TOWNSHIP OF KEARNY
FIRE STATION No. 2
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 Kearny Township Fire Station No. 2 (station) in Kearny, NJ. The 3,000 square foot facility consists of a fire station building, dispatch building, and unheated garage/shed. The main fire station building is a two story building with an unoccupied basement. The dispatch building is a single story building with a partial basement, and the garage/shed is a small single story structure used for storage.

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. 2, located in Kearny, New Jersey. The 3,000 square foot facility consists of a fire station building, dispatch building, and unheated garage/shed. The following areas were evaluated for energy conservation measures:

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

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Measures which are recommended for implementation have a payback of 10 years or less. This threshold is considered a viable return on investment. Potential annual savings of $3,000 for the recommended ECMs may be realized with a payback of 7.2 years.

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

ECM-6 Install Thermostatic Valves - Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
7,600	0	0	530	800	1.1	NA	9.9	NA

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

ECM-8 Replace Domestic Hot Water Heater - Dispatch

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
7,500	5	2,960	(60)	900	1.2	100	8.3	8.2

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

ECM-9 Lighting Replacements - Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
3,800	1.0	4,020	0	600	1.4	400	6.3	5.7

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

ECM-10 Install Occupancy Sensors - Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
600	0.0	1,650	0	200	4.0	100	3.0	2.5

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

ECM-11 Lighting Replacements with Occupancy Sensors - Dispatch

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
2,100	0.9	2,910	0	500	2.6	300	4.2	3.6

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

3.0 EXISTING CONDITIONS

3.1 Building General

The Kearny Fire Station No. 2 facility consists of the main fire station building, dispatch building, and unheated garage/shed.

The main fire station (main building) is a two story structure with an unoccupied basement. The building was constructed in 1920, and has undergone limited renovations. The first floor consists of two bay garages, small repair shop, and a social room. The second floor houses a kitchen, offices, sleeping quarters, and restrooms.

The building's basement walls are constructed of stone and the above ground exterior walls are brick. The interior walls of the first floor are finished with tiles and the second floor finished with plaster. Most of the windows are about 10 years' old and are double pane. There is an attic space above the second floor that is not insulated. The wooden roof structure supports wood boards covered with singles.

The dispatch building is a single story building with a partial basement. The building was constructed in 1930. The building houses a main dispatch room, single bedroom, and small unheated garage. The walls are constructed of brick and concrete blocks with an interior tile finish. The exterior walls exhibit numerous cracks that should be repaired. The basement is constructed of stone. The roof is flat and not insulated. Similarly to the main station, many windows were replaced with double pane windows about 10 years' ago.

The garage/shed is a small single story unoccupied structure used for storage.

The main building is occupied by about 12 persons; dispatch by one individual. Both buildings are operational 24 hours per day.

3.2 Utility Usage

The buildings use electricity, natural gas, municipal water, and are 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 entire Fire Station No. 2 facility consumed a combined total of 95,700 kWh of electricity at an annual cost of $15,000. The annual natural gas usage for the main station was about 7,700 therms at a cost of $11,300. The annual consumption of natural gas for the dispatch building was 1,500 therms at a cost of $2,300.

Water usage data was not available; however, the facility is not charged for water usage.

The average blended rate for electricity was $0.15 per kWh. The electricity usage trend showed a higher consumption during the summer cooling months.

The majority of natural gas was used for heating, as indicated by the higher usage trend during the 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

Heating for the main building is provided by a gas fired Weil McLain (model LGB-6) steam boiler rated at 660MBH input and 526MBH output. The boiler manufactured in 1994 is located in the basement and produces steam at 15 psig pressure. The steam is delivered to cast iron radiators throughout the building, including the apparatus floor.

The dispatch building is also heated by a steam boiler system with space radiators.. Steam heating is provided by a gas fired Peerless (model 81V520) steam boiler rated at 200MBH input and 160MBH output. The boiler was manufactured in 1974 and produces steam at 15 psig pressure.

The main building has four window AC units cooling the sleeping quarters, offices, kitchen, and exercise room. The dispatch building is cooled with two window AC units (one per room). The average size of the window unit is about 14,000Btu/hr.

3.4 Lighting/Electrical Systems

Fire Station No. 2's main building is in constant operation. In the garage where the fire engines are kept, the lights remain on continuously. The rest of the building's lights are switched on and off by the occupants. This building contains a mixture of T-8 and T-12 fluorescent fixtures, incandescent bulbs and compact fluorescent bulbs. There are also six fixtures using metal halide bulbs along the wall in the fire engine garage that serve as safety lights to help the fire engine driver back into the garage.

The dispatch building is also continually occupied; however, only one light fixture is on constantly. The rest of the lights are switched on and off by the occupants. Most of the lights within this building, about 21 total, are fluorescent T-12 fixtures that use 4' or 8' T-12 bulbs. There are also four inefficient incandescent bulbs in use.

The exterior lighting within this complex consists of five compact fluorescent spotlights located on the dispatch building as well as four 175 watt and one 400 watt metal halide wall pack fixtures on the main building.

3.5 Control Systems

The heating temperature in the main building is controlled by a single non programmable thermostat set to 70°F and located on the second floor. Similarly, a single thermostat in the dispatch room controls the heating temperature for the entire building and is also set to 70°F. Window AC units for both buildings are controlled at the units.

3.6 Domestic Hot Water Systems

The domestic hot water for the main building is produced by a natural gas-fired A.O. Smith (model FSG 40 242) 40 gallon capacity hot water heater. The dispatch building's hot water is produced by a gas fired Rheem (model 81V520), 50 gallon capacity hot water heater.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Increase Ceiling Insulation

The second floor ceiling of the main building and the first floor ceiling of the dispatch structure are not insulated, which results in excessive heat loss or gain. Heat conduction through ceilings is a function of the resistance to heat flow and the difference between the indoor and outdoor temperature. Adding thermal insulation increases the structural resistance to sensible heat transfer and, consequently, lowers the space-heating load. It is, therefore, proposed to install new batt insulation rated at R-24 in the attic of the main building, and above the dropped ceiling of the dispatch building.

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 600 therms and 270 kWh for the main station; and 180 therms and 70 kWh for the dispatch building.

Insulation has an expected life of 24 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 15,000 therms and 6,750 kWh, totaling $22,500 for the main station; and 4,500 therms and 1,750 kWh, totaling $7,500 for the dispatch building.

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

ECM-1 Increase Ceiling Insulation – Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
10,700	0	270	600	900	1.4	NA	11.8	NA

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

This measure is not recommended.

ECM-1a Increase Ceiling Insulation - Dispatch

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,000	0	70	180	300	0.5	NA	17.7	NA

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

This measure is not recommended.

4.2 ECM-2 Increase Wall Insulation - Main

The existing building walls are not insulated, resulting in significant heat losses. Adding additional wall insulation throughout the building would decrease the amount of the heat loss. Increasing wall insulation for the main building of the Fire Station No. 2 would be possible by installing additional 1 ½" thick rigid insulation to the outside of the building and providing final stucco finishing that would match the front façade of the building. The front wall would not be altered or insulated.

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 from adding rigid board insulation and stucco to the building's exterior walls are expected to be 880 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 22,000 therms and 5,250 kWh, totaling $32,500.

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

ECM-2 Increase Wall Insulation - Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
31.500	-	200	880	1,300	0.0	NA	24.0	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 Doors - Main

The existing back and side doors offer low resistance to heat transfer and do not seal well 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 doors would be replaced with premium thermal protection doors with high R value (R11).

This measure determined the square area, perimeter length, and infiltration parameters of the doors. Using these factors in conjunction with weather bin data, the heating energy lost due to insulation and infiltration factors for the existing and proposed doors was calculated. This ECM results in annual energy savings of about 30 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 600 therms, totaling $1,000.

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

ECM-3 Replace Doors - Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,000	0	0	30	50	0.0	NA	22.6	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

Both buildings use window air conditioning to provide cooling comfort in occupied rooms. The main station uses about four window air conditioning units and the dispatch two. The window AC units use more energy than ductless split system. Under this measure replacement of window units with ductless split air conditioners was evaluated.

In the main station two outdoor condensers could be installed on the lower roof section. The indoor evaporators replacing window AC units would therefore share common condensers. Similarly both window AC units in the dispatch building would share a common condenser that would be located outdoors on the ground behind the bedroom wall. The compressors could be installed a considerable distance away from the indoor evaporators.

Ductless split systems combine the zoning flexibility of a conventional room unit (a single air-conditioner installed through a wall or window frame) with semi-central system cooling potential. Like central systems, they have two main components, consisting of a condenser; and air handling unit, containing an evaporator. The condenser is located outdoors; evaporator unit in the area requiring cooling. A conduit, which houses the power cable, refrigerant tubing, suction tubing, and condensate drain, links the outdoor and indoor units.

The proposed ductless split system would have higher efficiency ratings than the existing window ACs. The energy savings are results of 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. The payback is not attractive; however the splits systems do not block the windows and are not as noisy, because the condensing units are installed remotely.

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 24,000 kWh, totaling $4,500 for the main station; and 9,600 kWh, totaling $1,500 for the dispatch building.

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

ECM-4 Replace Window AC Units - Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
12,600	0	1,600	0	300	(0.6)	400	>25	>25

* Incentive shown is per the New Jersey Smart Start Program, 2010 Unitary HVAC Application.

This measure is not recommended.

ECM-4a Replace Window AC Units - Dispatch

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,000	0	640	0	100	(0.7)	100	>25	>25

* Incentive shown is per the New Jersey Smart Start Program, 2010 Unitary HVAC Application.

This measure is not recommended.

4.5 ECM-5 Install Infrared Garage Heaters - Main

Steam radiators are used to heat the garage in the main station building. This energy conservation measure proposes that the existing unit radiators in the main station will be replaced with infrared gas-fired heaters. Infrared heaters distribute heat more effectively and have higher burner efficiencies.

For calculation purposes a separate block load calculation was used for the garage area. It was determined that the existing garage area requires approximately 3,500 therms of energy to meet the yearly heating load. The proposed infrared heaters have an improved burner efficiency of 85% and transfer heat more effectively than radiators. 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 650 therms.

To implement this measure, some natural gas piping, flue piping, and minor electrical modifications will be necessary. To calculate the budgetary cost, two infrared heaters were used as outlined in the cost estimate. The quantity, size, and capacity of the heaters were used for estimate purposes.

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 11,520 therms, totaling $18,000.

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

ECM-5 Install Infrared Garage Heaters - Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
13,500	0	0	640	1000	0.2	NA	14.4	NA

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

This measure is not recommended.

4.6 ECM-6 Install Thermostatic Valves - Main

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 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 overheated rooms typically open the windows or doors. This results in additional infiltration heating losses.

It was estimated that installation of thermostatic valves for all radiators will save about 530 therms of natural gas in heating and result in $800 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 10,600 therms, totaling $16,000.

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

ECM-6 Install Thermostatic Valves - Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
7,600	0	0	530	800	1.1	NA	9.9	NA

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

This measure is recommended.

4.7 ECM-7 Replace Boiler - Dispatch

The boiler serving the dispatch building surpassed its own useful life. Although operating it may require major repairs in the near future. This ECM proposes to replace operations of the existing boiler with installation of a new high efficiency steam boiler. The new boiler shall be gas-fired with an output capacity of 160 MBH. The existing boiler would be removed.

In absence of efficiency testing results, it was estimated that the existing efficiency of the boiler is about 73%. In order to project savings for this measure, the building's current natural gas consumption was

used. Utilizing a new high efficiency steam boiler would reduce the annual boiler consumption and result in energy savings of approximately 200 therms, and monetary savings of $300. The proposed boiler efficiency rating of 83% is based on the use of a new high efficiency steam boiler.

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 6,000 therms, totaling $9,000.

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

ECM-7 Replace Boiler - Dispatch

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
9,900	0	0	200	300	(0.1)	300	>25	>25

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

This measure is not recommended.

4.8 ECM-8 Replace Domestic Hot Water Heater - Dispatch

Domestic hot water (DHW) for the dispatch building is supplied by a Rheem 50 gallon capacity, 4.5 kW electric, water heater. This measure evaluates replacing the existing domestic hot water heater with a tankless, instantaneous, condensing domestic hot water heater. This would eliminate standby losses from the tank that occur during periods of zero demand and utilize lower energy cost utility source.

To calculate the savings for this measure, the consumption of the electricity by the heater was estimated based on its rating and operating hours and converted to thermal units. The standby losses were then calculated for the hot water storage tank and the annual energy required to meet the hot water demand was determined. This value was then applied to the proposed water heater efficiency of 92% in order to determine the projected annual energy consumption. Since the electric heaters are almost 100% efficient the thermal energy use will be higher, however due to high unitary cost, monetary savings will be achieved.

Calculations can be found in Appendix I. Proposed efficiency was based on the small Takagi Flash T-H1 instantaneous hot water heater. A more detailed hot water demand analysis may be necessary to verify proper sizing.

The application of this measure will require replacement of the existing domestic hot water heater with a new tankless, instantaneous, condensing domestic hot water heater, new immediate water and gas piping, new venting, and electrical connections will also be required.

Instantaneous DHW heaters have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 53,280 kWh and (1,080) therms, totaling $16,200.

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

ECM-8 Replace Domestic Hot Water Heater - Dispatch

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
7,500	5	2,960	(60)	900	1.2	100	8.3	8.2

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

This measure is recommended.

4.9 ECM-9 Lighting Replacements

Fire Station No. 2 utilizes two fluorescent fixtures utilizing two F34T12 bulbs each, and about eight incandescent bulbs in the main building. The dispatch building also utilizes T-12 fluorescent and incandescent bulbs. Overall energy consumption can be reduced by replacing the T-12 fluorescent and incandescent bulbs with more efficient T-8 fluorescent and compact fluorescent bulbs.

The exterior lighting of the main building utilizes 175 watt or 400 watt Metal Halide wall pack fixtures and on the dispatch building are compact fluorescent spot lights. The energy consumption of the exterior lighting can be reduced by replacing the 175 watt fixtures with 100 watt induction light wall pack fixtures, and the 400 watt fixtures with two (2) 100 watt induction light wall pack fixtures. Induction lighting is a fairly new technology, and an induction lighting specialist should be consulted for the design of an outdoor fixture replacement.

The energy consumption of the existing lighting fixtures was established for both buildings. It was determined that the main building used 28,010 kWh per year and the dispatch building used 8,650 kWh per year. To calculate the annual energy consumption utilizing the proposed 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 for each building. Calculations are provided in Appendix J.

Existing T-12 fluorescent lamps would be replaced with new T-8 fluorescent lamps, incandescent bulbs would be replaced with compact fluorescent bulbs, and outdoor metal halide wall pack fixtures would be replaced with induction wall pack fixtures. This ECM will provide annual savings of 4,020 kWh and $800 for the main building and 2,260 kWh and $500 for the dispatch building.

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 60,300 kWh, totaling $9,000 for the main station; and 33,900 kWh, totaling $6,000 for the dispatch building.

