TOWNSHIP OF KEARNY
HEALTH DEPARTMENT
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

CHA PROJECT NO. 20711

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1.0 INTRODUCTION & BACKGROUND

This report summarizes the energy audit for the Health Department, a 4,500 square foot facility located in Kearny, NJ. The single story building has a partial basement, which houses a mechanical room and storage space. The first floor houses a main lobby, examination rooms, offices, and restrooms.

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

2.0 EXECUTIVE SUMMARY

This report details the results of the energy audit for the single story, 4,500 square foot Health Department, which includes examination rooms and offices. The following areas were evaluated for energy conservation measures:

- Night setback
- Lighting replacements with occupancy sensors
- Boiler replacement
- Condensing unit replacement
- Premium efficiency motors

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Measures which are recommended for implementation have a payback of 10 years or less. This threshold is considered a viable return on investment. Potential annual savings of $1,700 for the recommended ECMs may be realized with a payback of 1.8 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–2 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	0	480	700	12.1	NA	1.1	NA

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

ECM-7 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
2,200	1.1	6,190	0	1,000	5.8	300	2.2	1.9

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

3.0 EXISTING CONDITIONS

3.1 Building General

3.1.1 Structure

Kearny's Health Department is a single story building constructed in 1967. The majority of the building's structure and HVAC equipment is original, and there were no major renovations. The building houses a main lobby, examination rooms, offices, meeting room, and reserooms. The partial basement houses a mechanical room and storage spaces.

This building is a framed structure with walls constructed of veneer brick, with insulation and interior sheetrock finish or paneling. The windows are single pane with exterior storm windows. The sloped roof has an insulated attic space, which houses three air handlers.

3.1.2 Occupancy and Operating Hours

The building is open 8:00 AM to 5:00 PM Monday through Friday, with an eight person staff and typically about six patients at a time. The building is closed on weekends and holidays.

3.2 Utility Usage

The building uses electricity, natural gas, municipal water, and is connected to the town's municipal sewage system. The water usage was not available; however, the building is not charged for the use of water.

Electricity and natural gas are purchased from the Public Service Electric and Gas Company (PSE&G). For 2008, the building had an annual electricity consumption of 52,840 kWh at a cost of $10,000, and a natural gas usage of 2,700 therms at a cost of $4,000. The largest portion of the energy bill is for electricity and the average blended rate was $0.18 per kWh. The electricity usage trend shows that there is a higher consumption during the summer cooling months. As indicated by the higher usage trends, the majority of natural gas is used for building heat; the average blended rate for natural gas was $1.49 per therm.

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, as is the case with the library. Since contract terms and rates can vary among suppliers, it is important to review all options on a regular basis to ensure the building is receiving the best possible price. A list of approved electrical and natural gas energy commodity suppliers can be found in Appendix A.

Utility data is provided in Appendix A.

3.3 HVAC Systems

3.3.1 Central Systems

Building heat is provided by a single gas fired hot water boiler located in the basement. The 1968 Peerless Company boiler is rated at 420 MBH output and 525 MBH input. The heating hot water is distributed through six fractional horsepower circulating pumps into three air handlers and baseboard perimeter

fintubes. According to personnel, the air handlers' heating units are not operational and have not been used for many years; however, baseboard hot water heating is sufficient for facility heating needs.

Cooling is provided through the use of three air handlers noted above and three outdoor condensing units. The Carrier air handlers and condensing units range from 5 to 7.5 tons in cooling capacity.

3.3.2 Controls

Temperature control is provided by nonprogrammable heating/cooling thermostats. The heating system does not utilize night setback. The cooling system is equipped with a timer that shuts down during the unoccupied times. Temperature setpoints are 74°F during cooling and 72°F during heating.

3.4 Lighting/Electrical Systems

The lighting system within the building is manually controlled by individual switches in the spaces and is used based on occupancy. Most of the lighting within the building is fluorescent using F32T8 32 watt lamps. There is one older fluorescent that uses F34T12 34 watt lamps in the basement storage room which is rarely used. There are approximately 40 incandescent bulbs utilized for interior and exterior lighting. About four incandescent bulbs have been replaced with compact fluorescent bulbs. All of the exit signs within the building have been upgraded to LED technology.

The building's exterior lighting consists of a mixture of halogen and incandescent fixtures that are controlled by photosensors.

3.5 Domestic Hot Water Systems

Hot water is produced by a gas fired A.O. Smith 40 gallon capacity 40,000 Btu/hr output domestic hot water heater which was installed in 1996.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Replace Boiler

Building heat is provided by an original hot water boiler rated at 420 MBH output, which has surpassed its useful life. In addition, based on the size of the building and envelope conditions, the existing boiler appears to be oversized. An oversized boiler typically operates at lower efficiency; the existing boiler's average efficiency was estimated at 75%. A new boiler would provide higher efficiencies and reduce maintenance repairs.

This ECM evaluated the potential of replacing the existing boiler with two, smaller high efficiency condensing hot water boilers to operate in a lead-lag arrangement. Modifications to the existing piping, electrical wiring and flue stacks would also be required. It was calculated that the new high efficiency boilers would provide energy savings of 470 therms $700 per year.

Boilers have an expected life of 25 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 11,750 therms and $17,500.

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

ECM–1 Replace Boiler

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
23,800	0	0	470	700	(0.3)	800	>25	>25

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

This measure is not recommended.

4.2 ECM-2 Night Setback

According to building personnel, night setback is not performed. The individual nonprogrammable thermostats maintain at constant temperature during occupied and unoccupied periods. Significant energy is expended to maintain the building at the same temperature during the unoccupied periods. Energy savings could be achieved by setting back the heating temperature from 72°F to 65°F during the unoccupied times. Cooling setback was not evaluated because the air conditioning system is controlled by a timer which has been correlated to the occupied hours.

To implement this measure, the existing heating thermostats would be replaced with programmable units. The thermostats would be programmed to lower the operating temperatures to minimum during the unoccupied periods such as nights and weekends.

To determine savings for this measure, a base case building model was created, which calculated heating energy consumption under existing conditions, taking into consideration the outside weather, building envelope, occupancy, operating hours, and other parameters. The base case model was reconciled to the average yearly energy usage of utilities. To determine the proposed energy usage, the same model was

used but with different temperature setpoints for unoccupied operating hours. The temperatures for the unoccupied hours would be allowed to drift down in the winter. The difference in use between the base case and proposed model is the energy saving. The night setback will result in an annual natural gas savings of 770 therms.

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 7,200 therms and $10,500.

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

ECM–2 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	0	480	700	12.1	NA	1.1	NA

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

This measure is recommended.

4.3 ECM-3 Replace Condensing Units

The existing HVAC system is original. The cooling system uses three existing condensing units that have surpassed their useful life. This measure evaluated replacing the existing condensing units with more efficient units. The energy savings were determined by comparing the existing units' EER of 9 to EER of the proposed new units rated at 13.0, and were based on occupied and unoccupied operating hours.

Implementation of this measure would install the new units in the location of the original units. The new installation may require replacement of the existing tubing and wiring. Additionally, since the existing cooling uses an old type of refrigerant, cooling coils may also need to be replaced.

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

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

ECM–3 Replace Condensing Units

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
23,500	0	900	0	200	(0.9)	1,000	>25	>25

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

This measure is not recommended.

4.4 ECM-4 Install Premium Efficiency Motors

The existing air handlers use 1 HP 78.5% efficient motors, which is lower than currently available motors. The energy savings were calculated by applying the motor operating hours to the existing and proposed motor efficiencies. Only the cooling operating hours were considered since the air handlers are cooling only units.

This measure provides savings of less than $100 with an unfavorable payback, and is not recommended. Calculations are provided in Appendix E.

Premium motors have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 900 kWh and $720.

4.5 ECM-5 Lighting Replacements

The building contains roughly 25 incandescent light bulbs throughout the inside of the building, and about 15 incandescent bulbs used for exterior lighting. Overall energy consumption can be reduced by replacing the existing incandescent bulbs with compact fluorescent bulbs.

To compute the annual savings for this ECM, the energy consumption of the lighting fixtures was established, and it was determined to be 14,620 kWh per year. To calculate the annual energy consumption utilizing replacement bulbs, the proposed fixture power requirement was used with the same annual hours of operation. The difference between the existing and proposed annual energy consumption was the energy savings. Calculations are provided in Appendix F.

Existing 40 watt incandescent bulbs would be replaced with 13 watt compact fluorescent bulbs, and existing 60 watt incandescent bulbs would be replaced with 26 watt compact fluorescent bulbs. This ECM will provide annual savings of 3,260 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 48,900 kWh and $9,000.

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

ECM-5 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
300	1.1	3,260	0	600	29.0	N/A	0.5	N/A

* There are no Incentives for this ECM based on New Jersey Smart Start Prescriptive Lighting Measures.

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

4.6 ECM-6 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 in many areas of the facility. Occupancy sensors were not considered for some areas because of safety concerns or low use.

Applying the same process used in the calculation of ECM-5, 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 2,300 kWh.

Approximately 15 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 44,100 kWh, and $6,000.

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

ECM-6 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,900	0.0	2,940	0	400	2.2	300	4.8	4.0

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

This measure is not recommended in lieu of ECM-7.

4.7 ECM-7 Lighting Replacements with Occupancy Sensors

This measure is a combination of ECMs 5 and 6 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 92,850 kWh, and $15,000.

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

ECM-7 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
2,200	1.1	6,190	0	1,000	5.8	300	2.2	1.9

* 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 Health Department is eligible for several incentives available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about $2,100 towards a new boiler, new condensing units and upgrades to the lighting system.

When calculating the total incentive for the New Jersey Pay For Performance program, all energy conservation measures are applicable as the amount received is based on building wide energy improvements. Since the overall energy reduction for the building is estimated to exceed the 15% minimum, the building is eligible for Incentives #2 and #3 as previously discussed. This would result in a total incentive of about $5,700, reducing the total project payback from 11.6 years to 9.2 years. ECM-3 was not included in the incentive analysis because the payback is greater than 100 years. See Appendix I for calculations.

