	6	T 34 R F 4 (MAG)	F44EE	144	RL/RB	T 28 R F 4	F44SSILL	96	4	1				$20.00	$45.00	INC	$20.00	$20.00	INC	$26.25	**$20.00**	**$131.25**
	65	I 100	I100/1	100	Replace	CF 26	CFQ26/1-L	27									$5.00	$10.00	INC	$5.25		**$20.25**
	77	I 150	I150/1	150	Replace	CF 26	CFQ26/1-L	27									$5.00	$10.00	INC	$5.25	**$0.00**	**$20.25**
	109	SP I 150	I150/1	150	NONE	CF 26	CFQ26/1-L	27									$5.00	$10.00	INC	$5.25		**$20.25**
	111	W 34 W F 1 (MAG)	F41EE	43	NONE	W 28 W F 1	F41SSILL	26						$20.00	$45.00	INC	$5.00	$5.00	INC	$26.25		**$101.25**
	191	S 60 P F 2 (MAG) 8'	F82EE	123	NONE																	**$0.00**
	209	SP 13 W CF 2	CFQ13/2-L	28	NONE															$0.00		**$0.00**
	242	SP85QZ1	QL85/1	85	NONE																	**$0.00**
	OCC	OCCUPANCY SENSOR SWITCH									$50	$45	INC							$23.75	**$20.00**	**$118.75**
	C-OCC	OCC SENSOR W/ 20 FT. WIRE TO CEILING									$100	$50	INC							$52.50	**$35.00**	**$202.50**

Rebuild Notes:
(1) Replace with client requested fixtures
(2) 2' x 2' U-Tube to 17 w 2' lamps with Reflector Kit Vendor Code RK(2F17t)

New Jersey Smart Start Prescriptive Lighting type	Watt/Fix	Lamps	$/Unit	
New Hard Wired Compact Fluorescents	N/A	1	$25	
New Hard Wired Compact Fluorescents	N/A	2	$30	
For retrofit of T-12 fixtures to T-5 or T-8 with electronic ballasts				
Retrofit T-12 to T-5,T-8 with Electronic Ballasts	N/A	1&2	$10	
Retrofit T-12 to T-5,T-8 with Electronic Ballasts	N/A	3 & 4	$20	
For replacement of fixtures with new T-5 or T-8 fixtures				
HID, T-12, Incandescent to T-8, T-5 with Electronic Ballasts	>1000	N/A	$284	
HID, T-12, Incandescent to T-8, T-5 with Electronic Ballasts	400-999	N/A	$100	
HID, T-12, Incandescent to T-8, T-5 with Electronic Ballasts	250--399	N/A	$50	
HID Only to T-8, T-5 with Electronic Ballasts	175-249	N/A	$43	
HID Only to T-8, T-5 with Electronic Ballasts	100-174	N/A	$30	
HID Only to T-8, T-5 with Electronic Ballasts	75-99		$16	
T-12 Only to T-8, T-5 with Electronic Ballasts (1&2 lamp)	<250	1&2	$25	
T-12 Only to T-8, T-5 with Electronic Ballasts (3&4 lamp)	<250	3 & 4	$30	
For retrofit of T-8 fixtures by permanent delamping & new reflectors	N/A	N/A	$20	
New construction and complete renovation	N/A	N/A	Perf based only	
LED Exit Signs (new fixtures only): For existing facilities with load <= 75 kW	N/A	N/A	$20	
LED Exit Signs (new fixtures only): For existing facilities with load >= 75 kW	N/A	N/A	$10	
Pulse Start Metal Halide (for fixtures >= 150 watts) - includes parking lot lighting	N/A	N/A	$25	
Parking lot low bay - LED	N/A	N/A	$43	
T-12 to T-8 fixtures by permanent delamping & new reflectors	N/A	N/A	$30	
Controls				
OSW- Occupancy Sensor Wall Mounted (existing facilities only)	N/A	N/A	$20	
OSR- Occupancy Sensor Remote Mounted (existing facilities only)	N/A	N/A	$35	
DLD-Fluorescent Daylight Dimming	N/A	N/A	$25	Per Fixture Controlled
OHLF-Occupancy controlled High-Low with Step Ballast	N/A	N/A	$25	Per Fixture Controlled
OSRH- Occupancy Sensor Remote Mounted	N/A	N/A	$35	
OHLH-Occupancy controlled High-Low with Step Ballast	N/A	N/A	$75	Per Fixture Controlled
DDH-Daylight Dimming	N/A	N/A	$75	Per Fixture Controlled

Energy Audit of Roxbury Township
CHA Project No. 20556 - Fire Company No. 3
ECM 1 - Fixture and Control Replacement Cost Lighting Analysis

Hours of Operation

Energy Audit of Roxbury Township	Hours/Day	Hours/Year	Proposed	Utilized
Garage		500	500	Y
Offices		1040	728	Y
Outdoor Lighting	12	4368	4368	Y
Storage Areas		500	350	Y
Bath Room		500	350	Y
Linen/Utility/Wet/Janitor/Electrical		200	140	Y
Cafeteria/Kitchen/Service		1040	728	Y
Mechanical Room		200	140	Y
Conference		500	350	Y

APPENDIX D

ECM-2 Install Door Seals not Including Garage Doors

Roxbury Township
CHA Project No. 20556
Building: Volunteer Chemical Engine Co. No. 3

ECM - 2 Install Door Seals not Including Garage Doors

Existing: Doors or Door Seals result in excessive heat loss and infiltration
Proposed: Install new doors and/or weather-stripping to eliminate door infiltration

Building Footprint	5,856 SF	Ex Occupied Clng Temp.	72 °F	Ex Occupied Htg Temp.	72 °F
Heating System Efficiency	75%	Ex Unoccupied Clng Temp.	72 °F	Ex Unoccupied Htg Temp.	72 °F
Cooling System Efficiency	1.20 kW/ton	Prop Occupied Clng Temp.	72 °F	Prop Occupied Htg Temp.	72 °F
Internal Gains	50,965 btu/h	Prop Unoccupied Clng Temp.	72 °F	Prop Unoccupied Htg Temp.	72 °F
Unocc Internal Gain factor	0.03	Occupied Cooling UA	-765 btu/hr/°F	Occupied Heating UA	1,148 btu/hr/°F
Ave Occ Internal Gain Factor	0.7	Unoccupied Cooling UA	-624 btu/hr/°F	Unoccupied Heating UA	1,148 btu/hr/°F
		Cooling Occ Enthalpy Set point	27.5 Btu/lb		
		Cooling Unocc Enthalpy Set point	27.5 Btu/lb		