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

ECM-9 Lighting Replacements - Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
3,800	1.0	4,020	0	600	1.4	400	6.3	5.7

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

This measure is recommended.

ECM-9a Lighting Replacements - Dispatch

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,800	0.8	2,260	0	400	2.3	200	4.5	4.0

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

This measure is not recommended in lieu of ECM-11.

4.10 ECM-10 Install Occupancy Sensors

Lighting fixtures throughout the main and dispatch buildings are all manually switched on and off. The operating time of the interior lighting fixtures in the upstairs lounge/kitchen, weight room, and lobby areas in the main building and the office, kitchen, and bedroom in the dispatch building can be reduced by installing occupancy sensors. Occupancy sensors were not considered for many rooms within the buildings 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-9, 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 1,655 kWh in the main building and 907 kWh in the dispatch building.

Approximately six occupancy sensors (three for each building) and some standard electrical work are required for implementation of these measures.

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 24,750 kWh, totaling $3,000 for the main station; and 13,650 kWh, totaling $1,500 for the dispatch building.

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

ECM-10 Install Occupancy Sensors - Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
600	0.0	1,650	0	200	4.0	100	3.0	2.5

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

This measure is recommended.

ECM-10a Install Occupancy Sensors - Dispatch

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	910	0	100	2.8	200	4.0	2.0

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

This measure is not recommended in lieu of ECM-11.

4.11 ECM-11 Lighting Replacements With Occupancy Sensors - Dispatch

Due to interactive effects, the energy and cost savings for occupancy sensors and lighting upgrades are not cumulative. This measure for the dispatch building is a combination of ECMs-9a and 10a for the dispatch building to allow for maximum energy and demand reduction.

The lighting retrofits and controls have an expected lifetime of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 43,605 kWh, and $8,385.

Lighting and 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 88,800 kWh, totaling $12,000 for the main station; and 43,650 kWh, totaling $7,500 for the dispatch building.

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

ECM-11 Lighting Replacements with Occupancy Sensors - Dispatch

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
2,100	0.9	2,910	0	500	2.6	300	4.2	3.6

* Incentives based on the 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

Both the main and dispatch buildings at Fire Station No. 2 are eligible for several incentives available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about $900 for the main building and $800 for the dispatch building. Incentives are based on installing split-system AC units, high efficiency boiler, instantaneous water heater, and upgrades to the lighting systems.

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. Also, due to the fact that the two buildings are on separate utility meters, the incentive must be applied to each building separately. Since the overall energy reduction for each building is estimated to exceed the 15% minimum, both buildings are eligible for Incentives #2 and #3 as previously discussed. This would result in an incentive of about $12,500, reducing the project payback from 15.9 years to 13.4 years for the main building; and an incentive of about $3,500, reducing the project payback from 14.0 years to 12.4 years for the dispatch building. See Appendix M for calculations.

Under PSE&G's direct install program, the fire station main building is potentially eligible to receive $80,200, and would be required to repay $16,000. The dispatch building is potentially eligible to receive $29,500, and would be required to repay $5,900. 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.

Each building uses a gas-fired steam boiler in conjunction with 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 N.

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.

In 2008, the main and dispatch buildings at fire station No. 2 had a maximum electricity demand of 20.7 kW and 10.1 kW; and a minimum of 10.6 kW and 5.2 kW, respectively. The monthly average over the observed 12 month period was 14.6 kW for the main building and 7.1 kW for the dispatch building. The existing load for either building does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array; therefore, for calculations a 12 kW system size was selected for the main building and a 5 kW system size was selected for the dispatch building. 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 N and summarized below:

Photovoltaic (PV) Rooftop Solar Power Generation – 12 kW System – Main Building

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
200,000	0	23,660	0	3,700	3,700	20,000	11,500	>25	11.8

Photovoltaic (PV) Rooftop Solar Power Generation – 5 kW System – Dispatch Building

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
200,000	0	23,660	0	3,700	3,700	20,000	11,500	>25	11.8

*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 at both the main and dispatch buildings of fire station No. 2; therefore, this measure would offer site natural gas savings.

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 O and summarized as follows:

Solar Thermal Domestic Hot Water Plant – Main Building

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	190	300	300	NA	>25	NA

Solar Thermal Domestic Hot Water Plant – Dispatch Building

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	50	100	100	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 P.

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 two buildings at fire station No. 2 have 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 either 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.

6.5 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. In 2008, the fire station No. 2 main building and dispatch building had a monthly average electricity demand of 14.6 kW and 7.1 kW; and a maximum demand of 20.7 kW and 10.1 kW, respectively.

This measure is not recommended because neither building at the facility has an 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 combined (main building and dispatch building) Site Energy Usage Index (EUI) of 123 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 84 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 Q.

The user name and password for the fire station'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. 2, in Kearny, New Jersey identified potential ECMs for lighting upgrades, thermostatic valves, domestic hot water heater, and occupancy sensors. Potential annual savings of $3,000 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-6 Install Thermostatic Valves - Main

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
7,600	0	0	530	800	1.1	NA	9.9	NA

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

ECM-8 Replace Domestic Hot Water Heater - Dispatch

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
7,500	5	2,960	(60)	900	1.2	100	8.3	8.2

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

ECM-9 Lighting Replacements - Main

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
3,800	1.0	4,020	0	600	1.4	400	6.3	5.7

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

ECM-10 Install Occupancy Sensors - Main

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
600	0.0	1,650	0	200	4.0	100	3.0	2.5

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

ECM-11 Lighting Replacements with Occupancy Sensors - Dispatch

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
2,100	0.9	2,910	0	500	2.6	300	4.2	3.6

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

APPENDIX A

Utility Usage Analysis

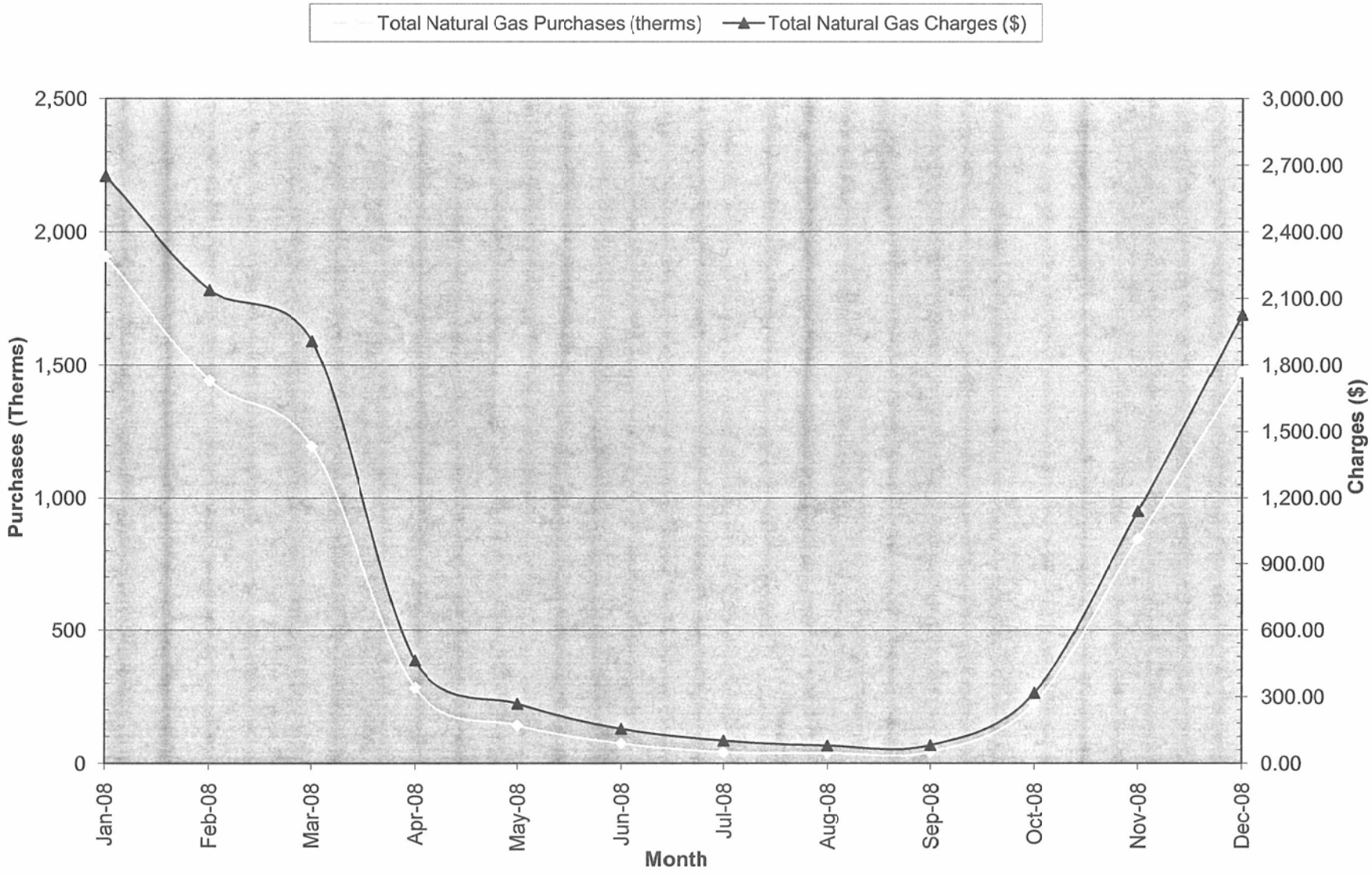
New Jersey BPU Energy Audit Program
CHA Project No.: 20711
Town of Kearny
PSE&G - Natural Gas Service

	Fire Department #2 - 110 Maple St. Account No.: 11 851 065 02 Meter No.: 3341655			Fire Department #2 - 109 Kearny Ave. Account No.: 11 880 172 09 Meter No.: 2611338		
Month	Therms	Charges ($)	($/Therm)	Therms	Charges ($)	($/Therm)
January-08	363	511.23	1.407	1,545	2,138.81	1.384
February-08	315	472.43	1.501	1,129	1,666.36	1.476
March-08	260	420.85	1.619	936	1,486.65	1.588
April-08	57	98.96	1.728	227	363.56	1.598
May-08	20	44.32	2.238	123	223.56	1.818
June-08	34	71.56	2.098	41	83.39	2.051
July-08	2	14.22	6.446	40	87.16	2.194
August-08	2	13.29	6.005	37	65.66	1.789
September-08	1	11.51	10.426	42	69.72	1.666
October-08	43	66.77	1.552	182	250.22	1.376
November-08	160	221.85	1.385	685	917.12	1.338
December-08	295	412.11	1.395	1,178	1,613.60	1.370
Most Recent Yr	1,553	2,359	1.519	6,165	8,966	1.454

Total (both meters)

Month	Therms	Charges ($)	($/Therm)
January-08	1,909	2,650.04	1.388
February-08	1,444	2,138.79	1.482
March-08	1,196	1,907.50	1.595
April-08	285	462.52	1.624
May-08	143	267.88	1.876
June-08	75	154.95	2.073
July-08	42	101.38	2.418
August-08	39	78.95	2.029
September-08	43	81.23	1.891
October-08	225	316.99	1.409
November-08	846	1,138.97	1.347
December-08	1,474	2,025.71	1.375
Most Recent Yr	7,718	11,325	1.467

Natural Gas Usage - Town of Kearny Fire Department #2



Utility Data - Kearny Fire#2(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 #2 - 110 Maple St.
Account No.: 11 851 065 02
Meter No.: 626052563

			Charges			Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
January-08	2,436	6.1	$308.00	$40.77	$267.23	0.1264	0.1097	6.68
February-08	2,361	5.9	$307.41	$40.03	$267.38	0.1302	0.1132	6.78
March-08	2,379	5.5	$301.89	$38.47	$263.42	0.1269	0.1107	6.99
April-08	2,082	5.5	$264.93	$38.47	$226.46	0.1272	0.1088	6.99
May-08	2,489	8.9	$325.46	$51.71	$273.75	0.1308	0.1100	5.81
June-08	3,405	9.2	$629.56	$147.78	$481.78	0.1849	0.1415	16.06
July-08	3,850	9.0	$702.98	$146.49	$556.49	0.1826	0.1445	16.28
August-08	3,169	8.0	$613.82	$135.37	$478.45	0.1937	0.1510	16.92
September-08	3,158	**10.1**	$615.94	$158.72	$457.22	0.1950	0.1448	15.71
October-08	2,078	6.6	$316.84	$72.43	$244.41	0.1525	0.1176	10.97
November-08	2,122	5.2	$310.47	$67.00	$243.47	0.1463	0.1147	12.88
December-08	2,186	5.2	$314.54	$67.00	$247.54	0.1439	0.1132	12.88
Most Recent Yr	31,715	10.1	$5,011.84	$1,004.24	$4,007.60	0.1580	0.1264	11.79

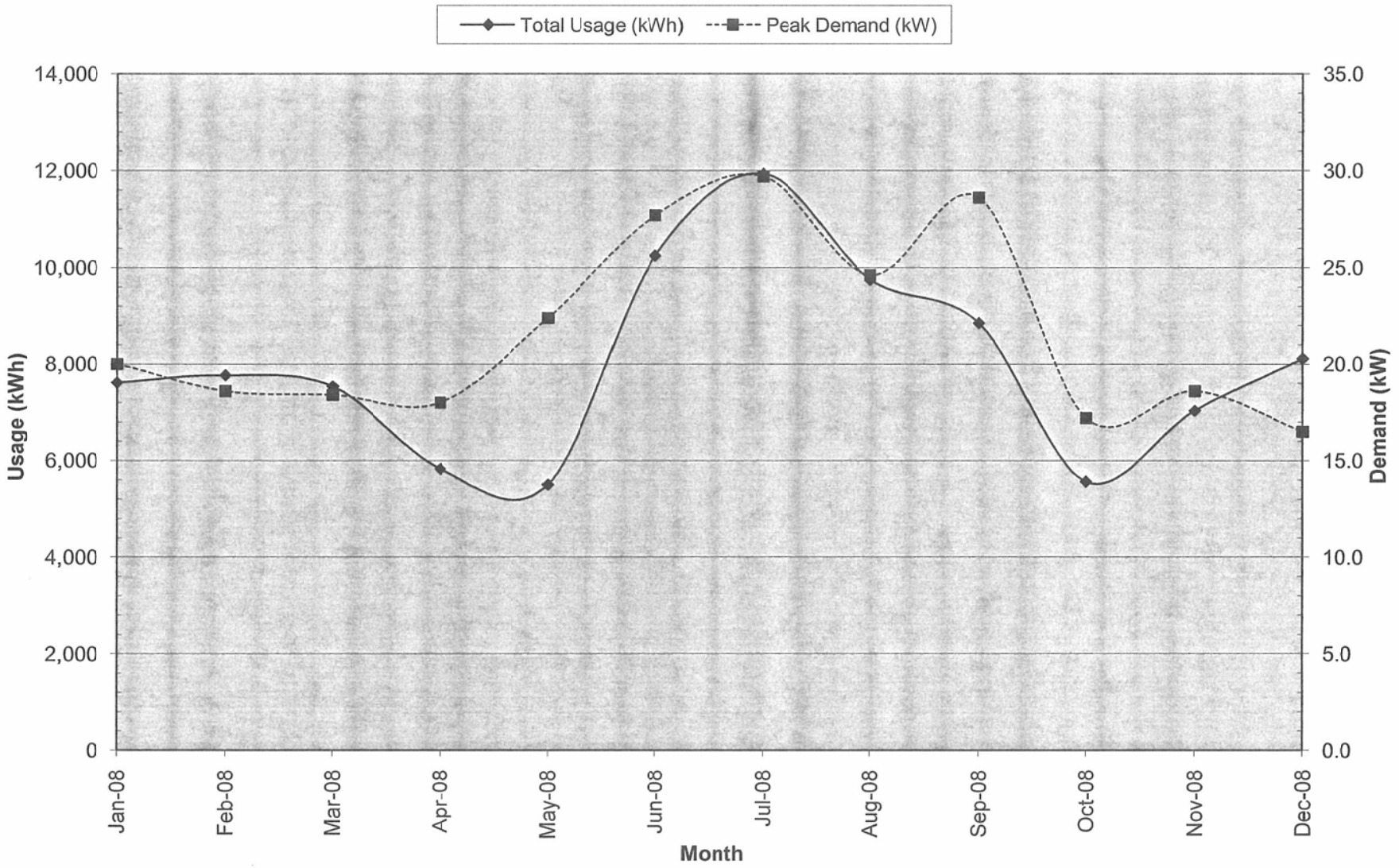
Fire Department #2 - 109 Kearny Ave.
Account No.: 11 880 172 09
Meter No.: 236006583