Under PSE&G's direct install program, the Health Department is potentially eligible to receive $51,700, and would be required to repay $10,300. All conservation measures were included in calculating this incentive. Incentives cannot be accepted under multiple programs.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

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

The building uses a gas-fired boiler and cooling only air handling units to meet the HVAC requirements. With exception to the hydronic heating system, the remaining 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 removed or overhauled; and either a low temperature closed loop water source heat pump system or a water to water heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground. Therefore, 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 Health Department 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 J.

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 26.0 kW and a minimum of 8.8 kW, from January 2008 through December 2008. The monthly average over the observed 12 month period was 17.0 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 J 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	3,400	3,400	15,000	8,600	>25	11.3

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

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

6.2.2 Solar Thermal Hot Water Plant

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

A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed on the roof of the building, oriented south, and tilted around the site's latitude, to maximize the amount of radiation collected on a yearly basis.

Several options exist for using active solar thermal systems for space heating. The most common method involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system). The most practical system would transfer the heat from the panels to thermal storage tanks and transfer solar produced thermal energy to use for domestic hot water production. DHW is presently produced by a gas-fired water heater and, therefore, this measure would offer savings in natural gas usage.

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 K and summarized below:

Solar Thermal Domestic Hot Water Plant

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
27,100	0	0	80	100	100	NA	>25	NA

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

This measure is not recommended.

6.3 Wind

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

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

The New Jersey Clean Energy Program for small wind installations has designated numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine

installations are based on kilowatt hours saved in the first year. Systems sized under 16,000 kWh per year of production will receive a $3.20 per kWh incentive. Systems producing over 16,000 kWh will receive $51,200 for the first 16,000 kWh of production with an additional $0.50 per kWh up to a maximum cap of 750,000 kWh per year. Federal tax credits are also available for renewable energy projects up to 30% of installation cost for systems less than 100 kW. However, as noted previously, municipalities do not pay federal taxes and is, therefore, not eligible for the tax credit incentive.

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. In the Kearny area, the map indicates a mean annual wind speed of 10 miles per hour. For the Health Department, there are site restrictions. Parking lots, tennis courts, trees and surrounding structures would greatly affect a tower location.

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

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 Health Department 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 Health Department 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 Health Department had a monthly average electricity demand of 17.0 kW and a maximum demand of 26.0 kW in 2008.

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

7.0 EPA PORTFOLIO MANAGER

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

The Health Department is considered a high energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 100 kBTU/ft^2/year. Several factors contribute to the unfavorable EUI, including, wasted energy from inefficient boilers, unnecessary heating and cooling during unoccupied times, inefficient motors, lighting systems, etc. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 73 kBTU/ft^2/year. The EPA Portfolio Manager did not generate an energy rating score for this building because the building type (Medical Office) is not eligible for an energy star rating.

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

The user name and password for the Health Department'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 Health Department, in Kearny, New Jersey identified potential ECMs for lighting upgrades with occupancy sensors and night setback. Potential annual savings of $1,700 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM–2 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	0	480	700	12.1	NA	1.1	NA

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

ECM-7 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
2,200	1.1	6,190	0	1,000	5.8	300	2.2	1.9

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

APPENDIX A

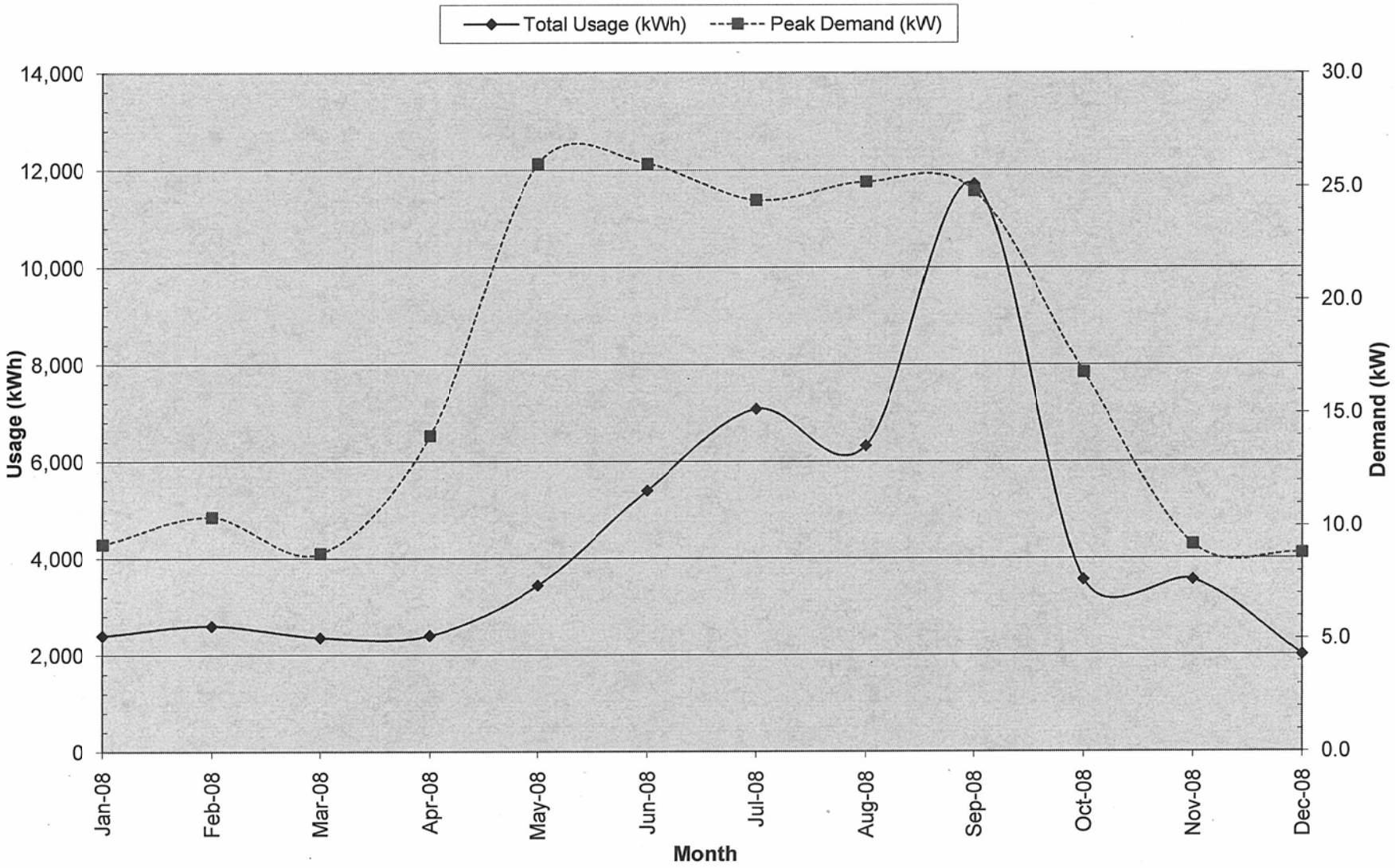
Utility Usage Analysis

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

Health Dept- 645 Kearny Ave
Account No.: 11 850 343 07
Meter No.: 226004307

			Charges			Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
January-08	2,400	9.2	$348.19	$84.84	$263.35	0.1451	0.1097	9.22
February-08	2,600	10.4	$383.24	$89.61	$293.63	0.1474	0.1129	8.62
March-08	2,360	8.8	$343.78	$70.94	$272.84	0.1457	0.1156	8.06
April-08	2,400	14.0	$364.17	$103.08	$261.10	0.1517	0.1088	7.36
May-08	3,440	26.0	$538.57	$156.07	$382.50	0.1566	0.1112	6.00
June-08	5,400	26.0	$1,180.30	$413.62	$766.68	0.2186	0.1420	15.91
July-08	7,080	24.4	$1,415.62	$395.83	$1,019.79	0.1999	0.1440	16.22
August-08	6,320	**25.2**	$1,356.09	$404.72	$951.37	0.2146	0.1505	16.06
September-08	11,720	24.8	$2,524.58	$800.53	$1,724.05	0.2154	0.1471	32.28
October-08	3,560	16.8	$603.89	$190.82	$413.07	0.1696	0.1160	11.36
November-08	3,560	9.2	$566.08	$161.23	$404.85	0.1590	0.1137	17.53
December-08	2,000	8.8	$386.31	$159.67	$226.64	0.1932	0.1133	18.14
Most Recent Yr	52,840	26.0	$10,010.82	$3,030.96	$6,979.87	0.1895	0.1321	14.89

