TOWNSHIP OF KEARNY
ANNEX BUILDING
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

CHA PROJECT NO. 20711

June 2010

Prepared by:

CLOUGH HARBOUR & ASSOCIATES LLP

6 Campus Drive
Parsippany, NJ 07054

(973) 538-2120

TABLE OF CONTENTS

APPENDICES

A	Utility Usage Analysis
B	ECM-1 Night Setback
C	ECM-2 Install Door Seals
D	ECM-3 Replace Domestic Hot Water Heater
E	ECM-4 Lighting Replacements
F	ECM-5 Install Occupancy Sensors
G	ECM-6: Lighting Replacements with Occupancy Sensors
H	New Jersey Pay For Performance Incentive Program
I	Photovoltaic (PV) Rooftop Solar Power Generation
J	Solar Thermal Domestic Hot Water Plant
K	Wind
L	EPA Portfolio Manager
M	Equipment Inventory

1.0 INTRODUCTION & BACKGROUND

This report summarizes the energy audit for the Town Hall Annex, (Annex) a 4,000 square foot facility in Kearny, NJ. The single story building with a partially unfinished basement houses offices and storage closets.

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

2.0 EXECUTIVE SUMMARY

This report details the results of the energy audit for the Town Hall Annex. The 4,000 square foot central fire station located in Kearny, New Jersey, is continually operational. The two floors consist of offices, two bay garage area, dispatch area, social room, sleeping area, kitchen, and restrooms. The following areas were evaluated for energy conservation measures:

- Night setback
- Domestic hot water heater
- Lighting replacements with occupancy sensors

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 $2,100 for the recommended ECMs may be realized with a payback of 5.9 years.

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

ECM-1 Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
800	0	430	360	600	10.3	NA	1.3	NA

* The ECM is not eligible for New Jersey's Smart Start Incentive of the 2010 Application

ECM-3 Replace Domestic Hot Water Heaters

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,700	3.0	1,970	(60)	600	0.9	100	9.5	9.3

* Incentive shown is per the New Jersey's Smart Start Gas Water Heating Application.

ECM-6 Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,900	1.9	5,160	0	900	1.3	1,000	6.6	5.4

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

3.0 EXISTING CONDITIONS

3.1 Building General

The Annex is a single story, 4,000 square foot building constructed in 1996. The building consists of offices and storage closets. The unoccupied partially unfinished basement is used as a storage area for archives.

The Annex was constructed on older foundations of a former building. The walls are stucco finish on the outside and gypsum on the interior. The walls are insulated and have a frame construction. The roof is flat and insulated and covered with a rubber membrane. All windows are double pane.

The building is occupied by about 12 staff and operates from 8:00 AM to 5:00 PM five days per week.

3.2 Utility Usage

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

Electricity and natural gas are purchased from the Public Service Electric and Gas Company (PSE&G). For 2008, the facility consumed a total of 72,000 kWh electricity at an annual cost of about $11,200. The annual natural gas usage was about 1,600 therms at a cost of $2,500.

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

Electricity is a large portion of the utility charges, and has an average blended rate of $0.15 per kWh. Electrical usage is higher during the summer cooling months; natural gas consumption is higher from November through April for building heating. The average blended rate for natural gas was $1.52 per therm.

Utility data is provided in Appendix A.

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

3.3 HVAC Systems

The building is heated and cooled by two rooftop Carrier gas fired air handlers equipped with economizers. One air handling unit (AHU), Model 48HJE004 rated at 72MBH input and 59MBH output of heating and 4 tons of cooling, serves the west side of the building. The other, Model 580DPV060 rated at 115MBH input and 92MBH output of heating and 5 tons of cooling, server the east half of the building. Additional cooling for the server room is provided by two split systems with condensing units, Sanyo CL1872 and Sanyo CL2432, installed on the roof.

3.4 Lighting/Electrical Systems

The lighting system within the building is manually controlled by individual switches within the spaces. Most of the lighting is fluorescent using F34T12 34 watt lamps. Some incandescent lamps still exist in the front vestibule; however, they are run on a timer and are used minimally. The exit signs within the building have all been upgraded to efficient LED technology. The building's exterior lighting consists of one compact fluorescent fixture in the back of the building controlled by a timer.

3.5 Control Systems

There are two nonprogrammable heating/cooling thermostats each controlling about half the building. The existing temperature setpoints are 70°F for heating and 74°F for cooling.

3.6 Domestic Hot Water Systems

The domestic hot water is produced by two electric A.O. Smith ELJC 6 917 hot water heaters each of 6 gallon capacity and rated at 1500 watts. The heaters are located in the ceiling spaces above the restrooms.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Night Setback

The building has two nonprogrammable thermostats controlling heating and cooling for about half of the building each. The thermostats have no ability to set back temperatures for nights and weekends. Significant energy is, therefore, wasted maintaining the building at the occupied temperature setpoint during unoccupied periods. When implementing this EMS strategy, the energy required for heating or cooling during unoccupied hours is reduced by lowering the heating space temperature setpoint or raising the cooling space temperature setpoint. The existing and proposed unoccupied temperature setpoints are as follows: 70°F heating and 74°F cooling existing; 60°F heating and 80°F cooling proposed.

In order to project savings for this measure, a base case block load building model was created to approximate the existing energy load for the building. The block load models the maximum overall heating and cooling loads for the space, taking into account various parameters such as roof, wall, and window construction, total envelope surface area, ventilation loads, building occupancy, internal heat generation, and other sources of heat gain and loss. By entering this calculated maximum load into a spreadsheet containing bin temperature data for Newark, NJ, the total accumulated year-round heating and cooling loads were determined. These loads are then reconciled to the average annual energy usage. To determine the proposed energy usage, a similar model was created except the unoccupied temperatures are changed to reflect the proposed night setback condition.

The difference in energy usage between the two models is the savings. Night setback would result in cooling savings of 430 kWh and heating savings of 360 therms. The budgetary cost for the proposed measure includes replacement and preprogramming thermostats.

Programmable thermostats have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 6,450 kWh and 5,400 therms, totaling $9,000.

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

ECM-1 Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
800	0	430	360	600	10.3	NA	1.3	NA

* The ECM is not eligible for New Jersey's Smart Start Incentive of the 2010 Application

This measure is recommended.

4.2 ECM-2 Install Door Seals

The front entry doors have large gaps on the bottom that is a source of air infiltration. Installing new door seals will reduce infiltration and save energy.

The measure determined the perimeter length and gap spacing of the doors. Infiltration reductions and the associated energy savings were then calculated by using weather bin heating and cooling hour data.

This measure was evaluated and the savings were less than $100; therefore, it is not recommended as part of the study. However, it is a low cost measure with an attractive payback, and implementation may be desired for occupant comfort. See Appendix C for calculations.

Door seals have an expected life of 10 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 200 kWh and 300 therms, totaling $400.

4.3 ECM-3 Replace Domestic Hot Water Heaters

Domestic hot water for the building is supplied by a two electric heaters. The electric units have high thermal efficiencies; however, electricity is a more expensive energy source than natural gas. This ECM evaluates replacement of existing electric hot water heaters with tankless gas fired hot water heaters.

The building does not have significant hot water usage, therefore, small tankless instantaneous unit rated for low flows would satisfy typical needs. A tankless heater eliminates energy standby losses that occur during periods when there is no demand for hot water.

To calculate the savings for this measure, average monthly energy consumption by the hot water heater was estimated. Applying the existing hot water heaters' efficiency to the energy consumed yielded the building's annual hot water demand. The annual use of electricity for producing hot water was then converted to thermal energy and the efficiency of the gas fired heater was applied. The operating costs for the existing electric unit and proposed gas fired unit were compared. Proposed efficiency was based on the Noritz instantaneous hot water heater capable of producing a maximum of 4.5 gpm of hot water. A more detailed hot water demand analysis may be necessary to verify proper sizing.

By applying this measure, a more expensive energy source will be replaced with one less expensive energy source. The implementation will require installation of tankless unit with associated gas, water piping and exhaust vent.

Instantaneous hot water heaters have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 35,460 kWh and (1,080) therms, totaling $10,800.

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

ECM-3 Replace Domestic Hot Water Heaters

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,700	3.0	1,970	(60)	600	0.9	100	9.5	9.3

* Incentive shown is per the New Jersey's Smart Start Gas Water Heating Application.

This measure is recommended.

4.4 ECM-4 Lighting Replacements

The Town Hall Annex building contains approximately 40 fluorescent fixtures with inefficient T-12 lamps. Each fixture is equipped with either four - 4' bulbs, or two - 2' u-tube bulbs. There are also about (10) 8' fluorescent fixtures that utilize two energy saver lightbulbs per fixture. There are two inefficient incandescent bulbs in the front vestibule that are not used, and two locations where compact fluorescents have been installed in place of incandescent bulbs. Overall energy consumption can be reduced by retrofitting the existing 2' and 4' T-12 fixtures with more efficient T-8 fluorescent lamps.

To compute the annual savings for this ECM, the energy consumption of the lighting fixtures was established, and it was determined to be 13,830 kWh per year. To calculate the annual energy consumption utilizing T-8 lamps, the proposed fixture power requirement was used with the same annual hours of operation. The difference between the existing and proposed annual energy consumption was the energy savings. Calculations are provided in Appendix E.

Existing lamps and ballasts of each fixture would be replaced with electronic ballasts T-8 fluorescent lamps, the length and quantity varies based on application. This ECM will provide annual savings of 3,790 kWh.

The lighting retrofits have an expected life of 15 years, according to the manufacturers, and total energy savings over the life of the project are estimated at 56,850 kWh and $10,500.

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

ECM-4 Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,100	1.9	3,790	0	700	1.1	700	7.3	6.3

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

This measure is not recommended in lieu of ECM-6.

4.5 ECM-5 Install Occupancy Sensors

Lighting fixtures throughout the building are manually switched on and off, and are operational with occupancy. The operating time of many of the building's interior lighting fixtures can be reduced by installing occupancy sensors. Occupancy sensors were not considered for many areas because of safety concerns or low use.

Applying the same process used in the calculation of ECM-4, the existing baseline energy consumption for each fixture was determined. Typical traffic patterns for each space were then 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 2100 kWh.

Approximately five occupancy sensors and some standard electrical work are required for this measure.

Lighting controls have an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 31,500 kWh, and $4,500.

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

ECM-5 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
800	0.0	2,100	0	300	4.6	300	2.7	1.7

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

This measure is not recommended in lieu of ECM-6.

4.6 ECM-6 Lighting Replacements with Occupancy Sensors

This measure is a combination of ECMs 4 and 5 to allow for maximum energy and demand reduction. Due to interactive effects, the energy and cost savings for occupancy sensors and lighting upgrades are not cumulative.

The lighting retrofits and controls have an expected lifetime of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 77,400 kWh, and $13,500.