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-23,338	-79,493	-35,676	-19,028	-69,773	-1,529	-23,338	-74,957	-35,676	-19,028	-65,237	-1,529	0	0	0	0
97.5	42.5	6	1	5	-19,512	-55,204	-35,676	-15,909	-48,454	-1,529	-19,512	-52,054	-35,676	-15,909	-45,304	-1,529	43	41	0	0
92.5	39.5	45	5	40	-15,686	-44,163	-35,676	-12,789	-38,763	-1,529	-15,686	-41,643	-35,676	-12,789	-36,243	-1,529	262	250	0	0
87.5	36.6	146	17	129	-11,860	-33,490	-35,676	-9,670	-29,395	-1,529	-11,860	-31,579	-35,676	-9,670	-27,484	-1,529	663	635	0	0
82.5	34.0	298	35	263	-8,035	-23,922	-35,676	-6,551	-20,997	-1,529	-8,035	-22,557	-35,676	-6,551	-19,632	-1,529	1,004	963	0	0
77.5	31.6	476	57	420	-4,209	-15,089	-35,676	-3,431	-13,244	-1,529	-4,209	-14,228	-35,676	-3,431	-12,383	-1,529	1,075	1,034	0	0
72.5	29.2	662	79	583	-383	-6,256	-35,676	-312	-5,491	-1,529	-383	-5,899	-35,676	-312	-5,134	-1,529	761	738	0	0
67.5	27.0	740	88	652	5,167	3,975	-35,676	5,167	3,489	-1,529	5,167	3,748	-35,676	5,167	3,262	-1,529	234	236	0	0
62.5	24.5	765	91	674	10,908	8,391	-35,676	10,908	7,365	-1,529	10,908	7,912	-35,676	10,908	6,886	-1,529	149	154	0	0
57.5	21.4	733	87	646	16,649	12,807	-35,676	16,649	11,241	-1,529	16,649	12,076	-35,676	16,649	10,510	-1,529	54	61	0	0
52.5	18.7	668	80	589	22,390	17,224	-35,676	22,390	15,118	-1,529	22,390	16,241	-35,676	22,390	14,135	-1,529	0	0	287	278
47.5	16.2	659	78	581	28,131	21,640	-35,676	28,131	18,994	-1,529	28,131	20,405	-35,676	28,131	17,759	-1,529	0	0	368	357
42.5	14.4	685	82	604	33,872	26,056	-35,676	33,872	22,870	-1,529	33,872	24,569	-35,676	33,872	21,383	-1,529	0	0	471	457
37.5	12.6	739	88	651	39,614	30,472	-35,676	39,614	26,746	-1,529	39,614	28,734	-35,676	39,614	25,008	-1,529	0	0	603	586
32.5	10.7	717	85	632	45,355	34,889	-35,676	45,355	30,623	-1,529	45,355	32,898	-35,676	45,355	28,632	-1,529	0	0	678	659
27.5	8.6	543	65	479	51,096	39,305	-35,676	51,096	34,499	-1,529	51,096	37,062	-35,676	51,096	32,256	-1,529	0	0	584	567
22.5	6.8	318	38	280	56,837	43,721	-35,676	56,837	38,375	-1,529	56,837	41,227	-35,676	56,837	35,881	-1,529	0	0	383	372
17.5	5.5	245	29	216	62,578	48,138	-35,676	62,578	42,252	-1,529	62,578	45,391	-35,676	62,578	39,505	-1,529	0	0	327	318
12.5	4.1	156	19	137	68,319	52,554	-35,676	68,319	46,128	-1,529	68,319	49,555	-35,676	68,319	43,129	-1,529	0	0	228	222
7.5	2.6	92	11	81	74,060	56,970	-35,676	74,060	50,004	-1,529	74,060	53,719	-35,676	74,060	46,753	-1,529	0	0	146	142
2.5	1.0	36	4	32	79,801	61,387	-35,676	79,801	53,881	-1,529	79,801	57,884	-35,676	79,801	50,378	-1,529	0	0	62	60
-2.5	0.0	19	2	17	85,542	65,803	-35,676	85,542	57,757	-1,529	85,542	62,048	-35,676	85,542	54,002	-1,529	0	0	35	34
-7.5	-1.5	8	1	7	91,283	70,219	-35,676	91,283	61,633	-1,529	91,283	66,212	-35,676	91,283	57,626	-1,529	0	0	16	15
TOTALS		**8,760**	**1,043**	**7,717**													**4,246**	**4,112**	**4,187**	**4,069**

Existing Building Ventilation & Infiltration	**818**	**cfm**
Existing Unocc. Building Ventilation & Infiltration	**718**	**cfm**
Door infiltration (Not including Garage Doors)	**58**	**cfm**
Proposed reduction (80%)	**47**	**cfm**
Proposed Building Ventilation & Infiltration	**771**	**cfm**
Proposed Unocc. Building Ventilation & Infiltration	**671**	**cfm**

Savings	**118 therms**
	134 kWh

Roxbury Township

CHA Project No. 20556

Building: Volunteer Chemical Engine Co. No. 3

ECM - 2 Install Door Seals not Including Garage Doors

Multipliers	
	0.99
Labor:	1.22
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
									$ -	
Door Seals (3'x7')	4	ea	$ 35	$ 50	$ -	$ 139	$ 244	$ -	$ 383	
Door Seals (double door - 6' x 7')	0	ea	$ 65	$ 100	$ -	$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 383		Subtotal
$ 38	10%	Contingency
$ 42	10%	Contractor O&P
$ -	0%	Engineering
$ 463		**Total**

APPENDIX E

ECM-3 Window Replacements

Roxbury Township
CHA Project No. 20556
Building: Volunteer Chemical Engine Co. No. 3

*Change U-value and air infiltration rates based on new windows or storm windows
See block load spreadsheet for U-values

ECM - 3 **Replace Windows**

Description Windows can lead to increased energy consumption due to infiltration/infiltration and heat gain/loss. Replacing older windows with more panes and low-emissivity coatings and insulated frames can decrease energy usage.

Given	Occupied Cooling Hours per Week	20	Hours		
	Occupied Heating Hours per Week	20	Hours		
	Heating Energy Cost	$1.90	$/therm		
	Cooling Cost	$0.186	$/kWh		
	Occupied Cooling Setpoint Temperature	72.0	Degrees F		(Assumption)
	Occupied Cooling Avg Space Air Enthalpy	25.5	btu/# air		(Assumption)
	Occupied Heating Setpoint Temperature	72.0	Degrees F	Occupied	(Assumption)
	Unoccupied Heating Setpoint Temperature	72.0	Degrees F	Unoccupied	(Assumption)
	Window Area	189	sq.ft.		(From window survey)
	Window Perimeter	350	ft		(From window survey)
	Proposed U factor	0.50	Btu/(h*sq.ft*degf)		(From window vendor)
	Proposed Air Infiltration	0.20	cfm/ft		(From window vendor)
	Cooling Conversion	12,000	Btu/ton		
	Heating Btu Conversion	1,000,000	Btu/MMBtu		
Assumptions	Existing U factor	0.90	Btu/(h*sq.ft*degf)		(From ASHRAE Fundamentals)
	Existing Air Infiltration	0.50	cfm/ft		(From ASHRAE Fundamentals)
	Heating System Efficiency	75%			
	Cooling System Efficiency	1.20	kW/ton		

Formula Cooling Energy Conduction = (Existing U x Area x (OA Temp - RA Temp) x Op Hours)

Heating Energy Conduction = (Existing U x Area x (RA Temp - OA Temp) x Op Hours)
Cooling Energy Infiltration = (4.5 x Leakage x Perimeter x (OA Enthalpy - RA Enthalpy) x Op Hours)
Heating Energy Infiltration = 1.08 x Leakage x Perimeter x (RA temp - OA temp) x Op Hours)
Load = (Conduction) + (Infiltration)
Cooling Energy = (Cooling Load) / (12,000 Btu/Ton) x (kw/Ton)
Heating Energy = (Heating Load) / (1,000,000 Btu/MMBtu) / (Boiler Efficiency)
Energy Cost = (Energy) x (Cost/Unit)