			Charges			Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
January-08	5,178	13.9	$652.40	$89.15	$563.25	0.1260	0.1088	6.41
February-08	5,406	12.7	$691.33	$84.55	$606.78	0.1279	0.1122	6.66
March-08	5,154	12.9	$649.31	$85.32	$563.99	0.1260	0.1094	6.61
April-08	3,744	12.5	$487.64	$83.77	$403.87	0.1302	0.1079	6.70
May-08	3,012	13.5	$418.04	$87.66	$330.38	0.1388	0.1097	6.49
June-08	6,840	18.5	$1,258.97	$295.46	$963.51	0.1841	0.1409	15.97
July-08	8,082	**20.7**	$1,485.27	$321.75	$1,163.52	0.1838	0.1440	15.54
August-08	6,582	16.6	$1,265.34	$276.15	$989.19	0.1922	0.1503	16.64
September-08	5,694	18.5	$1,118.30	$297.28	$821.02	0.1964	0.1442	16.07
October-08	3,486	10.6	$540.63	$133.49	$407.14	0.1551	0.1168	12.59
November-08	4,908	13.4	$701.98	$144.41	$557.57	0.1430	0.1136	10.78
December-08	5,922	11.3	$799.60	$136.23	$663.37	0.1350	0.1120	12.06
Most Recent Yr	64,008	20.7	$10,068.81	$2,035.22	$8,033.59	0.1573	0.1255	11.62

Total (Both Meters):

			Charges			Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
January-08	7,614	20.0	$960.40	$129.92	$830.48	0.1261	0.1091	6.50
February-08	7,767	18.6	$998.74	$124.58	$874.16	0.1286	0.1125	6.70
March-08	7,533	18.4	$951.20	$123.79	$827.41	0.1263	0.1098	6.73
April-08	5,826	18.0	$752.57	$122.24	$630.33	0.1292	0.1082	6.79
May-08	5,501	22.4	$743.50	$139.37	$604.13	0.1352	0.1098	6.22
June-08	10,245	27.7	$1,888.53	$443.24	$1,445.29	0.1843	0.1411	16.00
July-08	11,932	29.7	$2,188.25	$468.24	$1,720.01	0.1834	0.1442	15.77
August-08	9,751	24.6	$1,879.16	$411.52	$1,467.64	0.1927	0.1505	16.73
September-08	8,852	28.6	$1,734.24	$456.00	$1,278.24	0.1959	0.1444	15.94
October-08	5,564	17.2	$857.47	$205.92	$651.55	0.1541	0.1171	11.97
November-08	7,030	18.6	$1,012.45	$211.41	$801.04	0.1440	0.1139	11.37
December-08	8,108	16.5	$1,114.14	$203.23	$910.91	0.1374	0.1123	12.32
Most Recent Yr	95,723	29.7	$15,080.65	$3,039.46	$12,041.19	0.1575	0.1258	11.68

Electric Usage - Town of Kearny Fire Department #2



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

Macquaric Cook Encrgy, 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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Jan 14, 2009

APPENDIX B

ECM-1 & 1a Increase Ceiling Insulation

New Jersey BPU - Energy Audits
CHA #20711
Building: Fire Station #2 - Main Station

ECM-1 Increase Ceiling Insulation

Existing Roof Area	4,241	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	78%	
Cooling System Efficiency	1.20	kW/on

Existing Cooling

Existing Cooling Load Temp Diff.	73	F
Existing Max. Roof Cooling Load	30,958	Btu/hr

Proposed Cooling

Proposed Cooling Load	9,105	Btu/hr
Occupied Cooling Setpoint	74	F
Unoccupied Cooling Setpoint	80	F

Existing Heating

Existing Heating Load Temp Diff.	56	F
Existing Max. Roof Heating Load	23,748	Btu/hr

Proposed Heating

Proposed Heating Load	6,985	Btu/hr
Occupied Heating Setpoint	70	F
Unoccupied Heating Setpoint	60	F

Existing Heating Total	66,794,720	Btu/yr
Proposed Heating Total	19,645,506	Btu/yr
Savings	47,149,214	Btu/yr
Input	604	**therms**
Existing Cooling Total	377	kWh/yr
Proposed Cooling Total	111	kWh/yr
Savings	266	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	12,086	3,555	-	-	9,542	2,806	-	-	-	-	-	-
97.5	3	3	0	9,966	2,931	-	-	7,421	2,183	-	-	3	-	1	-
92.5	34	34	0	7,845	2,307	-	-	5,301	1,559	-	-	27	-	8	-
87.5	131	131	0	5,725	1,684	-	-	3,181	935	-	-	75	-	22	-
82.5	500	500	0	3,605	1,060	-	-	1,060	312	-	-	180	-	53	-
77.5	620	620	0	1,484	437	-	-	-	-	-	-	92	-	27	-
72.5	664	664	0	-	-	-	-	-	-	-	-	-	-	-	-
67.5	854	854	0	-	-	1,060	312	-	-	-	-	-	905,411	-	266,297
62.5	927	927	0	-	-	3,181	935	-	-	-	-	-	2,948,416	-	867,181
57.5	600	600	0	-	-	5,301	1,559	-	-	1,060	312	-	3,180,600	-	935,471
52.5	610	610	0	-	-	7,421	2,183	-	-	3,181	935	-	4,527,054	-	1,331,486
47.5	611	611	0	-	-	9,542	2,806	-	-	5,301	1,559	-	5,830,040	-	1,714,718
42.5	656	656	0	-	-	11,662	3,430	-	-	7,421	2,183	-	7,650,403	-	2,250,119
37.5	1,023	1,023	0	-	-	13,783	4,054	-	-	9,542	2,806	-	14,099,600	-	4,146,941
32.5	734	734	0	-	-	15,903	4,677	-	-	11,662	3,430	-	11,672,802	-	3,433,177
27.5	334	334	0	-	-	18,023	5,301	-	-	13,783	4,054	-	6,019,816	-	1,770,534
22.5	252	252	0	-	-	20,144	5,925	-	-	15,903	4,677	-	5,076,238	-	1,493,011
17.5	125	125	0	-	-	22,264	6,548	-	-	18,023	5,301	-	2,783,025	-	818,537
12.5	47	47	0	-	-	24,385	7,172	-	-	20,144	5,925	-	1,146,076	-	337,081
7.5	22	22	0	-	-	26,505	7,796	-	-	22,264	6,548	-	583,110	-	171,503
2.5	13	13	0	-	-	28,625	8,419	-	-	24,385	7,172	-	372,130	-	109,450
-2.5	0	0	0	-	-	30,746	9,043	-	-	26,505	7,796	-	-	-	-
-7.5	0	0	0	-	-	32,866	9,667	-	-	28,625	8,419	-	-	-	-
TOTALS	**8,760**	**8,760**	**0**									**377**	**66,794,720**	**111**	**19,645,506**

New Jersey BPU - Energy Audits
CHA #20711
Building: Fire Station #2 - Main Station

ECM-1 Increase 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	4,241	sf	$ 1.34	$ 0.50		$ 5,569	$ 2,566	$ -	$ 8,135	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 8,135	Subtotal
$20	15% Contingency
$1,223	15% Contractor O&P
$0	Engineering
$9,378	**Total**

Kearny NJ
CHA #20711
Building: Fire Station #2 - Dispatch Building

ECM-1a Increase Ceiling Insulation

Existing Roof Area	1,254	sf
Existing U-value	0.10	Btu/hr/(sf*F)
Proposed R-value	29	
Proposed U-value	0.03	Btu/hr/(sf*F)
Heating System Efficiency	73%	
Cooling System Efficiency	1.20	kW/ton

Existing Cooling

Existing Cooling Load Temp Diff.	73	F
Existing Max. Roof Cooling Load	9,154	Btu/hr

Proposed Cooling

Proposed Cooling Load	3,157	Btu/hr
Occupied Cooling Setpoint	74	F
Unoccupied Cooling Setpoint	80	F

Existing Heating

Existing Heating Loac Temp Diff.	58	F
Existing Max. Roof Heating Load	7,022	Btu/hr

Proposed Heating

Proposed Heating Load	2,422	Btu/hr
Occupied Heating Setpoint	70	F
Unoccupied Heating Setpoint	60	F

Existing Heating Total	19,751,127	Btu/yr
Proposed Heating Total	6,810,733	Btu/yr
Savings	12,940,394	Btu/yr
Input	178	**therms**
Existing Cooling Total	111	kWh/yr
Proposed Cooling Total	38	kWh/yr
Savings	73	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	3,574	1,232	-	-	2,822	973	-	-	-	-	-	-
97.5	3	3	0	2,947	1,016	-	-	2,195	757	-	-	1	-	0	-
92.5	34	34	0	2,320	800	-	-	1,568	541	-	-	8	-	3	-
87.5	131	131	0	1,693	584	-	-	941	324	-	-	22	-	8	-
82.5	500	500	0	1,066	368	-	-	314	108	-	-	53	-	18	-
77.5	620	620	0	439	151	-	-	-	-	-	-	27	-	9	-
72.5	664	664	0	-	-	-	-	-	-	-	-	-	-	-	-
67.5	854	854	0	-	-	314	108	-	-	-	-	-	267,729	-	92,320
62.5	927	927	0	-	-	941	324	-	-	-	-	-	871,844	-	300,636
57.5	600	600	0	-	-	1,568	541	-	-	314	108	-	940,500	-	324,310
52.5	610	610	0	-	-	2,195	757	-	-	941	324	-	1,338,645	-	461,602
47.5	611	611	0	-	-	2,822	973	-	-	1,568	541	-	1,723,937	-	594,461
42.5	656	656	0	-	-	3,449	1,189	-	-	2,195	757	-	2,262,216	-	780,074
37.5	1,023	1,023	0	-	-	4,076	1,405	-	-	2,822	973	-	4,169,237	-	1,437,668
32.5	734	734	0	-	-	4,703	1,622	-	-	3,449	1,189	-	3,451,635	-	1,190,219
27.5	334	334	0	-	-	5,330	1,838	-	-	4,076	1,405	-	1,780,053	-	613,811
22.5	252	252	0	-	-	5,957	2,054	-	-	4,703	1,622	-	1,501,038	-	517,599
17.5	125	125	0	-	-	6,584	2,270	-	-	5,330	1,838	-	822,938	-	283,772
12.5	47	47	0	-	-	7,211	2,486	-	-	5,957	2,054	-	338,894	-	116,860
7.5	22	22	0	-	-	7,838	2,703	-	-	6,584	2,270	-	172,425	-	59,457
2.5	13	13	0	-	-	8,465	2,919	-	-	7,211	2,486	-	110,039	-	37,944
-2.5	0	0	0	-	-	9,092	3,135	-	-	7,838	2,703	-	-	-	-
-7.5	0	0	0	-	-	9,719	3,351	-	-	8,465	2,919	-	-	-	-
TOTALS	**8,760**	**8,760**	**0**									**111**	**19,751,127**	**38**	**6,810,733**

Kearny NJ
CHA #20711
Building: Fire Station #2 - Dispatch Building

ECM-1a Increase 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	1,254	sf	$ 0.47	$ 1.23		$ 581	$ 1,866	$ -	$ 2,448	
Installation details	1	ls	$ -	$ 750		$ -	$ 908	$ -	$ 908	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 3,355	Subtotal
$ 1,007	30% Contingency
$ 654	15% Contractor O&P
$ -	Engineering
$ 5,016	**Total**

APPENDIX C

ECM-2 Increase Wall Insulation – Main

New Jersey BPU - Energy Audits
CHA #20711
Building: Fire Station #2 - Main Station

ECM-2 Increase Wall Insulation

Total Existing Wall Area	4,275	sf
Existing U-value	0.18	Btu/hr/(sf*F)
Proposed U-value	0.08	Btu/hr/(sf*F)
Heating Efficiency	78%	
Cooling Efficiency	1.20	kW/ton

Existing Cooling

Max. North Wall Cooling Load	2,668	Btu/hr
Max. East Wall Cooling Load	1,872	Btu/hr
Max. South Wall Cooling Load	3,827	Btu/hr
Max. West Wall Cooling Load	1,218	Btu/hr

Existing Heating

Existing Heating Load Temp Diff	56	F
Existing Max. Wall Heating Load	53,289	Btu/hr

Proposed Cooling

Max. North Wall Cooling Load	1,262	Btu/hr
Max. East Wall Cooling Load	824	Btu/hr
Max. South Wall Cooling Load	1,684	Btu/hr
Max. West Wall Cooling Load	536	Btu/hr

Proposed Heating

Proposed Max. Heating Load	23,447	Btu/hr

Occupied Cooling Setpoint	74	F
Unoccupied Cooling Setpoint	80	F

Occupied Heating Setpoint	70	F
Unoccupied Heating Setpoint	60	F

Existing Cooling Total	370	kWh/yr
Proposed Cooling Total	163	kWh/yr
Savings	207	kWh/yr