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

ECM-6 Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,900	1.9	5,160	0	900	1.3	1,000	6.6	5.4

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

This measure is recommended.

5.0 PROJECT INCENTIVES

5.1 Incentives Overview

5.1.1 New Jersey Pay For Performance and Smart Start Programs

The building will be eligible for incentives from the New Jersey Office of Clean Energy. The most significant incentives will be from the New Jersey Pay for Performance (P4P) Program. The P4P program is designed for qualified energy conservation projects in facilities whose demand in any of the preceding 12 months exceeds 200 kW. Facilities that meet this criterion must also achieve a minimum performance target of 15% by using the EPA Portfolio Manager benchmarking tool before and after construction. Incentives for this program are in three parts. Incentive #1 energy reduction plan pays $0.05 per square foot to a maximum of $25,000 or 50% of facility annual energy cost paid after approval of application. Incentive #2 is paid after installation of recommended measures; base incentives deliver $0.11/kWh and $1.10/therm not to exceed 30% of total project cost. Incentive #3 post-construction benchmarking is paid after acceptance of a report proving energy savings over one year utilizing the EPA Portfolio Manager benchmarking tool. Incentive #3 base incentives deliver $0.07/ kWh and $0.70/therm not to exceed 20% of total project cost. Combining incentives #2 and #3 will provide a total of $0.18/ kWh and $1.8/therm not to exceed 50% of total project cost. Additional incentives for #2 and #3 are increased by $0.005/kWh and $0.05/therm for each percentage increase above minimum performance target calculated with the EPA Portfolio Manager benchmarking tool not to exceed 50% of total project cost.

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

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

5.1.2 PSE&G Small Business Direct Install Program

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

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

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

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

Eligible energy efficiency equipment upgrades include:

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

5.2 Building Incentives

The annex building is eligible for several incentives available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about $1,100 towards a new gas-fired water heater and upgrades to the lighting system.

When calculating the total incentive for the New Jersey Pay For Performance program, all energy conservation measures are applicable since the amount received is based on building-wide energy improvements. The overall energy reduction for the building does not reach the 15% minimum; therefore, the building is not eligible for Incentives #2 and #3 as previously discussed. See Appendix H for calculations.

Under PSE&G's direct install program, the annex is potentially eligible to receive $12,600, and would be required to repay $2,500. Incentives cannot be accepted under multiple programs.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

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

The building uses packaged rooftop units with gas-fired heat and DX cooling to meet the HVAC 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 annex 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 I.

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

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission producers and is set each year on a declining scale of 3% per year. One SREC credit is equivalent to 1000 kilowatt hours of PV electrical production; these credits can be traded for period of 15 years from the date of installation. The cost of the ACP penalty for 2009 is $700; this is the amount that must be paid per SERC by the high emission producers. The expected dollar amount that will be paid to the PV producer for 2009 is expected to be $600/SREC credit. Payments that will be received from the PV producer will change from year to year dependent upon supply and demand. Renewable Energy Consultants is a third party SREC broker that has been approved by the New Jersey Clean Energy Program. As stated above there is no definitive way to calculate an exact price that will be received by the PV producer per SREC over the next 15 years. Renewable Energy Consultants estimated an average of $487/ SERC per year and this number was utilized in the cash flow for this report.

The building had a maximum electricity demand of 20.0 kW and a minimum of 12.6 kW, from January 2008 through December 2008. The monthly average over the observed 12 month period was 16.0 kW. The existing load does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array; therefore, a 15 kW system size was selected for the calculations. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Agency) estimates of total cost of system installation. It should be noted that the cost of installation is currently $10 per watt or $10,000 per kW of installed system. This has increased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

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

Photovoltaic (PV) Rooftop Solar Power Generation – 15 kW System

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive*	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		Natural Gas	Total					
$	kW	kWh	Therms	$	$	$	$	Years	Years
150,000	0	17,750	0	2,800	2,800	15,000	8,600	>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 electric water heaters and, therefore, this measure would offer savings in site electricity.

Currently, an incentive is not available for installation of thermal solar systems. A Federal tax credit of 30% of installation cost for the thermal applications is available; however, the Township of Kearny does not pay Federal taxes and, therefore, would not benefit from this program.

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

Solar Thermal Domestic Hot Water Plant

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
27,100	0	1,750	0	300	300	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 annex building, 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 K.

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 annex has sufficient need for electrical generation and the ability to use most of the thermal byproduct during the winter, thermal usage during the summer months is low. Thermal energy produced by the CHP plant in the warmer months will be wasted. An absorption chiller could be installed to utilize the heat to produce chilled water; however, there is no chilled water distribution system in the building. The most viable selection for a CHP plant at this location would be a reciprocating engine natural gas-fired unit. Purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

This measure is not recommended.

6.5 Biomass Power Generation

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

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

- Wood wastes not adulterated with chemicals, glues or adhesives
- Agricultural residues (corn stover, rice hulls or nut shells, manures, poultry litter, horse manure, etc) and/or methane gases from landfills
- Food wastes
- Municipal tree trimming and grass clipping wastes
- Paper and cardboard wastes
- Non adulterated construction wood wastes, pallets

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

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

* from NJOCE Website

This measure is not recommended because of noise issues, potential zoning issues, and because the annex does not have a steady waste stream to fuel the power generation system. Additionally, purchasing this system and performing modifications to the existing HVAC and electrical systems would greatly outweigh the savings over the life of the equipment.

6.6 Demand Response Curtailment

Presently, electricity is delivered by PSE&G, which receives the electricity from regional power grid RFC. PSE&G is the regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia including the State of New Jersey.

Utility Curtailment is an agreement with the PSE&G regional transmission organization and an approved Curtailment Service Provider (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a facility utilizing an emergency generator; therefore, reducing the electrical demand on the utility grid. This program is to benefit the utility company during high demand periods and PSE&G offers incentives to the CSP to participate in this program. Enrolling in the program will require program participants to drop electrical load or turn on emergency generators during high electrical demand conditions or during emergencies. Part of the program also will require that program participants reduce their required load or run emergency generators with notice to test the system.

A PSE&G pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. The annex building had a monthly average electricity demand of 29.1 kW and a maximum demand of 41.7 kW from July 2008 through June 2009.

This measure is not recommended because the facility does not have adequate load to meet the required minimum load reduction.

7.0 EPA PORTFOLIO MANAGER

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

The annex building is considered a high energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 103 kBTU/ft^2/year. Several factors contribute to the unfavorable EUI, including, wasted energy from unnecessary heating and cooling during unoccupied hours, use of electric DHW heaters, inefficient lighting operation, etc. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 88 kBTU/ft^2/year. The EPA Portfolio Manager did not generate an energy rating score for this building because the building is less than 5,000 square feet, and therefore not eligible for an energy star rating.

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

The user name and password for the annex building'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 the Town Hall Annex, in Kearny, New Jersey identified potential ECMs for lighting upgrades with occupancy sensors, domestic hot water heater, and night setback. Potential annual savings of $2,100 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-1 Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
800	0	430	360	600	10.3	NA	1.3	NA

* The ECM is not eligible for New Jersey's Smart Start Incentive of the 2010 Application

ECM-3 Replace Domestic Hot Water Heaters

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,700	3.0	1,970	(60)	600	0.9	100	9.5	9.3

* Incentive shown is per the New Jersey's Smart Start Gas Water Heating Application.

ECM-6 Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
5,900	1.9	5,160	0	900	1.3	1,000	6.6	5.4

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

APPENDIX A

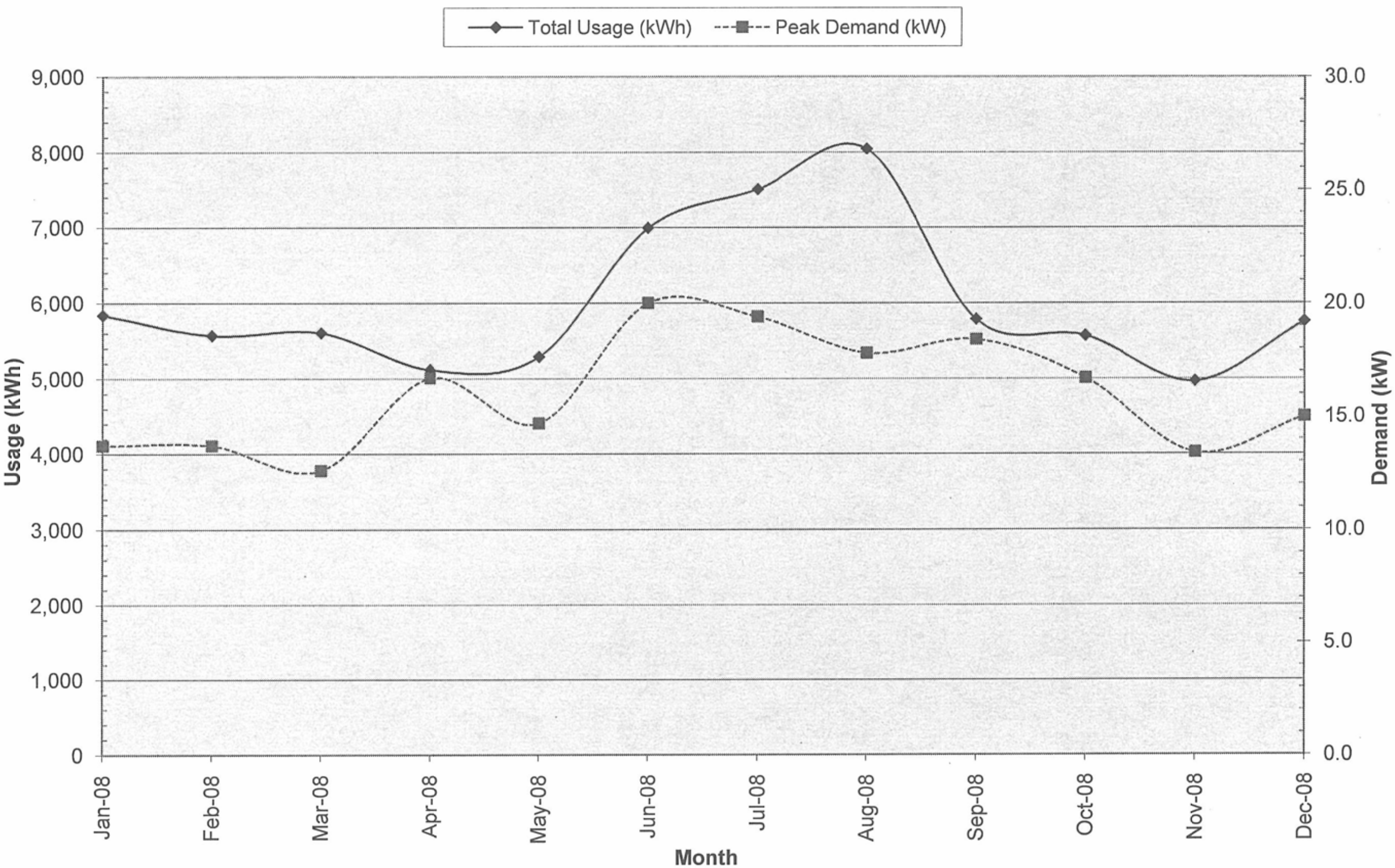
Utility Usage Analysis

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

Town Hall Annex - 410 Kearny Ave.
Account No.: 11 878 163 02
Meter No.: 266001613