Existing	Operation	OA Enthalpy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
	Cooling	38.3	92.5	51	6.1	0.0	0.0	21,181	0	0	61,228	0	0
	Cooling	36.6	87.5	146	17.4	0.0	0.0	45,847	0	0	152,001	0	0
	Cooling	33.5	82.5	298	35.5	0.0	0.0	63,391	0	0	223,602	0	0
	Cooling	31.6	77.5	476	56.7	0.0	0.0	53,039	0	0	272,337	0	0
	Cooling	30.3	72.5	662	78.8	0.0	0.0	6,706	0	0	298,036	0	0
	Heating	27.9	67.5	740	0.0	88.1	652.2	0	67,463	499,228	0	74,959	554,698
	Heating	24.6	62.5	765	0.0	91.1	674.2	0	147,234	1,089,532	0	163,593	1,210,592
	Heating	21.6	57.5	733	0.0	87.3	646.0	0	215,325	1,593,408	0	239,250	1,770,454
	Heating	18.7	52.5	668	0.0	79.6	588.7	0	263,897	1,952,838	0	293,219	2,169,820
	Heating	16.2	47.5	659	0.0	78.5	580.8	0	327,096	2,420,508	0	363,440	2,689,454
	Heating	14.3	42.5	685	0.0	81.6	603.7	0	409,389	3,029,477	0	454,876	3,366,086
	Heating	12.4	37.5	739	0.0	88.0	651.3	0	516,520	3,822,246	0	573,911	4,246,940
	Heating	10.4	32.5	717	0.0	85.4	631.9	0	573,772	4,245,916	0	637,525	4,717,684
	Heating	8.7	27.5	543	0.0	64.7	478.6	0	489,534	3,622,555	0	543,927	4,025,061
	Heating	7	22.5	318	0.0	37.9	280.3	0	318,901	2,359,866	0	354,334	2,622,074
	Heating	5.4	17.5	245	0.0	29.2	215.9	0	270,512	2,001,786	0	300,568	2,224,207
	Heating	3.9	12.5	156	0.0	18.6	137.5	0	188,046	1,391,543	0	208,940	1,546,159
	Heating	2.5	7.5	92	0.0	11.0	81.1	0	120,218	889,616	0	133,576	988,462
	Heating	1.2	2.5	36	0.0	4.3	31.7	0	50,689	375,096	0	56,321	416,773
	Heating	-0.2	-2.5	19	0.0	2.3	16.7	0	28,677	212,210	0	31,863	235,788
	Heating	-1.4	-7.5	8	0.0	1.0	7.0	0	12,879	95,305	0	14,310	105,894
	Subtotal =			**8,760**	**194**	**848**	**6,278**	**190,163**	**4,000,153**	**29,601,131**	**btu**	**1,007,204**	**4,444,614**	**32,890,145**	**btu**

	Conduction		Infiltration			
Cooling Load =	(190163) + (		1007204) =		**1,197,367**	**btu**
	Cooling Load					
Cooling Energy =	(1197367)/(		12000) * (	1.20) =	**120**	**kWh**
	Cooling Energy	Cooling Cost				
Cooling Energy Cost =	(119.74) x (		$0.186) =		**$ 22.30**	
	Conduction		Infiltration			
Heating Load =	(33601284) + (		37334759) =		**70,936,043**	**btu**
	Heating Load		Heat Content			
Heating Energy =	(70936043)/(		75%)/(	100000) =	**946**	**therms**
	Heating Energy	Heating Cost				
Heating Energy Cost =	(945.81) x (		$1.898) =		**$ 1,795**	

Roxbury Township
CHA Project No. 20556
Building: Volunteer Chemical Engine Co. No. 3

*Change U-value and air infiltration rates based on new windows or storm windows
See block load spreadsheet for U-values

Operation	OA Enthalpy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
Cooling	38.3	92.5	51	6.1	0.0	0.0	11,767	0	0	24,491	0	0
Cooling	36.6	87.5	146	17.4	0.0	0.0	25,470	0	0	60,800	0	0
Cooling	33.5	82.5	298	35.5	0.0	0.0	35,217	0	0	89,441	0	0
Cooling	31.6	77.5	476	56.7	0.0	0.0	29,466	0	0	108,935	0	0
Cooling	30.3	72.5	662	78.8	0.0	0.0	3,725	0	0	119,214	0	0
Heating	27.9	67.5	740	0.0	88.1	652.2	0	37,480	277,349	0	29,984	221,879
Heating	24.6	62.5	765	0.0	91.1	674.2	0	81,797	605,296	0	65,437	484,237
Heating	21.6	57.5	733	0.0	87.3	646.0	0	119,625	885,227	0	95,700	708,181
Heating	18.7	52.5	668	0.0	79.6	588.7	0	146,609	1,084,910	0	117,288	867,928
Heating	16.2	47.5	659	0.0	78.5	580.8	0	181,720	1,344,727	0	145,376	1,075,782
Heating	14.3	42.5	685	0.0	81.6	603.7	0	227,438	1,683,043	0	181,951	1,346,434
Heating	12.4	37.5	739	0.0	88.0	651.3	0	286,955	2,123,470	0	229,564	1,698,776
Heating	10.4	32.5	717	0.0	85.4	631.9	0	318,762	2,358,842	0	255,010	1,887,074
Heating	8.7	27.5	543	0.0	64.7	478.6	0	271,964	2,012,530	0	217,571	1,610,024
Heating	7	22.5	318	0.0	37.9	280.3	0	177,167	1,311,037	0	141,734	1,048,830
Heating	5.4	17.5	245	0.0	29.2	215.9	0	150,284	1,112,103	0	120,227	889,683
Heating	3.9	12.5	156	0.0	18.6	137.5	0	104,470	773,080	0	83,576	618,464
Heating	2.5	7.5	92	0.0	11.0	81.1	0	66,788	494,231	0	53,430	395,385
Heating	1.2	2.5	36	0.0	4.3	31.7	0	28,160	208,387	0	22,528	166,709
Heating	-0.2	-2.5	19	0.0	2.3	16.7	0	15,932	117,894	0	12,745	94,315
Heating	-1.4	-7.5	8	0.0	1.0	7.0	0	7,155	52,947	0	5,724	42,358
Subtotal =			**8,760**	**194**	**848**	**6,278**	**105,646**	**2,222,307**	**16,445,073**	**btu**	**402,881**	**1,777,846**	**13,156,058**	**btu**

	Conduction		Infiltration		
Cooling Load =	(105646) + (	402881) =		**508,528**	**btu**
	Cooling Load				
Cooling Energy =	(508528)/(	12000) * (	1.20) =	**51**	**kWh**
	Cooling Energy	Cooling Cost			
Cooling Energy Cost =	(50.85) x (	$0.186) =		**$ 9.47**	
	Conduction		Infiltration		
Heating Load =	(18667380) + (	14933904) =		**33,601,284**	**btu**
	Heating Load	Heat Content			
Heating Energy =	(33601284)/(	75%) / (	100000) =	**448**	**therms**
	Heating Energy	Heating Cost			
Heating Energy Cost =	(448.02) x (	$1.898) =		**$ 850**	

Summary

EXISTING COOLING ENERGY	**119.74**	**kWh**	**$**	**22.30**
EXISTING HEATING ENERGY	**945.81**	**therms**	**$**	**1,794.78**
EXISTING ENERGY COST			**$**	**1,817.07**

PROPOSED COOLING ENERGY	**50.85**	**kWh**	**$**	**9.47**
PROPOSED HEATING ENERGY	**448.02**	**therms**	**$**	**850.16**
PROPOSED ENERGY COST			**$**	**859.63**