Existing Heating Total	122,417,182	Btu/yr
Proposed Heating Total	53,863,560	Btu/yr
Savings	68,553,622	Btu/yr
Input	879	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	9,785	4,305	-	-	9,785	4,305	-	-	3	-	1	-
92.5	34	34	0	7,703	3,389	-	-	6,989	3,075	-	-	26	-	12	-
87.5	131	131	0	5,621	2,473	-	-	4,193	1,845	-	-	74	-	32	-
82.5	500	500	0	3,539	1,557	-	-	1,398	615	-	-	177	-	78	-
77.5	620	620	0	1,457	641	-	-	-	-	-	-	90	-	40	-
72.5	664	664	0	-	-	-	-	-	-	-	-	-	-	-	-
67.5	854	854	0	-	-	1,943	855	-	-	-	-	-	1,659,380	-	730,127
62.5	927	927	0	-	-	5,829	2,565	-	-	-	-	-	5,403,673	-	2,377,616
57.5	600	600	0	-	-	9,715	4,275	-	-	1,943	855	-	5,829,205	-	2,564,850
52.5	610	610	0	-	-	13,601	5,985	-	-	5,829	2,565	-	8,296,901	-	3,650,637
47.5	611	611	0	-	-	17,488	7,695	-	-	9,715	4,275	-	10,684,932	-	4,701,370
42.5	656	656	0	-	-	21,374	9,404	-	-	13,601	5,985	-	14,021,180	-	6,169,319
37.5	1,023	1,023	0	-	-	25,260	11,114	-	-	17,488	7,695	-	25,840,864	-	11,369,980
32.5	734	734	0	-	-	29,146	12,824	-	-	21,374	9,404	-	21,393,181	-	9,413,000
27.5	334	334	0	-	-	33,032	14,534	-	-	25,260	11,114	-	11,032,741	-	4,854,406
22.5	252	252	0	-	-	36,918	16,244	-	-	29,146	12,824	-	9,303,410	-	4,093,501
17.5	125	125	0	-	-	40,804	17,954	-	-	33,032	14,534	-	5,100,554	-	2,244,244
12.5	47	47	0	-	-	44,691	19,664	-	-	36,918	16,244	-	2,100,457	-	924,201
7.5	22	22	0	-	-	48,577	21,374	-	-	40,804	17,954	-	1,068,688	-	470,223
2.5	13	13	0	-	-	52,463	23,084	-	-	44,691	19,664	-	682,017	-	300,087
-2.5	0	0	0	-	-	56,349	24,794	-	-	48,577	21,374	-	-	-	-
-7.5	0	0	0	-	-	60,235	26,503	-	-	52,463	23,084	-	-	-	-
TOTALS	8,760	8,760	0									370	122,417,182	163	53,863,560

New Jersey BPU - Energy Audits
CHA #20711
Building: Fire Station #2 - Main Station

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	4,275	sf	$ 0.70	$ 0.44	$ 0.06	$ 2,949	$ 2,276	$ 256	$ 5,481	
Stucco texture siding , mesh, colo	474	sy	$9.36	$13.66		$ 4,352	$ 7,843	$ -	$ 12,195	
Trim and misc	1	ls	$ 1,000	$ 2,000		$ 980	$ 2,420	$ -	$ 3,400	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$21,077	Subtotal
$6,323	30% Contingency
$4,110	15% Contractor O&P
$0	Engineering
$31,510	**Total**

APPENDIX D

ECM-3 Replace Garage Doors – Main

New Jersey BPU - Energy Audits
CHA #20711
Building: Fire Station #2 - Main Station

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

ECM-3 Replace Doors

Two doors are not insulated and are poorly sealed

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

	Occupied Cooling Hours per Week	0	Hours		
	Occupied Heating Hours per Week	168	Hours		
Given	Heating Energy Cost	$1.45	$/therm		
	Cooling Cost	$0.157	$/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	70.0	Degrees F	Occupied	(Assumption)
	Unoccupied Heating Setpoint Temperature	0.0	Degrees F	Unoccupied	(Assumption)
	Door Area	49	sq.ft.		(From door survey)
	Door Perimeter	42	ft		(From door survey)
	Proposed U factor	0.09	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	0.14	Btu/(h*sqft*degf)		(Hollow metal doors)
	Existing Air Infiltration	0.50	cfm/ft		(From ASHRAE Fundamentals)
	Heating System Efficiency	78%			
	Cooling System Efficiency	1.20	kW/ton		

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

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

Existing	Operation	OA Enthalpy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
	Cooling	38.3	92.5	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	33.5	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	30.3	72.5	664	0.0	0.0	0.0	0	0	0	0	0	0
	Heating	27.9	67.5	854	0.0	854.0	0.0	0	14,646	0	0	48,422	0
	Heating	24.6	62.5	927	0.0	927.0	0.0	0	47,694	0	0	157,683	0
	Heating	21.6	57.5	600	0.0	600.0	0.0	0	51,450	0	0	170,100	0
	Heating	18.7	52.5	610	0.0	610.0	0.0	0	73,231	0	0	242,109	0
	Heating	16.2	47.5	611	0.0	611.0	0.0	0	94,308	0	0	311,793	0
	Heating	14.3	42.5	656	0.0	656.0	0.0	0	123,754	0	0	409,147	0
	Heating	12.4	37.5	1,023	0.0	1023.0	0.0	0	228,078	0	0	754,053	0
	Heating	10.4	32.5	734	0.0	734.0	0.0	0	188,822	0	0	624,267	0
	Heating	8.7	27.5	334	0.0	334.0	0.0	0	97,376	0	0	321,943	0
	Heating	7	22.5	252	0.0	252.0	0.0	0	82,114	0	0	271,480	0
	Heating	5.4	17.5	125	0.0	125.0	0.0	0	45,019	0	0	148,838	0
	Heating	3.9	12.5	47	0.0	47.0	0.0	0	18,539	0	0	61,293	0
	Heating	2.5	7.5	22	0.0	22.0	0.0	0	9,433	0	0	31,185	0
	Heating	1.2	2.5	13	0.0	13.0	0.0	0	6,020	0	0	19,902	0
	Heating	-0.2	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
	Heating	-1.4	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
	Subtotal =			8,760	0	6,808	0	0	1,080,484	0 btu	0	3,572,213	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 (	$0.157) =			$ -
	Conduction		Infiltration		
Heating Load =	(1080484) + (	3572213) =			4,652,698 btu
	Heating Load	Heat Content			
Heating Energy =	(4652698)/(	78%)/(	100000) =		60 therms
	Heating Energy	Heating Cost			
Heating Energy Cost =	(59.65) x (	$1.454) =			$ 87

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	38.3	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	33.5	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	30.3	72.5	664	0.0	0.0	0.0	0	0	0	0	0	0
Heating	27.9	67.5	854	0.0	854.0	0.0	0	9,415	0	0	19,369	0
Heating	24.6	62.5	927	0.0	927.0	0.0	0	30,661	0	0	63,073	0
Heating	21.6	57.5	600	0.0	600.0	0.0	0	33,075	0	0	68,040	0
Heating	18.7	52.5	610	0.0	610.0	0.0	0	47,077	0	0	96,844	0
Heating	16.2	47.5	611	0.0	611.0	0.0	0	60,626	0	0	124,717	0
Heating	14.3	42.5	656	0.0	656.0	0.0	0	79,556	0	0	163,659	0
Heating	12.4	37.5	1,023	0.0	1023.0	0.0	0	146,621	0	0	301,621	0
Heating	10.4	32.5	734	0.0	734.0	0.0	0	121,385	0	0	249,707	0
Heating	8.7	27.5	334	0.0	334.0	0.0	0	62,600	0	0	128,777	0
Heating	7	22.5	252	0.0	252.0	0.0	0	52,788	0	0	108,592	0
Heating	5.4	17.5	125	0.0	125.0	0.0	0	28,941	0	0	59,535	0
Heating	3.9	12.5	47	0.0	47.0	0.0	0	11,918	0	0	24,517	0
Heating	2.5	7.5	22	0.0	22.0	0.0	0	6,064	0	0	12,474	0
Heating	1.2	2.5	13	0.0	13.0	0.0	0	3,870	0	0	7,961	0
Heating	-0.2	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	-1.4	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Subtotal =			8,760	0	6,808	0	0	694,597	0 btu	0	1,428,885	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 ($0.157) =	$ -
	Conduction Infiltration	
Heating Load =	(694597) + (1428885) =	2,123,482 btu
	Heating Load Heat Content	
Heating Energy =	(2123482)/(78%) / (100000) =	27 therms
	Heating Energy Heating Cost	
Heating Energy Cost =	(27.22) x ($1.454) =	$ 40

Summary

EXISTING COOLING ENERGY	0.00	kWh	$	-
EXISTING HEATING ENERGY	59.65	therms	$	86.73
EXISTING ENERGY COST			$	86.73

PROPOSED COOLING ENERGY	0.00	kWh	$	-
PROPOSED HEATING ENERGY	27.22	therms	$	39.58
PROPOSED ENERGY COST			$	39.58

COOLING ENERGY SAVINGS	0.00	kWh	$	-	
HEATING ENERGY SAVINGS	32.43	therms	$	47.15	54.4% of existing
ENERGY COST SAVINGS			$	47.15	54.4% of existing

Comments

New Jersey BPU - Energy Audits
CHA #20711
Building: Fire Station #2 - Main Station

ECM-3 Replace Doors

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 existing door (small door)	2	ea		$ 40		$ -	$ 97	$ -	$ 97	
Insulated exterior door	2	ea	$ 240	$ 65		$ 470	$ 157	$ -	$ 628	
Misc	2	ea	$ 30	$ 25		$ 59	$ 61	$ -	$ 119	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

844	Subtotal
84	10% Contingency
139	Contractor 15% O&P
$ -	Engineering
$ 1,067	**Total**

APPENDIX E

ECM-4 & 4a Replace Window AC Units

New Jersey BPU - Energy Audits
CHA #20711
Building: Fire Station #2 - Main Station

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

ASSUMPTIONS			Comments
Electric Cost	$0.157	/ 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	4		
Existing Annual Electric Usage	3,156	kWh	
Proposed EER	14.4		New ductless mini-splits (per manufacturer)
Proposed Annual Electric Usage	1,534	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Savings	1,622	kWh
Annual Cost Savings	$255	

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

New Jersey BPU - Energy Audits
CHA #20711
Building: Fire Station #2 - Main Station

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	4	LS		$ 50		$ -	$ 242	$ -	$ 242	
Indoor wall unit	4	ea	$ 1,090	$ 210		$ 4,273	$ 1,016	$ -	$ 5,289	
Condensing unit	2	ea	$ 1,025	$ 296		$ 2,009	$ 716	$ -	$ 2,725	
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	4	Tons	$92	$368	$ 8,015	$ 7,647
					$ -	$ -
				$368	$8,015	$7,647

$ 9,338	Subtotal	
$ 1,868	20%	Contingency
$ 1,401	15%	Contractor O&P
$ -		Engineering
$ 12,606	**Total**	

Total ECM Cost w/ Incentives	**$12,238**

Kearny NJ
CHA #20711
Building: Fire Station #2 - Dispatch Building

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

ASSUMPTIONS			Comments
Electric Cost	$0.158	/ kWh	
Average run hours per Week	55	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	2		
Existing Annual Electric Usage	1,240	kWh	
Proposed EER	14.4		New ductless mini-splits (per manufacturer)
Proposed Annual Electric Usage	603	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Savings	637	kWh
Annual Cost Savings	$101	

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	11	79%	9
87.5	131	43	68%	29
82.5	500	164	58%	95
77.5	620	203	47%	96
72.5	664	217	37%	80
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	639	49%	310

Kearny NJ
CHA #20711
Building: Fire Station #2 - Dispatch Building

ECM-4a 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	2	LS		$ 50		$ -	$ 121	$ -	$ 121	
Dobule zone split system	1	ea	$ 3,200	$ 320		$ 3,136	$ 387	$ -	$ 3,523	
Misc	1	LS	$ 100	$ 100		$ 98	$ 121	$ -	$ 219	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
					$ -	$ -
Unitary Split System < 5.4 tons	1	Tons	$92	$92	$ 3,523	$ 3,431
					$ -	$ -
				$92	$3,523	$3,431

Total ECM Cost w/ Incentives	**$4,930**

$ 3,863	Subtotal	
$ 579	15%	Contingency
$ 579	15%	Contractor O&P
$ -		Engineering
$ 5,022	**Total**	

APPENDIX F

ECM-5 Install Infrared Garage Heaters – Main

New Jersey BPU - Energy Audits
CHA #20711
Fire Station #2 - Main Station

ECM-5 Install Infrared Garage Heaters

Garage Building Footprint	2,870	SF
Heat Content	100,000	Btu/Therm
Building Balance Temp.	60	*F
Internal Gains	16,185	btu/h
Unoc Internal Gain factor	0.03	
Ave Occ Internal Gain Factor	0.7	
Existing Heating Efficiency	78%	
Existing Heat Distribution Effectiveness	80%	
Proposed Burner Efficiency	85%	
Proposed Heat Distribution Effectiveness	90%	

Ex Occupied Htg Temp.	70	*F
Ex Unoccupied Htg Temp.	60	*F
Occupied Heating UA	763	btu/hr/°F
Unoccupied Heating UA	763	btu/hr/°F

Heating Energy Savings	**650**	**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	-11,329	0	0	-486	0	0	-11,329	0	0	-486	0	0
97.5	43	3	3	0	0	0	-11,329	0	0	-486	0	0	-11,329	0	0	-486	0	0
92.5	40	34	34	0	0	0	-11,329	0	0	-486	0	0	-11,329	0	0	-486	0	0
87.5	37	131	131	0	0	0	-11,329	0	0	-486	0	0	-11,329	0	0	-486	0	0
82.5	34	500	500	0	0	0	-11,329	0	0	-486	0	0	-11,329	0	0	-486	0	0
77.5	32	620	620	0	0	0	-11,329	0	0	-486	0	0	-11,329	0	0	-486	0	0
72.5	29	664	664	0	0	0	-11,329	0	0	-486	0	0	-11,329	0	0	-486	0	0
67.5	27	854	854	0	1,907	2,718	-11,329	0	0	-486	1,907	2,718	-11,329	0	0	-486	0	0
62.5	25	927	927	0	5,721	8,155	-11,329	0	0	-486	5,721	8,155	-11,329	0	0	-486	38	31
57.5	21	600	600	0	9,535	13,591	-11,329	1,907	664	-486	9,535	13,591	-11,329	1,907	664	-486	113	93
52.5	19	610	610	0	13,350	19,028	-11,329	5,721	1,992	-486	13,350	19,028	-11,329	5,721	1,992	-486	206	168
47.5	16	611	611	0	17,164	24,465	-11,329	9,535	3,320	-486	17,164	24,465	-11,329	9,535	3,320	-486	297	242
42.5	14	656	656	0	20,978	29,901	-11,329	13,350	4,648	-486	20,978	29,901	-11,329	13,350	4,648	-486	416	339
37.5	13	1,023	1,023	0	24,792	35,338	-11,329	17,164	5,975	-486	24,792	35,338	-11,329	17,164	5,975	-486	800	653
32.5	11	734	734	0	28,606	40,774	-11,329	20,978	7,303	-486	28,606	40,774	-11,329	20,978	7,303	-486	683	557
27.5	9	334	334	0	32,420	46,211	-11,329	24,792	8,631	-486	32,420	46,211	-11,329	24,792	8,631	-486	360	294
22.5	7	252	252	0	36,235	51,648	-11,329	28,606	9,959	-486	36,235	51,648	-11,329	28,606	9,959	-486	309	252
17.5	6	125	125	0	40,049	57,084	-11,329	32,420	11,287	-486	40,049	57,084	-11,329	32,420	11,287	-486	172	140
12.5	4	47	47	0	43,863	62,521	-11,329	36,235	12,615	-486	43,863	62,521	-11,329	36,235	12,615	-486	72	58
7.5	3	22	22	0	47,677	67,957	-11,329	40,049	13,943	-486	47,677	67,957	-11,329	40,049	13,943	-486	37	30
2.5	1	13	13	0	51,491	73,394	-11,329	43,863	15,271	-486	51,491	73,394	-11,329	43,863	15,271	-486	24	19
-2.5	0	0	0	0	55,305	78,831	-11,329	47,677	16,599	-486	55,305	78,831	-11,329	47,677	16,599	-486	0	0
-7.5	-2	0	0	0	59,120	84,267	-11,329	51,491	17,926	-486	59,120	84,267	-11,329	51,491	17,926	-486	0	0
TOTALS		8,760	8,760	0													3,526	2,876