			Charges			Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
January-08	5,841	13.7	$731.91	$97.08	$634.83	0.1253	0.1087	7.09
February-08	5,571	13.7	$722.34	$97.17	$625.17	0.1297	0.1122	7.09
March-08	5,607	12.6	$706.10	$92.89	$613.21	0.1259	0.1094	7.37
April-08	5,121	16.7	$659.70	$108.85	$550.85	0.1288	0.1076	6.52
May-08	5,292	14.7	$678.31	$101.06	$577.25	0.1282	0.1091	6.87
June-08	6,993	**20.0**	$1,310.41	$325.43	$984.98	0.1874	0.1409	16.27
July-08	7,506	19.4	$1,401.63	$320.73	$1,080.90	0.1867	0.1440	16.53
August-08	8,046	17.8	$1,508.08	$302.93	$1,205.15	0.1874	0.1498	17.02
September-08	5,787	18.4	$1,140.13	$309.61	$830.52	0.1970	0.1435	16.83
October-08	5,571	16.7	$818.91	$170.77	$648.14	0.1470	0.1163	10.23
November-08	4,968	13.4	$722.28	$157.95	$564.33	0.1454	0.1136	11.79
December-08	5,760	15.0	$809.52	$164.18	$645.34	0.1405	0.1120	10.95
Most Recent Yr	72,063	20.0	$11,209.32	$2,248.65	$8,960.67	0.1555	0.1243	11.71

Electric Usage - Town of Kearny Town Hall Annex Building



Utility Data - Kearny TownHallAnnex(rev-0).xls
Electricity Chart

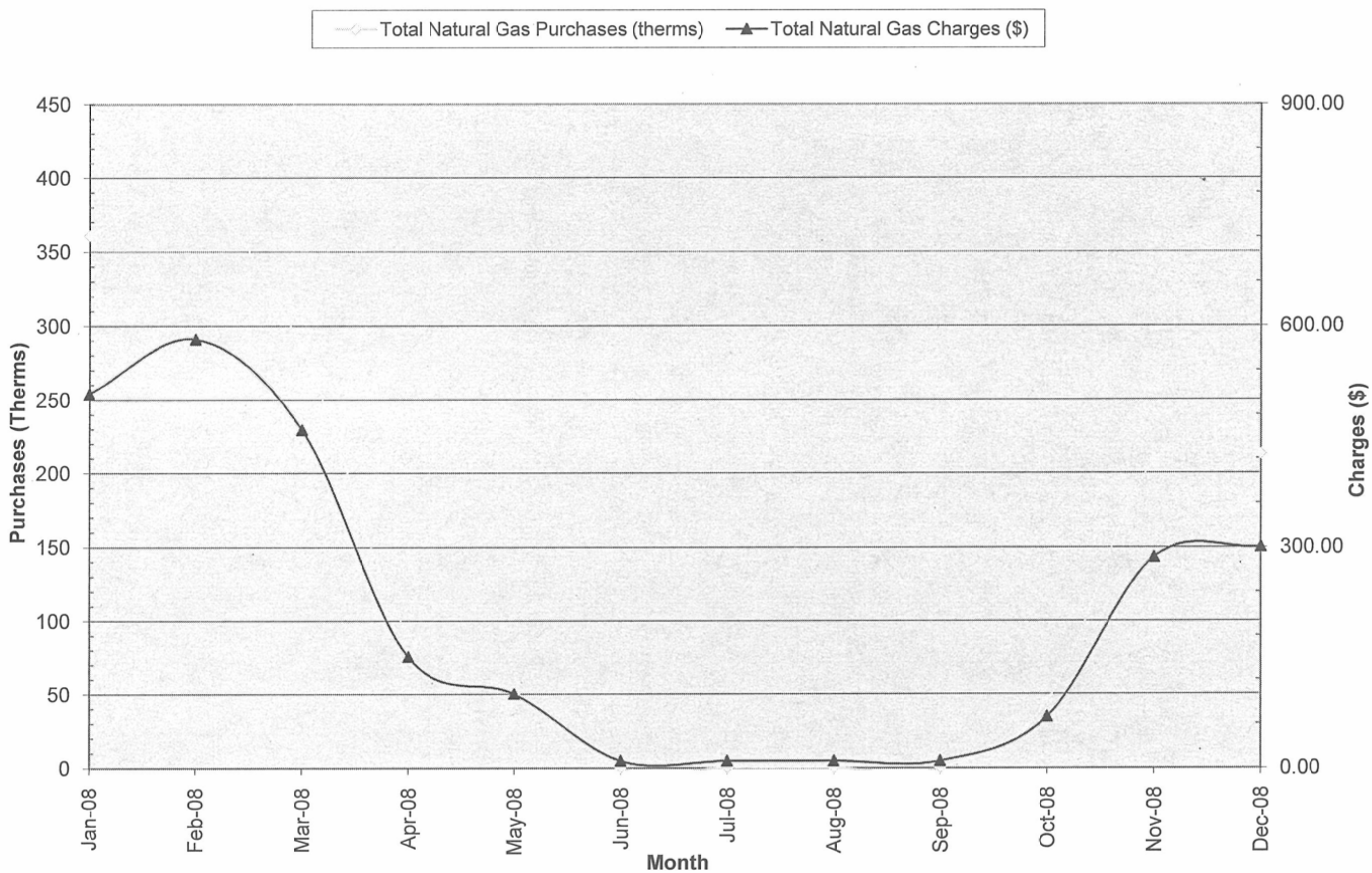
New Jersey BPU Energy Audit Program
CHA Project No.: 20711
Town of Kearny
PSE&G - Natural Gas Service

Town Hall Annex - 410 Kearny Ave.
Account No.: **11 878 163 02**
Meter No.: **2645982**

Month	Therms	Charges ($)	($/Therm)
January-08	361	508.23	1.408
February-08	389	581.81	1.496
March-08	284	459.02	1.617
April-08	91	151.05	1.664
May-08	52	100.45	1.927
June-08	0	9.93	-
July-08	0	9.93	-
August-08	0	9.93	-
September-08	0	9.93	-
October-08	45	69.31	1.542
November-08	208	286.65	1.377
December-08	213	300.64	1.411

Most Recent Yr	1,643	2,497	1.520

Natural Gas Usage - Town of Kearny Town Hall Annex Building



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

GAS MARKETERS LIST

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

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

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

RPL Holdings, Inc
601 Carlson Pkwy
Minnetonka, MN 55305

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX B

ECM-1 Night Setback

Kearny NJ
CHA #20711
Building: Annex

ECM-1 Night Setback

Building Footprint	2,700 SF	Ex Occupied Clng Temp.	74 °F	Ex Occupied Htg Temp.	70 °F
Heating Efficiency	78%	Ex Unoccupied Clng Temp.	74 °F	Ex Unoccupied Htg Temp.	70 °F
Cooling Efficiency	0.9 kW/ton	Prop Occupied Clng Temp.	74 °F	Prop Occupied Htg Temp.	70 °F
Building Balance Temp.	60 °F	Prop Unoccupied Clng Temp.	80 °F	Prop Unoccupied Htg Temp.	60 °F
Internal Gains	15,264 btu/h	Occupied Cooling UA	-987 btu/hr/°F	Occupied Heating UA	406 btu/hr/°F
Unoc Internal Gain factor	0.03	Unoccupied Cooling UA	-873 btu/hr/°F	Unoccupied Heating UA	406 btu/hr/°F
Ave Occ Internal Gain Factor	0.7	Cooling Occ Enthalpy Setpoint	27.5 Btu/lb		
		Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb		

Heating Energy Savings 363 therms
Cooling Energy Savings 430 kWh

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

					EXISTING LOADS						PROPOSED LOADS										
					Occupied			Unoccupied			Occupied			Unoccupied							
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-28,126	-108,845	-10,685	-24,887	-26,832	-458	-28,126	-108,845	-10,685	-19,648	-26,832	-458	0	0	0	0
97.5	42.5	3	1	2	-23,192	-75,587	-10,685	-20,521	-18,633	-458	-23,192	-75,587	-10,685	-15,282	-18,633	-458	14	13	0	0
92.5	39.5	34	10	24	-18,257	-60,469	-10,685	-16,155	-14,907	-458	-18,257	-60,469	-10,685	-10,915	-14,907	-458	124	115	0	0
87.5	36.6	131	39	92	-13,323	-45,856	-10,685	-11,789	-11,304	-458	-13,323	-45,856	-10,685	-6,549	-11,304	-458	367	331	0	0
82.5	34	500	149	351	-8,388	-32,754	-10,685	-7,422	-8,074	-458	-8,388	-32,754	-10,685	-2,183	-8,074	-458	999	861	0	0
77.5	31.6	620	185	435	-3,454	-20,660	-10,685	-3,056	-5,093	-458	-3,454	-20,660	-10,685	0	0	-458	763	497	0	0
72.5	29.2	664	198	466	0	0	-10,685	0	0	-458	0	0	-10,685	0	0	-458	174	174	0	0
67.5	27	854	254	600	1,016	3,023	-10,685	1,016	745	-458	1,016	3,023	-10,685	0	0	-458	127	147	0	0
62.5	24.5	927	276	651	3,048	9,070	-10,685	3,048	2,236	-458	3,048	9,070	-10,685	0	0	-458	0	0	45	1
57.5	21.4	600	179	421	5,081	15,117	-10,685	5,081	3,727	-458	5,081	15,117	-10,685	1,016	745	-458	0	0	67	29
52.5	18.7	610	182	428	7,113	21,164	-10,685	7,113	5,217	-458	7,113	21,164	-10,685	3,048	2,236	-458	0	0	106	67
47.5	16.2	611	182	429	9,145	27,211	-10,685	9,145	6,708	-458	9,145	27,211	-10,685	5,081	3,727	-458	0	0	145	106
42.5	14.4	656	195	461	11,177	33,258	-10,685	11,177	8,199	-458	11,177	33,258	-10,685	7,113	5,217	-458	0	0	196	155
37.5	12.6	1,023	304	719	13,209	39,305	-10,685	13,209	9,689	-458	13,209	39,305	-10,685	9,145	6,708	-458	0	0	370	305
32.5	10.7	734	218	516	15,242	45,352	-10,685	15,242	11,180	-458	15,242	45,352	-10,685	11,177	8,199	-458	0	0	311	265
27.5	8.6	334	99	235	17,274	51,399	-10,685	17,274	12,671	-458	17,274	51,399	-10,685	13,209	9,689	-458	0	0	163	141
22.5	6.8	252	75	177	19,306	57,446	-10,685	19,306	14,161	-458	19,306	57,446	-10,685	15,242	11,180	-458	0	0	138	122
17.5	5.5	125	37	88	21,338	63,493	-10,685	21,338	15,652	-458	21,338	63,493	-10,685	17,274	12,671	-458	0	0	76	69
12.5	4.1	47	14	33	23,370	69,540	-10,685	23,370	17,143	-458	23,370	69,540	-10,685	19,306	14,161	-458	0	0	32	29
7.5	2.6	22	7	15	25,403	75,587	-10,685	25,403	18,633	-458	25,403	75,587	-10,685	21,338	15,652	-458	0	0	16	15
2.5	1	13	4	9	27,435	81,633	-10,685	27,435	20,124	-458	27,435	81,633	-10,685	23,370	17,143	-458	0	0	10	10
-2.5	0	0	0	0	29,467	87,680	-10,685	29,467	21,615	-458	29,467	87,680	-10,685	25,403	18,633	-458	0	0	0	0
-7.5	-1.5	0	0	0	31,499	93,727	-10,685	31,499	23,105	-458	31,499	93,727	-10,685	27,435	20,124	-458	0	0	0	0
TOTALS		8,760	2,607	6,153													2,567	2,137	1,676	1,313