COOLING ENERGY SAVINGS	**68.88**	**kWh**	**$**	**12.83**	**57.5% of existing**
COOLING ENERGY SAVINGS	**0.02**	**kWh**	**$**	**0.27**	
HEATING ENERGY SAVINGS	**497.80**	**therms**	**$**	**944.62**	**52.6% of existing**
ENERGY COST SAVINGS			**$**	**957.45**	**52.7% of existing**

Roxbury Township
CHA Project No. 20556
Building: Volunteer Chemical Engine Co. No. 3

ECM - 3 **Replace Windows**

Multipliers	
Material:	0.99
Labor:	1.22
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Replace Existing 3' x 4' Window Units	2	ea.	$ 340	$ 74		$ 673	$ 179	$ -	$ 853	
Replace Existing 3' x 1.5' Window Units	8	ea.	$ 204	$ 66		$ 1,616	$ 644	$ -	$ 2,260	
Replace Existing 3' x 2' Window Units	4	ea.	$ 204	$ 66		$ 808	$ 322	$ -	$ 1,130	
Replace Existing 2' x 4' Window Units	9	ea.	$ 204	$ 66		$ 1,818	$ 725	$ -	$ 2,542	
Replace Existing 1' x 1' Window Units	3	ea.	$ 204	$ 66		$ 606	$ 242	$ -	$ 847	
Remove Existing Window Units	26	ea.		$ 50		$ -	$ 1,586	$ -	$ 1,586	
Trimwork	26	ea.	$ 50	$ 100		$ 1,287	$ 3,172	$ -	$ 4,459	
						$ -	$ -	$ -	$ -	

$ 13,677	Subtotal	
$ 2,052	15%	Contingency
$ 2,359	15%	Contractor O&P
$ -	0%	Engineering
$ 18,088	**Total**	

APPENDIX F

ECM-4a Night Setback Controls

Roxbury Township
CHA Project No. 20556
Building: Volunteer Chemical Engine Co. No. 3

ECM - 4a **Night Setback Controls**

Building Footprint	5,856	SF	Ex Occupied Clng Temp.	72	*F	Ex Occupied Htg Temp.	72	*F	**Heating Energy Savings**	**1,325**	**therms**
Heating Efficiency	75%		Ex Unoccupied Clng Temp.	72	*F	Ex Unoccupied Htg Temp.	72	*F	**Cooling Energy Savings**	**1,053**	**kWh**
Cooling Efficiency	1.2	kW/ton	Prop Occupied Clng Temp.	72	*F	Prop Occupied Htg Temp.	72	*F			
Building Balance Temp.	60	*F	Prop Unoccupied Clng Temp.	80	*F	Prop Unoccupied Htg Temp.	60	*F	Building Footprint	5,856	SF
Internal Gains	50,965	btu/h	Occupied Cooling UA	-765	btu/hr/°F	Occupied Heating UA	1,148	btu/hr/°F	24/7 Operation	0	SF
Unoc Internal Gain factor	0.03		Unoccupied Cooling UA	-624	btu/hr/°F	Unoccupied Heating UA	1,148	btu/hr/°F	Percentage to Night Setback	100%	
Ave Occ Internal Gain Factor	0.7		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb						
			Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb						

Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-23,338	-79,493	-35,676	-19,028	-69,773	-1,529	-23,338	-79,493	-35,676	-14,037	-69,773	-1,529	0	0	0	0
97.5	42.5	6	1	5	-19,512	-55,204	-35,676	-15,909	-48,454	-1,529	-19,512	-55,204	-35,676	-10,918	-48,454	-1,529	43	40	0	0
92.5	39.5	45	5	40	-15,686	-44,163	-35,676	-12,789	-38,763	-1,529	-15,686	-44,163	-35,676	-7,798	-38,763	-1,529	262	242	0	0
87.5	36.6	146	17	129	-11,860	-33,490	-35,676	-9,670	-29,395	-1,529	-11,860	-33,490	-35,676	-4,679	-29,395	-1,529	663	599	0	0
82.5	34	298	35	263	-8,035	-23,922	-35,676	-6,551	-20,997	-1,529	-8,035	-23,922	-35,676	-1,560	-20,997	-1,529	1,004	873	0	0
77.5	31.6	476	57	420	-4,209	-15,089	-35,676	-3,431	-13,244	-1,529	-4,209	-15,089	-35,676	0	0	-1,529	1,075	376	0	0
72.5	29.2	662	79	583	-383	-6,256	-35,676	-312	-5,491	-1,529	-383	-6,256	-35,676	0	0	-1,529	761	423	0	0
67.5	27	740	88	652	5,167	3,975	-35,676	5,167	3,489	-1,529	5,167	3,975	-35,676	0	0	-1,529	234	334	0	0
62.5	24.5	765	91	674	10,908	8,391	-35,676	10,908	7,365	-1,529	10,908	8,391	-35,676	0	0	-1,529	149	252	0	0
57.5	21.4	733	87	646	16,649	12,807	-35,676	16,649	11,241	-1,529	16,649	12,807	-35,676	2,871	1,938	-1,529	54	54	0	0
52.5	18.7	668	80	589	22,390	17,224	-35,676	22,390	15,118	-1,529	22,390	17,224	-35,676	8,612	5,814	-1,529	0	0	287	105
47.5	16.2	659	78	581	28,131	21,640	-35,676	28,131	18,994	-1,529	28,131	21,640	-35,676	14,353	9,691	-1,529	0	0	368	189
42.5	14.4	685	82	604	33,872	26,056	-35,676	33,872	22,870	-1,529	33,872	26,056	-35,676	20,094	13,567	-1,529	0	0	471	285
37.5	12.6	739	88	651	39,614	30,472	-35,676	39,614	26,746	-1,529	39,614	30,472	-35,676	25,835	17,443	-1,529	0	0	603	403
32.5	10.7	717	85	632	45,355	34,889	-35,676	45,355	30,623	-1,529	45,355	34,889	-35,676	31,576	21,320	-1,529	0	0	678	484
27.5	8.6	543	65	479	51,096	39,305	-35,676	51,096	34,499	-1,529	51,096	39,305	-35,676	37,317	25,196	-1,529	0	0	584	436
22.5	6.8	318	38	280	56,837	43,721	-35,676	56,837	38,375	-1,529	56,837	43,721	-35,676	43,058	29,072	-1,529	0	0	383	297
17.5	5.5	245	29	216	62,578	48,138	-35,676	62,578	42,252	-1,529	62,578	48,138	-35,676	48,799	32,949	-1,529	0	0	327	260
12.5	4.1	156	19	137	68,319	52,554	-35,676	68,319	46,128	-1,529	68,319	52,554	-35,676	54,540	36,825	-1,529	0	0	228	186
7.5	2.6	92	11	81	74,060	56,970	-35,676	74,060	50,004	-1,529	74,060	56,970	-35,676	60,282	40,701	-1,529	0	0	146	121
2.5	1	36	4	32	79,801	61,387	-35,676	79,801	53,881	-1,529	79,801	61,387	-35,676	66,023	44,577	-1,529	0	0	62	52
-2.5	0	19	2	17	85,542	65,803	-35,676	85,542	57,757	-1,529	85,542	65,803	-35,676	71,764	48,454	-1,529	0	0	35	30
-7.5	-1.5	8	1	7	91,283	70,219	-35,676	91,283	61,633	-1,529	91,283	70,219	-35,676	77,505	52,330	-1,529	0	0	16	14
TOTALS		**8,760**	**1,043**	**7,717**													**4,246**	**3,192**	**4,187**	**2,862**