Electric Usage - Town of Kearny Health Department



Utility Data - KearnyHealth(rev-0).xls
Electricity Chart

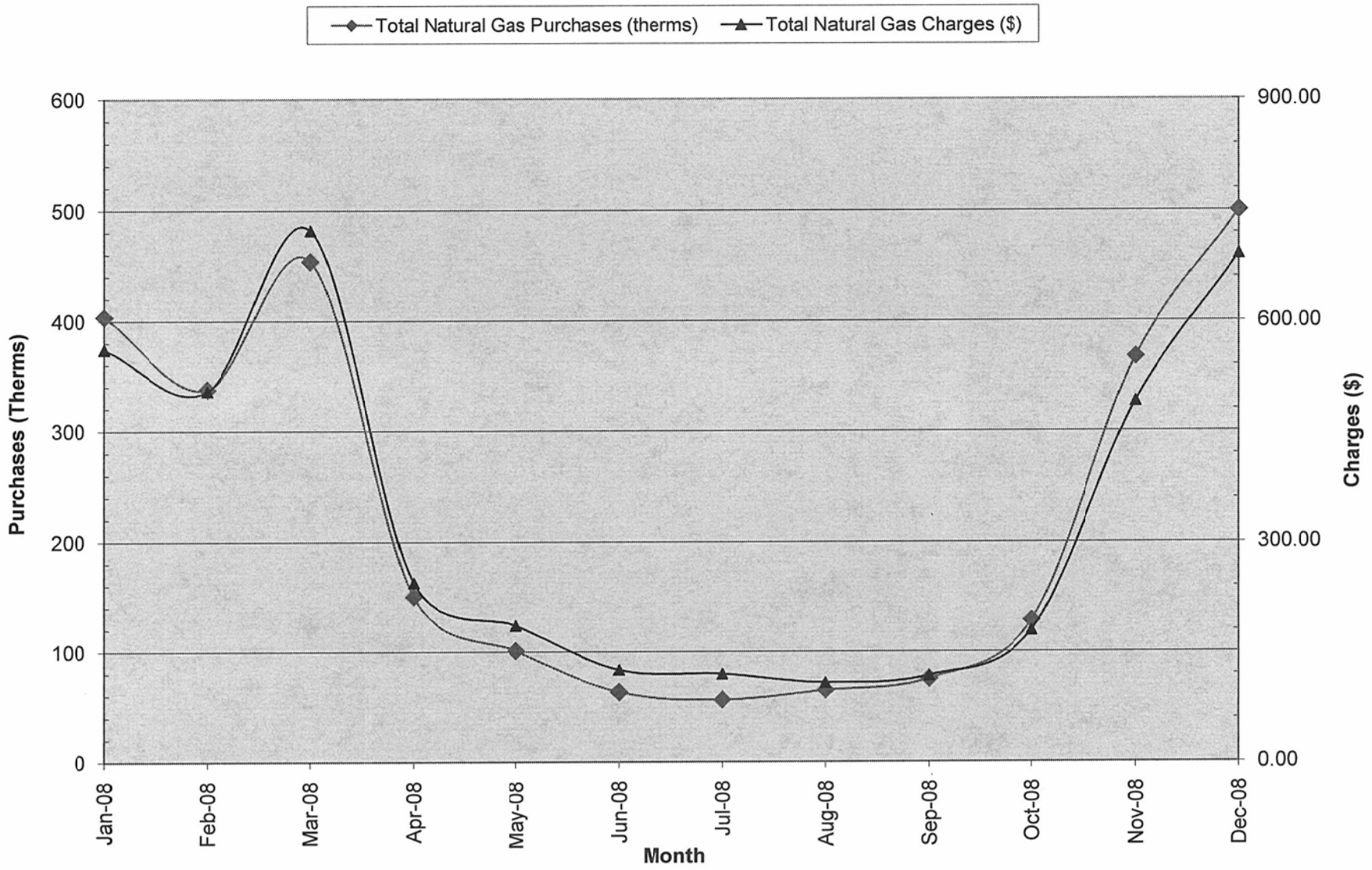
New Jersey BPU Energy Audit Program
CHA Project No.: 20711
Town of Kearny
PSE&G - Natural Gas Service

Health Dept- 645 Kearny Ave
Account No.: 11 850 343 07
Meter No.: 2049568

Month	Therms	Charges ($)	($/Therm)
January-08	404	560.94	1.389
February-08	338	504.10	1.493
March-08	454	722.70	1.592
April-08	150	244.47	1.627
May-08	101	186.01	1.840
June-08	64	125.27	1.970
July-08	56	119.67	2.120
August-08	65	107.67	1.656
September-08	75	117.38	1.558
October-08	129	179.36	1.395
November-08	367	490.13	1.334
December-08	500	690.72	1.381

Most Recent Yr	2,703	4,048	1.498

Natural Gas Usage - Town of Kearny Health Department



Utility Data - KearnyHealth(rev-0).xls
Natural Gas Chart

ELECTRIC MARKETERS LIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Jan 14, 2009

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 Replace Boiler

Kearny NJ
CHA #20711
Building: Health Department

ECM-1 Boiler Replacement

Existing Fuel	Nat.Gas
Proposed Fuel	Nat.Gas

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$ 1.49		
Proposed Fuel Cost	$ 1.49		
Baseline Fuel Use	2,541	Therms	Based on historical utility data
Existing Boiler Plant Efficiency	75%		Estimated or Measured
Baseline Boiler Load	190,562	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 100 Mbtu/Therms
Baseline Fuel Cost	$ 3,786		
Proposed Boiler Plant Efficiency	92%		New Boiler Efficiency
Proposed Fuel Use	2,071	Therms	Baseline Boiler Load / Proposed Efficiency / 100 Mbtu/Therms
Proposed Fuel Cost	$ 3,086		
Annual Savings	469	Therms	
Annual Savings	**$ 700**	**/yr**	

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

Kearny NJ
CHA #20711
Building: Health Department

ECM-1 Boiler Replacement

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.		
						$ -	$ -	$ -	$ -	
Boiler Removal	1	ea		$ 300		$ -	$ 363	$ -	$ 363	
Condensing boiler 230 MBH	2	ea	$ 4,350	$ 1,240		$ 8,526	$ 3,001	$ -	$ 11,527	
Shot Chemical Feeder	1	ea	$ 250	$ 220		$ 245	$ 266	$ -	$ 511	
Flue Attachment	25	lf	$ 13	$ 19		$ 325	$ 572	$ -	$ 896	
Miscellaneous Electrical	2	ea	$ 150	$ 250		$ 294	$ 605	$ -	$ 899	
Piping	20	lf	$ 33	$ 20		$ 637	$ 472	$ -	$ 1,109	
Valves	2	ea	$ 120	$ 60		$ 235	$ 145	$ -	$ 380	
Controls	1	ls	$ 1,820	$ 360		$ 1,784	$ 436	$ -	$ 2,219	
Air intake piping	25	lf	$ 13	$ 19		$ 325	$ 572	$ -	$ 896	

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
					$ -	$ -
>300 MBH	460	MBH	$2	$805	$ 11,527	$ 10,722
						$ -
				$805	$11,527	$10,722

Total ECM Cost w/ Incentives	**$22,979**

$ 18,801		Subtotal
$ 2,820	15%	Contingency
$ 2,162	10%	Contractor O&P
$ -		Engineering
$ 23,784		**Total**

APPENDIX C

ECM-2 Night Setback

Kearny NJ
CHA #20711
Building: Health Department

ECM-2 Night Setback

Building Footprint	4,500	SF
Heating Efficiency	75%	
Cooling Efficiency	1.2	kW/ton
Building Balance Temp.	60	*F
Internal Gains	21,900	btu/h
Unoc Internal Gain factor	0.03	
Ave Occ Internal Gain Factor	0.7	

Ex Occupied Clng Temp.	74	*F
Ex Unoccupied Clng Temp.	74	*F
Prop Occupied Clng Temp.	74	*F
Prop Unoccupied Clng Temp.	74	*F
Occupied Cooling UA	-3,014	btu/hr/*F
Unoccupied Cooling UA	-1,890	btu/hr/*F
Cooling Occ Enthalpy Setpoint	27.5	Btu/lb
Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb

Ex Occupied Htg Temp.	72	*F
Ex Unoccupied Htg Temp.	72	*F
Prop Occupied Htg Temp.	72	*F
Prop Unoccupied Htg Temp.	65	*F
Occupied Heating UA	925	btu/hr/*F
Unoccupied Heating UA	925	btu/hr/*F

Heating Energy Savings	**477**	**therms**
Cooling Energy Savings	**-43**	**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	-85,897	-36,912	-15,330	-53,851	-36,912	-657	-85,897	-36,912	-15,330	-53,851	-36,912	-657	0	0	0	0
97.5	42.5	3	1	2	-70,827	-25,633	-15,330	-44,404	-25,633	-657	-70,827	-25,633	-15,330	-44,404	-25,633	-657	24	24	0	0
92.5	39.5	34	8	26	-55,758	-20,507	-15,330	-34,956	-20,507	-657	-55,758	-20,507	-15,330	-34,956	-20,507	-657	220	220	0	0
87.5	36.6	131	31	100	-40,688	-15,551	-15,330	-25,508	-15,551	-657	-40,688	-15,551	-15,330	-25,508	-15,551	-657	640	640	0	0
82.5	34	500	119	381	-25,618	-11,108	-15,330	-16,061	-11,108	-657	-25,618	-11,108	-15,330	-16,061	-11,108	-657	1,680	1,680	0	0
77.5	31.6	620	148	472	-10,549	-7,006	-15,330	-6,613	-7,006	-657	-10,549	-7,006	-15,330	-6,613	-7,006	-657	1,160	1,160	0	0
72.5	29.2	664	158	506	0	0	-15,330	0	0	-657	0	0	-15,330	0	0	-657	276	276	0	0
67.5	27	854	203	651	4,164	1,846	-15,330	4,164	1,846	-657	4,164	1,846	-15,330	0	0	-657	190	232	0	0
62.5	24.5	927	221	706	8,790	3,896	-15,330	8,790	3,896	-657	8,790	3,896	-15,330	2,313	1,025	-657	58	58	0	0
57.5	21.4	600	143	457	13,416	5,947	-15,330	13,416	5,947	-657	13,416	5,947	-15,330	6,940	3,076	-657	0	0	122	65
52.5	18.7	610	145	465	18,043	7,998	-15,330	18,043	7,998	-657	18,043	7,998	-15,330	11,566	5,127	-657	0	0	178	120
47.5	16.2	611	145	466	22,669	10,048	-15,330	22,669	10,048	-657	22,669	10,048	-15,330	16,192	7,177	-657	0	0	233	175
42.5	14.4	656	156	500	27,296	12,099	-15,330	27,296	12,099	-657	27,296	12,099	-15,330	20,819	9,228	-657	0	0	308	246
37.5	12.6	1,023	244	779	31,922	14,149	-15,330	31,922	14,149	-657	31,922	14,149	-15,330	25,445	11,279	-657	0	0	572	475
32.5	10.7	734	175	559	36,548	16,200	-15,330	36,548	16,200	-657	36,548	16,200	-15,330	30,071	13,329	-657	0	0	476	406
27.5	8.6	334	80	254	41,175	18,251	-15,330	41,175	18,251	-657	41,175	18,251	-15,330	34,698	15,380	-657	0	0	246	214
22.5	6.8	252	60	192	45,801	20,301	-15,330	45,801	20,301	-657	45,801	20,301	-15,330	39,324	17,431	-657	0	0	208	184
17.5	5.5	125	30	95	50,427	22,352	-15,330	50,427	22,352	-657	50,427	22,352	-15,330	43,951	19,481	-657	0	0	114	103
12.5	4.1	47	11	36	55,054	24,403	-15,330	55,054	24,403	-657	55,054	24,403	-15,330	48,577	21,532	-657	0	0	47	43
7.5	2.6	22	5	17	59,680	26,453	-15,330	59,680	26,453	-657	59,680	26,453	-15,330	53,203	23,582	-657	0	0	24	22
2.5	1	13	3	10	64,307	28,504	-15,330	64,307	28,504	-657	64,307	28,504	-15,330	57,830	25,633	-657	0	0	15	14
-2.5	0	0	0	0	68,933	30,555	-15,330	68,933	30,555	-657	68,933	30,555	-15,330	62,456	27,684	-657	0	0	0	0
-7.5	-1.5	0	0	0	73,559	32,605	-15,330	73,559	32,605	-657	73,559	32,605	-15,330	67,082	29,734	-657	0	0	0	0
TOTALS		**8,760**	**2,086**	**6,674**													**4,246**	**4,289**	**2,543**	**2,066**

