TOWNSHIP OF KEARNY
FIRE STATION No. 1
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

CHA PROJECT NO. 20711

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1.0 INTRODUCTION & BACKGROUND

This report summarizes the energy audit for the Kearny Township Fire Station No. 1, a 6,000 square foot facility located in the Kearny, NJ. The facility, which is operational 24/7, consists of two bay garage areas, dispatch area, social room, sleeping quarters, kitchen, and restrooms.

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 consumptions while increasing comfort.

2.0 EXECUTIVE SUMMARY

This report details the results of the energy audit for Fire Station No. 1, located in Kearny, New Jersey. The facility, which is operational 24/7, consists of two bay garage areas, dispatch area, social room, sleeping quarters, kitchen, and restrooms. The following areas were evaluated for energy conservation measures:

- Garage heating
- Lighting replacements
- Occupancy sensors
- Insulation upgrades
- Garage door replacement
- Window AC upgrade
- Boiler replacement
- Thermostatic valves

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 $1,400 for the recommended ECMs may be realized with a payback of 6.1 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 Smart Start Buildings Program. A summary of the costs, savings, and paybacks for the recommended ECMs follows:

ECM-5 Install Infrared Garage Heaters

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	740	1,100	1.4	NA	7.5	NA

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

ECM-8 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
100	0.3	920	0	200	29.0	NA	0.5	NA

* There are no incentives in the New Jersey Smart Start Prescriptive Lighting Measures for this ECM.

ECM-9 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
400	0.0	320	0	100	0.5	$200	4.0	2.0

* Incentives based on New Jersey Smart Start Prescriptive Lighting Measures.

3.0 EXISTING CONDITIONS

3.1 Building General

Fire Station No. 1 (station) is a two story building constructed in 1928; minor renovations have been performed at the facility. The first floor consists of a two bay garage apparatus area, dispatch area, social room, and restrooms; the second floor houses sleeping quarters.

The building envelope is in poor condition. The outside brick walls have significant cracks and require repointing. In addition, the interior plaster finish is peeling off in many areas. The basement walls are constructed of stone.

All the windows were upgraded to double pane about 8-10 years' ago. The front garage doors are not insulated. The roof is constructed of wooden framing and finished with shingles has unoccupied attic space that is not insulated. The station is occupied by approximately 7 staff members.

3.2 Utility Usage

The building uses electricity, natural gas, municipal water, and is connected to the municipal sewage system.

Electricity and natural gas are purchased from the Public Service Electric and Gas Company (PSE&G). For 2008, the facility consumed a total of 39,600 kWh of electricity at an annual cost of about $7,000. The annual natural gas usage for the station was about 6,100 therms at a cost of $8,900.

Water usage was not available; however, the building is not charged for water use.

Electricity is a large portion of the utility charges, and has an average blended rate of $0.17 per kWh. The electricity usage trend shows a higher consumption during the summer cooling months due to air conditioning.. The majority of natural gas is used for heating the building, as indicated by the higher usage trend during the colder months of November through April. The average blended rate for natural gas was $1.46 per therm.

Utility data is provided in Appendix A.

As noted, electricity and natural gas commodity supply and delivery is presently purchased from PSE&G. The delivery component will always be the responsibility of the utility that connects the facility to the power grid or gas line; however, the supply can be purchased from a third party. The electricity or natural gas commodity supply entity will require submission of one to three years of past energy bills. Contract terms can vary among suppliers. A list of approved electrical and natural gas energy commodity suppliers can be found in Appendix A.

3.3 HVAC Systems

The heating is provided by a 1983 Peerless gas fired 630MBH input and 504MBH output steam boiler, located in the basement. Steam is delivered to about 20 radiators throughout the building.

Cooling is provided to selected rooms by the use of five window AC units, with an average size rated at about 14,000Btu/hr.

3.4 Lighting/Electrical Systems

The lighting systems within the building are manually controlled by individual switches or pull strings in the spaces and are turned on and off by occupants. The fire engine garage lighting remains on 24 hours a day for safety reasons. Most of the lighting is fluorescent, using F32T8, 32 watt lamps; there are also two, 8 foot T-12 fixtures in the garage. Some incandescent lamps have been changed to compact fluorescent; about ten incandescent lamps are still used.

The building's exterior lighting consists of high pressure sodium and compact fluorescent spotlight fixtures controlled by timers.

3.5 Control Systems

The heating temperature is controlled by the use of a single non programmable thermostat located on the second floor. Window AC units are individually controlled.

3.6 Plumbing Systems

Hot water is produced by a natural gas-fired A.O. Smith domestic hot water heater manufactured in 1996. The 40 gallon capacity heater is rated at an input of 40,000 Btu/hr.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Increase Ceiling Insulation

The ceiling of the station is not insulated. The heat loss or gain through the noninsulated ceiling can significantly increase the energy consumption of a building. This ECM proposes to install new batt insulation rated at R-24 in the ceiling. To calculate the savings, the heat losses and gains through the roof and ceiling were found using the existing roof assembly's R-value and bin weather data for Newark, NJ. The values were then totaled to determine the annual heating and cooling loads. Values were then determined with a thermal resistance, R-value, which included the additional R-24 insulation. The combined annual energy savings of adding insulation to the ceiling is expected to be 500 therms and 200 kWh.

The amount of heat conduction through ceilings and roofs is proportional to its overall heat transfer coefficient (commonly called the U factor) and the temperature difference between the conditioned space and its surroundings. This measure will save about 500 therms of natural gas and 200 kWh of electricity.

Insulation has an expected life of 24 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 4,560 kWh and 12,000 therms, totaling $19,200.

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

ECM-1 Increase Ceiling Insulation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
7,400	0	200	500	800	1.6	NA	9.3	NA

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

This measure is recommended.

4.2 ECM-2 Increase Wall Insulation

The existing building walls are not insulated, resulting insignificant heat loss. Additionally, the exterior walls have many cracks in need of repairs. Repointing the brick walls should be done as a minimum. Adding wall insulation would decrease heat loss. This measure assesses installing an additional 1½" thick rigid insulation to the outside of the building and providing stucco finishing that would match the front façade.

The same methodology used in section 4.1 was applied to calculate the savings of adding wall insulation. Using R-values for the existing and proposed wall assemblies, heat loss values were totaled and the difference was the overall annual savings. The annual energy savings of adding rigid board insulation and stucco to the building's exterior walls is expected to be 700 therms and 200 kWh.

Insulation has an expected life of 24 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 4,800 kWh and 16,560 therms, totaling $24,000.

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

ECM-2 Increase Wall Insulation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
25,000	-	200	700	1,000	0.0	NA	25.0	NA

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

This measure is not recommended.

4.3 ECM-3 Replace Garage Doors

The existing wooden thin panel garage doors provide minimal resistance to heat transfer and do not seal effectively around the edges. Installing insulated doors with tighter fitting seals around the perimeter would result in energy savings by reducing heat loss and infiltration. Both garage doors would be replaced with premium thermal protection garage doors with an R value of15.7 based on Model 2700 manufactured by Amarr.

To determine potential savings resulting from insulated doors, heat transfer calculations were performed. The square area, perimeter length, and infiltration parameters of the doors were determined. Using these factors in conjunction with weather bin data, the heating energy lost due to poor insulation and infiltration was calculated for existing conditions and the proposed case. The difference in heat losses for existing and proposed cases resulted in energy savings. This ECM resulted in annual savings of about 240 therms.

Garage doors have an expected life of 20 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 4,800 therms, totaling $6,000.

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

ECM-3 Replace Garage Doors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
8,000	0	0	240	300	(0.3)	NA	>25	NA

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

This measure is not recommended.

4.4 ECM-4 Replace Window AC Units

The existing building uses five window air conditioning units to provide cooling in occupied rooms. The window AC units use more energy than a split system, due to lower efficiency levels. In the back of the building three outdoor condensers could be installed that would comprise operations of five indoor

evaporating units. Some indoor evaporators replacing window AC units would, therefore, share common condensers.

For the energy savings model, existing and proposed energy usage was calculated. It was estimated that the existing five window units have an energy efficiency ratio (EER) of 7 based on age; typical new window units may have a nameplate EER of above 10. The proposed ductless splits have an EER of 14.4, based on manufacturer data of a new ductless mini-split system. Local bin weather data was used to vary runtime between 0% and 100% as outdoor air temperature varies. Runtime was assumed to be the same for the existing and proposed case.

The energy savings results from the difference in efficiency rating between existing window units and ductless systems. The proposed system will have independent thermostats for temperature control of each zone.

Split system AC units have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 30,450 kWh, totaling $6,000.

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

ECM-4 Replace Window AC Unit

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
15,400	0	2,000	0	400	(0.6)	500	>25	>25

* There will be $92/ton incentive available through the New Jersey Smart Start Program for this ECM.

This measure is not recommended.

4.5 ECM-5 Install Infrared Garage Heaters

The garages use steam radiators for heating. This energy conservation measure proposes that the existing unit radiators be replaced with infrared gas-fired heaters. Infrared heaters distribute heat more effectively and have high burner efficiencies.

For calculation purposes, a block load calculation was developed. It was determined that the existing garage area requires approximately 2,300 therms of energy produced by the steam boiler. The proposed infrared heaters have an improved burner efficiency of 85% and transfer heat more effectively. Repeating the energy consumption calculation with the proposed values and calculating difference in energy consumptions between the existing and proposed models yielded an annual natural gas savings of about 740 therms.

This measure will require installing two infrared heaters and new natural gas piping from the service line to the proposed units. New exhaust flue stacks and electrical wiring will also be necessary. Flue stacks for the heaters can be combined per the manufacturer's installation instructions.

Infrared heaters have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 13,320 kWh, totaling $19,800.

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

ECM-5 Install Infrared Garage Heaters

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	740	1,100	1.4	NA	7.5	NA

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

This measure is recommended.

4.6 ECM-6 Replace Boiler

The existing boiler serving the station is about 27 years' old and approaching the end of its useful life. This ECM proposes replacing the existing boiler with a new high efficiency steam boiler. The existing boiler would remain in place as a standby unit. This will give the facility 100% redundancy compared to the existing system. The new boiler would be gas-fired with an output capacity of 500 MBH.

Based on the age and condition of the existing boiler, the efficiency was estimated at about 72%. The base case model assumed that the annual energy consumed by the existing boiler will be lowered by the amount of energy provided to the garage area by infrared heating described in ECM-5. Utilizing the new high efficiency steam boiler would reduce the annual boiler consumption and result in energy savings of approximately 430 therms. The proposed boiler efficiency rating is assumed at 83%.

Steam boilers have an expected life of 30 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 12,900 kWh and $18,000.

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

ECM-6 Replace Boiler

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
18,600	0	0	430	600	0.0	900	>25	20.6

* Incentive shown is per the New Jersey Smart Start Program, 2010 Gas Heating Application.

This measure is not recommended.

4.7 ECM-7 Install Thermostatic Valves

Most of the radiators in the main station have limited or no control. Radiators are designed to cope with the coldest weather conditions. However, for much of the heating season the outside air temperature will be above these extreme conditions and radiators are then able to supply more heat than required and unwanted overheating may occur.

To determine savings for this measure, a block load building model was developed and reconciled with utility data to quantify the existing heat load. The existing model assumes there is an additional 20% air infiltration due to the opening of windows or doors in the winter. A proposed building model was prepared, which is identical to the existing model except 20% less air infiltration is assumed. The difference between the existing and proposed model is the projected annual energy savings.

To ensure that space is kept comfortably warm with minimized running costs, it is essential that an effective control system is fitted. Such a system can be achieved using Thermostatic Radiator valves. Since the individual rooms don't have thermostats occupants in the overheating rooms typically open the windows or doors. This results in additional ventilation heating losses. It was estimated that installation of thermostatic valves for all radiators will save about 320 therms of natural gas in heating and result in $500 annual savings.

Thermostatic valves have an expected life of 20 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 6,400 kWh and $10,000.

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

ECM-7 Install Thermostatic Valves

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
6,600	0	0	320	500	0.5	NA	13.2	NA

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

This measure is not recommended.

4.8 ECM-8 Lighting Replacements

Fire Station No. 1 utilizes approximately 10 inefficient incandescent bulbs. Overall energy consumption can be reduced by replacing the bulbs with more efficient compact fluorescent bulbs.

To compute the annual savings for this ECM, the energy consumption of the lighting fixtures was established, and it was determined to be 15,100 kWh per year. To calculate the annual energy consumption utilizing compact fluorescent bulbs, the proposed fixture power requirement was used with the same annual hours of operation. The difference between the existing and proposed annual energy consumption was the energy savings. Calculations are provided in Appendix I.

Existing incandescent bulbs would be replaced with compact fluorescent bulbs. This ECM will provide annual savings of 920 kWh and $200.

Lighting has an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 13,800 kWh, totaling $3,000.

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

ECM-8 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
100	0.3	920	0	200	29.0	NA	0.5	NA

* There are no incentives in the New Jersey Smart Start Prescriptive Lighting Measures for this ECM.