Existing Building Ventilation & Infiltration (occ)	**818**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**718**	**cfm**

Roxbury Township
CHA Project No. 20556
Volunteer Chemical Engine Co. No. 3

ECM - 4a Night Setback Controls

Multipliers	
Material:	0.99
Labor:	1.22
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	Means Mechanical-2009
Programmable Thermostats	4	ea	$ 50	$ 47		$ 198	$ 229	$ -	$ 427	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$	427	Subtotal
$	42.74	10% Contingency
$	70.51	15% Contractor O&P
$	-	0% Engineering
$	**541**	**Total**

APPENDIX G

ECM-4b Night Shutdown

Roxbury Township
CHA Project No. 20556
Building: Volunteer Chemical Engine Co. No. 3

ECM - 4b **Night Shutdown**

Building Footprint	5,856	SF	Ex Occupied Clng Temp.	72	°F	Ex Occupied Htg Temp.	72	°F	Exhaust Fan Motor Power	0.0	kW
Heating Efficiency	75%		Ex Unoccupied Clng Temp.	80	°F	Ex Unoccupied Htg Temp.	60	°F	Supply/Return Fan Motor Power	0.2	kW
Cooling Efficiency	1.2	kW/ton	Prop Occupied Clng Temp.	72	°F	Prop Occupied Htg Temp.	72	°F	Existing unoccupied ventilation/infiltration CFM	818	cfm
Internal Gains	50,965	btu/h	Prop Unoccupied Clng Temp.	80	°F	Prop Unoccupied Htg Temp.	60	°F	Proposed unoccupied ventilation/infiltration CFM	718	cfm
Unoc Internal Gain factor	0.03		Occupied Cooling UA	-766	btu/hr/°F	Occupied Heating UA	1,148	btu/hr/°F	**Fan Energy Savings**	**886**	**kWh**
Ave Occ Internal Gain Factor	0.7		Unoccupied Cooling UA	-624	btu/hr/°F	Unoccupied Heating UA	1,148	btu/hr/°F	**Heating Energy Savings**	**0**	**therms**
			Cooling Occ Enthalpy Setpoint	27.5	Btu/lb				**Cooling Energy Savings**	**0**	**kWh**
			Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb						

	Existing	
Building Footprint	5,856	SF
24/7 Operation	0	SF
Percentage to Night Setback	100%	

					EXISTING LOADS						PROPOSED LOADS											
					Occupied			Unoccupied			Occupied			Unoccupied								
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms	Existing Fan Energy kWh	Proposed Fan Energy kWh
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N	O	P
102.5	49.1	0	0	0	-23,338	-79,493	-35,676	-14,037	-69,773	-1,529	-23,338	-79,493	-35,676	-14,037	-69,773	-1,529	0	0	0	0	0	0
97.5	42.5	6	1	5	-19,512	-55,204	-35,676	-10,918	-48,454	-1,529	-19,512	-55,204	-35,676	-10,918	-48,454	-1,529	40	40	0	0	1	1
92.5	39.5	45	5	40	-15,686	-44,163	-35,676	-7,798	-38,763	-1,529	-15,686	-44,163	-35,676	-7,798	-38,763	-1,529	242	242	0	0	8	7
87.5	36.6	146	17	129	-11,860	-33,490	-35,676	-4,679	-29,395	-1,529	-11,860	-33,490	-35,676	-4,679	-29,395	-1,529	599	599	0	0	27	21
82.5	34.0	298	35	263	-8,035	-23,922	-35,676	-1,560	-20,997	-1,529	-8,035	-23,922	-35,676	-1,560	-20,997	-1,529	873	873	0	0	56	41
77.5	31.6	476	57	420	-4,209	-15,089	-35,676	0	0	-1,529	-4,209	-15,089	-35,676	0	0	-1,529	376	376	0	0	89	11
72.5	29.2	662	79	583	-383	-6,256	-35,676	0	0	-1,529	-383	-6,256	-35,676	0	0	-1,529	423	423	0	0	124	15
67.5	27.0	740	88	652	5,167	3,975	-35,676	0	0	-1,529	5,167	3,975	-35,676	0	0	-1,529	334	334	0	0	138	16
62.5	24.5	765	91	674	10,908	8,391	-35,676	0	0	-1,529	10,908	8,391	-35,676	0	0	-1,529	252	252	0	0	143	17
57.5	21.4	733	87	646	16,649	12,807	-35,676	2,871	1,938	-1,529	16,649	12,807	-35,676	2,871	1,938	-1,529	54	54	0	0	137	36
52.5	18.7	668	80	589	22,390	17,224	-35,676	8,612	5,814	-1,529	22,390	17,224	-35,676	8,612	5,814	-1,529	0	0	105	105	125	55
47.5	16.2	659	78	581	28,131	21,640	-35,676	14,353	9,691	-1,529	28,131	21,640	-35,676	14,353	9,691	-1,529	0	0	189	189	123	67
42.5	14.4	685	82	604	33,872	26,056	-35,676	20,094	13,567	-1,529	33,872	26,056	-35,676	20,094	13,567	-1,529	0	0	285	285	128	79
37.5	12.6	739	88	651	39,614	30,472	-35,676	25,835	17,443	-1,529	39,614	30,472	-35,676	25,835	17,443	-1,529	0	0	403	403	138	92
32.5	10.7	717	85	632	45,355	34,889	-35,676	31,576	21,320	-1,529	45,355	34,889	-35,676	31,576	21,320	-1,529	0	0	484	484	134	94
27.5	8.6	543	65	479	51,096	39,305	-35,676	37,317	25,196	-1,529	51,096	39,305	-35,676	37,317	25,196	-1,529	0	0	436	436	102	74
22.5	6.8	318	38	280	56,837	43,721	-35,676	43,058	29,072	-1,529	56,837	43,721	-35,676	43,058	29,072	-1,529	0	0	297	297	59	45
17.5	5.5	245	29	216	62,578	48,138	-35,676	48,799	32,949	-1,529	62,578	48,138	-35,676	48,799	32,949	-1,529	0	0	260	260	46	35
12.5	4.1	156	19	137	68,319	52,554	-35,676	54,540	36,825	-1,529	68,319	52,554	-35,676	54,540	36,825	-1,529	0	0	186	186	29	23
7.5	2.6	92	11	81	74,060	56,970	-35,676	60,282	40,701	-1,529	74,060	56,970	-35,676	60,282	40,701	-1,529	0	0	121	121	17	14
2.5	1.0	36	4	32	79,801	61,387	-35,676	66,023	44,577	-1,529	79,801	61,387	-35,676	66,023	44,577	-1,529	0	0	52	52	7	5
-2.5	0.0	19	2	17	85,542	65,803	-35,676	71,764	48,454	-1,529	85,542	65,803	-35,676	71,764	48,454	-1,529	0	0	30	30	4	3
-7.5	-1.5	8	1	7	91,283	70,219	-35,676	77,505	52,330	-1,529	91,283	70,219	-35,676	77,505	52,330	-1,529	0	0	14	14	1	1
TOTALS		**8,760**	**1,043**	**7,717**													**3,192**	**3,192**	**2,862**	**2,862**	**1,638**	**752**

Existing Building Ventilation & Infiltration (occ)	**818**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**718**	**cfm**