Existing Building Ventilation & Infiltration (occ)	1,120 cfm
Overheat Ventilation Factor	1.00
Additional ventilation to offset overheat	0 cfm
Existing Building Ventilation & Infiltration (unocc)	276 cfm

Kearny NJ
CHA #20711
Building: Annex

Reconcile Thermal Model

Building Footprint	2,700 SF	Ex Occupied Clng Temp.	74 °F	Ex Occupied Htg Temp.	70 °F
Heating Efficiency	78%	Ex Unoccupied Clng Temp.	74 °F	Ex Unoccupied Htg Temp.	70 °F
Cooling Efficiency	0.90 kW/ton	Occupied Cooling UA	(987) btu/hr/°F	Occupied Heating UA	406 btu/hr/°F
Internal Gains	15,264 btu/h	Unoccupied Cooling UA	(873) btu/hr/°F	Unoccupied Heating UA	406 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)	Yes				

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

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-28,126	-108,845	-10,685	-24,887	-26,832	-458	0	0	0	0
97.5	42.5	3	1	2	-23,192	-75,587	-10,685	-20,521	-18,633	-458	0	14	14	0
92.5	39.5	34	10	24	-18,257	-60,469	-10,685	-16,155	-14,907	-458	0	124	124	0
87.5	36.6	131	39	92	-13,323	-45,856	-10,685	-11,789	-11,304	-458	0	367	367	0
82.5	34.0	500	149	351	-8,388	-32,754	-10,685	-7,422	-8,074	-458	0	999	999	0
77.5	31.6	620	185	435	-3,454	-20,660	-10,685	-3,056	-5,093	-458	0	763	763	0
72.5	29.2	664	198	466	0	0	-10,685	0	0	-458	0	174	174	0
67.5	27.0	854	254	600	1,016	3,023	-10,685	1,016	745	-458	36	127	90	0
62.5	24.5	927	276	651	3,048	9,070	-10,685	3,048	2,236	-458	0	0	0	45
57.5	21.4	600	179	421	5,081	15,117	-10,685	5,081	3,727	-458	0	0	0	67
52.5	18.7	610	182	428	7,113	21,164	-10,685	7,113	5,217	-458	0	0	0	106
47.5	16.2	611	182	429	9,145	27,211	-10,685	9,145	6,708	-458	0	0	0	145
42.5	14.4	656	195	461	11,177	33,258	-10,685	11,177	8,199	-458	0	0	0	196
37.5	12.6	1,023	304	719	13,209	39,305	-10,685	13,209	9,689	-458	0	0	0	370
32.5	10.7	734	218	516	15,242	45,352	-10,685	15,242	11,180	-458	0	0	0	311
27.5	8.6	334	99	235	17,274	51,399	-10,685	17,274	12,671	-458	0	0	0	163
22.5	6.8	252	75	177	19,306	57,446	-10,685	19,306	14,161	-458	0	0	0	138
17.5	5.5	125	37	88	21,338	63,493	-10,685	21,338	15,652	-458	0	0	0	76
12.5	4.1	47	14	33	23,370	69,540	-10,685	23,370	17,143	-458	0	0	0	32
7.5	2.6	22	7	15	25,403	75,587	-10,685	25,403	18,633	-458	0	0	0	16
2.5	1.0	13	4	9	27,435	81,633	-10,685	27,435	20,124	-458	0	0	0	10
-2.5	0.0	0	0	0	29,467	87,680	-10,685	29,467	21,615	-458	0	0	0	0
-7.5	-1.5	0	0	0	31,499	93,727	-10,685	31,499	23,105	-458	0	0	0	0
TOTALS		8,760	2,607	6,153								2,567	2,531	1,676

Existing Building Ventilation & Infiltration (occ)	**1,120 cfm**
Overheat Ventilation Factor	**1.00**
Additional ventilation to offset overheat	**0 cfm**
Existing Building Ventilation & Infiltration (unocc)	**276 cfm**
Economizer Ventilation (from AHU's)	**844 cfm**

Energy Use Indices (calculated)

	Base Case
Heating	1,676
Target ->	1,643
	102.0%

	Base Case
Cooling	2,531
Target ->	300
	843.7%

HEAT GAIN/LOSS WORKSHEET

Project Name:	Kearny NJ	**Project No.:**	CHA #20711		
Location		**Site Elevation:**	460 Feet	**Specific Volume**	14.00 CF/#
Building Name	Annex	**Date:**			
Engineer:	ND				

Building/Facility Designation

Outdoor Winter Design DB Temperature	14 *F	**Indoor Winter Design DB Temperature**	70 *F
Outdoor Summer Design DB Temperature	91 *F	**Indoor Summer Design DB Temperature**	74 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 ##	**Indoor Air (70*F) Humidity Ratio**	0.0079 ##

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

Select	Description	R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
x	Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
	4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
	Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
	4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
	4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
	Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
	Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
	Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
	4" Block, 1" insulation, 8" Block	19.9	16

Roofs (Select One)

Select	Description	R Value	Roof Type
	Tectum Deck, 3.3" Insul., BU Roof	13.0	1
	Steel Deck, 5" Insul., BU Roof	18.2	1
	Attic Roof with 6" Insul.	25.0	4
	4" HW Concrete Deck, BU Roof	2.7	2
	Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
x	Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
	Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
	Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
	Wood Deck, 6" insulation, Felt & Membrane	18.0	
	Other		

Windows (Select One)

Select	Description	U Value
	Aluminum Frame, 1/8" SP Glazing	1.05
x	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
	Other	

	No Storm
Flat Glass	1.05
Flat Glass (e=.6)	1.00
Flat Glass (e=0.4)	0.90
Flat Glass (e=0.2)	0.77
Double Glaze (3/16 in air)	0.63
Double Glaze (1/4 in air)	0.60
Double Glaze (1/2 in air)	0.53
Double Glaze (e=.6)	0.50
Double Glaze (e=0.4)	0.42
Double Glaze (e=0.2)	0.35
Triple Glaze (1/4 in air)	0.42
Triple Glaze (1/2 in air)	0.35

BUILDING CHARACTERISTICS

Roof Area 2,700 SF
Occupied Area 2,700 SF
Return Plenum? n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	50 Ft	12.0 Ft	10.0 Ft	0 SF	0 SF	600 SF
East Exposure	54 Ft	12.0 Ft	10.0 Ft	8 SF	49 SF	591 SF
South Exposure	50 Ft	12.0 Ft	10.0 Ft	0 SF	0 SF	600 SF
West Exposure	54 Ft	12.0 Ft	10.0 Ft	30 SF	25 SF	594 SF

Forced Ventilation 844 cfm

HEAT GAIN/LOSS WORKSHEET

Project Name:	Kearny NJ	**Project No.:**	CHA #20711		
Location		**Site Elevation:**	460 Feet	**Specific Volume**	14.00 CF/#
Building Name	Annex	**Date:**			
Engineer:	ND				

Building/Facility Designation

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain	
North Exposure	0	38 btu/h/sf	0.8	0.75	Glass Type C	0 Btu/hr	
East Exposure	8	216 btu/h/sf	0.8	0.31	Glass Type C	429 Btu/hr	
South Exposure	0	109 btu/h/sf	0.8	0.58	Glass Type C	0 Btu/hr	
West Exposure	30	216 btu/h/sf	0.8	0.29	Glass Type C	1,503 Btu/hr	
							1,932 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain	
North Exposure	500	0.06	20 °F	1.0	550 Btu/hr	
East Exposure	483	0.06	39 °F	1.0	1,036 Btu/hr	
South Exposure	500	0.06	27 °F	1.0	743 Btu/hr	
West Exposure	486	0.06	22 °F	1.0	587 Btu/hr	
Roof	2,700	0.05	73 °F	1.0	10,643 Btu/hr	
Fenestration	38	0.60	17 °F		388 Btu/hr	
Doors	74	0.14	27 °F		277 Btu/hr	
Ceiling	2,700	0.14	0 °F		0 Btu/hr	
Partition		0.05	0 °F		0 Btu/hr	
Floor	2,700	0.04	0 °F		0 Btu/hr	
						14,224 Btu/h

INTERNAL HEAT GAINS

						Room Heat Gain	
Lights	0.80 w/sf x	2,700 Occ Area =		2.2 kW x 3.4x	1.0 RAF =	7,372 Btu/h	
Plug Load	0.25 w/sf x	2,700 Occ Area =		0.7 kW x 3.4x	1.0 RAF =	2,304 Btu/h	
People	8 people x	255 btu/person x	33% time in space =			673 Btu/h	
Computer Work Stations		12 Units x	120 W/Unit x	3414 =		4,915 Btu/h	
Equipment		kW x 3.413 =				0 Btu/h	
Misc.						0 Btu/h	
							15,264 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain	
Walls	1,969 SF	0.10 CFM/SF		1.04	17 °F	3,772 Btu/h	
Doors	74 SF	0.40 CFM/LF	0.86 LF/SF	1.04	17 °F	483 Btu/h	
Windows	38 SF	0.20 CFM/LF	1.63 LF/SF	1.04	17 °F	238 Btu/h	
Ventilation	844 cfm			1.04	17 °F	16,170 Btu/h	
							20,663 Btu/h