Existing Building Ventilation & Infiltration (occ)	**380**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**380**	**cfm**

Kearny NJ
CHA #20711
Building: Health Department

Reconcile Thermal Model

Building Footprint	4,500	SF	Ex Occupied Clng Temp.	74	°F	Ex Occupied Htg Temp.	72	°F
Heating Efficiency	75%		Ex Unoccupied Clng Temp.	74	°F	Ex Unoccupied Htg Temp.	72	°F
Cooling Efficiency	1.20	kW/ton	Occupied Cooling UA	(3,014)	btu/hr/°F	Occupied Heating UA	925	btu/hr/°F
Internal Gains	21,900	btu/h	Unoccupied Cooling UA	(1,890)	btu/hr/°F	Unoccupied Heating UA	925	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	-85,897	-36,912	-15,330	-53,851	-36,912	-657	0	0	0	0
97.5	42.5	3	1	2	-70,827	-25,633	-15,330	-44,404	-25,633	-657	0	24	24	0
92.5	39.5	34	8	26	-55,758	-20,507	-15,330	-34,956	-20,507	-657	0	220	220	0
87.5	36.6	131	31	100	-40,688	-15,551	-15,330	-25,508	-15,551	-657	0	640	640	0
82.5	34.0	500	119	381	-25,618	-11,108	-15,330	-16,061	-11,108	-657	0	1,680	1,680	0
77.5	31.6	620	148	472	-10,549	-7,006	-15,330	-6,613	-7,006	-657	0	1,160	1,160	0
72.5	29.2	664	158	506	0	0	-15,330	0	0	-657	0	276	276	0
67.5	27.0	854	203	651	4,164	1,846	-15,330	4,164	1,846	-657	0	190	190	0
62.5	24.5	927	221	706	8,790	3,896	-15,330	8,790	3,896	-657	0	58	58	0
57.5	21.4	600	143	457	13,416	5,947	-15,330	13,416	5,947	-657	0	0	0	122
52.5	18.7	610	145	465	18,043	7,998	-15,330	18,043	7,998	-657	0	0	0	178
47.5	16.2	611	145	466	22,669	10,048	-15,330	22,669	10,048	-657	0	0	0	233
42.5	14.4	656	156	500	27,296	12,099	-15,330	27,296	12,099	-657	0	0	0	308
37.5	12.6	1,023	244	779	31,922	14,149	-15,330	31,922	14,149	-657	0	0	0	572
32.5	10.7	734	175	559	36,548	16,200	-15,330	36,548	16,200	-657	0	0	0	476
27.5	8.6	334	80	254	41,175	18,251	-15,330	41,175	18,251	-657	0	0	0	246
22.5	6.8	252	60	192	45,801	20,301	-15,330	45,801	20,301	-657	0	0	0	208
17.5	5.5	125	30	95	50,427	22,352	-15,330	50,427	22,352	-657	0	0	0	114
12.5	4.1	47	11	36	55,054	24,403	-15,330	55,054	24,403	-657	0	0	0	47
7.5	2.6	22	5	17	59,680	26,453	-15,330	59,680	26,453	-657	0	0	0	24
2.5	1.0	13	3	10	64,307	28,504	-15,330	64,307	28,504	-657	0	0	0	15
-2.5	0.0	0	0	0	68,933	30,555	-15,330	68,933	30,555	-657	0	0	0	0
-7.5	-1.5	0	0	0	73,559	32,605	-15,330	73,559	32,605	-657	0	0	0	0
TOTALS		8,760	2,086	6,674								4,246	4,246	2,543

Existing Building Ventilation & Infiltration (occ)	**380**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**380**	**cfm**
Economizer Ventilation (from AHU's)	**0**	**cfm**

Energy Use Indices (calculated)

	Base Case
Heating	2,543
Target ->	2,541
	100.1%

	Base Case
Cooling	4,246
Target ->	3,740
	113.5%

HEAT GAIN/LOSS WORKSHEET

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

Building/Facility Designation Entire building

Outdoor Winter Design DB Temperature	14 *F	**Indoor Winter Design DB Temperature**	72 *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)

		R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
	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
x	Brick, insulation, gypsum	14.4	

Roofs (Select One)

		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
	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	
x	Attic Roof with 4" Insul.	18.00	

Windows (Select One)

		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	5,720 SF		
Occupied Area	4,500 SF	**Return Plenum?**	n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	50 Ft	9.0 Ft	8.0 Ft	32 SF	21 SF	397 SF
East Exposure	107 Ft	9.0 Ft	8.0 Ft	140 SF	63 SF	760 SF
South Exposure	50 Ft	9.0 Ft	8.0 Ft	25 SF	0 SF	425 SF
West Exposure	107 Ft	9.0 Ft	8.0 Ft	192 SF	25 SF	747 SF

Forced Ventilation 0 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	Health Department	Date:			
Engineer:	ND				

Building/Facility Designation: Entire building

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	32	38 btu/h/sf	0.8	0.75	Glass Type C	730 Btu/hr
East Exposure	140	216 btu/h/sf	0.8	0.31	Glass Type C	7,500 Btu/hr
South Exposure	25	109 btu/h/sf	0.8	0.58	Glass Type C	1,264 Btu/hr
West Exposure	192	216 btu/h/sf	0.8	0.29	Glass Type C	9,622 Btu/hr
						19,115 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	347	0.07	20 *F	1.0	482 Btu/hr
East Exposure	653	0.07	39 *F	1.0	1,769 Btu/hr
South Exposure	375	0.07	27 *F	1.0	703 Btu/hr
West Exposure	640	0.07	22 *F	1.0	977 Btu/hr
Roof	5,720	0.06	73 *F	1.0	23,198 Btu/hr
Fenestration	389	0.60	17 *F		3,968 Btu/hr
Doors	109	0.14	27 *F		409 Btu/hr
Ceiling	4,500	0.14	0 *F		0 Btu/hr
Partition		0.05	0 *F		0 Btu/hr
Floor	4,500	0.04	0 *F		0 Btu/hr
					31,505 Btu/h

INTERNAL HEAT GAINS

								Room Heat Gain
Lights	0.80	w/sf x	4,500	Occ Area =	3.6	kW x 3.4x	1.0 RAF =	12,287 Btu/h
Plug Load	0.25	w/sf x	4,500	Occ Area =	1.1	kW x 3.4x	1.0 RAF =	3,840 Btu/h
People	12	people x	255	btu/person x	95%	time in space =		2,907 Btu/h
Computer Work Stations			7	Units x	120	W/Unit x 3414 =		2,867 Btu/h
Equipment		kW x 3.413 =						0 Btu/h
Misc.								0 Btu/h
								21,900 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor		Perimeter Ratio		Coef	Temp. Diff.	Room Heat Gain
Walls	2,015 SF	0.10	CFM/SF			1.04	17 *F	3,861 Btu/h
Doors	109 SF	0.20	CFM/LF	0.80	LF/SF	1.04	17 *F	333 Btu/h
Windows	389 SF	0.35	CFM/LF	0.95	LF/SF	1.04	17 *F	2,482 Btu/h
Ventilation	0 cfm					1.04	17 *F	0 Btu/h
								6,676 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	50	0.07	20	1.0	69 Btu/hr
East Exposure	107	0.07	39	1.0	290 Btu/hr
South Exposure	50	0.07	27	1.0	94 Btu/hr
West Exposure	107	0.07	22	1.0	163 Btu/hr
Roof	5,720	0.06	73	0.0	0 Btu/hr
					616 Btu/h

INTERNAL HEAT GAINS

							Room Heat Gain
Lights	0.80	w/sf x	4,500	Occ Area =	3.6	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	19,115	Internal Gains to Room	21,900
Conduction to Room	31,505	Internal Gains to Plenum	0
Conduction to Plenum	616		
Ventilaton and Infiltration	6,676		
Sub Total	57,913	Sub Total	21,900

HEAT GAIN/LOSS WORKSHEET

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

Building/Facility Designation Entire building

LATENT COOLING LOADS

Infiltration

			Infiltration Factor		Air Density	Humidity Ratio Dif.		Room Heat Gain	
Walls	6,034	SF	0.10	CFM/SF	4,629	0.0042 #/#		11,850	Btu/h
Doors	109	SF	0.20	CFM/LF	4,629	0.0042 #/#		342	Btu/h
Windows	389	SF	0.35	CFM/LF	4,629	0.0042 #/#		2,543	Btu/h
Ventilation	0	cfm			4,629	0.0042 #/#		0	Btu/h
People	12	people	0.95	time in space		250	Btu/hr/person	2,850	Btu/h
									17,585 Btu/h

Cooling Load Summary

	Sensible	Latent	Total		
Temperature Dependent Gains	57,913	17,585	75,497		
Temperature Indep. Gains	21,900		21,900	SHR=	0.82
Total	79,813	17,585	97,398		

Building Cooling Load 8.1 Tons at 554 SF/Ton

Building Air Flow to Condition Space based on a 12*F Temp Rise is **6,323 CFM** / **1.41 CFM/sf**

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain	
North Exposure	397	0.07	58	1,599	Btu/h
East Exposure	760	0.07	58	3,061	Btu/h
South Exposure	425	0.07	58	1,712	Btu/h
West Exposure	747	0.07	58	3,007	Btu/h
Fenestration	389	0.60	58	13,537	Btu/h
Roof	5,720	0.06	58	18,431	Btu/h
Doors	109	0.14	58	879	Btu/h
Ceiling	4,500	0.14	0	0	Btu/h
Partition	0	0.05	0	0	Btu/h
Floor	5,720	0.04	50	11,440	Btu/h