Roxbury Township
CHA Project No. 20556
Volunteer Chemical Engine Co. No. 3

ECM - 4b Night Shutdown

Multipliers	
Material:	0.99
Labor:	1.22
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	Means Mechanical-2009
Programmable Thermostats	ea	4	$ 50	$ 47		$ 198.00	$ 229	$ -	$ 427	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$	427	Subtotal
$	43	10% Contingency
$	71	15% Contractor O&P
$	-	0% Engineering
$	**541**	**Total**

APPENDIX H

ECM-4c Energy Management Control System

Roxbury Township
CHA Project No. 20556
Volunteer Chemical Engine Co. No. 3

ECM - 4c Energy Management Control System (Including 4a & 4b)

Multipliers	
	0.99
Labor:	1.22
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Programmable Thermostats	4	ea	$ 50	$ 47		$ 198	$ 229	$ -	$ 427	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
									$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$	427	Subtotal
$	43	10% Contingency
$	71	15% Contractor O&P
$	-	0% Engineering
$	**541**	**Total**

APPENDIX I

ECM-5 Install Two New Furnaces

Roxbury Township
CHA Project No. 20556
Volunteer Chemical Engine Co. No. 3

ECM - 5 **Install Two (2) New Furnaces**

Existing Fuel #2 Oil
Proposed Fuel #2 Oil

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$ 2.66		
Proposed Fuel Cost	$ 2.66		
Baseline Fuel Use	3,010	Gals #2	Based on calculated historical utility data
Existing Furnace Efficiency	75%		Estimated or Measured
Baseline Furnace Load	313,115	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 138.7 Mbtu/Gals #2
Baseline Fuel Cost	$ 7,996		
Proposed Furnace Efficiency	83%		New Furnace Efficiency
Proposed Fuel Use	2,720	Gals #2	Baseline Boiler Load / Proposed Efficiency / 138.7 Mbtu/Gals #2
Proposed Fuel Cost	$ 7,226		
Annual Savings	290	Gals #2	
Annual Savings	418	therms	
Annual Savings	**$ 771**	**/yr**	

Roxbury Township
CHA Project No. 20556
Volunteer Chemical Engine Co. No. 3

ECM - 5 **Install Two (2) New Furnaces**

Multipliers	
Material:	0.99
Labor:	1.22
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
New high efficiency Furnace Units(186 mBh)	2	ea.	2075	$ 234		$ 4,109	$ 571	$ -	$ 4,679	Means Mechanical Cost Data - 2009
Disconnect electrical	2	Lot		$ 500		$ -	$ 1,220	$ -	$ 1,220	Means Mechanical Cost Data - 2009
Furnace Startup	1	Lot		$ 500		$ -	$ 610	$ -	$ 610	1 day startup

$ 6,509	Subtotal
$651	10% Contingency
$1,074	Contractor 15% O&P
$ -	0% Engineering
$ 8,234	**Total**

APPENDIX J

New Jersey Pay For Performance Incentive Program

Roxbury Township
CHA Project No. 20556
Volunteer Chemical Engine Co. No. 3

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per September, 2009.
The values represented below are only applicable through December 31, 2010.

Building Area (sq. ft):		5,856
Incentive #1 ($0.05/sq.ft.)	$	293

	Annual Utilities	
	kWh	Therms
Existing Usage	18,330	4,214
Proposed Savings	5,275	2,359
Existing Total MMBtus	484	
Proposed Savings MMBtus	254	
% Reduction	52.5%	
Proposed Annual Savings	$4,990	

0.5 * Maximum allowable incentiv

	≥ %15 - < 20%	
	$/kWh	$/therm
Incentive #2	$0.11	$1.10
Incentive #3	$0.07	$0.70
	$0.18	$1.80

0.8 * Maximum allowable incentiv

	≥ 20%	
	$/kWh	$/therm
Incentive #2	$0.22	$2.20
Incentive #3	$0.14	$1.40
	$0.36	$3.60

	Incentives $		
	Elec	Gas	Total
Incentive #2	$1,161	$5,190	$6,351
Incentive #3	$739	$3,303	$4,041
Totals	**$1,899**	**$8,493**	**$10,392**

Total Project Cost	$32,880
% Incentives of Project Cost	31.6%
Project Cost w/ Incentives*	$22,488

Project Payback (years)	
w/o Incentives	w/ Incentives
6.6	4.5

* Maximum allowable incentive is 80% of total project cost, or
$2 million per gas account and $2 million per electric account

EPA Portfolio Manager:

	kWh	Therms
Proposed Savings	5,206	1,861
Proposed Savings MMBtus	204	
% Reduction	42.1%	

APPENDIX K

Photovoltaic (PV) Rooftop Solar Power Generation

AC Energy & Cost Savings

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	4.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	3.1 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	16.0 ¢/kWh

Results			
Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	331	52.96
2	4.05	358	57.28
3	4.58	434	69.44
4	4.84	424	67.84
5	5.30	467	74.72
6	5.33	440	70.40
7	5.27	445	71.20
8	5.25	440	70.40
9	5.06	427	68.32
10	4.46	402	64.32
11	3.15	287	45.92
12	2.87	277	44.32
Year	4.46	4732	757.12

[redacted] * [redacted]

About the Hourly Performance Data

Saving Text from a Browser

Run PVWATTS v.1 for another US location or an International location
Run PVWATTS v.2 (US only)

lease send questions and comments regarding PVWATTS to Webmaster

isclaimer and copyright notice

Return to RReDC home page (http://rredc.nrel.gov)


271 Berkshire Valley Rd, Wharton, NJ 07885
© 2009 Google
©2009
5, 2007
40°54'34.13" N 74°36'41.45" W elev 712 ft

Cautions for Interpreting the Results

The monthly and yearly energy production are modeled using the PV system parameters you selected and weather data that are typical or representative of long-term averages. For reference, or comparison with local information, the solar radiation values modeled for the PV array are included in the performance results.

Because weather patterns vary from year-to-year, the values in the tables are better indicators of long-term performance than performance for a particular month or year. PV performance is largely proportional to the amount of solar radiation received, which may vary from the long-term average by ± 30% for monthly values and ± 10% for yearly values. How the solar radiation might vary for your location may be evaluated by examining the tables in the *Solar Radiation Data Manual for Flat-Plate and Concentrating Collectors* (*http://rredc.nrel.gov/solar/old_data/nsrdb/redbook/*).

For these variations and the uncertainties associated with the weather data and the model used to model the PV performance, future months and years may be encountered where the actual PV performance is less than or greater than the values shown in the table. The variations may be as much as 40% for individual months and up to 20% for individual years. Compared to long-term performance over many years, the values in the table are accurate to within 10% to 12%.

If the default overall DC to AC derate factor is used, the energy values in the table will overestimate the actual energy production if nearby buildings, objects, or other PV modules and array structure shade the PV modules; if tracking mechanisms for one- and two-axis tracking systems do not keep the PV arrays at the optimum orientation with respect to the sun's position; if soiling or snow cover related losses exceed 5%; or if the system performance has degraded from new. (PV performance typically degrades 1% per year.) If any of these situations exist, an overall DC to AC derate factor should be used with PVWATTS that was calculated using system specific component derate factors for *shading*, *sun-tracking*, *soiling*, and *age*.

The PV system size is the nameplate DC power rating. The energy production values in the table are valid only for crystalline silicon PV systems.

The cost savings are determined as the product of the number of kilowatt hours (kWh) and the cost of electricity per kWh. These cost savings occur if the owner uses all the electricity produced by the PV system, or if the owner has a net-metering agreement with the utility. With net-metering, the utility bills the owner for the net electricity consumed. When electricity flows from the utility to the owner, the meter spins forward. When electricity flows from the PV system to the utility, the meter spins backwards.