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE

4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain	
North Exposure	100	0.06	20	1.0	110 Btu/hr	
East Exposure	108	0.06	39	1.0	232 Btu/hr	
South Exposure	100	0.06	27	1.0	149 Btu/hr	
West Exposure	108	0.06	22	1.0	131 Btu/hr	
Roof	2,700	0.05	73	0.0	0 Btu/hr	
						621 Btu/h

INTERNAL HEAT GAINS

Lights	0.80 w/sf x	2,700 Occ Area =	2.2 kW x3413x	0.00 RAF =	0 Btu/h	
Misc.					0 Btu/h	
						0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT		SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Solar	1,932	Internal Gains to Room	15,264
Conduction to Room	14,224	Internal Gains to Plenum	0
Conduction to Plenum	621		
Ventilaton and Infiltration	20,663		
Sub Total	37,440	Sub Total	15,264

HEAT GAIN/LOSS WORKSHEET

Project Name:	Kearny NJ	**Project No.:**	CHA #20711		
Location		**Site Elevation:**	460 Feet	**Specific Volume**	14.00 CF/#
Building Name	Annex	**Date:**			
Engineer:	ND				

Building/Facility Designation

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	3,116 SF	0.10 CFM/SF	4,629	0.0042 #/#	6,119 Btu/h
Doors	74 SF	0.40 CFM/LF	4,629	0.0042 #/#	495 Btu/h
Windows	38 SF	0.20 CFM/LF	4,629	0.0042 #/#	244 Btu/h
Ventilation	844 cfm		4,629	0.0042 #/#	16,570 Btu/h
People	8 people	0.33 time in space		250 Btu/hr/person	660 Btu/h

24,088 Btu/h

Cooling Load Summary

	Sensible	Latent	Total
Temperature Dependent Gains	37,440	24,088	61,527
Temperature Indep. Gains	15,264		15,264
Total	52,704	24,088	76,791

SHR= 0.69

Building Cooling Load 6.4 Tons at 422 SF/Ton

Building Air Flow to Condition Space based on a 12*F Temp Rise is **4,158 CFM** **1.54 CFM/sf**

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	600	0.06	56	1,848 Btu/h
East Exposure	591	0.06	56	1,820 Btu/h
South Exposure	600	0.06	56	1,848 Btu/h
West Exposure	594	0.06	56	1,828 Btu/h
Fenestration	38	0.60	56	1,277 Btu/h
Roof	2,700	0.05	56	8,165 Btu/h
Doors	74	0.14	56	575 Btu/h
Ceiling	2,700	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	2,700	0.04	50	5,400 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	2,385 SF	0.10 CFM/SF	1.04	56	238 cfm	13,938 Btu/h
Doors	74 SF	0.40 CFM/LF	1.04	56	25 cfm	1,473 Btu/h
Windows	38 SF	0.20 CFM/LF	1.04	56	12 cfm	725 Btu/h
Ventilation Load	844 cfm		1.04	56	844 cfm	53,265 Btu/h
Total Ventilation & Infiltration Load					1,120 cfm	69,401 Btu/h

Building Heating Load 92,162 btu/h

34.1 btu/sf

Kearny NJ
CHA #20711
Building: Annex

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
East	3.5	7.0	2	49.0	42.0
				0.0	0.0
				0.0	0.0
			Sub-total	49.0	42.0
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
West	3.5	7.0	1	24.5	21.0
				0.0	0.0
			Sub-total	24.5	21.0
			Total	**73.5**	**63.0**

LF/SF
0.86

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	50.0	12.0	1	600.0	124.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	50.0			600.0	124.0

All wall quantities must remain equal to 1

Ave. height 12.0 — Average height wall automatically linked to

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
East	54.0	12.0	1	648.0	132.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	54.0			648.0	132.0

Ave. height 12.0 — Average height wall automatically linked to

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
South	50.0	12.0	1	600.0	124.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	50.0			600.0	124.0

Ave. height 12.0 — Average height wall automatically linked to

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
West	54.0	12.0	1	648.0	132.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
	54.0			648.0	132.0

Ave. height 12.0 — Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
East	2.0	4.0	1	8.0	12.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	8.0	12.0
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
West	2.0	3.0	5	30.0	50.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	30.0	50.0
			Total	**38.0**	**62.0**

LF/SF 1.63

Kearny NJ
CHA #20711
Building: Annex

ECM-1 Night Setback

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.		
						$ -	$ -	$ -	$ -	
Programmable thermostat	2	ea	$ 100	$ 150	$ -	$ 196	$ 363	$ -	$ 559	
re-program t-stats	2	ea	$ -	$ 50	$ -	$ -	$ 121	$ -	$ 121	per temperature program
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 680	Subtotal
$ 68	10% Contingency
$ 75	Contractor 10% O&P
$ -	0% Engineering
$ 823	**Total**

APPENDIX C

ECM-2 Install Door Seals

Kearny NJ
CHA #20711
Building: Annex

ECM-2 Install Door Seals

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

Building Footprint	2,700 SF	Ex Occupied Clng Temp.	74 °F	Ex Occupied Htg Temp.	70 °F		
Heating System Efficiency	78%	Ex Unoccupied Clng Temp.	74 °F	Ex Unoccupied Htg Temp.	70 °F		
Cooling System Efficiency	0.90 kW/ton	Prop Occupied Clng Temp.	74 °F	Prop Occupied Htg Temp.	70 °F		
Internal Gains	15,264 btu/h	Prop Unoccupied Clng Temp.	74 °F	Prop Unoccupied Htg Temp.	70 °F		
Unoc Internal Gain factor	0.03	Occupied Cooling UA	-987 btu/hr/°F	Occupied Heating UA	406 btu/hr/°F		
Ave Occ Internal Gain Factor	0.7	Unoccupied Cooling UA	-873 btu/hr/°F	Unoccupied Heating UA	406 btu/hr/°F		
		Cooling Occ Enthalpy Setpoint	27.5 Btu/lb				
		Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb				

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy lbs	Proposed Heating Energy lbs
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-28,126	-108,845	-10,685	-24,887	-26,832	-458	-28,126	-107,865	-10,685	-24,887	-25,852	-458	0	0	0	0
97.5	42.5	6	2	4	-23,192	-75,587	-10,685	-20,521	-18,633	-458	-23,192	-74,906	-10,685	-20,521	-17,953	-458	29	29	0	0
92.5	39.5	45	16	29	-18,257	-60,469	-10,685	-16,155	-14,907	-458	-18,257	-59,925	-10,685	-16,155	-14,362	-458	176	174	0	0
87.5	36.6	146	52	94	-13,323	-45,856	-10,685	-11,789	-11,304	-458	-13,323	-45,443	-10,685	-11,789	-10,891	-458	439	435	0	0
82.5	34.0	298	106	192	-8,388	-32,754	-10,685	-7,422	-8,074	-458	-8,388	-32,459	-10,685	-7,422	-7,780	-458	643	637	0	0
77.5	31.6	476	170	306	-3,454	-20,660	-10,685	-3,056	-5,093	-458	-3,454	-20,474	-10,685	-3,056	-4,907	-458	642	635	0	0
72.5	29.2	662	237	426	0	0	-10,685	0	0	-458	0	0	-10,685	0	0	-458	204	204	0	0
67.5	27.0	740	264	476	1,016	3,023	-10,685	1,016	745	-458	1,016	2,996	-10,685	1,016	718	-458	132	132	0	0
62.5	24.5	765	273	492	3,048	9,070	-10,685	3,048	2,236	-458	3,048	8,989	-10,685	3,048	2,154	-458	0	0	35	35
57.5	21.4	733	262	471	5,081	15,117	-10,685	5,081	3,727	-458	5,081	14,981	-10,685	5,081	3,591	-458	0	0	82	81
52.5	18.7	668	239	430	7,113	21,164	-10,685	7,113	5,217	-458	7,113	20,974	-10,685	7,113	5,027	-458	0	0	119	118
47.5	16.2	659	235	424	9,145	27,211	-10,685	9,145	6,708	-458	9,145	26,966	-10,685	9,145	6,463	-458	0	0	161	159
42.5	14.4	685	245	441	11,177	33,258	-10,685	11,177	8,199	-458	11,177	32,959	-10,685	11,177	7,899	-458	0	0	213	210
37.5	12.6	739	264	475	13,209	39,305	-10,685	13,209	9,689	-458	13,209	38,951	-10,685	13,209	9,336	-458	0	0	278	275
32.5	10.7	717	256	461	15,242	45,352	-10,685	15,242	11,180	-458	15,242	44,944	-10,685	15,242	10,772	-458	0	0	317	314
27.5	8.6	543	194	349	17,274	51,399	-10,685	17,274	12,671	-458	17,274	50,936	-10,685	17,274	12,208	-458	0	0	276	273
22.5	6.8	318	114	205	19,306	57,446	-10,685	19,306	14,161	-458	19,306	56,929	-10,685	19,306	13,644	-458	0	0	183	181
17.5	5.5	245	88	158	21,338	63,493	-10,685	21,338	15,652	-458	21,338	62,921	-10,685	21,338	15,080	-458	0	0	157	155
12.5	4.1	156	56	100	23,370	69,540	-10,685	23,370	17,143	-458	23,370	68,914	-10,685	23,370	16,517	-458	0	0	110	109
7.5	2.6	92	33	59	25,403	75,587	-10,685	25,403	18,633	-458	25,403	74,906	-10,685	25,403	17,953	-458	0	0	71	70
2.5	1.0	36	13	23	27,435	81,633	-10,685	27,435	20,124	-458	27,435	80,899	-10,685	27,435	19,389	-458	0	0	30	30
-2.5	0.0	19	7	12	29,467	87,680	-10,685	29,467	21,615	-458	29,467	86,891	-10,685	29,467	20,825	-458	0	0	17	17
-7.5	-1.5	8	3	5	31,499	93,727	-10,685	31,499	23,105	-458	31,499	92,884	-10,685	31,499	22,262	-458	0	0	8	8
TOTALS		8,760	3,129	5,631													2,265	2,246	2,059	2,034

Existing Building Ventilation & Infiltration	1,120 cfm
Existing Unocc. Building Ventilation & Infiltration	276 cfm
Door infiltration	25 cfm
Proposed reduction (40%)	10 cfm
Proposed Building Ventilation & Infiltration	1,110 cfm
Proposed Unocc. Building Ventilation & Infiltration	266 cfm

Savings	**25 therms**
	19 kWh

Kearny NJ
CHA #20711
Building: Annex

ECM-2 Install Door Seals

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.		
									$ -	
Threshold	1	ea	$ 55	$ 50	$ -	$ 54	$ 61	$ -	$ 114	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 114	Subtotal
$ 23	20% Contingency
$ 14	Contractor 10% O&P
$ -	0% Engineering
$ 151	**Total**

APPENDIX D

ECM-3 Replace Domestic Hot Water Heater

Kearny NJ
CHA #20711
Building: Annex

ECM-3 Replace DHW Heater

Summary

* Replace (2) electric hot water heaters (each 15 gallon) w/ a single tankless instantaneous high efficiency unit