Existing Building Ventilation & Infiltration (occ)	**1,007**	**cfm**
Overheat Ventilation Factor	**0.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**246**	**cfm**

New Jersey BPU - Energy Audits
CHA #20711
Fire Station #2 - Main Station

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	2	ea		$ 300		$ -	$ 726	$ -	$ 726	
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	$ 1,320	$ 1,820		$ 1,294	$ 2,202	$ -	$ 3,496	
4" Class B Vent Piping	30	lf	$ 16.00	$ 15		$ 470	$ 545	$ -	$ 1,015	
4" Chimney Cap	2	ea	$ 11	$ 10		$ 22	$ 24	$ -	$ 46	
T-stats (w/setback, control wiring)	2	ea	$ 95	$ 30		$ 186	$ 73	$ -	$ 259	
Electric wiring for ignition	2	ea	$ 15	$ 90		$ 29	$ 218	$ -	$ 247	
Miscellaneous	1	ls	$ 800	$ 1,000		$ 784	$ 1,210	$ -	$ 1,994	

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

$9,833	Subtotal
$1,967	20% Contingency
$1,770	15% Contractor
$0	0% Engineering
$13,570	**Total**

APPENDIX G

ECM-6 Install Thermostatic Valves – Main

New Jersey BPU - Energy Audits
CHA #20711
Building: Fire Station #2 - Main Station

ECM-6 Thermostatic Valves

Building Footprint	7,700	SF	Ex Occupied Clng Temp.	74	°F	Ex Occupied Htg Temp.	70	°F	Base Case	5,713	therms
Heating Efficiency	78%		Ex Unoccupied Clng Temp.	74	°F	Ex Unoccupied Htg Temp.	70	°F	Proposed heating	5,184	therms
Cooling Efficiency	1.20	kW/ton	Occupied Cooling UA	(4,465)	btu/hr/°F	Occupiec Heating UA	1,798	btu/hr/°F	Savings	529	therms
Internal Gains	36,018	btu/h	Unoccupied Cooling UA	(3,509)	btu/hr/°F	Unoccupied Heating UA	1,798	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

					PROPOSED 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	-127,262	-159,346	-25,213	-100,003	-103,553	-1,081	0	0	0	0
97.5	42.5	3	3	0	-104,935	-110,657	-25,213	-82,458	-71,912	-1,081	0	72	72	0
92.5	39.5	34	34	0	-82,609	-88,526	-25,213	-64,914	-57,530	-1,081	0	668	668	0
87.5	36.6	131	131	0	-60,282	-67,132	-25,213	-47,370	-43,627	-1,081	0	1,999	1,999	0
82.5	34.0	500	500	0	-37,955	-47,951	-25,213	-29,825	-31,162	-1,081	0	5,556	5,556	0
77.5	31.6	620	620	0	-15,629	-30,246	-25,213	-12,281	-19,656	-1,081	0	4,407	4,407	0
72.5	29.2	664	664	0	0	0	-25,213	0	0	-1,081	0	1,674	1,674	0
67.5	27.0	854	854	0	4,496	4,426	-25,213	4,496	2,876	-1,081	0	1,391	1,391	0
62.5	24.5	927	927	0	13,488	13,279	-25,213	13,488	8,629	-1,081	0	0	0	18
57.5	21.4	600	600	0	22,480	22,131	-25,213	22,480	14,382	-1,081	0	0	0	149
52.5	18.7	610	610	0	31,472	30,984	-25,213	31,472	20,135	-1,081	0	0	0	291
47.5	16.2	611	611	0	40,464	39,837	-25,213	40,464	25,888	-1,081	0	0	0	432
42.5	14.4	656	656	0	49,456	48,689	-25,213	49,456	31,641	-1,081	0	0	0	613
37.5	12.6	1,023	1,023	0	58,448	57,542	-25,213	58,448	37,394	-1,081	0	0	0	1,191
32.5	10.7	734	734	0	67,440	66,394	-25,213	67,440	43,147	-1,081	0	0	0	1,022
27.5	8.6	334	334	0	76,432	75,247	-25,213	76,432	48,900	-1,081	0	0	0	542
22.5	6.8	252	252	0	85,424	84,099	-25,213	85,424	54,653	-1,081	0	0	0	466
17.5	5.5	125	125	0	94,416	92,952	-25,213	94,416	60,406	-1,081	0	0	0	260
12.5	4.1	47	47	0	103,407	101,804	-25,213	103,407	66,159	-1,081	0	0	0	108
7.5	2.6	22	22	0	112,399	110,657	-25,213	112,399	71,912	-1,081	0	0	0	56
2.5	1.0	13	13	0	121,391	119,510	-25,213	121,391	77,665	-1,081	0	0	0	36
-2.5	0.0	0	0	0	130,383	128,362	-25,213	130,383	83,418	-1,081	0	0	0	0
-7.5	-1.5	0	0	0	139,375	137,215	-25,213	139,375	89,171	-1,081	0	0	0	0
TOTALS		**8,760**	**8,760**	**0**								**15,768**	**15,768**	**5,184**

Existing Building Ventilation & Infiltration (occ)	**1,639**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**1,065**	**cfm**
Economizer Ventilation (from AHU's)	**574**	**cfm**

Energy Use Indices (calculated)

	Base Case
Heating	5,184
Target ->	5,672
	91.4%

	Base Case
Cooling	15,768
Target ->	300
	5256.0%

New Jersey BPU - Energy Audits
CHA #20711
Fire Station #2 - Main Station

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

ECM-6 Thermostatic Valves

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Thermostatic valves	20	ls	$ 85	$ 135		$ 1,666	$ 3,267	$ -	$ 4,933	
Misc	1	ls	$ 250	$ 500		$ 245	$ 605	$ -	$ 850	
						$ -	$ -	$ -	$ -	

$ 5,783	Subtotal
$ 867	15% Contingency
$ 998	15% Contractor O&P
$ -	Engineering
$ 7,648	**Total**

APPENDIX H

ECM-7 Replace Boiler – Dispatch

Kearny NJ
CHA #20711
Building: Fire Station #2 - Dispatch Building

ECM-7 Boiler Installation

Existing Fuel	Nat.Gas
Proposed Fuel	Nat.Gas

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$ 1.52		
Proposed Fuel Cost	$ 1.52		
Baseline Fuel Use	1,553	Therms	Based on historical utility data
Existing Boiler Plant Efficiency	73%		Estimated or Measured
Baseline Boiler Load	112,593	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 100 Mbtu/Therms
Baseline Fuel Cost	$ 2,359		
Proposed Boiler Plant Efficiency	83%		New Boiler Efficiency
Proposed Fuel Use	1,357	Therms	Baseline Boiler Load / Proposed Efficiency / 100 Mbtu/Therms
Proposed Fuel Cost	$ 2,061		
Annual Savings	196	Therms	
Annual Savings	**$ 298**	**/yr**	

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

Kearny NJ
CHA #20711
Building: Fire Station #2 - Dispatch Building

ECM-7 Boiler Installation

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	1	ea		$ 250.00		$ -	$ 303	$ -	$ 303	
Gas Fired Steam Boiler (160MBH)	1	ea	$ 2,950	$ 1,675		$ 2,891	$ 2,027	$ -	$ 4,918	
Flue Attachment	1	ls	$ 300	$ 120		$ 294	$ 145	$ -	$ 439	
Gas piping and steam connections	1	ls	$ 140	$ 360		$ 137	$ 436	$ -	$ 573	
Miscellaneous Electrical	1	ea	$ 150	$ 250		$ 147	$ 303	$ -	$ 450	
Boiler Controls	1	ls	$ 250	$ 450		$ 245	$ 545	$ -	$ 790	

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
					$ -	$ -
<300 MBH	160	Tons	$2	$320	$ 4,918	$ 4,598
						$ -
				$320	$4,918	$4,598

Total ECM Cost w/ Incentives	**$9,561**

$7,471	Subtotal	
$1,121	15%	Contingency
$1,289	15%	Contractor O&P
$0		Engineering
$9,881	**Total**	

APPENDIX I

ECM-8 Replace Domestic Hot Water Heater - Dispatch

Kearny NJ
CHA #20711
Building: Fire Station #2 - Dispatch Building

ECM-8 Replace DHW Heater

Summary

* Replace electric hot water heater w/ tankless instantaneous high efficiency unit

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	**246**	kWh/month	Estimated base on rating and utilization
Electric Demand	**4.5**	kW	
Total Annual Utility Demand by Water Heater	10,088	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	100%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	10,088	MBTU/yr	
Existing Tank Size	50	Gallons	Per manufacturer nameplate
Hot Water Piping System Capacity	5	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	°F	Per building personnel
Room Temperature	70	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.6	MBH	
Annual Standby Hot Water Load	5,019	MBTU/yr	
New Tank Size	0	Gallons	Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Hot Water Piping System Capacity	5	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	°F	
Room Temperature	70	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.1	MBH	
Annual Standby Hot Water Load	456	MBTU/yr	
Total Annual Hot Water Demand	5,525	MBTU/yr	
Proposed Avg. Hot water heater efficiency	92%		Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Proposed Fuel Use	6,006	MBTU/yr	Standby Losses and inefficient DHW heater eliminated
Electricty cost	0.158	$/kWh	
Gas Cost	$1.52	$/Therm	
Existing Operating Cost of DHW	$467	$/yr	
Proposed Operating Cost of DHW	$91	$/yr	

Savings Summary:

Utility	Energy	Cost Savings
Electric (kWh)	2,957	$1,104
Natural Gas (therms)	(60)	($91)
Cost savings		$1,013

Kearny NJ
CHA #20711
Building: Fire Station #2 - Dispatch Building

ECM-8 Replace DHW Heater

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.		
						$ -	$ -	$ -	$ -	
Gas-Fired DHW Heater Removal	1	LS		$ 50		$ -	$ 61	$ -	$ 61	
Instantaneous Gas-Fired DHW Heater	1	EA	$ 2,500	$ 280		$ 2,450	$ 339	$ -	$ 2,789	
Miscellaneous Electrical	1	LS	$ 300	$ 200		$ 294	$ 242	$ -	$ 536	
Venting Kit	1	EA	$ 450	$ 650		$ 441	$ 787	$ -	$ 1,228	
Extend piping	1	LS	$ 400	$ 360		$ 392	$ 436	$ -	$ 828	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 5,440	Subtotal	
$ 1,088	20%	Contingency
$ 979	15%	Contractor O&P
$ -	0%	Engineering
$ 7,508	**Total**	