This measure is recommended.

4.9 ECM-9 Install Occupancy Sensors

Lighting fixtures throughout the building are all manually switched on and off. In total, the interior building lights are operated approximately 9.5 hours per day. The operating time of many of the building's interior lighting fixtures can be reduced by installing occupancy sensors in the upstairs bathroom, weight room, and office. Occupancy sensors were not considered for the fire engine garage section due to safety concerns. If a sensor does not have a clear view of the occupant's room or is obstructed by large vehicles, it may darken even with people in the space, creating an unsafe condition.

Applying the same process used in the calculation of ECM-8, the existing baseline energy consumption for each fixture was determined, and typical traffic patterns for each space were taken into account to approximate the actual occupancy hours per day. It was established that the annual energy consumption of the lighting fixtures can be reduced by 320 kWh.

Approximately three occupancy sensors and some standard electrical work are required for implementation of this measure.

Occupancy sensors have an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 4,800 kWh, totaling $600.

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

ECM-9 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
400	0.0	320	0	100	0.5	$200	4.0	2.0

* Incentives based on New Jersey Smart Start Prescriptive Lighting Measures.

This measure is recommended.

5.0 PROJECT INCENTIVES

5.1 Incentives Overview

5.1.1 New Jersey Pay For Performance and Smart Start Programs

The building will be eligible for incentives from the New Jersey Office of Clean Energy. The most significant incentives will be from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed for qualified energy conservation projects in facilities whose demand in any of the preceding 12 months exceeds 200 kW. Facilities that meet this criterion must also achieve a minimum performance target of 15% by using the EPA Portfolio Manager benchmarking tool before and after construction. Incentives for this program are in three parts. Incentive #1 energy reduction plan pays $0.05 per square foot to a maximum of $25,000 or 50% of facility annual energy cost paid after approval of application. Incentive #2 is 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 post-construction benchmarking is paid after acceptance of a report proving energy savings over one year utilizing the EPA Portfolio Manager benchmarking tool. 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 provide a total of $0.18/ kWh and $1.8/therm not to exceed 50% of total project cost. Additional incentives for #2 and #3 are increased by $0.005/kWh and $0.05/therm for each percentage increase above minimum performance target calculated with the EPA Portfolio Manager benchmarking tool not to exceed 50% of total project cost.

A new incentive structure is in place for projects exceeding 20% in energy savings, which doubles incentives #2 and #3 for a total of $0.36/kWh and $3.60/therm. For Incentive #1, the maximum incentive has been raised to 80% of project costs, or $2 million per gas account and $2 million per electric account. The 200 kW/month average minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations. This new incentive structure has been extended to December 31, 2010.

Specific incentives for energy conservation measures were calculated on an individual basis utilizing the 2009 New Jersey Smart Start incentive program. This program provides incentives dependent upon mechanical and electrical equipment. 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 Pay for Performance Program, all energy savings will be included in the total building energy usage and savings to be applied towards the Pay for Performance incentive. A project is not applicable for incentives in both programs.

5.1.2 PSE&G Small Business Direct Install Program

PSE&G has a new Small Business Direct Install Program, and the following information was obtained from the current PSE&G customer service website. Small business and not-for-profit customers residing in the municipalities noted in the following listing, which includes Kearny, may be eligible to participate in the PSE&G Direct Install Program.

Bayonne	Gloucester City	**Kearny**	Orange	Plainfield
Camden	Guttenberg	Mt. Holly	Passaic	Roselle
Carteret	Hillside	New Brunswick	Paterson	Trenton
East Orange	Irvington	Newark	Pemberton	Union City
Elizabeth	Jersey City	North Bergen	Perth Amboy	West New York

PSE&G is offering this program to customers designated by the State of New Jersey as having "Urban Enterprise Zones". Program guidelines require that customers be a PSE&G customer of record with a separately metered PSE&G electric or gas account; must have a qualifying energy usage profile - an average electric demand of 200 kW or less, or 40,300 kWh or less per month (the kW limit is waived for municipalities); and have a satisfactory payment history with PSE&G. Customers who lease their business are eligible for program participation; however, landlord permission is required.

As part of the PSE&G Direct Install Program, participants can obtain a free on-site energy audit of electrical equipment, proposal based on the audit with recommended energy efficiency measures; and installation of energy-saving equipment. PSE&G pays 100% of the cost to install the recommended energy efficiency measures. The customer is required to repay 20% of the total cost interest free, over two years as part of their PSE&G bill. The measures eligible for participation in this program are subject to approval by PSE&G.

Eligible energy efficiency equipment upgrades include:

- Lighting retrofits including sensors and controls
- Refrigeration, motors, and HVAC
- Site-specific custom projects

5.2 Building Incentives

Fire Station No. 1 is eligible for several incentives available under the New Jersey Smart Start Programs. The total amount of all qualified incentives is about $1,600 and includes installing high efficiency boilers, split system AC units, and upgrades to the lighting system.

When calculating the total incentive for the New Jersey Pay For Performance program, all energy conservation measures are applicable as the amount received is based on building wide energy improvements. Since the overall energy reduction for the building is estimated to exceed the 15% minimum, the building is eligible for Incentives #2 and #3 as previously discussed. This would result in a total incentive of about $11,800, reducing the total project payback from 18.1 years to 15.7 years. See Appendix K for calculations.

Under PSE&G's direct install program, the station is potentially eligible to receive $89,500, and would be required to repay $17,900. Incentives cannot be accepted under multiple programs.

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 building uses a gas-fired steam boiler and radiators to meet the heating requirements. This existing equipment is not compatible with a geothermal energy source. Therefore, to take advantage of a GHP system, the existing mechanical equipment would have to be completely removed and a low temperature closed loop water source heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

This measure is not recommended due to the extent of HVAC system renovation needed for implementation.

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The fire station 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 PVWATT 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 PVWATT solar power generation model is provided in Appendix L.

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 $700; 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 building had a maximum electricity demand of 18.3 kW and a minimum of 4.1 kW in 2008. The monthly average over the observed 12 month period was 11.2 kW. The existing load does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array; therefore, a 10 kW system size was selected for the calculations. 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.

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

Photovoltaic (PV) Rooftop Solar Power Generation – 10 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
100,000	0	11,830	0	2,100	2,100	10,000	5,800	>25	11.4

*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

While this measure is currently not recommended, future increases in the cost of electricity may make the payback period more attractive.

6.2.2 Solar Thermal 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 would transfer the heat from the panels to thermal storage tanks and transfer solar produced thermal energy to use for domestic hot water production. DHW is presently produced by a natural gas fired water heater and, therefore, this measure would not save site electricity.

Currently, an incentive is not available for installation of thermal solar systems. A Federal tax credit of 30% of installation cost for the thermal applications is available; however, the Township of Kearny 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 M and summarized as follows:

Solar Thermal Domestic Hot Water Plant

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
27,100	0	0	120	200	200	NA	>25	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 is, 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 Kearny area, the map indicates a mean annual wind speed of 10 miles per hour. For the fire station, there are site restrictions. Parking lots, trees and surrounding structures would greatly affect a tower location.

A wind speed map and aerial site photo are included in Appendix N.

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

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 facility 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 station 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. Thermal energy produced by the CHP plant in the warmer months 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 selection for a CHP plant at this location would be a reciprocating engine natural gas-fired unit. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

This measure is not recommended.

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 of noise issues, and potential zoning issues. Additionally, the fire station does not have a steady biomass waste stream to fuel the power generation system.

6.6 Demand Response Curtailment

Presently, electricity is delivered by PSE&G, which receives the electricity from regional power grid RFC. PSE&G 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.

Utility Curtailment is an agreement with the PSE&G regional transmission organization and an approved Curtailment Service Provider (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a facility utilizing an emergency generator; therefore, reducing the electrical demand on the utility grid. 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 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 emergency generators with notice to test the system.

A PSE&G pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. The town of Kearny fire station No. 1 had a monthly average electricity demand of 11.2 kW and a maximum demand of 18.3 kW in 2008.

This measure is not recommended because the facility does not have adequate load to meet 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 facility's energy consumption. Inputting such parameters as 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 fire station is considered a high energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 125 kBTU/ft^2/year. Several factors contribute to the unfavorable EUI, including, wasted energy from poor roof and wall insulation, inefficient boiler operation, inefficient lighting operation, etc. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 74 kBTU/ft^2/year; the national average for this building type is 78 kBTU/ft^2/year. The EPA Portfolio Manager did not generate an energy rating score for this building because the building type (fire station/police station) is currently not eligible for an energy star rating.

A full EPA Energy Star Portfolio Manager Report is located in Appendix O.

The user name and password for the Fire No. 1's EPA Portfolio Manager Account has been provided to Gerry Kerr of the Township of Kearny.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at Fire Station No. 1, in Kearny, New Jersey identified potential ECMs for lighting upgrades, garage heating, and occupancy sensors. Potential annual savings of $1,400 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-5 Install Infrared Garage Heaters

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	740	1,100	1.4	NA	7.5	NA

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

ECM-8 Lighting Replacements

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
100	0.3	920	0	200	29.0	NA	0.5	NA

* There are no incentives in the New Jersey Smart Start Prescriptive Lighting Measures for this ECM.

ECM-9 Install 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
400	0.0	320	0	100	0.5	$200	4.0	2.0

* Incentives based on New Jersey Smart Start Prescriptive Lighting Measures.

APPENDIX A

Utility Usage Analysis

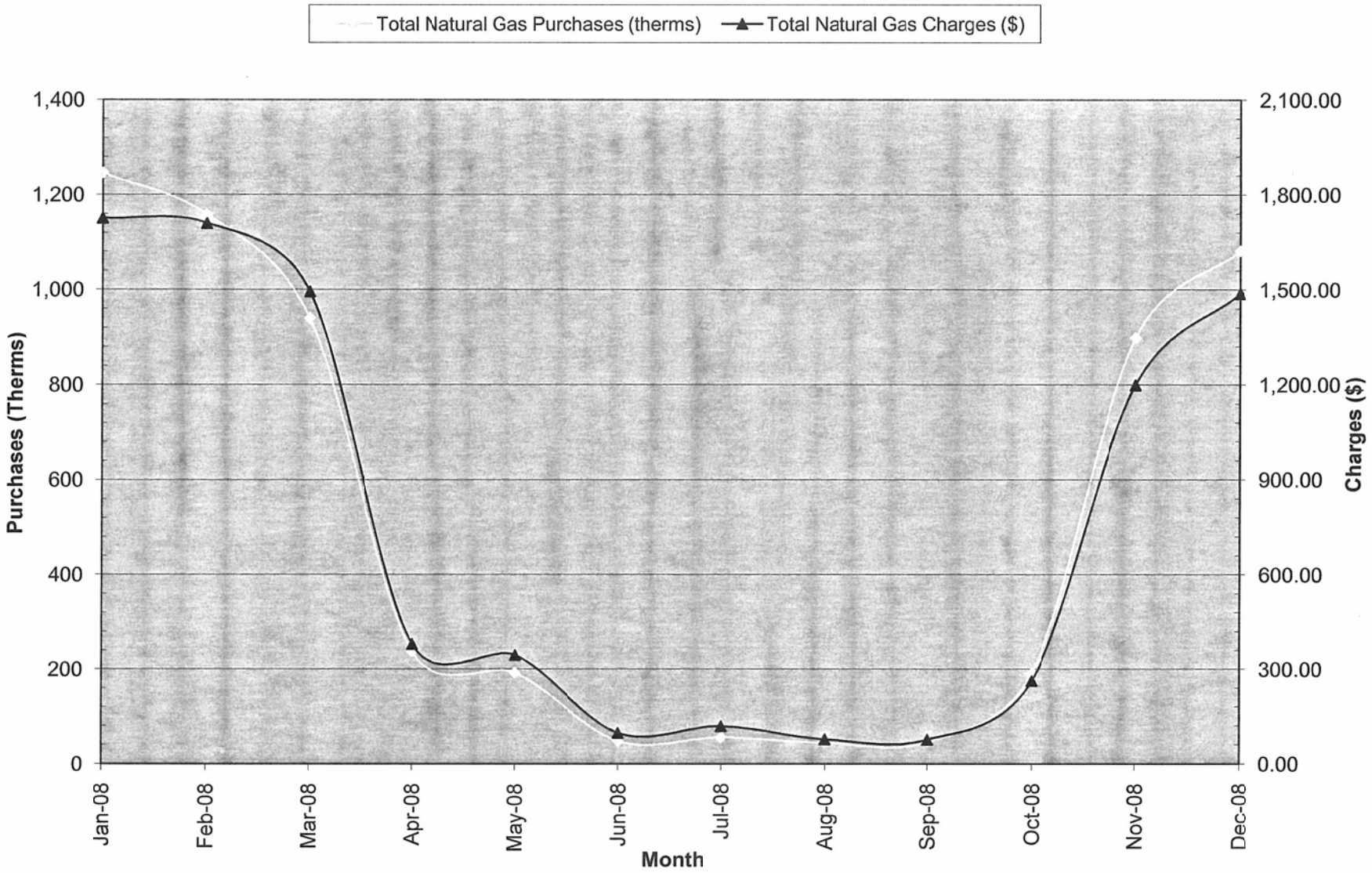
New Jersey BPU Energy Audit Program
CHA Project No.: 20711
Town of Kearny
PSE&G - Natural Gas Service