If net-metering isn't available and the PV system sends surplus electricity to the utility grid, the utility generally buys the electricity from the owner at a lower price than the owner pays the utility for electricity. In this case, the cost savings shown in the table should be reduced.

Besides the cost savings shown in the table, other benefits of PV systems include greater energy independence and a reduction in fossil fuel usage and air pollution. For commercial customers, additional cost savings may come from reducing demand charges. Homeowners can often include the cost of the PV system in their home mortgage as a way of accommodating the PV system's initial cost.

To accelerate the use of PV systems, many state and local governments offer financial incentives and programs. Go to http://www.nrel.gov/stateandlocal for more information.

Roxbury Fire Station # 3

Cost of Electricity $0.19 $/kWh

ECM-8.2 Photovoltaic (PV) Rooftop Solar Power Generation-4kW System

Budgetary	Annual Utility Savings				Estimated	Total	New Jersey Renewable	New Jersey Renewable	Payback	Payback
Cost					Maintenance	Savings	* Energy Incentive	** SREC	(without incentive)	(with incentive)
					Savings					
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$40,000	**0.0**	**4,732**	**0**	**$880**	**0**	**$880**	**$4,000**	**$2,303**	**45.4**	**11.3**

*Incentive based on New Jersey renewable energy program for non-residential applications(PV)= $1.00/W of installed PV system

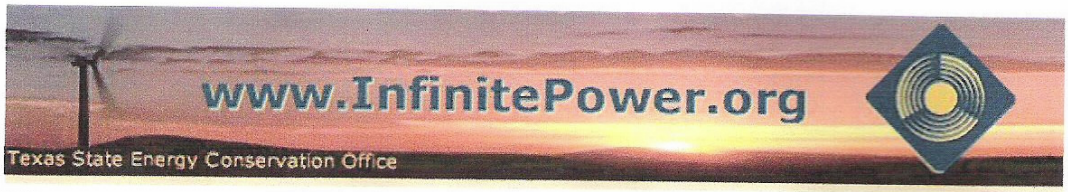
** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $487/1000kwh

Estimated Solar Renewable Energy Certificate Program (SREC) payments for 15 Years from RR Renewable Energy Consultants

Year	SREC
1	600
2	600
3	600
4	500
5	500
6	500
7	500
8	500
9	500
10	500
11	400
12	400
13	400
14	400
15	400
AVG	**487**

APPENDIX L

Solar Thermal Domestic Hot Water Plant



SOLAR WATER HEATING CALCULATOR

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

Water heating is a major energy consumer. Although the energy consumed daily is often less than for air conditioning or heating, it is required year round, making it a good application of solar energy.

Use this calculator to explore the energy usage of your water heater, and to estimate whether a solar water heater could save you money.

Water Heater Characteristics			
Physical		**Thermal**	
? Diameter (feet)	1.5	? Water Inlet Temperature (Degrees F)	55
? Capacity (gallons)	50	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	21.36	? Hot Water Temperature (Degrees F)	120
? Effective R-value	36	? Hot Water Usage (Gallons per Day)	12
Energy Use			
266.8		? Heat Delivered in Hot Water (BTU/hr)	
29.67		? Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		**Electric**
0	? Overall Efficiency	0.8819
0	? Conversion Efficiency	0.98
NaN BTU/hr	? Power Into Water Heater	302.5 BTU/hr
Cost		
$ 0.40 /Therm	? Utility Rates	$ 0.0 /kWh
$ NaN	? Yearly Water Heating Cost	$ 0
How Does Solar Compare?		
? Solar Water Heater Cost: $ 2000		? Percentage Solar: 70
NaN years for gas	? Payback Time for Solar System	Infinity years for electric

More information on solar water heating:

- Fact sheet - Solar Water Heaters (requires Adobe Acrobat reader)

Roxbury Community Center

$/kWh	$ 0.19	$/kWh	Electric DHW Heater
Btu/hr savings Savings	267	Btu/Hr	Infiinate calculator Btu/hr Savings 1.5 Gallon/Day per Occupant (4 Avg Occ through out the day)= 12 Gallon/day
Hours/Year	2,000	Hr	Assume 2000 hours per year to account for Fire Station
Btu/kWh	3,412	Btu/kWh	
kWh Saving/Yr	157	kWh/Year	

ECM-5.6 Solar Thermal Domestic Hot Water Plant

Budgetary	Annual Utility Savings				Estimated	Total	New Jersey Renewable	Payback	Payback
Cost					Maintenance Savings	Savings	Energy Incentive	(without incentive)	(with incentive)
$	kW	kWh	Gallons	$	$	$	$	Years	Years
$5,691	**0.0**	**157**	**0**	**$29**	**0**	**$29**	**$0**	**>30**	**>30**

*No Incentive available for the New Jersey renewable energy program at this time.

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.07

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Synergy Solar Thermal System	1	ea						$ 3,600	$ 3,600	
80 GallonStorage Tanks	1	ea	$ 350	$ 200		$ 350	$ 200	$ -	$ 550	
15 Gallon Drip Tank	1	ea	$ 150	$ 78		$ 150	$ 78	$ -	$ 228	

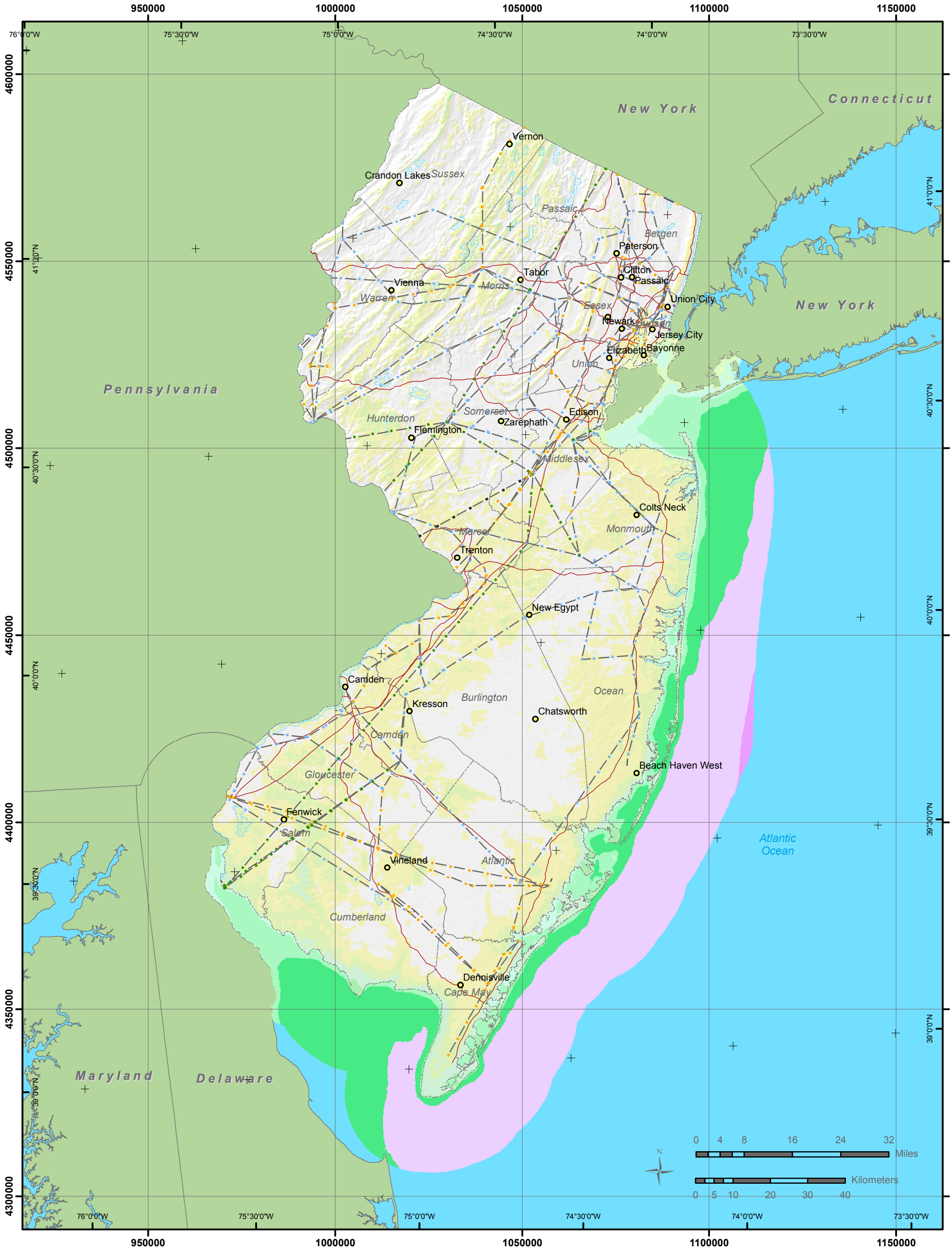
$ 4,378	Subtotal
$ 438	10% Contingency
$ 438	10% Contractor O&P
$ 438	10% Engineering
$ 5,691	**Total**