APPENDIX J

ECM-9 & 9a Lighting Replacements

Energy Audit of Kearny, NJ

CHA Project No. 20711 - Fire Station #2 Main Building 0 $0.126 $/kWh

ECM-9 Lighting Replacements $11.62 $/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
81	Basement Stairs	1	S 34 C F 2	F42EE	72	0.1	SW	2000	144	1	S 28 C F 2	F42SSILL	48	0.0	SW	2,000	96	48	0.0	$ 9.37	$ 106.25	$10	11.3	10.3
70	Basement	6	W 32 C F 1	F41LL	32	0.2	SW	2000	384	6	W 32 C F 1	F41LL	32	0.2	SW	2,000	384	-	-	$ -	$ -	$0		
70	Basement	4	W 32 C F 1	F41LL	32	0.1	SW	2000	256	4	W 32 C F 1	F41LL	32	0.1	SW	2,000	256	-	-	$ -	$ -	$0		
204	Basement	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2000	414	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2,000	414	-	-	$ -	$ -	$0		
70	Rear Machine/Mechanics Room	4	W 32 C F 1	F41LL	32	0.1	SW	2600	333	4	W 32 C F 1	F41LL	32	0.1	SW	2,600	333	-	-	$ -	$ -	$0		
38	Rear Lounge Area	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	8760	1,051	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	8,760	1,051	-	-	$ -	$ -	$0		
72	Above Garage Sink	1	I 34	I34/1	34	0.0	Breaker	2600	88	1	CF 13	CFQ13/1-L	15	0.0	Breaker	2,600	39	49	0.0	$ 8.85	$ 18.75	$0	2.1	2.1
33	Fire Engine Garage	1	13 W CF 1	CFQ13/1-L	15	0.0	Pull String	8760	131	1	13 W CF 1	CFQ13/1-L	15	0.0	Pull String	8,760	131	-	-	$ -	$ -	$0		
70	Fire Engine Garage	4	W 32 C F 1	F41LL	32	0.1	SW	8760	1,121	4	W 32 C F 1	F41LL	32	0.1	SW	8,760	1,121	-	-	$ -	$ -	$0		
204	Fire Engine Garage	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	8760	1,813	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	8,760	1,813	-	-	$ -	$ -	$0		
70	Fire Engine Garage	4	W 32 C F 1	F41LL	32	0.1	SW	8760	1,121	4	W 32 C F 1	F41LL	32	0.1	SW	8,760	1,121	-	-	$ -	$ -	$0		
204	Fire Engine Garage	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	Pull String	8760	1,813	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	Pull String	8,760	1,813	-	-	$ -	$ -	$0		
221	Fire Engine Garage	1	S 30 C F 1 (MAG)	F31SS	46	0.0	SW	8760	403	1	S 30 C F 1 (MAG)	F31SS	46	0.0	SW	8,760	403	-	-	$ -	$ -	$0		
142	Fire Engine Garage	6	MH 100	MH100/1	128	0.8	SW	8760	6,728	6	MH 100	MH100/1	128	0.8	SW	8,760	6,728	-	-	$ -	$ -	$0		
72	Fire Engine Garage	1	I 34	I34/1	34	0.0	Pull String	8760	298	1	CF 13	CFQ13/1-L	15	0.0	Pull String	8,760	131	166	0.0	$ 23.54	$ 18.75	$0	0.8	0.8
81	Compressor Room	1	S 34 C F 2	F42EE	72	0.1	SW	2600	187	1	S 28 C F 2	F42SSILL	48	0.0	SW	2,600	125	62	0.0	$ 11.18	$ 106.25	$10	9.5	8.6
117	Stair Well	1	CF 23	CFS23/1	23	0.0	SW	2600	60	1	CF 23	CFS23/1	23	0.0	SW	2,600	60	-	-	$ -	$ -	$0		
71	Stair Well	2	I 60	I60/1	60	0.1	SW	2600	312	2	CF 26	CFQ26/1-L	27	0.1	SW	2,600	140	172	0.1	$ 30.74	$ 12.50	$0	0.4	0.4
204	Weight Room	2	S 96 P F 2 (MAG) 8'	F82EHE	207	0.4	SW	2600	1,076	2	S 96 P F 2 (MAG) 8'	F82EHE	207	0.4	SW	2,600	1,076	-	-	$ -	$ -	$0		
38	Upstairs Lounge/Kitchen	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	8760	1,051	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	8,760	1,051	-	-	$ -	$ -	$0		
71	Upstairs Lounge/Kitchen	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	$ 40.88	$ 6.25	$0	0.2	0.2
117	Upstairs Common Bathroom	4	CF 23	CFS23/1	23	0.1	SW	2600	239	4	CF 23	CFS23/1	23	0.1	SW	2,600	239	-	-	$ -	$ -	$0		
38	Locker 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 Office	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	2600	624	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	2,600	624	-	-	$ -	$ -	$0		
117	Upstairs Office Bathroom	1	CF 23	CFS23/1	23	0.0	SW	2080	48	1	CF 23	CFS23/1	23	0.0	SW	2,080	48	-	-	$ -	$ -	$0		
71	Upstairs Office Bathroom	2	I 60	I60/1	60	0.1	SW	2080	250	2	CF 26	CFQ26/1-L	27	0.1	SW	2,080	112	137	0.1	$ 26.43	$ 12.50	$0	0.5	0.5
38	Upstairs Lobby	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	2600	624	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	2,600	624	-	-	$ -	$ -	$0		
37	Upstairs Front Closet 1	1	SP 26 R CF 2	CFQ26/2-L	50	0.1	SW	2600	130	1	SP 26 R CF 2	CFQ26/2-L	50	0.1	SW	2,600	130	-	-	$ -	$ -	$0		
71	Upstairs Front Closet 2	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	$ 15.37	$ 6.25	$0	0.4	0.4
46	Rear Door Exterior Light	1	SP 26 R CF 1	CFQ26/1-L	27	0.0	SW	4368	118	1	SP 26 R CF 1	CFQ26/1-L	27	0.0	SW	4,368	118	-	-	$ -	$ -	$0		
230	Rear Parking Lot	1	WP400MH1	MH400/1	458	0.5	Timer	4368	2,001	1	WP100W2	IND200	210	0.2	Timer	4,368	917	1,083	0.2	$ 170.53	$ 1,144.25	$70	6.7	6.3
37	Rear Parking Lot	2	SP 26 R CF 2	CFQ26/2-L	50	0.1	SW	4368	437	2	SP 26 R CF 2	CFQ26/2-L	50	0.1	SW	4,368	437	-	-	$ -	$ -	$0		
140	Left Side Building Exterior	3	WPMH 175	MH175/1	215	0.6	Timer	4368	2,817	3	WP100WInduction	IND100	105	0.3	Timer	4,368	1,376	1,441	0.3	$ 226.92	$ 1,810.13	$210	8.0	7.1
140	Front Building Exterior	1	WPMH 175	MH175/1	215	0.2	Timer	4368	939	1	WP100WInduction	IND100	105	0.1	Timer	4,368	459	480	0.1	$ 75.64	$ 603.38	$70	8.0	7.1
	Total	**74**				**5.6**			**26,006**	**74**				**2,327**	**5**			**23,991**	**4,015**	**1.0**	**$639**	**$3,845**	**$370**		
																		Demand Savings		**1.0**	**$136**			
																		kWh Savings		**4,015**	**$504**			
																		Total savings			**$639**		**6.0**	**5.4**

Energy Audit of Kearny, NJ

CHA Project No. 20711 - Fire Station #2 Dispatch 0 $0.126 $/kWh

ECM-9a Lighting Replacements $11.79 $/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
6	Dispatch Office	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	749	2	T 28 R F 4	F44SSILL	96	0.2	SW	2,600	499	250	0.1	$ 45.13	$ 262.50	$40	5.8	4.9
6	Dispatch Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	8760	1,261	1	T 28 R F 4	F44SSILL	96	0.1	SW	8,760	841	420	0.0	$ 59.94	$ 131.25	$20	2.2	1.9
6	Dispatch Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	2600	374	1	T 28 R F 4	F44SSILL	96	0.1	SW	2,600	250	125	0.0	$ 22.57	$ 131.25	$20	5.8	4.9
6	Dispatch Bedroom	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	749	2	T 28 R F 4	F44SSILL	96	0.2	SW	2,600	499	250	0.1	$ 45.13	$ 262.50	$40	5.8	4.9
16	Dispatch Kitchen	1	T 34 R F 2 (MAG)	F42EE	72	0.1	SW	2600	187	1	T 28 R F 2	F42SSILL	48	0.0	SW	2,600	125	62	0.0	$ 11.28	$ 106.25	$10	9.4	8.5
187	Dispatch Side Entrance	1	W 34 C F 4 (MAG)	F44EE	144	0.1	SW	2600	374	1	W 28 C F 4	F44SSILL	96	0.1	SW	2,600	250	125	0.0	$ 22.57	$ 131.25	$0	5.8	5.8
73	Dispatch Side Entrance	1	I 120	I120/1	120	0.1	SW	2600	312	1	CF 26	CFQ26/1-L	27	0.0	SW	2,600	70	242	0.1	$ 43.72	$ 18.75	$0	0.4	0.4
204	Dispatch Garage	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2600	538	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2,600	538	-	-	$ -	$ -	$0		
81	Dispatch Basement Front Storage	1	S 34 C F 2	F42EE	72	0.1	SW	2000	144	1	S 28 C F 2	F42SSILL	48	0.0	SW	2,000	96	48	0.0	$ 9.46	$ 106.25	$10	11.2	10.2
204	Dispatch Basement Computer Room	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2000	414	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2,000	414	-	-	$ -	$ -	$0		
188	Dispatch Basement Computer Room	1	W 34 C F 2	F42EE	72	0.1	SW	2000	144	1	W 28 R F 2	F42SSILL	48	0.0	SW	2,000	96	48	0.0	$ 9.46	$ 106.25	$0	11.2	11.2
81	Dispatch Basement Computer Room	2	S 34 C F 2	F42EE	72	0.1	SW	2000	288	2	S 28 C F 2	F42SSILL	48	0.1	SW	2,000	192	96	0.0	$ 18.93	$ 212.50	$20	11.2	10.2
81	Dispatch Basement Computer Room	1	S 34 C F 2	F42EE	72	0.1	SW	2000	144	1	S 28 C F 2	F42SSILL	48	0.0	SW	2,000	96	48	0.0	$ 9.46	$ 106.25	$10	11.2	10.2
204	Dispatch Basement Computer Room	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2000	414	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2,000	414	-	-	$ -	$ -	$0		
73	Dispatch Basement Computer Room	1	I 120	I120/1	120	0.1	SW	2000	240	1	CF 26	CFQ26/1-L	27	0.0	SW	2,000	54	186	0.1	$ 36.67	$ 18.75	$0	0.5	0.5
187	Dispatch Basement Rear Storage	1	W 34 C F 4 (MAG)	F44EE	144	0.1	SW	2000	288	1	W 28 C F 4	F44SSILL	96	0.1	SW	2,000	192	96	0.0	$ 18.93	$ 131.25	$0	6.9	6.9
73	Dispatch Basement Rear Storage	1	I 120	I120/1	120	0.1	SW	2000	240	1	CF 26	CFQ26/1-L	27	0.0	SW	2,000	54	186	0.1	$ 36.67	$ 18.75	$0	0.5	0.5
108	Dispatch Bathroom	1	I 65	I65/1	65	0.1	SW	2080	135	1	CF 26	CFQ26/1-L	27	0.0	SW	2,080	56	79	0.0	$ 15.37	$ 18.75	$0	1.2	1.2
204	Separated Garage	4	S 96 P F 2 (MAG) 8'	F82EHE	207	0.8	SW	2000	1,656	4	S 96 P F 2 (MAG) 8'	F82EHE	207	0.8	SW	2,000	1,656	-	-	$ -	$ -	$0		
45	Exterior Spot Lights	5	SP 26 R CF 1	CFQ26/1-L	27	0.1	SW	2000	270	5	SP 26 R CF 1	CFQ26/1-L	27	0.1	SW	2,000	270	-	-	$ -	$ -	$0		
	Total	25				3.5			8,652	25			1,752	3			6,392	2,261	0.8	$405	$1,763	$170		
																	Demand Savings			0.8	$120			
																	kWh Savings			2,261	$286			
																	Total savings				$405		4.3	3.9

APPENDIX K

ECM-10 & 10a Install Occupancy Sensors

Energy Audit of Kearny, NJ

CHA Project No. 20711 - Fire Station #2 Main Building 0 $0.126 $/kWh

ECM-10 Install Occupancy Sensors $11.62 $/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
81	Basement Stairs	1	S 34 C F 2	F42EE	72	0.1	SW	2000	144.0	1	S 34 C F 2	F42EE	72	0.1	None	2000	144.0	0.0	0.0	$0.00	$0.00	$0.00		
70	Basement	6	W 32 C F 1	F41LL	32	0.2	SW	2000	384.0	6	W 32 C F 1	F41LL	32	0.2	None	2000	384.0	0.0	0.0	$0.00	$0.00	$0.00		
70	Basement	4	W 32 C F 1	F41LL	32	0.1	SW	2000	256.0	4	W 32 C F 1	F41LL	32	0.1	None	2000	256.0	0.0	0.0	$0.00	$0.00	$0.00		
204	Basement	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2000	414.0	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	2000	414.0	0.0	0.0	$0.00	$0.00	$0.00		
70	Rear Machine/Mechanics Room	4	W 32 C F 1	F41LL	32	0.1	SW	2600	332.8	4	W 32 C F 1	F41LL	32	0.1	None	2600	332.8	0.0	0.0	$0.00	$0.00	$0.00		
38	Rear Lounge Area	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	8760	1,051.2	2	T 32 R F 2 (ELE)	F42LL	60	0.1	None	8760	1,051.2	0.0	0.0	$0.00	$0.00	$0.00		
72	Above Garage Sink	1	I 34	I34/1	34	0.0	Breaker	2600	88.4	1	I 34	I34/1	34	0.0	None	2600	88.4	0.0	0.0	$0.00	$0.00	$0.00		
33	Fire Engine Garage	1	13 W CF 1	CFQ13/1-L	15	0.0	Pull String	8760	131.4	1	13 W CF 1	CFQ13/1-L	15	0.0	None	8760	131.4	0.0	0.0	$0.00	$0.00	$0.00		
70	Fire Engine Garage	4	W 32 C F 1	F41LL	32	0.1	SW	8760	1,121.3	4	W 32 C F 1	F41LL	32	0.1	None	8760	1,121.3	0.0	0.0	$0.00	$0.00	$0.00		
204	Fire Engine Garage	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	8760	1,813.3	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	8760	1,813.3	0.0	0.0	$0.00	$0.00	$0.00		
70	Fire Engine Garage	4	W 32 C F 1	F41LL	32	0.1	SW	8760	1,121.3	4	W 32 C F 1	F41LL	32	0.1	None	8760	1,121.3	0.0	0.0	$0.00	$0.00	$0.00		
204	Fire Engine Garage	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	Pull String	8760	1,813.3	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	8760	1,813.3	0.0	0.0	$0.00	$0.00	$0.00		
221	Fire Engine Garage	1	S 30 C F 1 (MAG)	F315S	46	0.0	SW	8760	403.0	1	S 30 C F 1 (MAG)	F315S	46	0.0	None	8760	403.0	0.0	0.0	$0.00	$0.00	$0.00		
142	Fire Engine Garage	6	MH 100	MH100/1	128	0.8	SW	8760	6,727.7	6	MH 100	MH100/1	128	0.8	None	8760	6,727.7	0.0	0.0	$0.00	$0.00	$0.00		
72	Fire Engine Garage	1	I 34	I34/1	34	0.0	Pull String	8760	297.8	1	I 34	I34/1	34	0.0	None	8760	297.8	0.0	0.0	$0.00	$0.00	$0.00		
81	Compressor Room	1	S 34 C F 2	F42EE	72	0.1	SW	2600	187.2	1	S 34 C F 2	F42EE	72	0.1	None	2600	187.2	0.0	0.0	$0.00	$0.00	$0.00		
117	Stair Well	1	CF 23	CFS23/1	23	0.0	SW	2600	59.8	1	CF 23	CFS23/1	23	0.0	None	2600	59.8	0.0	0.0	$0.00	$0.00	$0.00		
71	Stair Well	2	I 60	I60/1	60	0.1	SW	2600	312.0	2	I 60	I60/1	60	0.1	None	2600	312.0	0.0	0.0	$0.00	$0.00	$0.00		
204	Weight Room	2	S 96 P F 2 (MAG) 8'	F82EHE	207	0.4	SW	2600	1,076.4	2	S 96 P F 2 (MAG) 8'	F82EHE	207	0.4	C-OCC	1200	496.8	579.6	0.0	$72.74	$187.50	$35.00	2.6	2.1
38	Upstairs Lounge/Kitchen	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	8760	1,051.2	2	T 32 R F 2 (ELE)	F42LL	60	0.1	C-OCC	2600	312.0	739.2	0.0	$92.77	$187.50	$35.00	2.0	1.6
71	Upstairs Lounge/Kitchen	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		
117	Upstairs Common Bathroom	4	CF 23	CFS23/1	23	0.1	SW	2600	239.2	4	CF 23	CFS23/1	23	0.1	None	2600	239.2	0.0	0.0	$0.00	$0.00	$0.00		
38	Locker Room	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	2000	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		
38	Upstairs Office	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	2600	624.0	4	T 32 R F 2 (ELE)	F42LL	60	0.2	None	2600	624.0	0.0	0.0	$0.00	$0.00	$0.00		
117	Upstairs Office Bathroom	1	CF 23	CFS23/1	23	0.0	SW	2080	47.8	1	CF 23	CFS23/1	23	0.0	None	2080	47.8	0.0	0.0	$0.00	$0.00	$0.00		
71	Upstairs Office Bathroom	2	I 60	I60/1	60	0.1	SW	2080	249.6	2	I 60	I60/1	60	0.1	None	2080	249.6	0.0	0.0	$0.00	$0.00	$0.00		
38	Upstairs Lobby	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	2600	624.0	4	T 32 R F 2 (ELE)	F42LL	60	0.2	C-OCC	1200	288.0	336.0	0.0	$42.17	$187.50	$35.00	4.4	3.6
37	Upstairs Front Closet 1	1	SP 26 R CF 2	CFQ26/2-L	50	0.1	SW	2600	130.0	1	SP 26 R CF 2	CFQ26/2-L	50	0.1	None	2600	130.0	0.0	0.0	$0.00	$0.00	$0.00		
71	Upstairs Front Closet 2	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		
45	Rear Door Exterior Light	1	SP 26 R CF 1	CFQ26/1-L	27	0.0	SW	4368	117.9	1	SP 26 R CF 1	CFQ26/1-L	27	0.0	None	4368	117.9	0.0	0.0	$0.00	$0.00	$0.00		
230	Rear Parking Lot	1	WP400MH1	MH400/1	458	0.5	Timer	4368	2,000.5	1	WP400MH1	MH400/1	458	0.5	None	4368	2,000.5	0.0	0.0	$0.00	$0.00	$0.00		
37	Rear Parking Lot	2	SP 26 R CF 2	CFQ26/2-L	50	0.1	SW	4368	436.8	2	SP 26 R CF 2	CFQ26/2-L	50	0.1	None	4368	436.8	0.0	0.0	$0.00	$0.00	$0.00		
140	Left Side Building Exterior	3	WPMH 175	MH175/1	215	0.0	Timer	4368	2,817.4	3	WPMH 175	MH175/1	215	0.6	None	4368	2,817.4	0.0	0.0	$0.00	$0.00	$0.00		
140	Front Building Exterior	1	WPMH 175	MH175/1	215	0.2	Timer	4368	939.1	1	WPMH 175	MH175/1	215	0.2	None	4368	939.1	0.0	0.0	$0.00	$0.00	$0.00		
	Total	**74**				**5.6**			**28,006**	**74**				**6**			**26,351**	**1,655**	**0**	**208**	**$563**	**105**		
																		Demand Savings		**0.0**	**$0**			
																		kWh Savings		**1,655**	**$208**			
																		Total Savings			**$208**		**2.7**	**2.2**