Fire Department #1 - 47 Davis Ave.
Account No.: 11 850 343 07
Meter No.: 2049568

Month	Therms	Charges ($)	($/Therm)
January-08	1,246	1,725.69	1.385
February-08	1,158	1,709.49	1.476
March-08	940	1,493.47	1.589
April-08	238	379.78	1.596
May-08	193	344.86	1.788
June-08	48	96.69	2.017
July-08	55	117.62	2.123
August-08	44	76.80	1.744
September-08	46	75.72	1.645
October-08	191	262.66	1.373
November-08	899	1,198.65	1.334
December-08	1,082	1,487.60	1.375

Most Recent Yr	6,140	8,969	1.461

Natural Gas Usage - Town of Kearny Fire Department #1



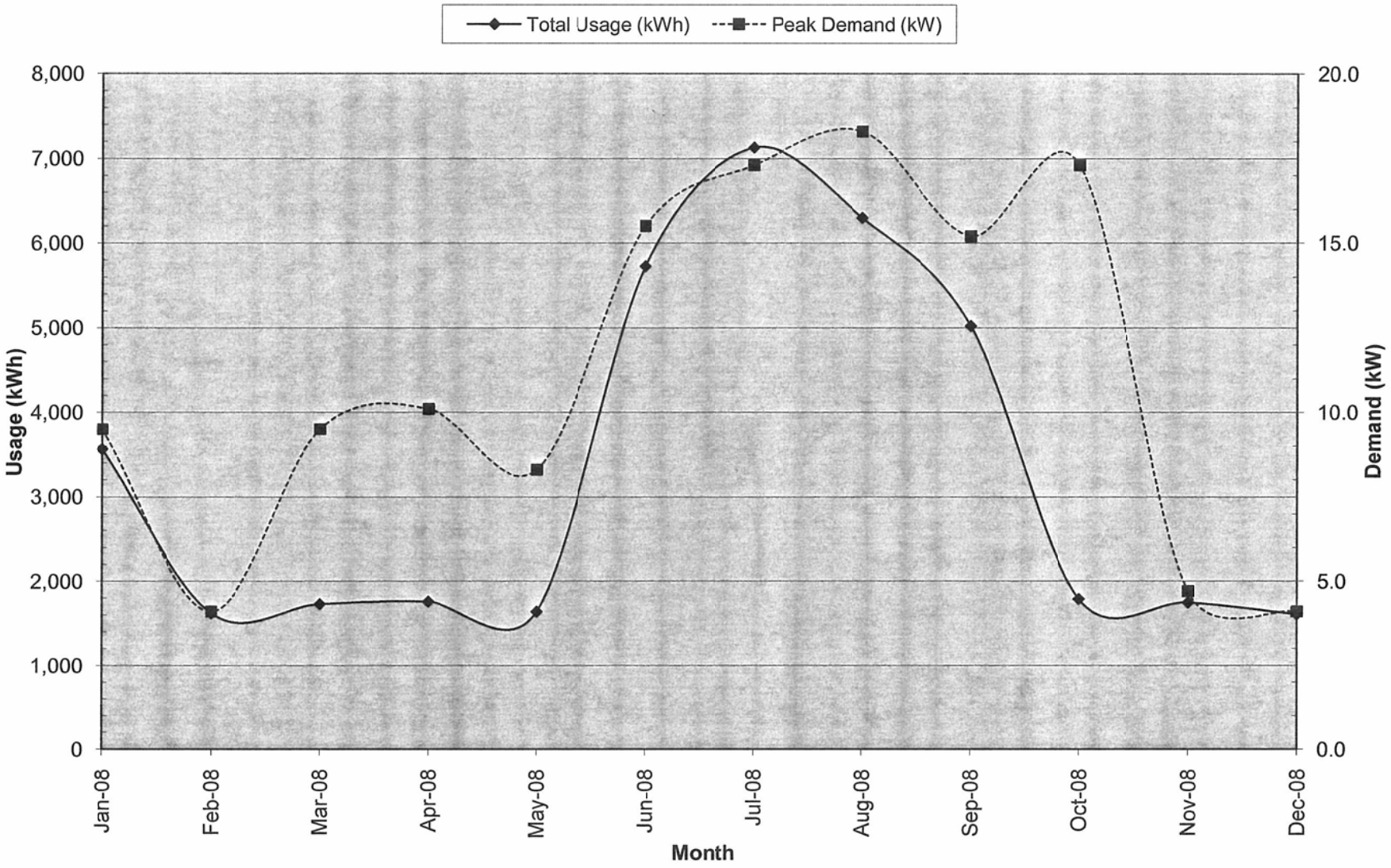
Utility Data - Kearny Fire#1(rev-0).xls
Natural Gas Chart

New Jersey BPU Energy Audit Program
CHA Project No.: 20711
Town of Kearny
PSE&G - Electric Service

Fire Department #1 - 47 Davis Ave.
Account No.: 11 850 343 07
Meter No.: 226004307

			Charges			Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
January-08	3,564	9.5	$539.79	$149.23	$390.56	0.1515	0.1096	15.71
February-08	1,620	4.1	$234.70	$49.91	$184.79	0.1449	0.1141	12.17
March-08	1,728	9.5	$262.86	$70.94	$191.92	0.1521	0.1111	7.47
April-08	1,758	10.1	$265.17	$73.28	$191.89	0.1508	0.1092	7.26
May-08	1,638	8.3	$247.89	$66.27	$181.62	0.1513	0.1109	7.98
June-08	5,724	15.5	$1,069.75	$257.78	$811.97	0.1869	0.1419	16.63
July-08	7,128	17.3	$1,304.49	$277.80	$1,026.69	0.1830	0.1440	16.06
August-08	6,294	**18.3**	$1,234.99	$288.91	$946.08	0.1962	0.1503	15.79
September-08	5,022	15.2	$979.07	$254.44	$724.63	0.1950	0.1443	16.74
October-08	1,788	17.3	$364.29	$153.39	$210.90	0.2037	0.1180	8.87
November-08	1,746	4.7	$305.38	$104.34	$201.04	0.1749	0.1151	22.20
December-08	1,608	4.1	$285.05	$102.01	$183.04	0.1773	0.1138	24.88
Most Recent Yr	39,618	18.3	$7,093.43	$1,848.30	$5,245.13	0.1790	0.1324	13.80

Electric Usage - Town of Kearny Fire Department #1



Utility Data - Kearny Fire#1(rev-0).xls
Electricity Chart

GAS MARKETERS LIST

The following is a listing of marketers/suppliers/brokers that have been licensed by the NJ Board of Public Utilities to sell natural gas to residential, small commercial and industrial customers served by the Public Service Electric and Gas Company distribution system. **This listing is provided for informational purposes only and PSE&G makes no representations or warranties as to the competencies of the entities listed herein or to the completeness of this listing.**

Gateway Energy Services
44 Whispering Pines Lane
Lakewood, NJ 08701
(800) 805-8586
www.gesc.com

Metro Energy Group, LLC
14 Washington Place
Hackensack, NJ 07601
www.metroenergy.com

RPL Holdings, Inc
601 Carlson Pkwy
Minnetonka, MN 55305

Great Eastern Energy
3044 Coney Island Ave. PH
Brooklyn, NY 11235
888-651-4121
www.greateasterngas.com

Metromedia Energy, Inc.
6 Industrial Way
Eatontown, NJ 07724
(800) 828-9427
www.metromediaenergy.com

South Jersey Energy Company
One South Jersey Plaza, Rte 54
Folsom, NJ 08037
(800) 756-3749
www.sjindustries.com/sje.htm

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095
(800) 437-7872
www.hess.com

Mitchell- Supreme Fuel
(NATGASCO)
532 Freeman Street
Orange, NJ 07050
(800) 840-4GAS
www.mitchellsupreme.com

Sprague Energy Corp.
Two International Drive, Ste 200
Portsmouth, NH 03801
800-225-1560
www.spragueenergy.com

Hudson Energy Services, LLC
545 Route 17 South
Ridgewood, NJ 07450
(201) 251-2400
www.hudsonenergyservices.com

MxEnergy Inc.
P.O. Box 177
Annapolis Junction, MD 20701
800-375-1277
www.mxenergy.com

Stuyvesant Energy LLC
642 Southern Boulevard
Bronx, NY 10455
(718) 665-5700
www.stuyfuel.com

Intelligent Energy
7001 SW 24th Avenue
Gainesville, FL 32607
Sales: 1 877 I've Got Gas
(1 877 483-4684)
Customer Service:
1 800 927-9794
www.intelligentenergy.org

Pepco Energy Services, Inc.
23 S Kinderkamack Rd, Suite D
Montvale, NJ 07645
(800) 363-7499
www.pepco-services.com

Tiger Natural Gas, Inc.
1422 E. 71st Street, Suite J.
Tulsa, OK 74136
1-888-875-6122
www.tigernaturalgas.com

Systrum Energy
877-SYSTRUM
(877-797-8786)
www.systrumenergy.com

Plymouth Rock Energy, LLC
165 Remsen Street
Brooklyn, NJ 11201
866-539-6450
www.plymouthrockenergy.com

UGI Energy Services, Inc.
d/b/a GASMARK
704 E. Main Street, Suite I
Moorestown, NJ 08057
856-273-9995
www.ugienergyservices.com

Macquarie Cook Energy, LLC
10100 Santa Monica Blvd, 18th
Fl
Los Angeles, CA 90067

PPL EnergyPlus, LLC
Energy Marketing Center
Two North Ninth Street
Allentown, PA 18101
1-866-505-8825
www.pplenergyplus.com/natural+gas/

Woodruff Energy
73 Water Street
P.O. Box 777
Bridgeton, NJ 08302
(856) 455-1111
www.woodruffenergy.com

Apr 10, 2009

ELECTRIC MARKETERS LIST

The following is a listing of marketers/suppliers/brokers that have been licensed by the NJ Board of Public Utilities to sell electricity to residential, small commercial and industrial customers served by the Public Service Electric and Gas Company distribution system. **This listing is provided for informational purposes only and PSE&G makes no representations or warranties as to the competencies of the entities listed herein or to the completeness of this listing.**

American Powernet Management
867 Berkshire Blvd, Suite 101
Wyomissing, PA 19610
www.americanpowernet.com

Gerdau Ameristeel Energy Co.
North Crossman Road
Sayreville, NJ 08872

PPL EnergyPlus, LLC
Energy Marketing Center
Two North Ninth Street
Allentown, PA 18101
1-866-505-8825
http://www.pplenergyplus.com/

BOC Energy Services
575 Mountain Avenue
Murray Hill, NJ 07974
www.boc-gases.com

Gexa Energy LLC New Jersey
20 Greenway Plaza, Suite 600
Houston, TX 77046
(866) 304-GEXA
Beth.miller@gexaenergy.com

Sempra Energy Solutions
The Mac-Cali Building
581 Main Street, 8th Floor
Woodbridge, NJ 07095
(877) 273-6772
www.SempraSolutions.com

Commerce Energy Inc.
535 Route 38, Suite 138
Cherry Hill, NJ 08002
(888) 817-8572 or
(858) 910-8099
www.commerceenergy.com

Glacial Energy of New Jersey
2602 McKinney Avenue, Suite 220
Dallas, TX 75204
www.glacialenergy.com

South Jersey Energy Company
1 South Jersey Plaza, Route 54
Folsom, NJ 08037
(800) 756-3749
www.sjindustries.com

ConEdison Solutions
701 Westchester Avenue
Suite 201 West
White Plains, NY 10604
(800) 316-8011
www.ConEdSolutions.com

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095
www.hess.com

Strategic Energy, LLC
6 East Main Street, Suite 6E
Ramsey, NJ 07446
(888) 925-9115
www.sel.com

Constellation NewEnergy, Inc.
1199 Route 22 East
Mountainside, NJ 07092
908 228-5100
www.newenergy.com

Integrys Energy Services, Inc
99 Wood Avenue, Suite 802
Iselin, NJ 08830
www.integrysenergy.com

Suez Energy Resources NA
333 Thornall Street FL6
Edison, NJ 08818
866.999.8374(toll free)
www.suezenergyresources.com

Credit Suisse (USA), Inc.
700 College Road East
Princeton, NJ 08450
www.creditsuisse.com

Liberty Power Delaware, LLC
1901 W Cypress Road, Suite 600
Fort Lauderdale, FL 33309
(866) Power-99
(866) 769-3799
www.libertypowercorp.com