Ventilation and Infiltration

			Infiltration Factor		Coef	Temp. Difference	Air Flow	Room Heat Gain	
Walls	2,329	SF	0.10	CFM/SF	1.04	58	233 cfm	14,097	Btu/h
Doors	109	SF	0.20	CFM/LF	1.04	58	17 cfm	1,053	Btu/h
Windows	389	SF	0.35	CFM/LF	1.04	58	130 cfm	7,840	Btu/h
Ventilation Load	0	cfm			1.04	58	0 cfm	0	Btu/h
Total Ventilation & Infiltration Load							380 cfm	22,990	Btu/h

Building Heating Load 76,656 btu/h

17.0 btu/sf

Kearny NJ
CHA #20711
Building: Health Department

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North	3.0	7.0	1	21.0	20.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	21.0	20.0	
East	6.0	7.0	1	42.0	26.0	
	3.0	7.0	1	21.0	20.0	
				0.0	0.0	
			Sub-total	63.0	46.0	
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	**108.5**	**87.0**	LF/SF 0.80

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	40.0	9.0	1	360.0	98.0		All wall quantities must remain equal to 1
	10.0	9.0	1	90.0	38.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	50.0			450.0	136.0	9.0	Average height wall automatically linked to
East	107.0	9.0	1	963.0	232.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	107.0			963.0	232.0	9.0	Average height wall automatically linked to
South	15.0	9.0	1	135.0	48.0		
	35.0	9.0	1	315.0	88.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	50.0			450.0	136.0	9.0	Average height wall automatically linked to
West	37.0	9.0	1	333.0	92.0		
	70.0	9.0	1	630.0	158.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	107.0			963.0	250.0	9.0	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	4.0	4.0	2	32.0	32.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	32.0	32.0
East	4.0	5.0	7	140.0	126.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	140.0	126.0
South	5.0	5.0	1	25.0	20.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	25.0	20.0
West	4.0	5.0	4	80.0	72.0
	4.0	4.0	6	96.0	96.0
	2.0	4.0	2	16.0	24.0
				0.0	0.0
				0.0	0.0
			Sub-total	192.0	192.0
					LF/SF
			Total	**389.0**	**370.0** 0.95

Kearny NJ
CHA #20711
Building: Health Department

ECM-2 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	3	ea	$ 100	$ 50	$ -	$ 294	$ 182	$ -	$ 476	
Pre-program T-stats	3	ea	$ -	$ 50	$ -	$ -	$ 182	$ -	$ 182	per temperature program
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 657		Subtotal
$ 66	10%	Contingency
$ 72	10%	Contractor O&P
$ -	0%	Engineering
$ 795		**Total**

APPENDIX D

ECM-3 Replace Condensing Units

Kearny NJ
CHA #20711
Health Department

ECM-3 Replace Condensing Units

Replace existing condensing units with same size high efficiency units

ASSUMPTIONS			Comments
Electric Cost	$0.189	/ kWh	
Average run hours per Week	40	Hours	manual operations
Space Temperature Setpoint	70	deg F	setpoint
Avg. Rating of existing condensing unit	6	Tons	each
Average EER	9.0		Units appear to be more than 10 years old

Item	Value	Units	Comments
Total Number of Units	3		one is on the roof, other on ground
Existing Annual Electric Usage	2,914	kWh	
Proposed EER	13.0		New unit
Proposed Annual Electric Usage	2,017	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Savings	897	kWh
Annual Cost Savings	$169	

OAT - DB Bin Temp F	Annual Hours	Cooling Hrs at Temp Above balance point	Assumed % of time of operation	Assumed hrs of Operation
102.5	0	0	100%	0
97.5	3	1	85%	1
92.5	34	8	69%	6
87.5	131	31	54%	17
82.5	500	119	38%	46
77.5	620	148	23%	34
72.5	664	158	8%	12
67.5	854	0	0%	0
62.5	927	0	0%	0
57.5	600	0	0%	0
52.5	610	0	0%	0
47.5	611	0	0%	0
42.5	656	0	0%	0
37.5	1,023	0	0%	0
32.5	734	0	0%	0
27.5	334	0	0%	0
22.5	252	0	0%	0
17.5	125	0	0%	0
12.5	47	0	0%	0
7.5	22	0	0%	0
2.5	13	0	0%	0
-2.5	0	0	0%	0
-7.5	0	0	0%	0
Total	8,760	465	25%	115

Kearny NJ
CHA #20711
Health Department

ECM-3 Replace Condensing Units

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Demo ground unit	1	ls		$ 200		$ -	$ 242	$ -	$ 242	
Install new condensing unit (5tcn)	1	ea	$ 1,600	$ 440		$ 1,568	$ 532	$ -	$ 2,100	
Demo ground unit	2	ls		$ 90	$ 350	$ -	$ 218	$ 763	$ 981	
Install new condensing unit (7.5)	2	ea	$ 2,300	$ 440	$ 350	$ 4,508	$ 1,065	$ 763	$ 6,336	
Coils	3	ea	$ 820	$ 220		$ 2,411	$ 799	$ -	$ 3,209	
Piping/insulation	3	ea	$ 350	$ 440		$ 1,029	$ 1,597	$ -	$ 2,626	
Electrical	3	ea	$ 250	$ 220		$ 735	$ 799	$ -	$ 1,534	

Since this is R-22 refrigerant replacement of condensing units will require upgrade to new refrigerant at higher pressure; new coils & piping

$ 17,028	Subtotal		
$ 3,406	20%	Contingency	
$ 3,065	15%	Contractor O&P	
$ -	0%	Engineering	
$ 23,499	**Total**		

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
5 ton condensing unit	5	Ton	$92	$460	$ 2,100	$ 1,640
7.5 ton condensing unit	7.5	Ton	$73	$548	$ 6,336	$ 5,788
				$1,008	$8,436	$7,429

Total ECM Cost w/ Incentives	**$22,491**

APPENDIX E

ECM-4 Install Premium Efficiency Motors

Kearny NJ
CHA #20711
Building: Health Department

ECM-4 Install Premium Efficiency Motors

Demand Cost $/kW-month	Energy Cost $/kWh
$ 14.89	$ 0.13

Multipliers		
Material	Labor	Equipment
0.98	1.21	1.09

Savings Analysis

#	Description	Location	Existing HP	Load Factor	Existing Efficiency[a]	Existing kW	New HP[b]	New Load Factor	New Efficiency[a]	New kW	Demand Savings	Demand Savings $	Annual Hours	kWh Savings	$ kWh Savings	Total $ Savings	Estimated Cost	Payback Years
1	AHU 1 Fan	Attic	1	0.9	0.785	0.9	1	0.9	0.852	0.8	0.067	$ 12	261	18	$ 2	$ 14	$ 460	32.1
2	AHU 2 Fan	Attic	1	0.9	0.785	0.9	1	0.9	0.852	0.8	0.067	$ 12	261	18	$ 2	$ 14	$ 460	32.1
3	AHU 3 Fan	Attic	1	0.9	0.785	0.9	1	0.9	0.852	0.8	0.067	$ 12	261	18	$ 2	$ 14	$ 460	32.1
11																		
12																		
		Total	3			2.6	3			2.4	0.20	$ 36		53	$ 7	$ 43	$ 1,379	

Cost Estimates

#	Description	Unit Costs Materials	Unit Costs Labor	Unit Costs Equipment	Subtotal Costs Materials	Subtotal Costs Labor	Subtotal Costs Equipment	Total Cost	Remarks
1	AHU 1 Fan	$ 284	$ 150	$ -	$ 276	$ 182	$ -	$ 460	
2	AHU 2 Fan	$ 284	$ 150	$ -	$ 276	$ 182	$ -	$ 460	
3	AHU 3 Fan	$ 284	$ 150	$ -	$ 276	$ 182	$ -	$ 460	
11									
12									

Notes

a Existing and new efficiencies should be entered if known. If not known, use provided curve fit based on "DOE Survey Installed Average" and NEMA Premium values, respectively.

b Same as existing HP unless resized to better match load

APPENDIX F

ECM-6 Lighting Replacements

Energy Audit of Kearny, NJ
CHA Project No. 20711 - Health Department Building
ECM-5 Lighting Replacements