Energy Audit of Kearny, NJ

CHA Project No. 20711 - Fire Station #2 Dispatch 0 $0.126 $/kWh

ECM-10a Install Occupancy Sensors $11.79 $/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
6	Dispatch Office	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	748.8	2	T 34 R F 4 (MAG)	F44EE	144	0.3	C-OCC	1200	345.6	403.2	0.0	$50.96	$187.50	$70.00	3.7	2.3
6	Dispatch Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	8760	1,261.4	1	T 34 R F 4 (MAG)	F44EE	144	0.1	None	8760	1,261.4	0.0	0.0	$0.00	$0.00	$0.00		
6	Dispatch Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	2600	374.4	1	T 34 R F 4 (MAG)	F44EE	144	0.1	None	2600	374.4	0.0	0.0	$0.00	$0.00	$0.00		
6	Dispatch Bedroom	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	748.8	2	T 34 R F 4 (MAG)	F44EE	144	0.3	OCC	1200	345.6	403.2	0.0	$50.96	$118.75	$40.00	2.3	1.5
16	Dispatch Kitchen	1	T 34 R F 2 (MAG)	F42EE	72	0.1	SW	2600	187.2	1	T 34 R F 2 (MAG)	F42EE	72	0.1	OCC	1200	86.4	100.8	0.0	$12.74	$118.75	$40.00	9.3	6.2
187	Dispatch Side Entrance	1	W 34 C F 4 (MAG)	F44EE	144	0.1	SW	2600	374.4	1	W 34 C F 4 (MAG)	F44EE	144	0.1	None	2600	374.4	0.0	0.0	$0.00	$0.00	$0.00		
73	Dispatch Side Entrance	1	I 120	I120/1	120	0.1	SW	2600	312.0	1	I 120	I120/1	120	0.1	None	2600	312.0	0.0	0.0	$0.00	$0.00	$0.00		
204	Dispatch Garage	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2600	538.2	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	2600	538.2	0.0	0.0	$0.00	$0.00	$0.00		
81	Dispatch Basement Front Storage	1	S 34 C F 2	F42EE	72	0.1	SW	2000	144.0	1	S 34 C F 2	F42EE	72	0.1	None	2000	144.0	0.0	0.0	$0.00	$0.00	$0.00		
204	Dispatch Basement Computer Room	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2000	414.0	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	2000	414.0	0.0	0.0	$0.00	$0.00	$0.00		
188	Dispatch Basement Computer Room	1	W 34 C F 2	F42EE	72	0.1	SW	2000	144.0	1	W 34 C F 2	F42EE	72	0.1	None	2000	144.0	0.0	0.0	$0.00	$0.00	$0.00		
81	Dispatch Basement Computer Room	2	S 34 C F 2	F42EE	72	0.1	SW	2000	288.0	2	S 34 C F 2	F42EE	72	0.1	None	2000	288.0	0.0	0.0	$0.00	$0.00	$0.00		
81	Dispatch Basement Computer Room	1	S 34 C F 2	F42EE	72	0.1	SW	2000	144.0	1	S 34 C F 2	F42EE	72	0.1	None	2000	144.0	0.0	0.0	$0.00	$0.00	$0.00		
204	Dispatch Basement Computer Room	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2000	414.0	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	2000	414.0	0.0	0.0	$0.00	$0.00	$0.00		
73	Dispatch Basement Computer Room	1	I 120	I120/1	120	0.1	SW	2000	240.0	1	I 120	I120/1	120	0.1	None	2000	240.0	0.0	0.0	$0.00	$0.00	$0.00		
187	Dispatch Basement Rear Storage	1	W 34 C F 4 (MAG)	F44EE	144	0.1	SW	2000	288.0	1	W 34 C F 4 (MAG)	F44EE	144	0.1	None	2000	288.0	0.0	0.0	$0.00	$0.00	$0.00		
73	Dispatch Basement Rear Storage	1	I 120	I120/1	120	0.1	SW	2000	240.0	1	I 120	I120/1	120	0.1	None	2000	240.0	0.0	0.0	$0.00	$0.00	$0.00		
108	Dispatch Bathroom	1	I 65	I65/1	65	0.1	SW	2080	135.2	1	I 65	I65/1	65	0.1	None	2080	135.2	0.0	0.0	$0.00	$0.00	$0.00		
204	Separated Garage	4	S 96 P F 2 (MAG) 8'	F82EHE	207	0.8	SW	2000	1,656.0	4	S 96 P F 2 (MAG) 8'	F82EHE	207	0.8	None	2000	1,656.0	0.0	0.0	$0.00	$0.00	$0.00		
45	Exterior Spot Lights	5	SP 26 R CF 1	CFQ26/1-L	27	0.1	SW	2000	270.0	5	SP 26 R CF 1	CFQ26/1-L	27	0.1	None	2000	270.0	0.0	0.0	$0.00	$0.00	$0.00		
	Total	**25**				**3.5**			**8,652**	**25**				**3**			**7,745**	**907**	**0**	**115**	**$425**	**150**		
																		Demand Savings		**0.0**	**$0**			
																		kWh Savings		**907**	**$115**			
																		Total Savings			**$115**		**3.7**	**2.4**

APPENDIX L

ECM-11 Lighting Replacements with Occupancy Sensors - Dispatch

Energy Audit of Kearny, NJ

CHA Project No. 20711 - Fire Station #2 Dispatch 0 $0.126 $/kWh

ECM-11 Lighting Replacements with Occupancy Sensors $11.79 $/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
6	Dispatch Office	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	749	2	T 28 R F 4	F44SSILL	96	0.2	C-OCC	1,200	230	518	0.1	$ 79.11	$ 450.00	$ 110	5.7	4.3
6	Dispatch Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	8760	1,261	1	T 28 R F 4	F44SSILL	96	0.1	None	8,760	841	420	0.0	$ 59.94	$ 131.25	$ 20	2.2	1.9
6	Dispatch Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	2600	374	1	T 28 R F 4	F44SSILL	96	0.1	None	2,600	250	125	0.0	$ 22.67	$ 131.25	$ 20	6.8	4.9
6	Dispatch Bedroom	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	749	2	T 28 R F 4	F44SSILL	96	0.2	OCC	1,200	230	518	0.1	$ 79.11	$ 381.25	$ 80	4.8	3.8
16	Dispatch Kitchen	1	T 34 R F 2 (MAG)	F42EE	72	0.1	SW	2600	187	1	T 28 R F 2	F42SSILL	48	0.0	OCC	1,200	58	130	0.0	$ 19.78	$ 225.00	$ 50	11.4	8.8
187	Dispatch Side Entrance	1	W 34 C F 4 (MAG)	F44EE	144	0.1	SW	2600	374	1	W 28 C F 4	F44SSILL	96	0.1	None	2,600	250	125	0.0	$ 22.57	$ 131.25	$ -	5.8	5.8
73	Dispatch Side Entrance	1	I 120	I120/1	120	0.1	SW	2600	312	1	CF 26	CFQ26/1-L	27	0.0	None	2,600	70	242	0.1	$ 43.72	$ 18.75	$ -	0.4	0.4
204	Dispatch Garage	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2600	538	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	2,600	538	-	-	$ -	$ -	$ -		
81	Dispatch Basement Front Storage	1	S 34 C F 2	F42EE	72	0.1	SW	2000	144	1	S 28 C F 2	F42SSILL	27	0.0	None	2,000	54	90	0.0	$ 17.74	$ 18.75	$ -	1.1	1.1
204	Dispatch Basement Computer Room	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2000	414	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	2,000	414	-	-	$ -	$ -	$ -		
188	Dispatch Basement Computer Room	1	W 34 C F 2	F42EE	72	0.1	SW	2000	144	1	W 28 R F 2	F42SSILL	48	0.0	None	2,000	96	48	0.0	$ 9.46	$ 106.25	$ -	11.2	11.2
81	Dispatch Basement Computer Room	2	S 34 C F 2	F42EE	72	0.1	SW	2000	288	2	S 28 C F 2	F42SSILL	48	0.1	None	2,000	192	96	0.0	$ 18.93	$ 212.50	$ 20	11.2	10.2
81	Dispatch Basement Computer Room	1	S 34 C F 2	F42EE	72	0.1	SW	2000	144	1	S 28 C F 2	F42SSILL	48	0.0	None	2,000	96	48	0.0	$ 9.46	$ 106.25	$ 10	11.2	10.2
204	Dispatch Basement Computer Room	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	SW	2000	414	1	S 96 P F 2 (MAG) 8'	F82EHE	207	0.2	None	2,000	414	-	-	$ -	$ -	$ -		
73	Dispatch Basement Computer Room	1	I 120	I120/1	120	0.1	SW	2000	240	1	CF 26	CFQ26/1-L	27	0.0	None	2,000	54	186	0.1	$ 36.67	$ 18.75	$ -	0.5	0.5
187	Dispatch Basement Rear Storage	1	W 34 C F 4 (MAG)	F44EE	144	0.1	SW	2000	288	1	W 28 C F 4	F44SSILL	96	0.1	None	2,000	192	96	0.0	$ 18.93	$ 131.25	$ -	6.9	6.9
73	Dispatch Basement Rear Storage	1	I 120	I120/1	120	0.1	SW	2000	240	1	CF 26	CFQ26/1-L	27	0.0	None	2,000	54	186	0.1	$ 36.67	$ 18.75	$ -	0.5	0.5
108	Dispatch Bathroom	1	I 65	I65/1	65	0.1	SW	2080	135	1	CF 23	CFQ26/1-L	27	0.0	None	2,080	56	79	0.0	$ 15.37	$ 18.75	$ -	1.2	1.2
204	Separated Garage	4	S 96 P F 2 (MAG) 8'	F82EHE	207	0.8	SW	2000	1,656	4	S 96 P F 2 (MAG) 8'	F82EHE	207	0.8	None	2,000	1,656	-	-	$ -	$ -	$ -		
45	Exterior Spot Lights	5	SP 26 R CF 1	CFQ26/1-L	27	0.1	SW	2000	270	5	SP 26 R CF 1	CFQ26/1-L	27	0.1	None	2,000	270	-	-	$ -	$ -	$ -		
	Total	25				3.5			8,652	25				2.6			5,745		0.9	490	2,100	310		
																		Demand Savings		0.9	$123			
																		kWh Savings		2,907	$367			
																		Total Savings			$490		4.3	3.7

APPENDIX M

New Jersey Pay For Performance Incentive Program

New Jersey BPU - Energy Audits
CHA #20711
Building: Fire Station #2 - Main Station

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)	64,010	6,170
Proposed Savings	7,770	2,690
Existing Total MMBtus	835	
Proposed Savings MMBtus	296	
% Reduction	35.4%	
Proposed Annual Savings	$5,050	

	≥ %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	$1,709	$5,918	$7,627
Incentive #3	$1,088	$3,766	$4,854
Totals	**$2,797**	**$9,684**	**$12,481**

Total Project Cost	$80,200
% Incentives of Project Cost*	15.6%
Project Cost w/ Incentives*	$67,719

Project Payback (years)	
w/o Incentives	w/ Incentives
15.9	13.4

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

Kearny NJ
CHA #20711
Building: Fire Station #2 - Dispatch Building

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)	31,720	1,550
Proposed Savings	6,580	320
Existing Total MMBtus	263	
Proposed Savings MMBtus	54	
% Reduction	20.7%	
Proposed Annual Savings	$2,100	

	≥ %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	$1,448	$704	$2,152
Incentive #3	$921	$448	$1,369
Totals	**$2,369**	**$1,152**	**$3,521**

Total Project Cost	$29,500
% Incentives of Project Cost*	11.9%
Project Cost w/ Incentives*	$25,979

Project Payback (years)	
w/o Incentives	w/ Incentives
14.0	12.4

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

APPENDIX N

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:	12.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	9.2 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	15.8 ¢/kWh

Results			
Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	993	156.40
2	4.05	1073	169.00
3	4.58	1301	204.91
4	4.84	1272	200.34
5	5.30	1401	220.66
6	5.33	1321	208.06
7	5.27	1335	210.26
8	5.25	1321	208.06
9	5.06	1281	201.76
10	4.46	1207	190.10
11	3.15	861	135.61
12	2.87	830	130.72
Year	4.46	14196	2235.87

Output Hourly Performance Data

About the Hourly Performance Data

*

Output Results as Text

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

Township of Kearny
Fire Station No. 2
Main Building

Cost of Electricity $0.158 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-12kW 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
$120,000	**0.0**	**14,200**	**0**	**$2,200**	**0**	**$2,200**	**$12,000**	**$6,900**	**54.5**	**11.9**

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**

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:	5.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	3.8 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	15.8 ¢/kWh

Results			
Month	Solar Radiation (kWh/m^2/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	414	65.20
2	4.05	447	70.40
3	4.58	542	85.36
4	4.84	530	83.48
5	5.30	584	91.98
6	5.33	551	86.78
7	5.27	556	87.57
8	5.25	550	86.62
9	5.06	534	84.11
10	4.46	503	79.22
11	3.15	359	56.54
12	2.87	346	54.50
Year	4.46	5915	931.61

Output Hourly Performance Data

About the Hourly Performance Data

*

Output Results as Text

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

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Township of Kearny
Fire Station No. 2
Dispatch Building

Cost of Electricity $0.158 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-5kW 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
$50,000	**0.0**	**5,920**	**0**	**$900**	**0**	**$900**	**$5,000**	**$2,900**	**55.6**	**11.8**

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**

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.