UGI Energy Services, Inc.
d/b/a POWERMARK
1 Meridian Blvd. Suite 2C01
Wyomissing, PA 19610
(800) 427-8545
www.ugienergyservices.com

Direct Energy Services, LLC
One Gateway Center, Suite 2600
Newark, NJ 07102
(973) 799-8568
www.directenergy.com

Liberty Power Holdings, LLC
1901 W Cypress Creek Road, Suite 600
Fort Lauderdale, FL 33309
(866) Power-99
(866) 769-3799
www.libertypowercorp.com

FirstEnergy Solutions
395 Ghent Road Suite 407
Akron, OH 44333
(800) 977-0500
www.fes.com

Pepco Energy Services, Inc.
d/b/a Power Choice
23 S. Kinderkamack Rd Ste D
Montvale, NJ 07645
(800) 363-7499
www.pepco-services.com

Jan 14, 2009

APPENDIX B

ECM-1 Increase Ceiling Insulation

Kearny NJ
CHA #20711
Building: Fire Station #1

ECM-1 Install Ceiling Insulation

Existing Roof Area	3,087	sf
Existing U-value	0.10	Btu/hr/(sf*F)
Proposed R-value	34	
Proposed U-value	0.03	Btu/hr/(sf*F)
Heating System Efficiency	72%	
Cooling System Efficiency	1.20	kW/ton

Existing Cooling

Existing Cooling Load Temp Diff.	73	F
Existing Max. Roof Cooling Load	22,535	Btu/hr

Proposed Cooling

Proposed Cooling Load	6,628	Btu/hr
Occupied Cooling Setpoint	74	F
Unoccupied Cooling Setpoint	80	F

Existing Heating

Existing Heating Load Temp Diff.	57	F
Existing Max. Roof Heating Load	17,596	Btu/hr

Proposed Heating

Proposed Heating Load	5,175	Btu/hr
Occupied Heating Setpoint	71	F
Unoccupied Heating Setpoint	60	F

Existing Heating Total	50,723,423	Btu/yr
Proposed Heating Total	14,918,654	Btu/yr
Savings	35,804,769	Btu/yr
Input	497	**therms**
Existing Cooling Total	274	kWh/yr
Proposed Cooling Total	81	kWh/yr
Savings	194	kWh/yr

				Occupied				Unoccupied							
Avg Outdoor Air Temp. Bins °F	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Cooling Load	Existing Heating Load	Proposed Cooling Load	Proposed Heating Load
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
102.5	0	0	0	8,798	2,588	-	-	6,946	2,043	-	-	-	-	-	-
97.5	3	3	0	7,254	2,134	-	-	5,402	1,589	-	-	2	-	1	-
92.5	34	34	0	5,711	1,680	-	-	3,859	1,135	-	-	19	-	6	-
87.5	131	131	0	4,167	1,226	-	-	2,315	681	-	-	55	-	16	-
82.5	500	500	0	2,624	772	-	-	772	227	-	-	131	-	39	-
77.5	620	620	0	1,080	318	-	-	-	-	-	-	67	-	20	-
72.5	664	664	0	-	-	-	-	-	-	-	-	-	-	-	-
67.5	854	854	0	-	-	1,080	318	-	-	-	-	-	922,704	-	271,384
62.5	927	927	0	-	-	2,624	772	-	-	-	-	-	2,432,402	-	715,412
57.5	600	600	0	-	-	4,167	1,226	-	-	772	227	-	2,500,470	-	735,432
52.5	610	610	0	-	-	5,711	1,680	-	-	2,315	681	-	3,483,680	-	1,024,612
47.5	611	611	0	-	-	7,254	2,134	-	-	3,859	1,135	-	4,432,469	-	1,303,667
42.5	656	656	0	-	-	8,798	2,588	-	-	5,402	1,589	-	5,771,455	-	1,697,487
37.5	1,023	1,023	0	-	-	10,341	3,042	-	-	6,943	2,043	-	10,579,303	-	3,111,560
32.5	734	734	0	-	-	11,885	3,496	-	-	8,489	2,497	-	8,723,553	-	2,565,751
27.5	334	334	0	-	-	13,428	3,950	-	-	10,033	2,951	-	4,485,102	-	1,319,148
22.5	252	252	0	-	-	14,972	4,404	-	-	11,575	3,405	-	3,772,931	-	1,109,686
17.5	125	125	0	-	-	16,515	4,857	-	-	13,120	3,859	-	2,064,431	-	607,186
12.5	47	47	0	-	-	18,059	5,311	-	-	14,663	4,313	-	848,771	-	249,638
7.5	22	22	0	-	-	19,602	5,765	-	-	16,207	4,767	-	431,254	-	126,839
2.5	13	13	0	-	-	21,146	6,219	-	-	17,750	5,221	-	274,897	-	80,852
-2.5	0	0	0	-	-	22,689	6,673	-	-	19,294	5,675	-	-	-	-
-7.5	0	0	0	-	-	24,233	7,127	-	-	20,837	6,129	-	-	-	-
TOTALS	**8,760**	**8,760**	**0**									**274**	**50,723,423**	**81**	**14,918,654**

Kearny NJ
CHA #20711
Building: Fire Station #1

ECM-1 Install Ceiling Insulation

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
Install 24" wide 6" insulation R-24	3024	sf	$ 1.23	$ 0.50		$ 3,645	$ 1,830	$ -	$ 5,475	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 5,475		Subtotal
$ 1,094.93	20%	Contingency
$ 821.20	15%	Contractor O&P
$ -		Engineering
$ 7,391		**Total**

APPENDIX C

ECM-2 Increase Wall Insulation

Kearny NJ
CHA #20711
Building: Fire Station #1

ECM-2 Increase Wall Insulation

Total Existing Wall Area	3,396	sf
Existing U-value	0.18	Btu/hr/(sf*F)
Proposed U-value	0.08	Btu/hr/(sf*F)
Heating Efficiency	72%	
Cooling Efficiency	1.20	kW/ton

Existing Cooling		
Max. North Wall Cooling Load	2,625	Btu/hr
Max. East Wall Cooling Load	2,184	Btu/hr
Max. South Wall Cooling Load	2,752	Btu/hr
Max. West Wall Cooling Load	1,846	Btu/hr

Existing Heating		
Existing Heating Load Temp Diff	69	F
Existing Max. Wall Heating Load	29,005	Btu/hr

Proposed Cooling		
Max. North Wall Cooling Load	1,155	Btu/hr
Max. East Wall Cooling Load	961	Btu/hr
Max. South Wall Cooling Load	1,211	Btu/hr
Max. West Wall Cooling Load	812	Btu/hr

Proposed Heating		
Proposed Max. Heating Load	12,762	Btu/hr

Occupied Cooling Setpoint	74	F
Unoccupied Cooling Setpoint	80	F

Occupied Heating Setpoint	68	F
Unoccupied Heating Setpoint	60	F

Existing Cooling Total	356	kWh/yr
Proposed Cooling Total	157	kWh/yr
Savings	199	kWh/yr

Existing Heating Total	88,844,917	Btu/yr
Proposed Heating Total	39,091,764	Btu/yr
Savings	49,753,154	Btu/yr
Input	691	therms

				Occupied				Unoccupied							
Avg Outdoor Air Temp. Bins *F	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Cooling Load	Existing Heating Load	Proposed Cooling Load	Proposed Heating Load
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
97.5	3	3	0	9,407	4,139	-	-	9,407	4,139	-	-	3	-	1	-
92.5	34	34	0	7,406	3,258	-	-	6,719	2,956	-	-	25	-	11	-
87.5	131	131	0	5,404	2,378	-	-	4,032	1,774	-	-	71	-	31	-
82.5	500	500	0	3,403	1,497	-	-	1,344	591	-	-	170	-	75	-
77.5	620	620	0	1,401	616	-	-	-	-	-	-	87	-	38	-
72.5	664	664	0	-	-	-	-	-	-	-	-	-	-	-	-
67.5	854	854	0	-	-	309	136	-	-	-	-	-	263,653	-	116,007
62.5	927	927	0	-	-	3,396	1,494	-	-	-	-	-	3,148,092	-	1,385,160
57.5	600	600	0	-	-	6,483	2,853	-	-	1,544	679	-	3,889,964	-	1,711,584
52.5	610	610	0	-	-	9,571	4,211	-	-	4,631	2,038	-	5,838,033	-	2,568,734
47.5	611	611	0	-	-	12,658	5,569	-	-	7,718	3,396	-	7,733,927	-	3,402,928
42.5	656	656	0	-	-	15,745	6,928	-	-	10,805	4,754	-	10,328,780	-	4,544,663
37.5	1,023	1,023	0	-	-	18,832	8,286	-	-	13,893	6,113	-	19,265,508	-	8,476,824
32.5	734	734	0	-	-	21,920	9,645	-	-	16,980	7,471	-	16,089,013	-	7,079,166
27.5	334	334	0	-	-	25,007	11,003	-	-	20,067	8,830	-	8,352,308	-	3,675,015
22.5	252	252	0	-	-	28,094	12,361	-	-	23,155	10,188	-	7,079,734	-	3,115,083
17.5	125	125	0	-	-	31,181	13,720	-	-	26,242	11,546	-	3,897,682	-	1,714,980
12.5	47	47	0	-	-	34,269	15,078	-	-	29,329	12,905	-	1,610,630	-	708,677
7.5	22	22	0	-	-	37,356	16,437	-	-	32,418	14,263	-	821,832	-	361,606
2.5	13	13	0	-	-	40,443	17,795	-	-	35,504	15,622	-	525,763	-	231,336
-2.5	0	0	0	-	-	43,531	19,153	-	-	38,591	16,980	-	-	-	-
-7.5	0	0	0	-	-	46,618	20,512	-	-	41,679	18,338	-	-	-	-
TOTALS	**8,760**	**8,760**	**0**									**356**	**88,844,917**	**157**	**39,091,764**

Kearny NJ
CHA #20711
Building: Fire Station #1

ECM-2 Increase Wall Insulation

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
Polyisocyanurate 1.5" R-10	3,396	sf	$ 0.70	$ 0.44	$ 0.06	$ 2,343	$ 1,808	$ 204	$ 4,355	
Exterior stucco 3 coats, mesh, coloring	377	sy	$9.36	$13.66		$ 3,458	$ 6,231	$ -	$ 9,688	
Trim and misc	1	ls	$ 1,000	$ 1,280		$ 980	$ 1,549	$ -	$ 2,529	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
Trim and misc	1	ls	$ 1,000	$ 1,280		$ 980	$ 1,549	$ -	$ 2,529	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 19,100	Subtotal
$2,865	15% Contingency
$2,865	15% Contractor O&P
$ -	Engineering
$ 24,831	**Total**

APPENDIX D

ECM-3 Replace Garage Doors

Kearny NJ
CHA #20711
Fire Station #1

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

ECM-3 Replace Garage Doors

Description Doors can lead to increased energy consumption due to infiltration/exfiltration and heat gain/loss. Replacing existing metal with more insulated doors can decrease energy usage.

	Occupied Cooling Hours per Week	0	Hours		
	Occupied Heating Hours per Week	168	Hours		
Given	Heating Energy Cost	$1.46	$/therm		
	Cooling Cost	$0.179	$/kWh		
	Occupied Cooling Setpoint Temperature	74.0	Degrees F		(Assumption)
	Occupied Cooling Avg Space Air Enthalpy	25.5	btu/# air		(Assumption)
	Occupied Heatng Setpoint Temperature	71.0	Degrees F	Occupied	(Assumption)
	Unoccupied Heating Setpoint Temperature	0.0	Degrees F	Unoccupied	(Assumption)
	Door Area	316	sq.ft.		(From door survey)
	Door Perimeter	118	ft		(From door survey)
	Proposed U factor	0.07	Btu/(h*sqft*degf)		(From door vendor)
	Proposed Air Infiltration	0.20	cfm/ft		(From door vendor)
	Cooling Conversion	12,000	Btu/ton		
	Heating Btu Conversion	1,000,000	Btu/MMBtu		
Assumptions	Existing U factor	0.28	Btu/(h*sqft*degf)		(Hollow metal doors)
	Existing Air Infiltration	0.50	cfm/ft		(From ASHRAE Fundamentals)
	Heating System Efficiency	72%			
	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	39.5	92.5	37	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	36.6	87.5	131	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	34.0	82.5	500	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	31.6	77.5	620	0.0	0.0	0.0	0	0	0	0	0	0
Heating	29.2	72.5	664	0.0	0.0	0.0	0	0	0	0	0	0
Heating	27.0	67.5	854	0.0	854.0	0.0	0	264,467	0	0	190,459	0
Heating	24.5	62.5	927	0.0	927.0	0.0	0	697,178	0	0	502,082	0
Heating	21.4	57.5	600	0.0	600.0	0.0	0	716,688	0	0	516,132	0
Heating	18.7	52.5	610	0.0	610.0	0.0	0	998,497	0	0	719,080	0
Heating	16.2	47.5	611	0.0	611.0	0.0	0	1,270,440	0	0	914,924	0
Heating	14.4	42.5	656	0.0	656.0	0.0	0	1,654,222	0	0	1,191,309	0
Heating	12.6	37.5	1,023	0.0	1023.0	0.0	0	3,032,254	0	0	2,183,716	0
Heating	10.7	32.5	734	0.0	734.0	0.0	0	2,500,356	0	0	1,800,663	0
Heating	8.6	27.5	334	0.0	334.0	0.0	0	1,285,526	0	0	925,788	0
Heating	6.8	22.5	252	0.0	252.0	0.0	0	1,081,403	0	0	778,786	0
Heating	5.5	17.5	125	0.0	125.0	0.0	0	591,710	0	0	426,128	0
Heating	4.1	12.5	47	0.0	47.0	0.0	0	243,276	0	0	175,198	0
Heating	2.6	7.5	22	0.0	22.0	0.0	0	123,607	0	0	89,017	0
Heating	1.0	2.5	13	0.0	13.0	0.0	0	78,791	0	0	56,743	0
Heating	0.0	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	-1.5	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Subtotal =			8,760	0	6,808	0	0	14,538,414	0 btu	0	10,470,024	0 btu