APPENDIX M

Wind

Wind Resource of New Jersey

Mean Annual Wind Speed at 30 Meters



Features

- City
- Interstate Highway
- County Boundary
- Water Body

Generalized Transmission Line

Category

- Under 100 kV
- 100 kV-161 kV
- 230 kV-287 kV
- 345 kV
- 500 kV
- 735 kV +
- Step-Up
- DC Line

Mean Speed at 30 m

mph	*m/s*
< 10.1	< 4.5
10.1 - 11.2	4.5 - 5.0
11.2 - 12.3	5.0 - 5.5
12.3 - 13.4	5.5 - 6.0
13.4 - 14.5	6.0 - 6.5
14.5 - 15.7	6.5 - 7.0
15.7 - 16.8	7.0 - 7.5
16.8 - 17.9	7.5 - 8.0
17.9 - 19.0	8.0 - 8.5
> 19.0	> 8.5

AWS Truewind

Projection: Tranverse Mercator,
UTM Zone 17 WGS84
Spatial Resolution of Wind Resource Data: 200m
This map was created by AWS Truewind using the MesoMap system and historical weather data. Although it is believed to represent an accurate overall picture of the wind energy resource, estimates at any location should be confirmed by measurement.

The transmission line information was obtained by AWS Truewind from the Global Energy Decisions Velocity Suite. AWS does not warrant the accuracy of the transmission line information.

APPENDIX N

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Fire Company No. 3

Building ID: 1931117
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A
Date SEP Generated: January 07, 2010

Facility
Fire Company No. 3
271 Berkshire Valley Road
Wharton, NJ 07885

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1958
Gross Floor Area (ft²): 5,850

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	62,542
Fuel Oil (No. 2) (kBtu)	417,458
Natural Gas - (kBtu)[4]	0
Total Energy (kBtu)	480,000

Energy Intensity[5]

Site (kBtu/ft²/yr)	82
Source (kBtu/ft²/yr)	108

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	40

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison

National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	-31%
Building Type	Fire Station/Police Station

Stamp of Certifying Professional

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

Certifying Professional
N/A

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

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

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

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.
NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Fire Company No. 3	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Fire Station/Police Station	Is this an accurate description of the space in question?		☐
Location	271 Berkshire Valley Road, Wharton, NJ 07885	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Entire Fire House (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	5,850 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Number of PCs	3 (Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	20 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	20 (Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Electricity

Meter: Electric Meter Act #100001425089 (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2008	12/31/2008	1,812.00
11/01/2008	11/30/2008	1,542.00
10/01/2008	10/31/2008	1,511.00
09/01/2008	09/30/2008	1,201.00
08/01/2008	08/31/2008	1,360.00
07/01/2008	07/31/2008	1,092.00
06/01/2008	06/30/2008	1,196.00
05/01/2008	05/31/2008	1,286.00
04/01/2008	04/30/2008	1,451.00
03/01/2008	03/31/2008	1,785.00
02/01/2008	02/29/2008	2,270.00
01/01/2008	01/31/2008	1,824.00
Electric Meter Act #100001425089 Consumption (kWh (thousand Watt-hours))		**18,330.00**
Electric Meter Act #100001425089 Consumption (kBtu (thousand Btu))		**62,541.96**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**62,541.96**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Fuel Oil (No. 2)

Meter: Fuel Oil Meter Act #1876 (Gallons)
Space(s): Entire Facility

Start Date	End Date	Energy Use (Gallons)
12/01/2008	12/31/2008	600.00
11/01/2008	11/30/2008	0.00
10/01/2008	10/31/2008	378.00
09/01/2008	09/30/2008	0.00
08/01/2008	08/31/2008	0.00
07/01/2008	07/31/2008	0.00
06/01/2008	06/30/2008	0.00
05/01/2008	05/31/2008	0.00
04/01/2008	04/30/2008	572.00
03/01/2008	03/31/2008	460.00

02/01/2008	02/29/2008	500.00
01/01/2008	01/31/2008	500.00
Fuel Oil Meter Act #1876 Consumption (Gallons)		**3,010.00**
Fuel Oil Meter Act #1876 Consumption (kBtu (thousand Btu))		**417,458.40**
Total Fuel Oil (No. 2) Consumption (kBtu (thousand Btu))		**417,458.40**
Is this the total Fuel Oil (No. 2) consumption at this building including all Fuel Oil (No. 2) meters?		☐

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	☐

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	☐

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same as the PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Fire Company No. 3
271 Berkshire Valley Road
Wharton, NJ 07885

Facility Owner
N/A

Primary Contact for this Facility
N/A

General Information

Fire Company No. 3	
Gross Floor Area Excluding Parking: (ft^2)	5,850
Year Built	1958
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Entire Fire House	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft^2)	5,850
Number of PCs[o]	3
Weekly operating hours[o]	20
Workers on Main Shift[o]	20

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2008)	**Baseline** (Ending Date 12/31/2008)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft2)	82	82	0	0	78
Source (kBtu/ft2)	108	108	0	0	157
Energy Cost					
$/year	$ 11,409.89	$ 11,409.89	N/A	N/A	$ 10,846.70
$/ft2/year	$ 1.95	$ 1.95	N/A	N/A	$ 1.85
Greenhouse Gas Emissions					
$MtCO_2e$/year	40	40	0	0	38
$kgCO_2e/ft^2$/year	7	7	0	0	7

More than 50% of your building is defined as Fire Station/Police Station. This building is currently ineligible for a rating. Please note the National Average column represents the CBECS national average data for Fire Station/Police Station. This building uses X% less energy per square foot than the CBECS national average for Fire Station/Police Station.

Notes:
o - This attribute is optional.
d - A default value has been supplied by Portfolio Manager.