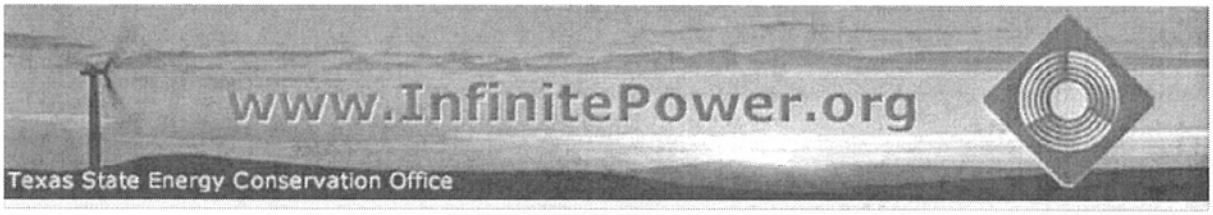
If net-metering isn't available and the PV system sends surplus electricity to the utility grid, the utility generally buys the electricity from the owner at a lower price than the owner pays the utility for electricity. In this case, the cost savings shown in the table should be reduced.

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.

APPENDIX O

Solar Thermal Domestic Hot Water Plant



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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)	80
Energy Use			
1779		? Heat Delivered in Hot Water (BTU/hr)	
0		? Heat loss through insulation (BTU/hr)	

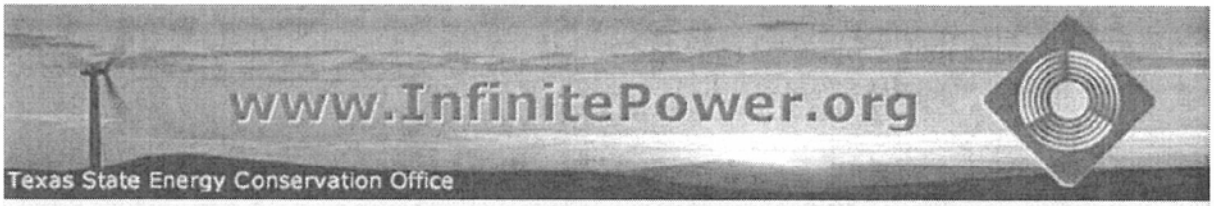
Gas vs. Electric Water Heating		
Gas		**Electric**
0.8	? Overall Efficiency	0.98
0.8	? Conversion Efficiency	0.98
2224 BTU/hr	? Power Into Water Heater	1815 BTU/hr
Cost		
$ 1.454 /Therm	? Utility Rates	$ .1573 /kWh
$ 283.271	? Yearly Water Heating Cost	$ 732.473
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
136.668 years for gas	? Payback Time for Solar System	52.8541 years for electric

NJBPU Energy Audits
CHA # 20711
Township of Kearny
Fire Station No. 2 - Main Building

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**



Interactive Energy Calculators

RENEWABLE ENERGY
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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.

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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)	50	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	21.36	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	20
Energy Use			
444.7		? 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
555.9 BTU/hr	? Power Into Water Heater	453.8 BTU/hr
Cost		
$ 1.519 /Therm	? Utility Rates	$ .1580 /kWh
$ 73.9704	? Yearly Water Heating Cost	$ 183.953
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
523.374 years for gas	? Payback Time for Solar System	210.456 years for electric

NJBPU Energy Audits
CHA # 20711
Township of Kearny
Fire Station No. 2 - Dispatch Building

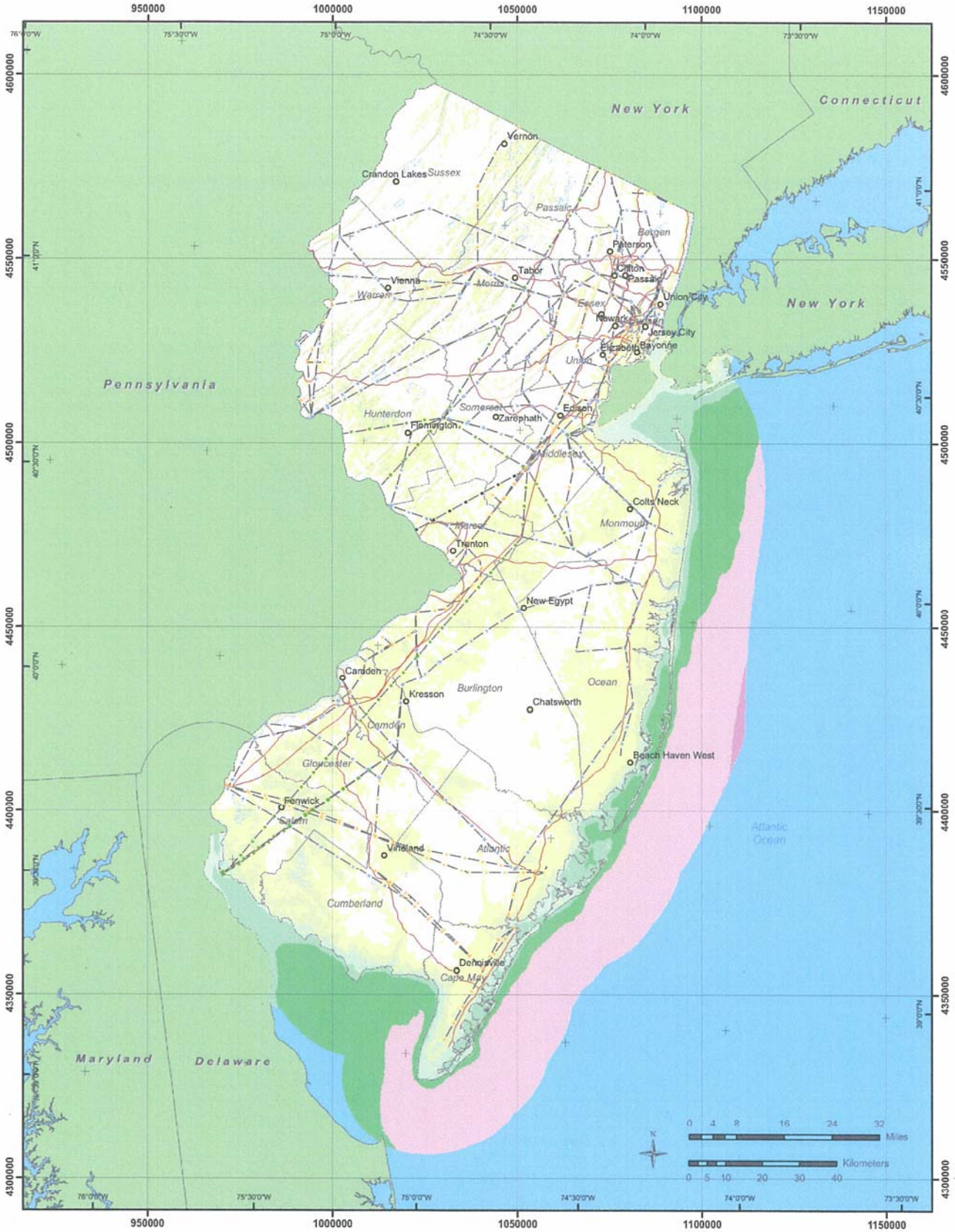
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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 P

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

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

AWS Truewind, LCC

Map of 109 Kearny Ave, Kearny, NJ 07032-2313

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 Q

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Fire Department #2

Building ID: 2023919
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: January 28, 2010

Facility
Fire Department #2
109 Kearny 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: 1920
Gross Floor Area (ft²): 8,954

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	326,607
Natural Gas (kBtu)[4]	771,700
Total Energy (kBtu)	1,098,307
Energy Intensity[5]	
Site (kBtu/ft²/yr)	123
Source (kBtu/ft²/yr)	212
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	91
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	35%
Building Type	Fire Station/Police Station

Stamp of Certifying Professional

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

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

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

Certifying Professional
N/A

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

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

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 #2	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	109 Kearny 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		☐

Dispatch (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	1,254 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	1 (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	1 (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.		☐

Fire Station (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	7,700 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	12 (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 626052563 Maple St (kWh (thousand Watt-hours))
Space(s): Dispatch
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2008	12/31/2008	2,186.00
11/01/2008	11/30/2008	2,122.00
10/01/2008	10/31/2008	2,078.00
09/01/2008	09/30/2008	3,158.00
08/01/2008	08/31/2008	3,169.00
07/01/2008	07/31/2008	3,850.00
06/01/2008	06/30/2008	3,405.00
05/01/2008	05/31/2008	2,489.00
04/01/2008	04/30/2008	2,082.00
03/01/2008	03/31/2008	2,379.00
02/01/2008	02/29/2008	2,361.00
01/01/2008	01/31/2008	2,436.00
PSE&G Electric 626052563 Maple St Consumption (kWh (thousand Watt-hours))		**31,715.00**
PSE&G Electric 626052563 Maple St Consumption (kBtu (thousand Btu))		**108,211.58**

Meter: PSE&G Electric 236006583 Kearny Ave. (kWh (thousand Watt-hours))
Space(s): Fire Station
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2008	12/31/2008	5,922.00
11/01/2008	11/30/2008	4,908.00
10/01/2008	10/31/2008	3,486.00
09/01/2008	09/30/2008	5,694.00
08/01/2008	08/31/2008	6,582.00
07/01/2008	07/31/2008	8,082.00
06/01/2008	06/30/2008	6,840.00
05/01/2008	05/31/2008	3,012.00
04/01/2008	04/30/2008	3,744.00
03/01/2008	03/31/2008	5,154.00
02/01/2008	02/29/2008	5,406.00
01/01/2008	01/31/2008	5,178.00
PSE&G Electric 236006583 Kearny Ave. Consumption (kWh (thousand Watt-hours))		**64,008.00**

PSE&G Electric 236006583 Kearny Ave. Consumption (kBtu (thousand Btu))	218,395.30
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))	326,606.88
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?	☐

Fuel Type: Natural Gas

Meter: PSE&G Natural Gas 3341655 Maple St (therms)
Space(s): Dispatch

Start Date	End Date	Energy Use (therms)
12/01/2008	12/31/2008	295.00
11/01/2008	11/30/2008	160.00
10/01/2008	10/31/2008	43.00
09/01/2008	09/30/2008	1.00
08/01/2008	08/31/2008	2.00
07/01/2008	07/31/2008	2.00
06/01/2008	06/30/2008	34.00
05/01/2008	05/31/2008	20.00
04/01/2008	04/30/2008	57.00
03/01/2008	03/31/2008	260.00
02/01/2008	02/29/2008	315.00
01/01/2008	01/31/2008	363.00
PSE&G Natural Gas 3341655 Maple St Consumption (therms)		1,552.00
PSE&G Natural Gas 3341655 Maple St Consumption (kBtu (thousand Btu))		155,200.00

Meter: PSE&G Natural Gas 2611338 Kearny Ave. (therms)
Space(s): Fire Station

Start Date	End Date	Energy Use (therms)
12/01/2008	12/31/2008	1,178.00
11/01/2008	11/30/2008	685.00
10/01/2008	10/31/2008	182.00
09/01/2008	09/30/2008	42.00
08/01/2008	08/31/2008	37.00
07/01/2008	07/31/2008	40.00
06/01/2008	06/30/2008	41.00
05/01/2008	05/31/2008	123.00
04/01/2008	04/30/2008	227.00
03/01/2008	03/31/2008	936.00
02/01/2008	02/29/2008	1,129.00
01/01/2008	01/31/2008	1,545.00
PSE&G Natural Gas 2611338 Kearny Ave. Consumption (therms)		6,165.00
PSE&G Natural Gas 2611338 Kearny Ave. Consumption (kBtu (thousand Btu))		616,500.00
Total Natural Gas Consumption (kBtu (thousand Btu))		771,700.00
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 #2
109 Kearny 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 #2	
Gross Floor Area Excluding Parking: (ft²)	8,954
Year Built	1920
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Dispatch	
Space Type	Other - Other
Gross Floor Area(ft²)	1,254
Number of PCs°	1
Weekly operating hours°	168
Workers on Main Shift°	1

Fire Station	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft²)	7,700
Number of PCs°	4
Weekly operating hours°	168
Workers on Main Shift°	12

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 12/31/2008)	**Baseline** (Ending Date 12/31/2008)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	123	123	0	N/A	78
Source (kBtu/ft²)	212	212	0	N/A	157
Energy Cost					
$/year	$ 26,405.56	$ 26,405.56	N/A	N/A	$ 16,791.40
$/ft²/year	$ 2.95	$ 2.95	N/A	N/A	$ 1.88
Greenhouse Gas Emissions					
$MtCO_2e$/year	91	91	0	N/A	58
$kgCO_2e$/ft²/year	10	10	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 R

Equipment Inventory

New Jersey BPU Energy Audit Program
CHA #20711
Kearny
Fire Station No.2

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Areas Served	Date Installed	Useable Life Expectancy (years)
Main Station								
Boiler	Weil McLain	Model LGB-6, Serial N0.2	Gas fired steam boiler	Input 650 MBH, Output 526 MBH, 15 psig	Basement	Entire building	1994	15
DHWH	AC Smith	FSG 40 242, Serial ME98-0021165-242	Gas fired domestic hot water heater	Capacity 40 gal, Input 32,000 Btu/hr, Insulation R7	Basement	Entire building	1992	3
Window AC	Carrier	Unknown	Window AC cooling unit	Estimated 14,000 btu/hr	Window	Kithen	Unknown	Unknown
Window AC	Carrier	Unkrown	Window AC cooling unit	Estimated 14,000 btu/hr	Window	Bedroom	Unknown	Unknown
Window AC	Carrier	Unknown	Window AC cooling unit	Estimated 14,000 btu/hr	Window	Bedroom	Unknown	Unknown
Window AC	Carrier	Unknown	Window AC cooling unit	Estimated 14,000 btu/hr	Window	Exercise room	Unknown	Unknown
Dispatch Building								
Boiler	Peerless	Model G-661-SP, Serial 61-7117	Gas fired steam boiler	Input 200 MBH, Output 160 MBH, 15 psig	Basement	Entire building	1973	-6
DHWH	Rheem	Model 81V520	Electric domestic hot water heater	Capacity 50 gal, Input 4500 watt	Basement	Entire building	1994	5
Window AC	Carrier	Unknown	Window AC cooling unit	Estimated 14,000 btu/hr	Window	Kithen	Unknown	Unknown
Window AC	Carrier	Unknown	Window AC cooling unit	Estimated 14,000 btu/hr	Window	Bedroom	Unknown	Unknown