	Conduction + Infiltration		
Cooling Load =	0 + 0 =		0 btu
	Cooling Load		
Cooling Energy =	0 / 12000 * 1.20 =		0 kWh
	Cooling Energy x Cooling Cost		
Cooling Energy Cost =	0.00 x $0.179 =		$ -
	Conduction + Infiltration		
Heating Load =	14538414 + 10470024 =		25,008,439 btu
	Heating Load / Heat Content		
Heating Energy =	25008439 / 72% / 100000 =		347 therms
	Heating Energy x Heating Cost		
Heating Energy Cost =	347.34 x $1.460 =		$ 507

Operation	OA Enthalphy	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	39.5	92.5	37	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	36.6	87.5	131	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	34.0	82.5	500	0.0	0.0	0.0	0	0	0	0	0	0
Cooling	31.6	77.5	620	0.0	0.0	0.0	0	0	0	0	0	0
Heating	29.2	72.5	664	0.0	0.0	0.0	0	0	0	0	0	0
Heating	27.0	67.5	854	0.0	854.0	0.0	0	66,117	0	0	76,184	0
Heating	24.5	62.5	927	0.0	927.0	0.0	0	174,295	0	0	200,833	0
Heating	21.4	57.5	600	0.0	600.0	0.0	0	179,172	0	0	206,453	0
Heating	18.7	52.5	610	0.0	610.0	0.0	0	249,624	0	0	287,632	0
Heating	16.2	47.5	611	0.0	611.0	0.0	0	317,610	0	0	365,969	0
Heating	14.4	42.5	656	0.0	656.0	0.0	0	413,556	0	0	476,524	0
Heating	12.6	37.5	1,023	0.0	1023.0	0.0	0	758,063	0	0	873,487	0
Heating	10.7	32.5	734	0.0	734.0	0.0	0	625,089	0	0	720,265	0
Heating	8.6	27.5	334	0.0	334.0	0.0	0	321,381	0	0	370,315	0
Heating	6.8	22.5	252	0.0	252.0	0.0	0	270,351	0	0	311,514	0
Heating	5.5	17.5	125	0.0	125.0	0.0	0	147,928	0	0	170,451	0
Heating	4.1	12.5	47	0.0	47.0	0.0	0	60,819	0	0	70,079	0
Heating	2.6	7.5	22	0.0	22.0	0.0	0	30,902	0	0	35,607	0
Heating	1.0	2.5	13	0.0	13.0	0.0	0	19,698	0	0	22,697	0
Heating	0.0	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	-1.5	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Subtotal =			8,760	0	6,808	0	0	3,634,604	0 btu	0	4,188,010	0 btu

	Conduction	Infiltration		
Cooling Load =	(0) + (	0) =		0 btu
	Cooling Load			
Cooling Energy =	(0)/(	12000) * (	1.20) =	0 kWh
	Cooling Energy	Cooling Cost		
Cooling Energy Cost =	(0.00) x (	$0.179) =		$ -
	Conduction	Infiltration		
Heating Load =	(3634604) + (	4188010) =		7,822,613 btu
	Heating Load	Heat Content		
Heating Energy =	(7822613)/(	72%) / (	100000) =	109 therms
	Heating Energy	Heating Cost		
Heating Energy Cost =	(108.65) x (	$1.460) =		$ 159

Summary

EXISTING COOLING ENERGY	0.00	kWh	$	-
EXISTING HEATING ENERGY	347.34	therms	$	507.12
EXISTING ENERGY COST			$	507.12
PROPOSED COOLING ENERGY	0.00	kWh	$	-
PROPOSED HEATING ENERGY	108.65	therms	$	158.63
PROPOSED ENERGY COST			$	158.63
COOLING ENERGY SAVINGS	0.00	kWh	$	-
HEATING ENERGY SAVINGS	238.69	therms	$	348.49
ENERGY COST SAVINGS			$	348.49

68.7% of existing
68.7% of existing

Comments

Kearny NJ
CHA #20711
Building: Fire Station #1

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

ECM-3 Replace Garage Doors

Based on Amarr Model 2700 R=15.6 insulated sectional doors

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Demo existing door	2	ea		$ 120		$ -	$ 290	$ -	$ 290	
12 x12 door (insulated)	2	ea	$ 1,800	$ 625		$ 3,528	$ 1,513	$ -	$ 5,041	Reuse existing hardware
Misc	2	ea	$ 150	$ 300		$ 294	$ 726	$ -	$ 1,020	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

6351	Subtotal
635	10% Contingency
1048	15% Contractor O&P
$ -	Engineering
$ 8,034	**Total**

APPENDIX E

ECM-4 Replace Window AC Units

Kearny NJ
CHA #20711
Building: Fire Station #1

ECM-4 Replace Window AC units w/ Ductless Splits
(utilize remote outdoor condensers)

ASSUMPTIONS			Comments
Electric Cost	$0.179	/ kWh	
Average run hours per Week	70	Hours	Unit is manually turned on (even if after hours)
Space Balance Point	55	F	
Space Temperature Setpoint	70	deg F	setpoint
Avg. BTU / Hr Rating of existing AC unit	14,000	Btu / Hr	(typical size for cooling office spaces in this type of building)
Average EER	7.0		Units appear to average 10 years old, EER was 8 when new

Item	Value	Units	Comments
Total Number of Units	5		
Existing Annual Electric Usage	3,946	kWh	
Proposed EER	14.4		New ductless mini-splits (per manufacturer)
Proposed Annual Electric Usage	1,918	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Savings	2,028	kWh
Annual Cost Savings	$363	

OAT - DB Bin Temp F	Annual Hours	Cooling Hrs at Temp Above balance point	Assumed % of time of operation	Assumed hrs of Operation
102.5	0	0	100%	0
97.5	3	1	89%	1
92.5	34	14	79%	11
87.5	131	55	68%	37
82.5	500	208	58%	121
77.5	620	258	47%	122
72.5	664	277	37%	102
67.5	854	0	0%	0
62.5	927	0	0%	0
57.5	600	0	0%	0
52.5	610	0	0%	0
47.5	611	0	0%	0
42.5	656	0	0%	0
37.5	1,023	0	0%	0
32.5	734	0	0%	0
27.5	334	0	0%	0
22.5	252	0	0%	0
17.5	125	0	0%	0
12.5	47	0	0%	0
7.5	22	0	0%	0
2.5	13	0	0%	0
-2.5	0	0	0%	0
-7.5	0	0	0%	0
Total	8,760	813	49%	395

Kearny NJ
CHA #20711
Building: Fire Station #1

ECM-4 Replace Window AC units w/ Ductless Splits

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Window AC Unit Removal	5	LS		$ 25		$ -	$ 151	$ -	$ 151	
Indoor wall unit	4	ea	$ 745	$ 210		$ 2,920	$ 1,016	$ -	$ 3,937	
Condensing unit	3	ea	$ 1,380	$ 290		$ 4,057	$ 1,053	$ -	$ 5,110	
Extensions	4	ea	$ 120	$ 80		$ 470	$ 387	$ -	$ 858	
Misc	4	LS	$ 20	$ 30		$ 78	$ 145	$ -	$ 224	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
					$ -	$ -
Unitary Split System < 5.4 tons	5	Tons	$92	$460	$ 9,047	$ 8,587
					$ -	$ -
				$460	$9,047	$8,587

$ 10,279	Subtotal	
$ 2,056	20%	Contingency
$ 1,542	15%	Contractor O&P
$ 1,542		Engineering
$ 15,419	**Total**	

Total ECM Cost w/ Incentives	**$14,959**

APPENDIX F

ECM-5 Install Infrared Garage Heaters

Kearny NJ
CHA #20711
Fire Station #1

ECM-5 Install Infrared Garage Heaters

Garage Building Footprint	2,352	SF	Ex Occupied Htg Temp.	71	*F
Heat Content	100,000	Btu/Therm	Ex Unoccupied Htg Temp.	60	*F
Building Balance Temp.	60	*F	Occupied Heating UA	514	btu/hr/°F
Internal Gains	9,093	btu/h	Unoccupied Heating UA	514	btu/hr/°F
Unoc Internal Gain factor	1.20				
Ave Occ Internal Gain Factor	0.7				
Existing Heating Efficiency	72%				
Existing Heat Distribution Effectiveness	80%				
Proposed Burner Efficiency	84%				
Proposed Heat Distribution Effectiveness	90%				

Heating Energy Savings	743	Therms/yr

					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 Heating Energy Therms	Proposed Heating Energy Therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	M	N
102.5	49	0	0	0	0	0	-6,365	0	0	-10,912	0	0	-6,365	0	0	-10,912	0	0
97.5	43	3	3	0	0	0	-6,365	0	0	-10,912	0	0	-6,365	0	0	-10,912	0	0
92.5	40	34	34	0	0	0	-6,365	0	0	-10,912	0	0	-6,365	0	0	-10,912	0	0
87.5	37	131	131	0	0	0	-6,365	0	0	-10,912	0	0	-6,365	0	0	-10,912	0	0
82.5	34	500	500	0	0	0	-6,365	0	0	-10,912	0	0	-6,365	0	0	-10,912	0	0
77.5	32	620	620	0	0	0	-6,365	0	0	-10,912	0	0	-6,365	0	0	-10,912	0	0
72.5	29	664	664	0	0	0	-6,365	0	0	-10,912	0	0	-6,365	0	0	-10,912	0	0
67.5	27	854	854	0	1,798	2,925	-6,365	0	0	-10,912	1,798	2,925	-6,365	0	0	-10,912	0	0
62.5	25	927	927	0	4,365	7,103	-6,365	0	0	-10,912	4,365	7,103	-6,365	0	0	-10,912	82	63
57.5	21	600	600	0	6,933	11,282	-6,365	1,284	359	-10,912	6,933	11,282	-6,365	1,284	359	-10,912	123	94
52.5	19	610	610	0	9,501	15,460	-6,365	3,852	1,076	-10,912	9,501	15,460	-6,365	3,852	1,076	-10,912	197	150
47.5	16	611	611	0	12,069	19,639	-6,365	6,420	1,793	-10,912	12,069	19,639	-6,365	6,420	1,793	-10,912	269	205
42.5	14	656	656	0	14,637	23,817	-6,365	8,988	2,510	-10,912	14,637	23,817	-6,365	8,988	2,510	-10,912	365	278
37.5	13	1,023	1,023	0	17,205	27,996	-6,365	11,556	3,227	-10,912	17,205	27,996	-6,365	11,556	3,227	-10,912	690	526
32.5	11	734	734	0	19,773	32,174	-6,365	14,124	3,944	-10,912	19,773	32,174	-6,365	14,124	3,944	-10,912	581	443
27.5	9	334	334	0	22,341	36,353	-6,365	16,691	4,661	-10,912	22,341	36,353	-6,365	16,691	4,661	-10,912	303	231
22.5	7	252	252	0	24,909	40,531	-6,365	19,259	5,378	-10,912	24,909	40,531	-6,365	19,259	5,378	-10,912	258	197
17.5	6	125	125	0	27,477	44,710	-6,365	21,827	6,096	-10,912	27,477	44,710	-6,365	21,827	6,096	-10,912	143	109
12.5	4	47	47	0	30,045	48,888	-6,365	24,395	6,813	-10,912	30,045	48,888	-6,365	24,395	6,813	-10,912	59	45
7.5	3	22	22	0	32,613	53,067	-6,365	26,963	7,530	-10,912	32,613	53,067	-6,365	26,963	7,530	-10,912	30	23
2.5	1	13	13	0	35,180	57,245	-6,365	29,531	8,247	-10,912	35,180	57,245	-6,365	29,531	8,247	-10,912	19	15
-2.5	0	0	0	0	37,748	61,424	-6,365	32,099	8,964	-10,912	37,748	61,424	-6,365	32,099	8,964	-10,912	0	0
-7.5	-2	0	0	0	40,316	65,602	-6,365	34,667	9,681	-10,912	40,316	65,602	-6,365	34,667	9,681	-10,912	0	0
TOTALS		8,760	8,760	0													3,121	2,378

Existing Building Ventilation & Infiltration (occ)	774	cfm
Overheat Ventilation Factor	0.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	133	cfm

Kearny NJ
CHA #20711
Fire Station #1

ECM-5 Install Infrared Garage Heaters

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Demo (disconnect piping, remove radiators)	2	ea		$ 500		$ -	$ 1,210	$ -	$ 1,210	
NG Infrared Tube Heater garage area (50MBH)	1	ea	$ 920	$ 158		$ 902	$ 191	$ -	$ 1,093	
NG Infrared Tube Heater (40MBH)	1	ea	$ 802	$ 142		$ 786	$ 172	$ -	$ 958	
Miscellaneous Gas Piping, Valves, etc.	1	ls	$ 420	$ 880		$ 412	$ 1,065	$ -	$ 1,476	
4" Class B Vent Piping	30	lf	$ 6.70	$ 10		$ 197	$ 363	$ -	$ 560	
4" Chimney Cap	2	ea	$ 11	$ 10		$ 22	$ 24	$ -	$ 46	
Roof Flashing	2	ea	$ 28	$ 10		$ 55	$ 24	$ -	$ 79	
T-stats (w/setback, control wiring)	2	ea	$ 95	$ 30		$ 186	$ 73	$ -	$ 259	
Electric wiring for ignition	2	ea	$ 30	$ 90		$ 59	$ 218	$ -	$ 277	

Note: Unit selections and budgetary pricing are per Reznor VR series infrared tube heaters.