0 $0.132 $/kWh
$14.89 $/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
101	OUTSIDE LIGHTS	11	I 40	I40/1	40	0.4	PHOTOCELL	4368	1,922	11	CF 13	CFQ13/1-L	15	0.2	PHOTOCELL	4,368	721	1,201	0.3	$ 207.70	$ 74.25	$0	0.4	0.4
71	OUSTIDE LIGHTS	5	I 60	I60/1	60	0.3	PHOTOCELL	4368	1,310	5	CF 26	CFQ26/1-L	27	0.1	PHOTOCELL	4,368	590	721	0.2	$ 124.62	$ 31.25	$0	0.3	0.3
234	ENTRANCE	1	SP 50 H I 2	H50/2	100	0.1	PHOTOCELL	4368	437	1	SP 50 H I 2	H50/2	100	0.1	PHOTOCELL	4,368	437	-	-	$ -	$ -	$0		
71	ENTRANCE	4	I 60	I60/1	60	0.2	PHOTOCELL	4368	1,048	4	CF 26	CFQ26/1-L	27	0.1	PHOTOCELL	4,368	472	577	0.1	$ 99.69	$ 25.00	$0	0.3	0.3
117	VESTIBULE	2	CF 23	CFS23/1	23	0.0	SW	1560	72	2	CF 23	CFS23/1	23	0.0	SW	1,560	72	-	-	$ -	$ -	$0		
53	ASSEMBLY HALL	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1,560	374	-	-	$ -	$ -	$0		
53	ASSEMBLY HALL	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1,560	374	-	-	$ -	$ -	$0		
X1	ASSEMBLY HALL	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	26	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	26	-	-	$ -	$ -	$0		
101	ASSEMBLY HALL MENS BR	4	I 40	I40/1	40	0.2	SW	1560	250	4	CF 13	CFQ13/1-L	15	0.1	SW	1,560	94	156	0.1	$ 38.46	$ 27.00	$0	0.7	0.7
101	ASSEMBLY HALL WOMENS BR	4	I 40	I40/1	40	0.2	SW	1560	250	4	CF 13	CFQ13/1-L	15	0.1	SW	1,560	94	156	0.1	$ 38.46	$ 27.00	$0	0.7	0.7
53	MAIN HALL	11	T 32 R F 2 (ELE)	F42LL	60	0.7	SW	1560	1,030	11	T 32 R F 2 (ELE)	F42LL	60	0.7	SW	1,560	1,030	-	-	$ -	$ -	$0		
221	MAIN HALL	3	T 55 C F 2	F62SE	122	0.4	SW	1560	571	3	T 55 C F 2	F62SE	122	0.4	SW	1,560	571	-	-	$ -	$ -	$0		
X1	MAIN HALL	5	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	66	5	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8,760	66	-	-	$ -	$ -	$0		
101	MAIN HALL	2	I 40	I40/1	40	0.1	SW	1560	125	2	CF 13	CFQ13/1-L	15	0.0	SW	1,560	47	78	0.1	$ 19.23	$ 13.50	$0	0.7	0.7
53	MAIN HALL SM RM	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	1560	187	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	1,560	187	-	-	$ -	$ -	$0		
101	MAIN HALL MENS BR	4	I 40	I40/1	40	0.2	SW	1300	208	4	CF 13	CFQ13/1-L	15	0.1	SW	1,300	78	130	0.1	$ 35.03	$ 27.00	$0	0.8	0.8
101	MAIN HALL WOMENS BR	4	I 40	I40/1	40	0.2	SW	1300	208	4	CF 13	CFQ13/1-L	15	0.1	SW	1,300	78	130	0.1	$ 35.03	$ 27.00	$0	0.8	0.8
53	NURSES RM	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	281	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1,560	281	-	-	$ -	$ -	$0		
101	NURSES RM	2	I 40	I40/1	40	0.1	SW	1560	125	2	CF 13	CFQ13/1-L	15	0.0	SW	1,560	47	78	0.1	$ 19.23	$ 13.50	$0	0.7	0.7
53	2ND FLOOR FLAG POLE RM	10	T 32 R F 2 (ELE)	F42LL	60	0.6	SW	1560	936	10	T 32 R F 2 (ELE)	F42LL	60	0.0	SW	1,560	936	-	-	$ -	$ -	$0		
53	KITCHEN	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	281	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1,560	281	-	-	$ -	$ -	$0		
53	SOCIAL SERV.	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	281	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1,560	281	-	-	$ -	$ -	$0		
53	SANITARY INSP.	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	281	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1,560	281	-	-	$ -	$ -	$0		
53	BOARD RM	6	T 32 R F 2 (ELE)	F42LL	60	0.4	SW	1560	562	6	T 32 R F 2 (ELE)	F42LL	60	0.4	SW	1,560	562	-	-	$ -	$ -	$0		
53	HEALTH OFFICER	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1,560	374	-	-	$ -	$ -	$0		
53	BUSINESS REC.	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1,560	374	-	-	$ -	$ -	$0		
53	BUSINESS REC.	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1,560	374	-	-	$ -	$ -	$0		
117	LEFT REAR OFFICE	2	CF 23	CFS23/1	23	0.0	SW	1560	72	2	CF 23	CFS23/1	23	0.0	SW	1,560	72	-	-	$ -	$ -	$0		
18	LEFT REAR OFFICE	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1560	349	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1,560	349	-	-	$ -	$ -	$0		
53	UTILITY ROOM	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	500	60	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	500	60	-	-	$ -	$ -	$0		
53	EXAMINATION RM	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	1560	187	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	1,560	187	-	-	$ -	$ -	$0		
18	MULTI PHASE CLINIC	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	1560	1,398	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	1,560	1,398	-	-	$ -	$ -	$0		
16	BASEMENT STORAGE	4	T 34 R F 2 (MAG)	F42EE	72	0.3	SW	500	144	4	T 34 R F 2 (MAG)	F42EE	72	0.3	SW	500	144	-	-	$ -	$ -	$0		
53	BASEMENT BOILER RM	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	500	30	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	500	30	-	-	$ -	$ -	$0		
71	BASEMENT BOILER RM	1	I 60	I60/1	60	0.1	SW	500	30	1	CF 26	CFQ26/1-L	27	0.0	SW	500	14	17	0.0	$ 8.07	$ 6.25	$0	0.8	0.8
101	BASEMENT BOILER RM	1	I 40	I40/1	40	0.0	SW	500	20	1	CF 13	CFQ13/1-L	15	0.0	SW	500	8	13	0.0	$ 6.12	$ 6.75	$0	1.1	1.1
	Total	**137**				**7.8**			**14,617**	**137**			**1,728**	**7**			**11,361**	**3,255**	**1.1**	**$632**	**$279**	**$0**		
																		Demand Savings		**1.1**	**$202**			
																		kWh Savings		**3,255**	**$430**			
																		Total savings			**$632**		**0.4**	**0.4**

APPENDIX G

ECM-7 Install Occupancy Sensors

Energy Audit of Kearny, NJ
CHA Project No. 20711 - Health Department Building 0 $0.132 $/kWh
ECM-6 Install Occupancy Sensors $14.89 $/kW

		EXISTING CONDITIONS								RETROFIT CONDITIONS								COST & SAVINGS ANALYSIS						
	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Standard Fixture Code	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Annual Hours	Annual kWh	Annual kWh Saved	Annual kW Saved	Annual $ Saved	Retrofit Cost	NJ Lighting Incentive	Simple Payback With Out Incentive	Simple Payback
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Number of Fixtures)	Retrofit control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	(Original Annual kWh) - (Retrofit Annual kWh)	(Original Annual kW) - (Retrofit Annual kW)	(kW Saved) * ($/kWh)	Cost for renovations to lighting system		Length of time for renovations cost to be recovered	Length of time for renovations cost to be recovered
101	OUTSIDE LIGHTS	11	I 40	I40/1	40	0.4	PHOTOCELL	4368	1,921.9	11	I 40	I40/1	40	0.4	None	4368	1,921.9	0.0	0.0	$0.00	$0.00	$0.00		
71	OUSTIDE LIGHTS	5	I 60	I60/1	60	0.3	PHOTOCELL	4368	1,310.4	5	I 60	I60/1	60	0.3	None	4368	1,310.4	0.0	0.0	$0.00	$0.00	$0.00		
234	ENTRANCE	1	SP 50 H I 2	H50/2	100	0.1	PHOTOCELL	4368	436.8	1	SP 50 H I 2	H50/2	100	0.1	None	4368	436.8	0.0	0.0	$0.00	$0.00	$0.00		
71	ENTRANCE	4	I 60	I60/1	60	0.2	PHOTOCELL	4368	1,048.3	4	I 60	I60/1	60	0.2	None	4368	1,048.3	0.0	0.0	$0.00	$0.00	$0.00		
117	VESTIBULE	2	CF 23	CFS23/1	23	0.0	SW	1560	71.8	2	CF 23	CFS23/1	23	0.0	None	1560	71.8	0.0	0.0	$0.00	$0.00	$0.00		
53	ASSEMBLY HALL	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374.4	4	T 32 R F 2 (ELE)	F42LL	60	0.2	None	1560	374.4	0.0	0.0	$0.00	$0.00	$0.00		
53	ASSEMBLY HALL	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374.4	4	T 32 R F 2 (ELE)	F42LL	60	0.2	None	1560	374.4	0.0	0.0	$0.00	$0.00	$0.00		
X1	ASSEMBLY HALL	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	26.3	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8760	26.3	0.0	0.0	$0.00	$0.00	$0.00		
101	ASSEMBLY HALL MENS BR	4	I 40	I40/1	40	0.2	SW	1560	249.6	4	I 40	I40/1	40	0.2	None	1560	249.6	0.0	0.0	$0.00	$0.00	$0.00		
101	ASSEMBLY HALL WOMENS BR	4	I 40	I40/1	40	0.2	SW	1560	249.6	4	I 40	I40/1	40	0.2	None	1560	249.6	0.0	0.0	$0.00	$0.00	$0.00		
53	MAIN HALL	11	T 32 R F 2 (ELE)	F42LL	60	0.7	SW	1560	1,029.6	11	T 32 R F 2 (ELE)	F42LL	60	0.7	None	1560	1,029.6	0.0	0.0	$0.00	$0.00	$0.00		
221	MAIN HALL	3	T 55 C F 2	F62SE	122	0.4	SW	1560	571.0	3	T 55 C F 2	F62SE	122	0.4	None	1560	571.0	0.0	0.0	$0.00	$0.00	$0.00		
X1	MAIN HALL	5	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	65.7	5	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8760	65.7	0.0	0.0	$0.00	$0.00	$0.00		
101	MAIN HALL	2	I 40	I40/1	40	0.1	SW	1560	124.8	2	I 40	I40/1	40	0.1	None	1560	124.8	0.0	0.0	$0.00	$0.00	$0.00		
53	MAIN HALL SM RM	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	1560	187.2	2	T 32 R F 2 (ELE)	F42LL	60	0.1	OCC	780	93.6	93.6	0.0	$12.36	$118.75	$20.00	9.6	8.0
101	MAIN HALL MENS BR	4	I 40	I40/1	40	0.2	SW	1300	208.0	4	I 40	I40/1	40	0.2	None	1300	208.0	0.0	0.0	$0.00	$0.00	$0.00		
101	MAIN HALL WOMENS BR	4	I 40	I40/1	40	0.2	SW	1300	208.0	4	I 40	I40/1	40	0.2	None	1300	208.0	0.0	0.0	$0.00	$0.00	$0.00		
53	NURSES RM	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	280.8	3	T 32 R F 2 (ELE)	F42LL	60	0.2	OCC	780	140.4	140.4	0.0	$18.53	$118.75	$20.00	6.4	5.3
101	NURSES RM	2	I 40	I40/1	40	0.1	SW	1560	124.8	2	I 40	I40/1	40	0.1	None	1560	124.8	0.0	0.0	$0.00	$0.00	$0.00		
53	REGESTRAR	10	T 32 R F 2 (ELE)	F42LL	60	0.6	SW	1560	936.0	10	T 32 R F 2 (ELE)	F42LL	60	0.6	OCC	780	468.0	468.0	0.0	$61.75	$118.75	$20.00	1.9	1.6
53	KITCHEN	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	280.8	3	T 32 R F 2 (ELE)	F42LL	60	0.2	OCC	780	140.4	140.4	0.0	$18.53	$118.75	$20.00	6.4	5.3
53	SOCIAL SERV.	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	280.8	3	T 32 R F 2 (ELE)	F42LL	60	0.2	OCC	780	140.4	140.4	0.0	$18.53	$118.75	$20.00	6.4	5.3
53	SANITARY INSP.	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	280.8	3	T 32 R F 2 (ELE)	F42LL	60	0.2	OCC	780	140.4	140.4	0.0	$18.53	$118.75	$20.00	6.4	5.3
53	BOARD RM	6	T 32 R F 2 (ELE)	F42LL	60	0.4	SW	1560	561.6	6	T 32 R F 2 (ELE)	F42LL	60	0.4	OCC	780	280.8	280.8	0.0	$37.07	$118.75	$20.00	3.2	2.7
53	HEALTH OFFICER	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374.4	4	T 32 R F 2 (ELE)	F42LL	60	0.2	OCC	780	187.2	187.2	0.0	$24.71	$118.75	$20.00	4.8	4.0
53	BUSINESS REC.	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374.4	4	T 32 R F 2 (ELE)	F42LL	60	0.2	C-OCC	780	187.2	187.2	0.0	$24.71	$187.50	$35.00	7.6	6.2
53	BUSINESS REC.	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374.4	4	T 32 R F 2 (ELE)	F42LL	60	0.2	C-OCC	780	187.2	187.2	0.0	$24.71	$187.50	$35.00	7.6	6.2
117	LEFT REAR OFFICE	2	CF 23	CFS23/1	23	0.0	SW	1560	71.8	2	CF 23	CFS23/1	23	0.0	OCC	780	35.9	35.9	0.0	$4.74	$118.75	$20.00	25.1	20.9
18	LEFT REAR OFFICE	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1560	349.4	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	780	174.7	174.7	0.0	$23.06	$118.75	$20.00	5.1	4.3
53	UTILITY ROOM	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	500	60.0	2	T 32 R F 2 (ELE)	F42LL	60	0.1	OCC	780	93.6	-33.6	0.0	-$4.44	$118.75	$20.00		
53	EXAMINATION RM	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	1560	187.2	2	T 32 R F 2 (ELE)	F42LL	60	0.1	OCC	780	93.6	93.6	0.0	$12.36	$118.75	$20.00	9.6	8.0
18	MULTI PHASE CLINIC	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	1560	1,397.8	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	OCC	780	698.9	698.9	0.0	$92.25	$118.75	$20.00	1.3	1.1
16	BASEMENT STORAGE	4	T 34 R F 2 (MAG)	F42EE	72	0.3	SW	500	144.0	4	T 34 R F 2 (MAG)	F42EE	72	0.3	None	500	144.0	0.0	0.0	$0.00	$0.00	$0.00		
53	BASEMENT BOILER RM	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	500	30.0	1	T 32 R F 2 (ELE)	F42LL	60	0.1	None	500	30.0	0.0	0.0	$0.00	$0.00	$0.00		
71	BASEMENT BOILER RM	1	I 60	I60/1	60	0.1	SW	500	30.0	1	I 60	I60/1	60	0.1	None	500	30.0	0.0	0.0	$0.00	$0.00	$0.00		
101	BASEMENT BOILER RM	1	I 40	I40/1	40	0.0	SW	500	20.0	1	I 40	I40/1	40	0.0	None	500	20.0	0.0	0.0	$0.00	$0.00	$0.00		
	Total	137				7.8			14,617	137				8			11,682	2,935	0	387	$1,919	330		
																		Demand Savings		0.0	$0			
																		kWh Savings		2,935	$387			
																		Total Savings			$387		5.0	4.1