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	**164**	kWh/month	Estimated base on rating and utilization
Electric Demand	**3.0**	kW	(2) units
Total Annual Utility Demand by Water Heater	6,725	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	100%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	6,725	MBTU/yr	
Existing Tank Size	12	Gallons	Per manufacturer nameplate (2) unit each 15 gallon
Hot Water Piping System Capacity	30	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)	0.4	MBH	
Annual Standby Hot Water Load	3,833	MBTU/yr	
New Tank Size	0	Gallons	Based on Noritz instantaneous, condensing DHW Heater
Hot Water Piping System Capacity	30	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)	0.3	MBH	
Annual Standby Hot Water Load	2,738	MBTU/yr	
Total Annual Hot Water Demand	5,630	MBTU/yr	
Proposed Avg. Hot water heater efficiency	91%		Based on Noritz instantaneous, condensing DHW Heater
Proposed Fuel Use	6,187	MBTU/yr	Standby Losses and inefficient DHW heater eliminated
Electricty cost	0.155	$/kWh	
Gas Cost	$1.52	$/Therm	
Existing Operating Cost of DHW	$306	$/yr	
Proposed Operating Cost of DHW	$94	$/yr	

Savings Summary:

Utility	Energy	Cost Savings
Electric (kWh)	1,971	$727
Natural Gas (therms)	(62)	($94)
Cost savings		$633

Kearny NJ
CHA #20711
Building: Annex

ECM-3 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.		
						$ -	$ -	$ -	$ -	
Electric DHW Heater Removal	2	LS		$ 50		$ -	$ 121	$ -	$ 121	
Instantaneous Gas-Fired DHW Heater	1	EA	$ 1,600	$ 280		$ 1,568	$ 339	$ -	$ 1,907	
Miscellaneous Electrical	1	LS	$ 150	$ 360		$ 147	$ 436	$ -	$ 583	
Venting Kit	1	EA	$ 450	$ 300		$ 441	$ 363	$ -	$ 804	
Miscellaneous Piping and Valves	1	LS	$ 250	$ 720		$ 245	$ 871	$ -	$ 1,116	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 4,531	Subtotal
$ 453	10% Contingency
$ 748	15% Contractor O&P
$ -	0% Engineering
$ 5,731	**Total**

APPENDIX E

ECM-4 Lighting Replacements

Energy Audit of Kearny, NJ
CHA Project No. 20711 - Town Hall Annex Building 0 $0.124 $/kWh
ECM-4 Lighting Replacements $11.71 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
Field Code	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
	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
71	FRONT VEST	2	I 60	I60/1	60	0.1	Timer	2080	250	2	I 60	I60/1	60	0.1	Timer	2,080	250	-	-	$ -	$ -	$0		
6	MAIN CENTRAL OFFICE	7	T 34 R F 4 (MAG)	F44EE	144	1.0	SW	2080	2,097	7	T 28 R F 4	F44SSILL	96	0.7	SW	2,080	1,398	699	0.3	$ 134.09	$ 918.75	$140	6.9	5.8
6	MAIN CENTRAL OFFICE	6	T 34 R F 4 (MAG)	F44EE	144	0.9	SW	2080	1,797	6	T 28 R F 4	F44SSILL	96	0.6	SW	2,080	1,198	599	0.3	$ 114.93	$ 787.50	$120	6.9	5.8
X1	MAIN CENTRAL OFFICE	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	39	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	39	-	-	$ -	$ -	$0		
4	MAIN CENTRAL OFFICE	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	150	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	SW	2,080	69	81	0.0	$ 15.56	$ 101.25	$10	6.5	5.9
6	PERSONNELL OFFICE	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2080	1,198	4	T 28 R F 4	F44SSILL	96	0.4	SW	2,080	799	399	0.2	$ 76.62	$ 525.00	$80	6.9	5.8
X1	PERSONNELL OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	13	-	-	$ -	$ -	$0		
6	LEFT FRONT OFFICE	6	T 34 R F 4 (MAG)	F44EE	144	0.9	SW	2080	1,797	6	T 28 R F 4	F44SSILL	96	0.6	SW	2,080	1,198	599	0.3	$ 114.93	$ 787.50	$120	6.9	5.8
X1	LEFT FRONT OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	13	-	-	$ -	$ -	$0		
6	REAR LEFT OFFICE	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	899	3	T 28 R F 4	F44SSILL	96	0.3	SW	2,080	599	300	0.1	$ 57.47	$ 393.75	$60	6.9	5.8
80	CLOSET/ JAN	1	SP 36 R CF 1	CFT36/1	51	0.1	SW	1000	51	1	SP 36 R CF 1	CFT36/1	51	0.1	SW	1,000	51	-	-	$ -	$ -	$0		
4	KITCHEN CUBBY	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	150	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	SW	2,080	69	81	0.0	$ 15.56	$ 101.25	$10	6.5	5.9
4	KITCHEN CUBBY	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	150	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	SW	2,080	69	81	0.0	$ 15.56	$ 101.25	$10	6.5	5.9
4	REAR BR	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	150	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	SW	2,080	69	81	0.0	$ 15.56	$ 101.25	$10	6.5	5.9
4	REAR BR	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	150	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	SW	2,080	69	81	0.0	$ 15.56	$ 101.25	$10	6.5	5.9
6	RIGHT REAR OFFICE	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2080	1,198	4	T 28 R F 4	F44SSILL	96	0.4	SW	2,080	799	399	0.2	$ 76.62	$ 525.00	$80	6.9	5.8
X1	RIGHT REAR OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	13	-	-	$ -	$ -	$0		
6	KUEZ OFFICE	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	899	3	T 28 R F 4	F44SSILL	96	0.3	SW	2,080	599	300	0.1	$ 57.47	$ 393.75	$60	6.9	5.8
6	COMPUTER RM/ CLOSET	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	1000	144	1	T 28 R F 4	F44SSILL	96	0.1	SW	1,000	96	48	0.0	$ 12.71	$ 131.25	$20	10.3	8.8
80	REAR EXIT	1	SP 36 R CF 1	CFT36/1	51	0.1	Breaker	8760	447	1	SP 36 R CF 1	CFT36/1	51	0.1	Breaker	8,760	447	-	-	$ -	$ -	$0		
4	BASEMENT ST	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	1000	72	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	SW	1,000	33	39	0.0	$ 10.33	$ 101.25	$10	9.8	8.8
204	BASEMENT	6	S 96 C F 2 (MAG) 8'	F82EHE	207	1.2	SW	1000	1,242	6	S 96 C F 2 (MAG) 8'	F82EHE	207	1.2	SW	1,000	1,242	-	-	$ -	$ -	$0		
204	BASEMENT	3	S 96 C F 2 (MAG) 8'	F82EHE	207	0.6	SW	1000	621	3	S 96 C F 2 (MAG) 8'	F82EHE	207	0.6	SW	1,000	621	-	-	$ -	$ -	$0		
208	REAR EXTERIOR	1	WP 26 W CF 2	CFQ25/2	66	0.1	Timer	4368	288	1	WP 26 W CF 2	CFQ25/2	66	0.1	Timer	4,368	288	-	-	$ -	$ -	$0		
	Total	60				7.5			13,826	60			1,614	6			10,039	3,787	1.9	$733	$5,070	$740		
																	Demand Savings			1.9	$262			
																	kWh Savings			3,787	$471			
																	Total savings				$733		6.9	5.9

APPENDIX F

ECM-5 Install Occupancy Sensors

Energy Audit of Kearny, NJ

CHA Project No. 20711 - Town Hall Annex Building

ECM-5 Install Occupancy Sensors

0 $0.124 $/kWh

$11.71 $/kW

EXISTING CONDITIONS

Field Code	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh
	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)
71	FRONT VEST	2	I 60	I60/1	60	0.1	Timer	2080	249.6
6	MAIN CENTRAL OFFICE	7	T 34 R F 4 (MAG)	F44EE	144	1.0	SW	2080	2,096.6
6	MAIN CENTRAL OFFICE	6	T 34 R F 4 (MAG)	F44EE	144	0.9	SW	2080	1,797.1
X1	MAIN CENTRAL OFFICE	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	39.4
4	MAIN CENTRAL OFFICE	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	149.8
6	PERSONNELL OFFICE	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2080	1,198.1
X1	PERSONNELL OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13.1
6	LEFT FRONT OFFICE	6	T 34 R F 4 (MAG)	F44EE	144	0.9	SW	2080	1,797.1
X1	LEFT FRONT OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13.1
6	REAR LEFT OFFICE	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	898.6
80	CLOSET/ JAN	1	SP 36 R CF 1	CFT36/1	51	0.1	SW	1000	51.0
4	KITCHEN CUBBY	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	149.8
4	KITCHEN CUBBY	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	149.8
4	REAR BR	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	149.8
4	REAR BR	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	149.8
6	RIGHT REAR OFFICE	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2080	1,198.1
X1	RIGHT REAR OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13.1
6	KUEZ OFFICE	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	898.6
6	COMPUTER RM/ CLOSET	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	1000	144.0
80	REAR EXIT	1	SP 36 R CF 1	CFT36/1	51	0.1	Breaker	8760	446.8
4	BASEMENT ST	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	1000	72.0
204	BASEMENT	6	S 96 C F 2 (MAG) 8'	F82EHE	207	1.2	SW	1000	1,242.0
204	BASEMENT	3	S 96 C F 2 (MAG) 8'	F82EHE	207	0.6	SW	1000	621.0
208	REAR EXTERIOR	1	WP 26 W CF 2	CFQ25/2	66	0.1	Timer	4368	288.3
	Total	60				7.5			13,826