$5,957	Subtotal
$1,191	20% Contingency
$1,072	15% Contractor O&P
$0	0% Engineering
$8,221	**Total**

APPENDIX G

ECM-6 Replace Boiler

Kearny NJ
CHA #20711
Building: Fire Station #1

ECM-6 Replace Boiler

Existing Fuel	Nat.Gas
Proposed Fuel	Nat.Gas

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$ 1.46		
Proposed Fuel Cost	$ 1.46		
Baseline Fuel Use	3,271	Therms	Existing consumption minus garage load (that will use infrared heating)
Existing Boiler Plant Efficiency	72%		Estimated or Measured
Baseline Boiler Load	235,502	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 100 Mbtu/Therms
Baseline Fuel Cost	$ 4,775		
Proposed Boiler Plant Efficiency	83%		New Boiler Efficiency
Proposed Fuel Use	2,837	Therms	Baseline Boiler Load / Proposed Efficiency / 100 Mbtu/Therms
Proposed Fuel Cost	$ 4,143		
Annual Savings	433	Therms	
Annual Savings	**$ 633**	**/yr**	

*Note to engineer: Link savings back to summary sheet in appropriate column.

Kearny NJ
CHA #20711
Building: Fire Station #1

ECM-6 Replace Boiler

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Demo										
Gas fired steam Boiler (544MBH)	1	ea	$ 8,125	$ 3,375		$ 7,963	$ 4,084	$ -	$ 12,046	
Flue Attachment	1	ls	$ 450	$ 120		$ 441	$ 145	$ -	$ 586	
Miscellaneous Electrical	1	ea	$ 150	$ 220		$ 147	$ 266	$ -	$ 413	
Gas piping, steam connections	1	ls	$ 340	$ 360		$ 333	$ 436	$ -	$ 769	
Misc controls	1	ls	$ 420	$ 420		$ 412	$ 508	$ -	$ 920	

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
					$ -	$ -
>300MBH-1500MBH	504	Tons	$2	$882	$ 12,046	$ 11,164
					$ -	$ -
				$882	$12,046	$11,164

$ 14,734		Subtotal
$1,473	10%	Contingency
$2,431	15%	Contractor O&P
$ -		Engineering
$ 18,639		**Total**

Total ECM Cost w/ Incentives	**$17,757**

APPENDIX H

ECM-7 Install Thermostatic Valves

Kearny NJ
CHA #20711
Building: Fire Station #1

ECM-7 Thermostatic Valves

Install thermostatic valves on all radiators

Building Footprint	6,043	SF	Ex Occupied Clng Temp.	74	°F	Ex Occupied Htg Temp.	71	°F	Base Case	5,513	therms
Heating Efficiency	72%		Ex Unoccupied Clng Temp.	74	°F	Ex Unoccupied Htg Temp.	71	°F	Proposed heating	5,192	therms
Cooling Efficiency	1.20	kW/ton	Occupied Cooling UA	(3,812)	btu/hr/°F	Occupied Heating UA	1,498	btu/hr/°F	Savings	321	therms
Internal Gains	23,822	btu/h	Unoccupied Cooling UA	(2,836)	btu/hr/°F	Unoccupied Heating UA	1,498	btu/hr/°F			
Unoc Internal Gain factor	0.03		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb						
Ave Occ Internal Gain Factor	0.7		Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb						
Economizer available (Y/N)	No										

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

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total 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	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-108,630	-129,082	-16,676	-80,819	-83,359	-715	0	0	0	0
97.5	42.5	3	3	0	-89,572	-89,640	-16,676	-66,640	-57,888	-715	0	59	59	0
92.5	39.5	34	34	0	-70,514	-71,712	-16,676	-52,462	-46,310	-715	0	540	540	0
87.5	36.6	131	131	0	-51,456	-54,382	-16,676	-38,283	-35,119	-715	0	1,605	1,605	0
82.5	34.0	500	500	0	-32,398	-38,844	-16,676	-24,104	-25,085	-715	0	4,396	4,396	0
77.5	31.6	620	620	0	-13,340	-24,502	-16,676	-9,925	-15,823	-715	0	3,380	3,380	0
72.5	29.2	664	664	0	0	0	-16,676	0	0	-715	0	1,107	1,107	0
67.5	27.0	854	854	0	5,245	5,020	-16,676	5,245	3,242	-715	0	547	547	0
62.5	24.5	927	927	0	12,737	12,191	-16,676	12,737	7,873	-715	0	0	0	106
57.5	21.4	600	600	0	20,230	19,362	-16,676	20,230	12,504	-715	0	0	0	191
52.5	18.7	610	610	0	27,722	26,533	-16,676	27,722	17,135	-715	0	0	0	318
47.5	16.2	611	611	0	35,215	33,705	-16,676	35,215	21,766	-715	0	0	0	443
42.5	14.4	656	656	0	42,707	40,876	-16,676	42,707	26,397	-715	0	0	0	610
37.5	12.6	1,023	1,023	0	50,199	48,047	-16,676	50,199	31,028	-715	0	0	0	1,159
32.5	10.7	734	734	0	57,692	55,218	-16,676	57,692	35,659	-715	0	0	0	981
27.5	8.6	334	334	0	65,184	62,389	-16,676	65,184	40,290	-715	0	0	0	514
22.5	6.8	252	252	0	72,677	69,561	-16,676	72,677	44,921	-715	0	0	0	439
17.5	5.5	125	125	0	80,169	76,732	-16,676	80,169	49,552	-715	0	0	0	243
12.5	4.1	47	47	0	87,662	83,903	-16,676	87,662	54,183	-715	0	0	0	101
7.5	2.6	22	22	0	95,154	91,074	-16,676	95,154	58,814	-715	0	0	0	52
2.5	1.0	13	13	0	102,647	98,245	-16,676	102,647	63,445	-715	0	0	0	33
-2.5	0.0	0	0	0	110,139	105,417	-16,676	110,139	68,076	-715	0	0	0	0
-7.5	-1.5	0	0	0	117,631	112,588	-16,676	117,631	72,707	-715	0	0	0	0
TOTALS		**8,760**	**8,760**	**0**								**11,635**	**11,635**	**5,192**

Existing Building Ventilation & Infiltration (occ)	**1,328**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**858**	**cfm**
Economizer Ventilation (from AHU's)	**470**	**cfm**

Energy Use Indices (calculated)

	Base Case
Heating	5,192
Target ->	5,649
	91.9%

	Base Case
Cooling	11,635
Target ->	300
	3878.2%

Kearny NJ
CHA #20711
Building: Fire Station #1

ECM-7 Thermostatic Valves

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Thermostatic valves	16	ls	$ 85	$ 135		$ 1,333	$ 2,614	$ -	$ 3,946	
Misc	1	ls	$ 250	$ 500		$ 245	$ 605	$ -	$ 850	
						$ -	$ -	$ -	$ -	

$ 4,796	Subtotal
$959	20% Contingency
$863	Contractor 15% O&P
$ -	Engineering
$ 6,619	**Total**

APPENDIX I

ECM-8 Lighting Replacements

Energy Audit of Kearny, NJ
CHA Project No. 20711 - Fire Station #1
ECM-8 Lighting Replacements

0 $0.132 $/kWh
$13.80 $/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
38	Upstairs Sleeping Quarters	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	2600	468	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	2,600	468	-	-	$ -	$ -	$0		
38	Upstairs Kitchen	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2600	156	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2,600	156	-	-	$ -	$ -	$0		
71	Upstairs Central Corridor	1	I 60	I60/1	60	0.1	SW	2600	156	1	CF 26	CFQ26/1-L	27	0.0	SW	2,600	70	86	0.0	$ 16.79	$ 6.25	$0	0.4	0.4
38	Upstairs Bathroom	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2080	125	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2,080	125	-	-	$ -	$ -	$0		
71	Upstairs Bathroom	3	I 60	I60/1	60	0.2	Pull-String	2080	374	3	CF 26	CFQ26/1-L	27	0.1	Pull-String	2,080	168	206	0.1	$ 43.58	$ 18.75	$0	0.4	0.4
38	Upstairs Weight Room	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2600	312	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2,600	312	-	-	$ -	$ -	$0		
38	Upstairs Front Office	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2600	156	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2,600	156	-	-	$ -	$ -	$0		
38	Downstairs Lounge	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2600	312	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2,600	312	-	-	$ -	$ -	$0		
204	Left Side Garage	2	S 96 W F 2 (MAG) 8'	F82EHE	207	0.4	SW	8760	3,627	2	S 96 W F 2 (MAG) 8'	F82EHE	207	0.4	SW	8,760	3,627	-	-	$ -	$ -	$0		
199	Left Side Garage	2	W 32 C F 1 (ELE)	F41LL	32	0.1	SW	8760	561	2	W 32 C F 1 (ELE)	F41LL	32	0.1	SW	8,760	561	-	-	$ -	$ -	$0		
199	Left Side Garage	2	W 32 C F 1 (ELE)	F41LL	32	0.1	SW	8760	561	2	W 32 C F 1 (ELE)	F41LL	32	0.1	SW	8,760	561	-	-	$ -	$ -	$0		
15	Left Side Garage	1	S 32 W F 2 (ELE)	F42LL	60	0.1	SW	8760	526	1	S 32 W F 2 (ELE)	F42LL	60	0.1	SW	8,760	526	-	-	$ -	$ -	$0		
71	Front Entrance	1	I 60	I60/1	60	0.1	SW	8760	526	1	CF 26	CFQ26/1-L	27	0.0	SW	8,760	237	289	0.0	$ 43.62	$ 6.25	$0	0.1	0.1
199	Right Side Garage	2	W 32 C F 1 (ELE)	F41LL	32	0.1	Breaker	8760	561	2	W 32 C F 1 (ELE)	F41LL	32	0.1	Breaker	8,760	561	-	-	$ -	$ -	$0		
199	Right Side Garage	4	W 32 C F 1 (ELE)	F41LL	32	0.1	SW	8760	1,121	4	W 32 C F 1 (ELE)	F41LL	32	0.1	SW	8,760	1,121	-	-	$ -	$ -	$0		
29	Right Side Garage	1	CR 32 C F 1 (MAG)	FC32/1	40	0.0	SW	8760	350	1	CR 32 C F 1 (MAG)	FC32/1	40	0.0	SW	8,760	350	-	-	$ -	$ -	$0		
71	Rear Closet	1	I 60	I60/1	60	0.1	SW	2000	120	1	CF 26	CFQ26/1-L	27	0.0	SW	2,000	54	66	0.0	$ 14.18	$ 6.25	$0	0.4	0.4
38	Rear Janitor's Closet	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2000	120	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2,000	120	-	-	$ -	$ -	$0		
71	Basement	3	I 60	I60/1	60	0.2	SW	2000	360	3	CF 26	CFQ26/1-L	27	0.1	SW	2,000	162	198	0.1	$ 42.53	$ 18.75	$0	0.4	0.4
72	Basement	2	I 34	I34/1	34	0.1	SW	2000	136	2	CF 13	CFQ13/1-L	15	0.0	SW	2,000	60	76	0.0	$ 16.32	$ 37.50	$0	2.3	2.3
80	Basement	1	36 CF 1	CFT36/1	51	0.1	SW	2000	102	1	36 CF 1	CFT36/1	51	0.1	SW	2,000	102	-	-	$ -	$ -	$0		
225	Front Flag Light	1	SP HPS 70	HPS70/1	95	0.1	Timer	4368	415	1	SP HPS 70	HPS70/1	95	0.1	Timer	4,368	415	-	-	$ -	$ -	$0		
80	Front Red Light	1	36 CF 1	CFT36/1	51	0.1	Timer	4368	223	1	36 CF 1	CFT36/1	51	0.1	Timer	4,368	223	-	-	$ -	$ -	$0		
225	Rear Spot Light	1	SP HPS 70	HPS70/1	95	0.1	Timer	4368	415	1	SP HPS 70	HPS70/1	95	0.1	Timer	4,368	415	-	-	$ -	$ -	$0		
225	Rear Spot Light	8	SP HPS 70	HPS70/1	95	0.8	Timer	4368	3,320	8	SP HPS 70	HPS70/1	95	0.8	Timer	4,368	3,320	-	-	$ -	$ -	$0		
	Total	**48**				**3.2**			**15,101**	**48**			**1,392**	**3**			**14,180**	**921**	**0.3**	**$177**	**$94**	**$0**		
																		Demand Savings		**0.3**	**$55**			
																		kWh Savings		**921**	**$122**			
																		Total savings			**$177**		**0.5**	**0.5**