APPENDIX H

ECM-8 Lighting Replacements with Occupancy Sensors

Energy Audit of Kearny, NJ

CHA Project No. 20711 - Health Department Building 0 $0.132 $/kWh

ECM-7 Lighting Replacements with Occupancy Sensors $14.89 $/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
101	OUTSIDE LIGHTS	11	I 40	I40/1	40	0.4	PHOTOCELL	4368	1,922	11	CF 13	CFQ13/1-L	15	0.2	None	4,368	721	1,201	0.3	$ 207.70	$ 74.25	$ -	0.4	0.4
71	OUSTIDE LIGHTS	5	I 60	I60/1	60	0.3	PHOTOCELL	4368	1,310	5	CF 26	CFQ26/1-L	27	0.1	None	4,368	590	721	0.2	$ 124.62	$ 31.25	$ -	0.3	0.3
234	ENTRANCE	1	SP 50 H I 2	H50/2	100	0.1	PHOTOCELL	4368	437	1	SP 50 H I 2	H50/2	100	0.1	None	4,368	437	-	-	$ -	$ -	$ -		
71	ENTRANCE	4	I 60	I60/1	60	0.2	PHOTOCELL	4368	1,048	4	CF 26	CFQ26/1-L	27	0.1	None	4,368	472	577	0.1	$ 99.69	$ 25.00	$ -	0.3	0.3
117	VESTIBULE	2	CF 23	CFS23/1	23	0.0	SW	1560	72	2	CF 23	CFS23/1	23	0.0	None	1,560	72	-	-	$ -	$ -	$ -		
53	ASSEMBLY HALL	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374	4	T 32 R F 2 (ELE)	F42LL	60	0.2	None	1,560	374	-	-	$ -	$ -	$ -		
53	ASSEMBLY HALL	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374	4	T 32 R F 2 (ELE)	F42LL	60	0.2	None	1,560	374	-	-	$ -	$ -	$ -		
X1	ASSEMBLY HALL	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	26	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8,760	26	-	-	$ -	$ -	$ -		
101	ASSEMBLY HALL MENS BR	4	I 40	I40/1	40	0.2	SW	1560	250	4	CF 13	CFQ13/1-L	15	0.1	None	1,560	94	156	0.1	$ 38.46	$ 27.00	$ -	0.7	0.7
101	ASSEMBLY HALL WOMENS BR	4	I 40	I40/1	40	0.2	SW	1560	250	4	CF 13	CFQ13/1-L	15	0.1	None	1,560	94	156	0.1	$ 38.46	$ 27.00	$ -	0.7	0.7
53	MAIN HALL	11	T 32 R F 2 (ELE)	F42LL	60	0.7	SW	1560	1,030	11	T 32 R F 2 (ELE)	F42LL	60	0.7	None	1,560	1,030	-	-	$ -	$ -	$ -		
221	MAIN HALL	3	T 55 C F 2	F62SE	122	0.4	SW	1560	571	3	T 55 C F 2	F62SE	122	0.4	None	1,560	571	-	-	$ -	$ -	$ -		
X1	MAIN HALL	5	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	66	5	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8,760	66	-	-	$ -	$ -	$ -		
101	MAIN HALL	2	I 40	I40/1	40	0.1	SW	1560	125	2	CF 13	CFQ13/1-L	15	0.0	None	1,560	47	78	0.1	$ 19.23	$ 13.50	$ -	0.7	0.7
53	MAIN HALL SM RM	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	1560	187	2	T 32 R F 2 (ELE)	F42LL	60	0.1	OCC	780	94	94	-	$ 12.36	$ 118.75	$ 20	9.6	8.0
101	MAIN HALL MENS BR	4	I 40	I40/1	40	0.2	SW	1300	208	4	CF 13	CFQ13/1-L	15	0.1	None	1,300	78	130	0.1	$ 35.03	$ 27.00	$ -	0.8	0.8
101	MAIN HALL WOMENS BR	4	I 40	I40/1	40	0.2	SW	1300	208	4	CF 13	CFQ13/1-L	15	0.1	None	1,300	78	130	0.1	$ 35.03	$ 27.00	$ -	0.8	0.8
53	NURSES RM	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	281	3	T 32 R F 2 (ELE)	F42LL	60	0.2	OCC	780	140	140	-	$ 18.53	$ 118.75	$ 20	6.4	5.3
101	NURSES RM	2	I 40	I40/1	40	0.1	SW	1560	125	2	CF 13	CFQ13/1-L	15	0.0	None	1,560	47	78	0.1	$ 19.23	$ 13.50	$ -	0.7	0.7
53	REGESTRAR	10	T 32 R F 2 (ELE)	F42LL	60	0.6	SW	1560	936	10	T 32 R F 2 (ELE)	F42LL	60	0.6	OCC	780	468	468	-	$ 61.78	$ 118.75	$ 20	1.9	1.6
53	KITCHEN	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	281	3	T 32 R F 2 (ELE)	F42LL	60	0.2	OCC	780	140	140	-	$ 18.53	$ 118.75	$ 20	6.4	5.3
53	SOCIAL SERV.	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	281	3	T 32 R F 2 (ELE)	F42LL	60	0.2	OCC	780	140	140	-	$ 18.53	$ 118.75	$ 20	6.4	5.3
53	SANITARY INSP.	3	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	281	3	T 32 R F 2 (ELE)	F42LL	60	0.2	OCC	780	140	140	-	$ 18.53	$ 118.75	$ 20	6.4	5.3
53	BOARD RM	6	T 32 R F 2 (ELE)	F42LL	60	0.4	SW	1560	562	6	T 32 R F 2 (ELE)	F42LL	60	0.4	OCC	780	281	281	-	$ 37.07	$ 118.75	$ 20	3.2	2.7
53	HEALTH OFFICER	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374	4	T 32 R F 2 (ELE)	F42LL	60	0.2	OCC	780	187	187	-	$ 24.71	$ 118.75	$ 20	4.8	4.0
53	BUSINESS REC.	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374	4	T 32 R F 2 (ELE)	F42LL	60	0.2	C-OCC	780	187	187	-	$ 24.71	$ 187.50	$ 35	7.6	6.2
53	BUSINESS REC.	4	T 32 R F 2 (ELE)	F42LL	60	0.2	SW	1560	374	4	T 32 R F 2 (ELE)	F42LL	60	0.2	C-OCC	780	187	187	-	$ 24.71	$ 187.50	$ 35	7.6	6.2
117	LEFT REAR OFFICE	2	CF 23	CFS23/1	23	0.0	SW	1560	72	2	CF 23	CFS23/1	23	0.0	OCC	780	36	36	-	$ 4.74	$ 118.75	$ 20	25.1	20.9
18	LEFT REAR OFFICE	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	1560	349	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	780	175	175	-	$ 23.06	$ 118.75	$ 20	5.1	4.3
53	UTILITY ROOM	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	500	60	2	T 32 R F 2 (ELE)	F42LL	60	0.1	OCC	780	94	(34)	-	$ (4.44)	$ 118.75	$ 20		
53	EXAMINATION RM	2	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	1560	187	2	T 32 R F 2 (ELE)	F42LL	60	0.1	OCC	780	94	94	-	$ 12.36	$ 118.75	$ 20	9.6	8.0
18	MULTI PHASE CLINIC	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	SW	1560	1,398	8	T 32 R F 4 (ELE)	F44ILL	112	0.9	OCC	780	699	699	-	$ 92.25	$ 118.75	$ 20	1.3	1.1
16	BASEMENT STORAGE	4	T 34 R F 2 (MAG)	F42EE	72	0.3	SW	500	144	4	T 34 R F 2 (MAG)	F42EE	72	0.3	None	500	144	-	-	$ -	$ -	$ -		
53	BASEMENT BOILER RM	1	T 32 R F 2 (ELE)	F42LL	60	0.1	SW	500	30	1	T 32 R F 2 (ELE)	F42LL	60	0.1	None	500	30	-	-	$ -	$ -	$ -		
71	BASEMENT BOILER RM	1	I 60	I60/1	60	0.1	SW	500	30	1	CF 26	CFQ26/1-L	27	0.0	None	500	14	17	0.0	$ 8.07	$ 6.25	$ -	0.8	0.8
101	BASEMENT BOILER RM	1	I 40	I40/1	40	0.0	SW	500	20	1	CF 13	CFQ13/1-L	15	0.0	None	500	8	13	0.0	$ 6.12	$ 6.75	$ -	1.1	1.1
	Total	137				7.8			14,617	137				6.7			8,426		1.1	1,019	2,197	330		
																		Demand Savings		1.1	$202			
																		kWh Savings		6,191	$817			
																		Total Savings			$1,019		2.2	1.8