RETROFIT CONDITIONS

Field Code	Area Description	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh
		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)
71	FRONT VEST	2	I 60	I60/1	60	0.1	None	2080	249.6
6	MAIN CENTRAL OFFICE	7	T 34 R F 4 (MAG)	F44EE	144	1.0	None	2080	2,096.6
6	MAIN CENTRAL OFFICE	6	T 34 R F 4 (MAG)	F44EE	144	0.9	None	2080	1,797.1
X1	MAIN CENTRAL OFFICE	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8760	39.4
4	MAIN CENTRAL OFFICE	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	None	2080	149.8
6	PERSONNELL OFFICE	4	T 34 R F 4 (MAG)	F44EE	144	0.6	None	2080	1,198.1
X1	PERSONNELL OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8760	13.1
6	LEFT FRONT OFFICE	6	T 34 R F 4 (MAG)	F44EE	144	0.9	C-OCC	1040	898.6
X1	LEFT FRONT OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8760	13.1
6	REAR LEFT OFFICE	3	T 34 R F 4 (MAG)	F44EE	144	0.4	None	2080	898.6
80	CLOSET/ JAN	1	SP 36 R CF 1	CFT36/1	51	0.1	None	1000	51.0
4	KITCHEN CUBBY	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	None	2080	149.8
4	KITCHEN CUBBY	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	None	2080	149.8
4	REAR BR	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	OCC	1000	72.0
4	REAR BR	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	OCC	1000	72.0
6	RIGHT REAR OFFICE	4	T 34 R F 4 (MAG)	F44EE	144	0.6	C-OCC	1040	599.0
X1	RIGHT REAR OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8760	13.1
6	KUEZ OFFICE	3	T 34 R F 4 (MAG)	F44EE	144	0.4	C-OCC	1040	449.3
6	COMPUTER RM/ CLOSET	1	T 34 R F 4 (MAG)	F44EE	144	0.1	None	1000	144.0
80	REAR EXIT	1	SP 36 R CF 1	CFT36/1	51	0.1	None	8760	446.8
4	BASEMENT ST	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	None	1000	72.0
204	BASEMENT	6	S 96 C F 2 (MAG) 8'	F82EHE	207	1.2	None	1000	1,242.0
204	BASEMENT	3	S 96 C F 2 (MAG) 8'	F82EHE	207	0.6	None	1000	621.0
208	REAR EXTERIOR	1	WP 26 W CF 2	CFQ25/2	66	0.1	None	4368	288.3
	Total	60				7			11,724

COST & SAVINGS ANALYSIS

Field Code	Area Description	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
		(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
71	FRONT VEST	0.0	0.0	$0.00	$0.00	$0.00		
6	MAIN CENTRAL OFFICE	0.0	0.0	$0.00	$0.00	$0.00		
6	MAIN CENTRAL OFFICE	0.0	0.0	$0.00	$0.00	$0.00		
X1	MAIN CENTRAL OFFICE	0.0	0.0	$0.00	$0.00	$0.00		
4	MAIN CENTRAL OFFICE	0.0	0.0	$0.00	$0.00	$0.00		
6	PERSONNELL OFFICE	0.0	0.0	$0.00	$0.00	$0.00		
X1	PERSONNELL OFFICE	0.0	0.0	$0.00	$0.00	$0.00		
6	LEFT FRONT OFFICE	898.6	0.0	$111.69	$187.50	$70.00	1.7	1.1
X1	LEFT FRONT OFFICE	0.0	0.0	$0.00	$0.00	$0.00		
6	REAR LEFT OFFICE	0.0	0.0	$0.00	$0.00	$0.00		
80	CLOSET/ JAN	0.0	0.0	$0.00	$0.00	$0.00		
4	KITCHEN CUBBY	0.0	0.0	$0.00	$0.00	$0.00		
4	KITCHEN CUBBY	0.0	0.0	$0.00	$0.00	$0.00		
4	REAR BR	77.8	0.0	$9.67	$118.75	$40.00	12.3	8.1
4	REAR BR	77.8	0.0	$9.67	$118.75	$40.00	12.3	8.1
6	RIGHT REAR OFFICE	599.0	0.0	$74.46	$187.50	$70.00	2.5	1.6
X1	RIGHT REAR OFFICE	0.0	0.0	$0.00	$0.00	$0.00		
6	KUEZ OFFICE	449.3	0.0	$55.85	$187.50	$35.00	3.4	2.7
6	COMPUTER RM/ CLOSET	0.0	0.0	$0.00	$0.00	$0.00		
80	REAR EXIT	0.0	0.0	$0.00	$0.00	$0.00		
4	BASEMENT ST	0.0	0.0	$0.00	$0.00	$0.00		
204	BASEMENT	0.0	0.0	$0.00	$0.00	$0.00		
204	BASEMENT	0.0	0.0	$0.00	$0.00	$0.00		
208	REAR EXTERIOR	0.0	0.0	$0.00	$0.00	$0.00		
	Total	2,102	0	261	$800	255		
		Demand Savings		0.0	$0			
		kWh Savings		2,102	$261			
		Total Savings			$261		3.1	2.1

APPENDIX G

ECM-6 Lighting Replacements with Occupancy Sensors

Energy Audit of Kearny, NJ

CHA Project No. 20711 - Town Hall Annex Building 0 $0.124 $/kWh

ECM-6 Lighting Replacements with Occupancy Sensors $11.71 $/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
71	FRONT VEST	2	I 60	I60/1	60	0.1	Timer	2080	250	2	I 60	I60/1	60	0.1	None	2,080	250	-	-	$ -	$ -	$- -		
6	MAIN CENTRAL OFFICE	7	T 34 R F 4 (MAG)	F44EE	144	1.0	SW	2080	2,097	7	T 28 R F 4	F44SSILL	96	0.7	None	2,080	1,398	699	0.3	$ 134.09	$ 918.75	$ 140	6.9	5.8
6	MAIN CENTRAL OFFICE	6	T 34 R F 4 (MAG)	F44EE	144	0.9	SW	2080	1,797	6	T 28 R F 4	F44SSILL	96	0.6	None	2,080	1,198	599	0.3	$ 114.93	$ 787.50	$ 120	6.9	5.8
X1	MAIN CENTRAL OFFICE	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	39	3	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8,760	39	-	-	$ -	$ -	$ -		
4	MAIN CENTRAL OFFICE	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	150	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	None	2,080	69	81	0.0	$ 15.56	$ 101.25	$ 10	6.5	5.9
6	PERSONNELL OFFICE	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2080	1,198	4	T 28 R F 4	F44SSILL	96	0.4	None	2,080	799	399	0.2	$ 76.62	$ 525.00	$ 80	6.9	5.8
X1	PERSONNELL OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8,760	13	-	-	$ -	$ -	$ -		
6	LEFT FRONT OFFICE	6	T 34 R F 4 (MAG)	F44EE	144	0.9	SW	2080	1,797	6	T 28 R F 4	F44SSILL	96	0.6	C-OCC	1,040	599	1,198	0.3	$ 189.39	$ 975.00	$ 190	5.1	4.1
X1	LEFT FRONT OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8,760	13	-	-	$ -	$ -	$ -		
6	REAR LEFT OFFICE	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	899	3	T 28 R F 4	F44SSILL	96	0.3	None	2,080	599	300	0.1	$ 57.47	$ 393.75	$ 60	6.9	5.8
80	CLOSET/ JAN	1	SP 36 R CF 1	CFT36/1	51	0.1	SW	1000	51	1	SP 36 R CF 1	CFT36/1	51	0.1	None	1,000	51	-	-	$ -	$ -	$ -		
4	KITCHEN CUBBY	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	150	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	None	2,080	69	81	0.0	$ 15.56	$ 101.25	$ 10	6.5	5.9
4	KITCHEN CUBBY	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	150	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	None	2,080	69	81	0.0	$ 15.56	$ 101.25	$ 10	6.5	5.9
4	REAR BR	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	150	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	OCC	1,000	33	117	0.0	$ 19.99	$ 220.00	$ 50	11.0	8.5
4	REAR BR	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	2080	150	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	OCC	1,000	33	117	0.0	$ 19.99	$ 220.00	$ 50	11.0	8.5
6	RIGHT REAR OFFICE	4	T 34 R F 4 (MAG)	F44EE	144	0.6	SW	2080	1,198	4	T 28 R F 4	F44SSILL	96	0.4	C-OCC	1,040	399	799	0.2	$ 126.26	$ 712.50	$ 150	5.6	4.5
X1	RIGHT REAR OFFICE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	13	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8,760	13	-	-	$ -	$ -	$ -		
6	KUEZ OFFICE	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	899	3	T 28 R F 4	F44SSILL	96	0.3	C-OCC	1,040	300	599	0.1	$ 94.70	$ 581.25	$ 95	6.1	5.1
6	COMPUTER RM/ CLOSET	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	1000	144	1	T 28 R F 4	F44SSILL	96	0.1	None	1,000	96	48	0.0	$ 12.71	$ 131.25	$ 20	10.3	8.8
80	REAR EXIT	1	SP 36 R CF 1	CFT36/1	51	0.1	Breaker	8760	447	1	SP 36 R CF 1	CFT36/1	51	0.1	None	8,760	447	-	-	$ -	$ -	$ -		
4	BASEMENT ST	1	2B 34 R F 2 (u) (MAG)	FU2EE	72	0.1	SW	1000	72	1	2T 17 R F 2 (ELE)	F22ILL	33	0.0	None	1,000	33	39	0.0	$ 10.33	$ 101.25	$ 10	9.8	8.8
204	BASEMENT	6	S 96 C F 2 (MAG) 8'	F82EHE	207	1.2	SW	1000	1,242	6	S 96 C F 2 (MAG) 8'	F82EHE	207	1.2	None	1,000	1,242	-	-	$ -	$ -	$ -		
204	BASEMENT	3	S 96 C F 2 (MAG) 8'	F82EHE	207	0.6	SW	1000	621	3	S 96 C F 2 (MAG) 8'	F82EHE	207	0.6	None	1,000	621	-	-	$ -	$ -	$ -		
208	REAR EXTERIOR	1	WP 26 W CF 2	CFQ25/2	66	0.1	Timer	4368	288	1	WP 26 W CF 2	CFQ25/2	66	0.1	None	4,368	288	-	-	$ -	$ -	$ -		
	Total	60				7.5			13,826	60				5.6			8,670		1.9	903	5,870	995		
																	Demand Savings			1.9	$262			
																	kWh Savings			5,157	$641			
																	Total Savings				$903		6.5	5.4

APPENDIX H

New Jersey Pay For Performance Incentive Program

Kearny NJ
CHA #20711
Building: Annex

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)	72,060	1,640
Proposed Savings	7,580	330
Existing Total MMBtus	410	
Proposed Savings MMBtus	59	
% Reduction	14.4%	
Proposed Annual Savings	$2,140	

	≥ %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	$0	$0	$0
Incentive #3	$0	$0	$0
Totals	**$0**	**$0**	**$0**

Total Project Cost	$12,600
% Incentives of Project Cost*	0.0%
Project Cost w/ Incentives*	$12,600

Project Payback (years)	
w/o Incentives	w/ Incentives
5.9	5.9

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

APPENDIX I

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:	15.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	11.5 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	15.6 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	3.36	1242	193.13
2	4.05	1341	208.53
3	4.58	1627	253.00
4	4.84	1590	247.25
5	5.30	1751	272.28
6	5.33	1652	256.89
7	5.27	1668	259.37
8	5.25	1651	256.73
9	5.06	1601	248.96
10	4.46	1508	234.49
11	3.15	1076	167.32
12	2.87	1038	161.41
Year	4.46	17745	2759.35

Output Hourly Performance Data * Output Results as Text

About the Hourly Performance Data

Saving Text from a Browser

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

Please send questions and comments regarding PVWATTS to Webmaster

PVWatts Cautions for Interpreting the Results

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

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

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

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

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

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

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

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

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

Township of Kearny
Town Hall Annex

Cost of Electricity $0.156 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-15kW 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
$150,000	**0.0**	**17,750**	**0**	**$2,800**	**0**	**$2,800**	**$15,000**	**$8,600**	**53.6**	**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

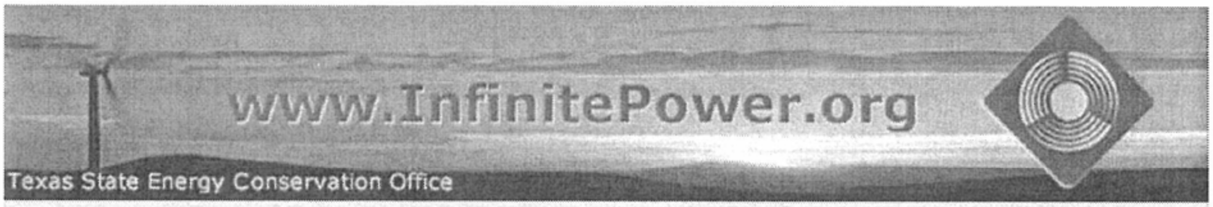
** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $487/1000kwh

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**

APPENDIX J

Solar Thermal Domestic Hot Water Plant



Home

What Can I Do?