APPENDIX J

ECM-9 Install Occupancy Sensors

Energy Audit of Kearny, NJ
CHA Project No. 20711 - Fire Station #1
ECM-9 Install Occupancy Sensors

0 $0.132 $/kWh
$13.80 $/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
38	Upstairs Sleeping Quarters	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	2600	468.0	3	T 32 R F 2 (ELE)	F42LL	60	0.2	None	2600	468.0	0.0	0.0	$0.00	$0.00	$0.00		
38	Upstairs Kitchen	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2600	156.0	1	T 32 R F 2 (ELE)	F42LL	60	0.1	None	2600	156.0	0.0	0.0	$0.00	$0.00	$0.00		
71	Upstairs Central Corridor	1	I 60	I60/1	60	0.1	SW	2600	156.0	1	I 60	I60/1	60	0.1	None	2600	156.0	0.0	0.0	$0.00	$0.00	$0.00		
38	Upstairs Bathroom	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2080	124.8	1	T 32 R F 2 (ELE)	F42LL	60	0.1	OCC	1000	60.0	64.8	0.0	$8.55	$118.75	$40.00	13.9	9.2
71	Upstairs Bathroom	3	I 60	I60/1	60	0.2	Pull-String	2080	374.4	3	I 60	I60/1	60	0.2	None	2080	374.4	0.0	0.0	$0.00	$0.00	$0.00		
38	Upstairs Weight Room	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2600	312.0	2	T 32 R F 2 (ELE)	F42LL	60	0.1	C-OCC	1200	144.0	168.0	0.0	$22.18	$187.50	$70.00	8.5	5.3
38	Upstairs Front Office	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2600	156.0	1	T 32 R F 2 (ELE)	F42LL	60	0.1	OCC	1200	72.0	84.0	0.0	$11.09	$118.75	$40.00	10.7	7.1
38	Downstairs Lounge	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2600	312.0	2	T 32 R F 2 (ELE)	F42LL	60	0.1	None	2600	312.0	0.0	0.0	$0.00	$0.00	$0.00		
204	Left Side Garage	2	S 96 W F 2 (MAG) 8'	F82EHE	207	0.4	SW	8760	3,626.6	2	S 96 W F 2 (MAG) 8'	F82EHE	207	0.4	None	8760	3,626.6	0.0	0.0	$0.00	$0.00	$0.00		
199	Left Side Garage	2	W 32 C F 1 (ELE)	F41LL	32	0.1	SW	8760	560.6	2	W 32 C F 1 (ELE)	F41LL	32	0.1	None	8760	560.6	0.0	0.0	$0.00	$0.00	$0.00		
199	Left Side Garage	2	W 32 C F 1 (ELE)	F41LL	32	0.1	SW	8760	560.6	2	W 32 C F 1 (ELE)	F41LL	32	0.1	None	8760	560.6	0.0	0.0	$0.00	$0.00	$0.00		
15	Left Side Garage	1	S 32 W F 2 (ELE)	F42LL	60	0.1	SW	8760	525.6	1	S 32 W F 2 (ELE)	F42LL	60	0.1	None	8760	525.6	0.0	0.0	$0.00	$0.00	$0.00		
71	Front Entrance	1	I 60	I60/1	60	0.1	SW	8760	525.6	1	I 60	I60/1	60	0.1	None	8760	525.6	0.0	0.0	$0.00	$0.00	$0.00		
199	Right Side Garage	2	W 32 C F 1 (ELE)	F41LL	32	0.1	Breaker	8760	560.6	2	W 32 C F 1 (ELE)	F41LL	32	0.1	None	8760	560.6	0.0	0.0	$0.00	$0.00	$0.00		
199	Right Side Garage	4	W 32 C F 1 (ELE)	F41LL	32	0.1	SW	8760	1,121.3	4	W 32 C F 1 (ELE)	F41LL	32	0.1	None	8760	1,121.3	0.0	0.0	$0.00	$0.00	$0.00		
29	Right Side Garage	1	CR 32 C F 1 (MAG)	FC32/1	40	0.0	SW	8760	350.4	1	CR 32 C F 1 (MAG)	FC32/1	40	0.0	None	8760	350.4	0.0	0.0	$0.00	$0.00	$0.00		
71	Rear Closet	1	I 60	I60/1	60	0.1	SW	2000	120.0	1	I 60	I60/1	60	0.1	None	2000	120.0	0.0	0.0	$0.00	$0.00	$0.00		
38	Rear Janitor's Closet	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2000	120.0	1	T 32 R F 2 (ELE)	F42LL	60	0.1	None	2000	120.0	0.0	0.0	$0.00	$0.00	$0.00		
71	Basement	3	I 60	I60/1	60	0.2	SW	2000	360.0	3	I 60	I60/1	60	0.2	None	2000	360.0	0.0	0.0	$0.00	$0.00	$0.00		
72	Basement	2	I 34	I34/1	34	0.1	SW	2000	136.0	2	I 34	I34/1	34	0.1	None	2000	136.0	0.0	0.0	$0.00	$0.00	$0.00		
80	Basement	1	36 CF 1	CFT36/1	51	0.1	SW	2000	102.0	1	36 CF 1	CFT36/1	51	0.1	None	2000	102.0	0.0	0.0	$0.00	$0.00	$0.00		
225	Front Flag Light	1	SP HPS 70	HPS70/1	95	0.1	Timer	4368	415.0	1	SP HPS 70	HPS70/1	95	0.1	None	4368	415.0	0.0	0.0	$0.00	$0.00	$0.00		
80	Front Red Light	1	36 CF 1	CFT36/1	51	0.1	Timer	4368	222.8	1	36 CF 1	CFT36/1	51	0.1	None	4368	222.8	0.0	0.0	$0.00	$0.00	$0.00		
225	Rear Spot Light	1	SP HPS 70	HPS70/1	95	0.1	Timer	4368	415.0	1	SP HPS 70	HPS70/1	95	0.1	None	4368	415.0	0.0	0.0	$0.00	$0.00	$0.00		
225	Rear Spot Light	8	SP HPS 70	HPS70/1	95	0.8	Timer	4368	3,319.7	8	SP HPS 70	HPS70/1	95	0.8	None	4368	3,319.7	0.0	0.0	$0.00	$0.00	$0.00		
	Total	**48**				**3.2**			**15,101**	**48**				**3**			**14,784**	**317**	**0**	**42**	**$425**	**150**		
																	Demand Savings			**0.0**	**$0**			
																	kWh Savings			**317**	**$42**			
																	Total Savings				**$42**		**10.2**	**6.6**

APPENDIX K

New Jersey Pay For Performance Incentive Program

Kearny NJ
CHA #20711
Building: Fire Station #1

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per January, 2010. Building must have a minimum average electric demand of 200 kW. This minimum is waived for buildings owned by local governements or non-profit organizations.
The incentive values represented below are applicable through December 31, 2010.

	Annual Utilities	
	kWh	Therms
Existing Usage (from utility)	39,620	6,140
Proposed Savings	3,660	2,920
Existing Total MMBtus	749	
Proposed Savings MMBtus	304.492	
% Reduction	40.6%	
Proposed Annual Savings	$4,940	

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

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

	Incentives $		
	Elec	Gas	Total
Incentive #2	$805	$6,424	$7,229
Incentive #3	$512	$4,088	$4,600
Totals	**$1,318**	**$10,512**	**$11,830**

Total Project Cost	$89,500
% Incentives of Project Cost*	13.2%
Project Cost w/ Incentives*	$77,670

Project Payback (years)	
w/o Incentives	w/ Incentives
18.1	15.7

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

APPENDIX L

Photovoltaic (PV) Rooftop Solar Power Generation

PVWatts * * * AC Energy & Cost Savings

Cautions for Interpreting the Results

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	10.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	7.7 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	17.9 ¢/kWh

Results			
Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	828	148.21
2	4.05	894	160.03
3	4.58	1084	194.04
4	4.84	1060	189.74
5	5.30	1168	209.07
6	5.33	1101	197.08
7	5.27	1112	199.05
8	5.25	1101	197.08
9	5.06	1068	191.17
10	4.46	1005	179.90
11	3.15	718	128.52
12	2.87	692	123.87
Year	4.46	11830	2117.57

Output Hourly Performance Data * Output Results as Text

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)

Please send questions and comments regarding PVWATTS to Webmaster

Disclaimer and copyright notice

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.

Township of Kearny
Fire Station No. 1

Cost of Electricity $0.179 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-10 kW System

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	New Jersey Renewable * Energy Incentive	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$100,000	**0.0**	**11,830**	**0**	**$2,100**	**0**	**$2,100**	**$10,000**	**$5,800**	**47.6**	**11.4**

Note: Budgetary cost is based on $10,000/kW.

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

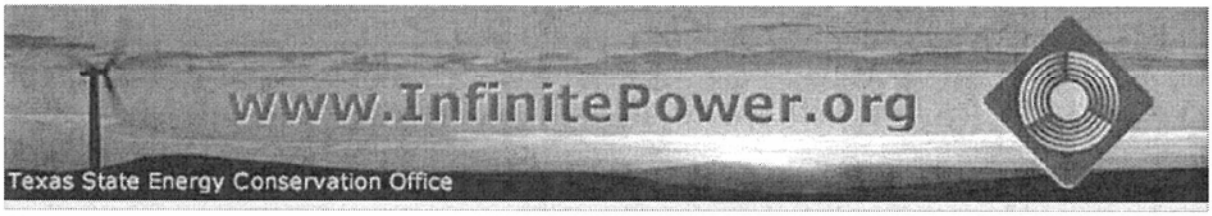
** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $487/1000kwh

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 M

Solar Thermal Domestic Hot Water Plant



Interactive Energy Calculators

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

Our calculators help you understand energy production and consumption in a whole new way. Use them to develop a personal profile of your own energy use.

Carbon Pollution Calculator
Electric Power Pollution Calculator
PV System Economics
Solar Water Heating
What's a Watt?