Electric Choice

Home Energy

FAQs

LEARN
Fact Sheets
Lesson Plans

PLAY
Calculators

NETWORK
Organizations
Businesses
Events Calendar

BROWSE
Resources
Solar
Wind
Biomass
Geothermal
Water

Projects

TX Energy - Past and Present

Financial Help

About Us

About SECO

RARE

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

Interactive Energy Calculators

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)	30	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	14.23	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	30
Energy Use			
667.1		? 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
833.9 BTU/hr	? Power Into Water Heater	680.7 BTU/hr
Cost		
$ 1.52 /Therm	? Utility Rates	$ .1555 /kWh
$ 111.035	? Yearly Water Heating Cost	$ 271.564
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
348.665 years for gas	? Payback Time for Solar System	142.560 years for electric

NJBPU Energy Audits
CHA # 20711
Township of Kearny
Town Hall Annex

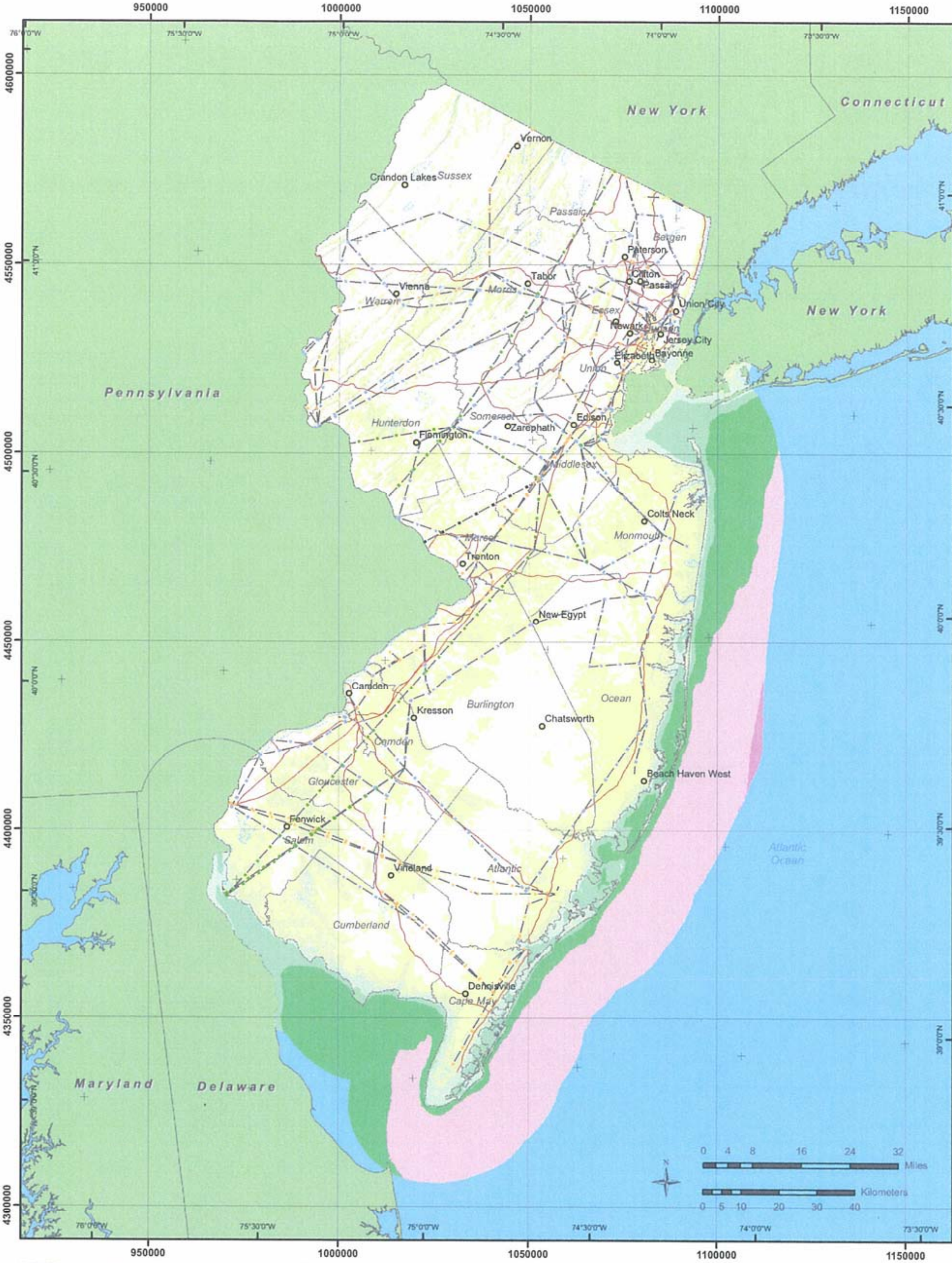
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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 K

Wind



Wind Resource of New Jersey *Mean Annual Wind Speed at 30 Meters*

Features

- City
- Interstate Highway
- County Boundary
- Water Body

Generalized Transmission Line

Category

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

Mean Speed at 30 m

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

AWS Truewind

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

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

AWS Truewind, LCC

Map of Urban Enterprises Zone Admin (201) 955-7985

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 L

EPA Portfolio Manager

STATEMENT OF ENERGY PERFORMANCE
Town Hall Annex

Building ID: 2224326
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: March 05, 2010

Facility
Town Hall Annex
410 Kearny Ave.
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: 1974
Gross Floor Area (ft²): 4,000

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	245,879
Natural Gas (kBtu)[4]	164,300
Total Energy (kBtu)	410,179
Energy Intensity[5]	
Site (kBtu/ft²/yr)	103
Source (kBtu/ft²/yr)	248
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	46
Electric Distribution Utility	
Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	77
National Average Source EUI	182
% Difference from National Average Source EUI	36%
Building Type	Office

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.

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	Town Hall Annex	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Office	Is this an accurate description of the space in question?		☐
Location	410 Kearny Ave., 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		☐

Annex (Office)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	4,000 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Weekly operating hours	45 Hours	Is this the total number of hours per week that the Office 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	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. The normal worker density ranges between 0.3 and 10 workers per 1000 square feet (92.8 square meters)		☐
Number of PCs	12	Is this the number of personal computers in the Office?		☐
Percent Cooled	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

Energy Consumption

Power Generation Plant or Distribution Utility: Public Service Elec & Gas Co

Fuel Type: Electricity

Meter: PSE&G Electric (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2008	12/31/2008	5,760.00
11/01/2008	11/30/2008	4,968.00
10/01/2008	10/31/2008	5,571.00
09/01/2008	09/30/2008	5,787.00
08/01/2008	08/31/2008	8,046.00
07/01/2008	07/31/2008	7,506.00
06/01/2008	06/30/2008	6,993.00
05/01/2008	05/31/2008	5,292.00
04/01/2008	04/30/2008	5,121.00
03/01/2008	03/31/2008	5,607.00
02/01/2008	02/29/2008	5,571.00
01/01/2008	01/31/2008	5,841.00
PSE&G Electric Consumption (kWh (thousand Watt-hours))		**72,063.00**
PSE&G Electric Consumption (kBtu (thousand Btu))		**245,878.96**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**245,878.96**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: PSE&G Natural Gas (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
12/01/2008	12/31/2008	213.00
11/01/2008	11/30/2008	208.00
10/01/2008	10/31/2008	45.00
09/01/2008	09/30/2008	0.00
08/01/2008	08/31/2008	0.00
07/01/2008	07/31/2008	0.00
06/01/2008	06/30/2008	0.00
05/01/2008	05/31/2008	52.00
04/01/2008	04/30/2008	91.00
03/01/2008	03/31/2008	284.00

02/01/2008	02/29/2008	389.00
01/01/2008	01/31/2008	361.00
PSE&G Natural Gas Consumption (therms)		**1,643.00**
PSE&G Natural Gas Consumption (kBtu (thousand Btu))		**164,300.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**164,300.00**
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
Town Hall Annex
410 Kearny Ave.
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

Town Hall Annex	
Gross Floor Area Excluding Parking: (ft²)	4,000
Year Built	1974
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Annex	
Space Type	Office
Gross Floor Area(ft2)	4,000
Weekly operating hours	45
Workers on Main Shift	12
Number of PCs	12
Percent Cooled	50% or more
Percent Heated	50% or more

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)	103	103	45	N/A	77
Source (kBtu/ft2)	248	248	109	N/A	182
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/ft2/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	46	46	20	N/A	35
$kgCO_2e$/ft2/year	12	12	5	N/A	9

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

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

APPENDIX M

Equipment Inventory

New Jersey BPU Energy Audit Program
CHA #20711
Kearny
Annex

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Areas Served	Date Installed	Useable Life Expectancy (years)
Air handler	Carrier	48HJE004---541, Serial 0309G100229	Gas heating/electric cooling	Input 72MBH, output 41/59MBH, 4ton	Roof	East side	1996	17
Air handler	Carrier	580DPV060115AAA, Serial 1095G20661	Gas heating/electric cooling	Input 115MBH,output 92MBH	Roof	West side	1996	7
Split System	Sanyo	CL 2432, Serail 0040412	Electric condensing unit	12,000 btu/hr	Window	Kithen	1996	7
Split System	Sanyo	CL 1872, Serail 0063672	Electric condensing unit	12,000 btu/hr	Window	Kithen	1996	7
DHWH	AO Smith	ELJC 6917	Electric hot water heater	6 gallon, 1500 watt	Bathroom	Bathroom	1996	7
DHWH	AO Smith	ELJC 6917	Electric hot water heater	6 gallon, 1500 watt	Bathroom	Bathroom	1996	7