Solar Water Heating Calculator

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)	40	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	17.79	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	50
Energy Use			
1112		? Heat Delivered in Hot Water (BTU/hr)	
0		? Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		**Electric**
0.8	? Overall Efficiency	0.98
0.8	? Conversion Efficiency	0.98
1390 BTU/hr	? Power Into Water Heater	1135 BTU/hr
Cost		
$ 1.461 /Therm	? Utility Rates	$ 0.179 /kWh
$ 177.897	? Yearly Water Heating Cost	$ 521.237
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
217.621 years for gas	? Payback Time for Solar System	74.2738 years for electric

NJBPU Energy Audits
CHA # 20711
Township of Kearny
Fire Station No. 1

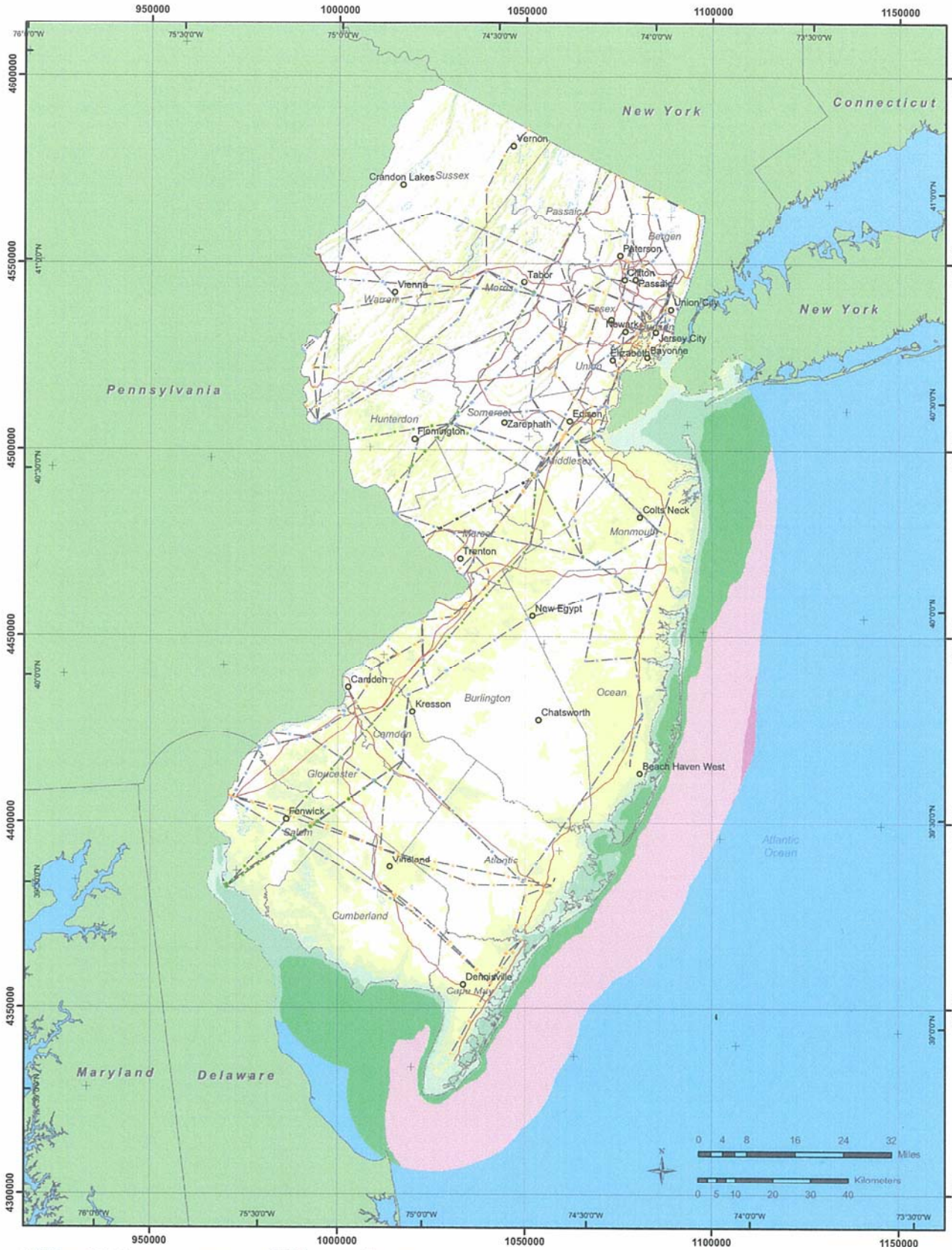
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Synergy Solar Thermal System	2	ea			$ 3,600	$ -	$ -	$ 7,848	$ 7,848	
Piping modifications	1	ls	$ 2,000	$ 3,500		$ 1,960	$ 4,235	$ -	$ 6,195	
Electrical modifications	1	ls	$ 1,000	$ 1,000		$ 980	$ 1,210	$ -	$ 2,190	
65 GallonStorage Tanks	2	ea	$ 200	$ 250		$ 400	$ 500	$ -	$ 900	
10 Gallon Drip Tank	2	ea	$ 100	$ 78		$ 200	$ 156	$ -	$ 356	
						$ -	$ -	$ -	$ -	

$17,489	Subtotal
$ 2,623	15% Contingency
$ 2,623	15% Contractor O&P
$ 4,372	25% Engineering
$27,108	**Total**

APPENDIX N

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

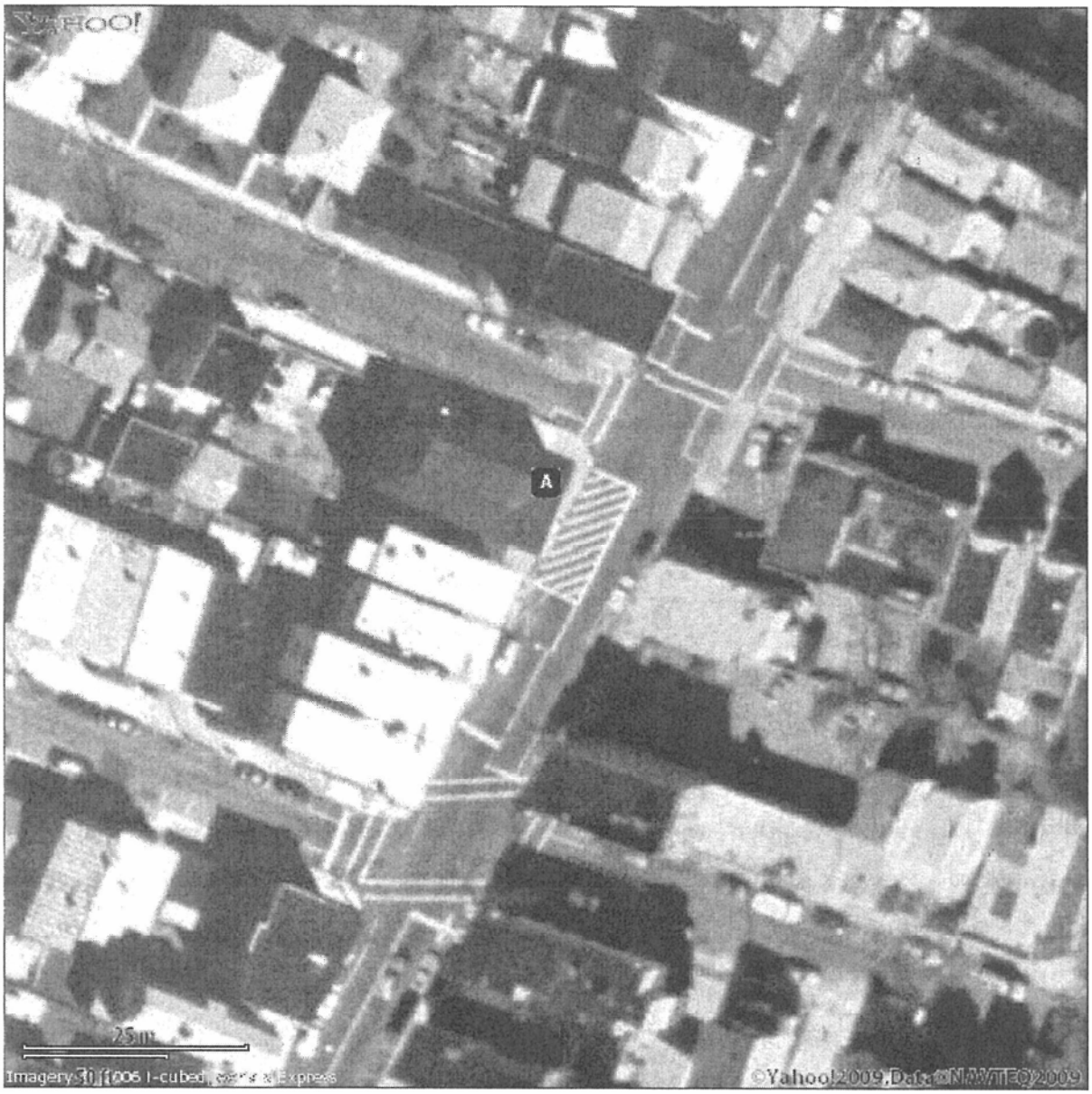
Mean Speed at 30 m		
mph	m/s	
< 10.1	< 4.5	
10.1 - 11.2	4.5 - 5.0	
11.2 - 12.3	5.0 - 5.5	
12.3 - 13.4	5.5 - 6.0	
13.4 - 14.5	6.0 - 6.5	
14.5 - 15.7	6.5 - 7.0	
15.7 - 16.8	7.0 - 7.5	
16.8 - 17.9	7.5 - 8.0	
17.9 - 19.0	8.0 - 8.5	
> 19.0	> 8.5	

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.

Map of 47 Davis Ave, Kearny, NJ 07032-3364



When using any driving directions or map, it's a good idea to do a reality check and make sure the road still exists, watch out for construction, and follow all traffic safety precautions. This is only to be used as an aid in planning.

APPENDIX O

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Fire Department #1

Building ID: 2019132
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: January 28, 2010

Facility
Fire Department #1
47 Davis Avenue
Kearny, NJ 07032

Facility Owner
Township of Kearny
357 Bergen Ave
Kearny, NJ 07032

Primary Contact for this Facility
Gerry Kerr
357 Bergen Ave
Kearny, NJ 07032

Year Built: 1928
Gross Floor Area (ft²): 6,000

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	135,177
Natural Gas (kBtu)[4]	614,000
Total Energy (kBtu)	749,177
Energy Intensity[5]	
Site (kBtu/ft²/yr)	125
Source (kBtu/ft²/yr)	182
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	53
Electric Distribution Utility	
Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	16%
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 Department #1	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	47 Davis Avenue, Kearny, NJ 07032	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		☐
Fire House (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	6,000 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	4 (Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	168 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	7 (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: Public Service Elec & Gas Co

Fuel Type: Electricity		
Meter: PSE&G Electric (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	1,608.00
11/01/2008	11/30/2008	1,746.00
10/01/2008	10/31/2008	1,788.00
09/01/2008	09/30/2008	5,022.00
08/01/2008	08/31/2008	6,294.00
07/01/2008	07/31/2008	7,128.00
06/01/2008	06/30/2008	5,724.00
05/01/2008	05/31/2008	1,638.00
04/01/2008	04/30/2008	1,758.00
03/01/2008	03/31/2008	1,728.00
02/01/2008	02/29/2008	1,620.00
01/01/2008	01/31/2008	3,564.00
PSE&G Electric Consumption (kWh (thousand Watt-hours))		**39,618.00**
PSE&G Electric Consumption (kBtu (thousand Btu))		**135,176.62**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**135,176.62**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: PSE&G Natural Gas (therms) **Space(s):** Entire Facility		
Start Date	**End Date**	**Energy Use (therms)**
12/01/2008	12/31/2008	1,082.00
11/01/2008	11/30/2008	899.00
10/01/2008	10/31/2008	191.00
09/01/2008	09/30/2008	46.00
08/01/2008	08/31/2008	44.00
07/01/2008	07/31/2008	55.00
06/01/2008	06/30/2008	48.00
05/01/2008	05/31/2008	193.00
04/01/2008	04/30/2008	238.00
03/01/2008	03/31/2008	940.00

02/01/2008	02/29/2008	1,158.00
01/01/2008	01/31/2008	1,246.00
PSE&G Natural Gas Consumption (therms)		**6,140.00**
PSE&G Natural Gas Consumption (kBtu (thousand Btu))		**614,000.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**614,000.00**
Is this the total Natural Gas consumption at this building including all Natural Gas 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 Department #1
47 Davis Avenue
Kearny, NJ 07032

Facility Owner
Township of Kearny
357 Bergen Ave
Kearny, NJ 07032

Primary Contact for this Facility
Gerry Kerr
357 Bergen Ave
Kearny, NJ 07032

General Information

Fire Department #1	
Gross Floor Area Excluding Parking: (ft^2)	6,000
Year Built	1928
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Fire House	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft^2)	6,000
Number of PCs[o]	4
Weekly operating hours[o]	168
Workers on Main Shift[o]	7

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/ft^2)	125	125	0	N/A	78
Source (kBtu/ft^2)	182	182	0	N/A	157
Energy Cost					
$/year	$ 16,062.46	$ 16,062.46	N/A	N/A	$ 10,034.21
$/$ft^2$/year	$ 2.68	$ 2.68	N/A	N/A	$ 1.67
Greenhouse Gas Emissions					
$MtCO_2e$/year	53	53	0	N/A	33
$kgCO_2e/ft^2$/year	9	9	0	N/A	6

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.

APPENDIX P

Equipment Inventory

New Jersey BPU Energy Audit Program
CHA #20711
Kearny
Fire Station No.1

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Areas Served	Date Installed	Useable Life Expectancy (years)
Boiler	Peerless	Model 211-4-S-T, Serial 211-9043-0584	Gas fired steam boiler	Input 630 MBH, Output 504 MBH, IBR 378MBH	Basement	Entire building	1983	4
DHWH	AO Smith	FSGL 40 242, Serial MC99-00854-78-242	Gas fired domestic hot water heater	Capacity 40 gal, Input 40,000 Btu/hr, recovery rate 40.9 gal/hr	Basement	Entire building	1996	7
Window AC	Carrier	Unknown	Window AC cooling unit	Estimated 14,000 btu/hr	Window	Kithen	N/A	N/A
Window AC	Carrier	Unknown	Window AC cooling unit	Estimated 14,000 btu/hr	Window	Bedroom	N/A	N/A
Window AC	Carrier	Unknown	Window AC cooling unit	Estimated 14,000 btu/hr	Window	Bedroom	N/A	N/A
Window AC	Carrier	Unknown	Window AC cooling unit	Estimated 14,000 btu/hr	Window	Office	N/A	N/A