APPENDIX I

New Jersey Pay For Performance Incentive Program

Kearny NJ
CHA #20711
Building: Health Department

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)	52,840	2,700
Proposed Savings	6,240	950
Existing Total MMBtus	450	
Proposed Savings MMBtus	116	
% Reduction	25.8%	
Proposed Annual Savings	$2,440	

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

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

	Incentives $		
	Elec	Gas	Total
Incentive #2	$1,373	$2,090	$3,463
Incentive #3	$874	$1,330	$2,204
Totals	**$2,246**	**$3,420**	**$5,666**

Total Project Cost	$28,200
% Incentives of Project Cost*	20.1%
Project Cost w/ Incentives*	$22,534

Project Payback (years)	
w/o Incentives	w/ Incentives
11.6	9.2

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

APPENDIX J

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:	19.0 ¢/kWh

Results

Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	1242	235.36
2	4.05	1341	254.12
3	4.58	1627	308.32
4	4.84	1590	301.31
5	5.30	1751	331.81
6	5.33	1652	313.05
7	5.27	1668	316.09
8	5.25	1651	312.86
9	5.06	1601	303.39
10	4.46	1508	285.77
11	3.15	1076	203.90
12	2.87	1038	196.70
Year	4.46	17745	3362.68

Output Hourly Performance Data *

About the Hourly Performance Data

Output Results as Text

Saving Text from a Browser

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

Please send questions and comments regarding PVWATTS to Webmaster

Disclaimer and copyright notice

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
Health Department

Cost of Electricity $0.190 $/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**	**$3,400**	**0**	**$3,400**	**$15,000**	**$8,600**	**44.1**	**11.3**

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

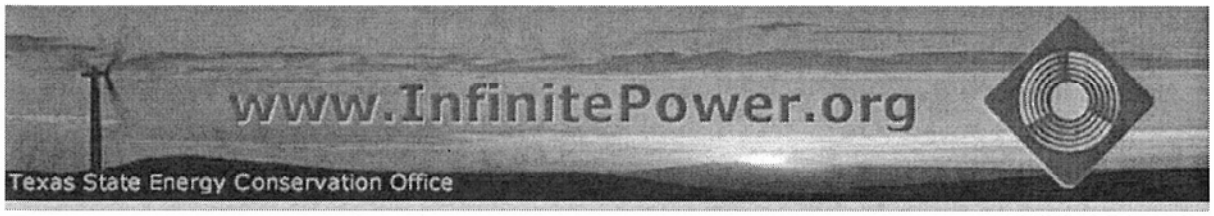
** Estimated Solar Renewable Energy Certificate Program (SREC) SREC for 15 Years= $487/1000kwh

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 K

Solar Thermal Domestic Hot Water Plant



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Interactive Energy Calculators

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

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

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)	50
? Capacity (gallons)	40	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	17.79	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	30
Energy Use			
718.4		? 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
898 BTU/hr	? Power Into Water Heater	733.1 BTU/hr
Cost		
$ 1.498 /Therm	? Utility Rates	$ 0.1895 /kWh
$ 117.839	? Yearly Water Heating Cost	$ 356.417
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
328.532 years for gas	? Payback Time for Solar System	108.620 years for electric

NJBPU Energy Audits
CHA # 20711
Township of Kearny
Health Department

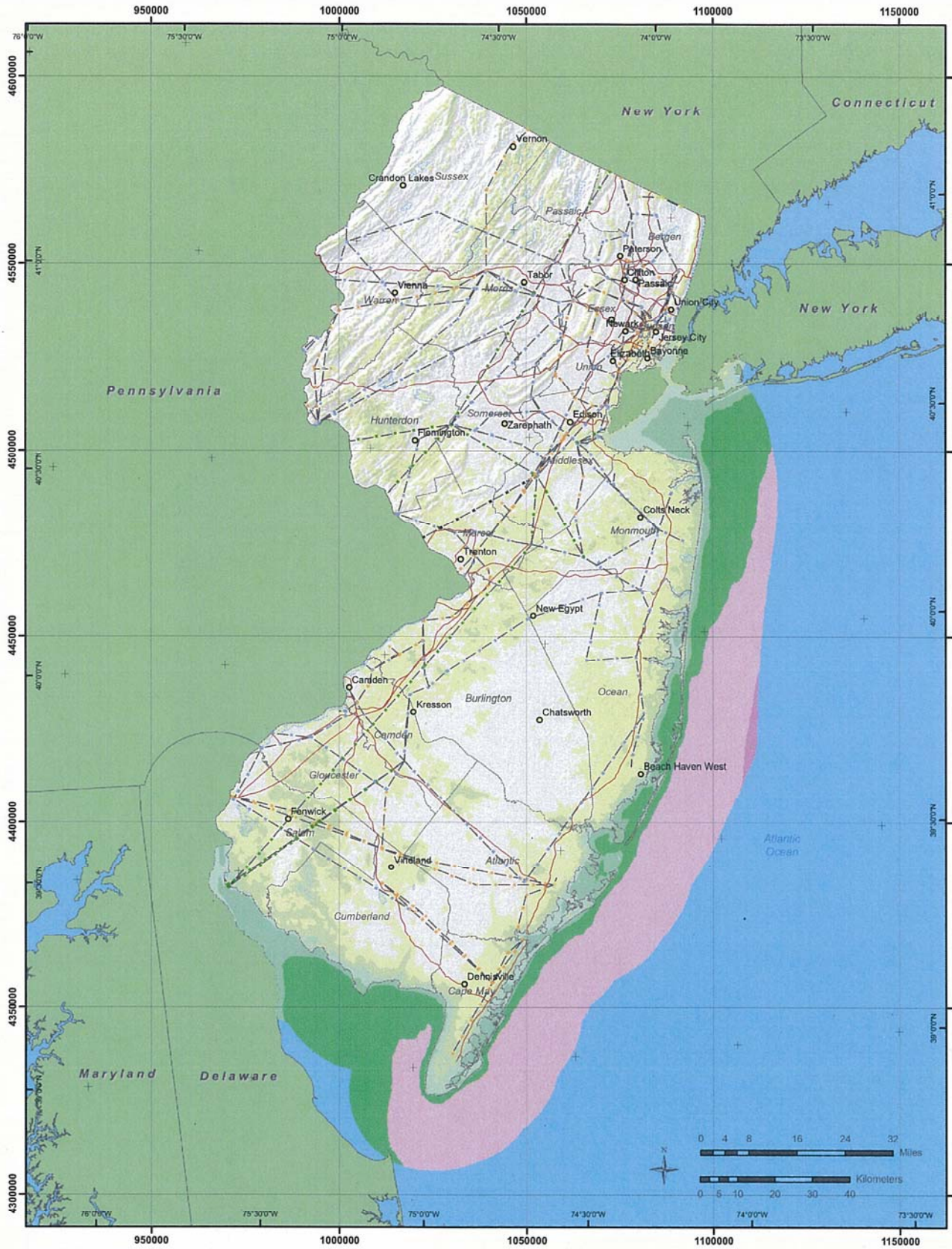
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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 L

Wind



Wind Resource of New Jersey

Mean Annual Wind Speed at 30 Meters

Features
- City
- Interstate Highway
- County Boundary
- Water Body

Generalized Transmission Line

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

Mean Speed at 30 m		
mph	m/s	
< 10.1	< 4.5	
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.

Bing Maps

645 Kearny Ave, Kearny, NJ 07032-2905

My Notes

APPENDIX M

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Health Department

Building ID: 2240800
For 12-month Period Ending: December 31, 2008[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: March 17, 2010

Facility
Health Department
645 Kearny Avenue
Kearny, NJ 07032

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

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

Year Built: 1967
Gross Floor Area (ft²): 4,500

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	180,290
Natural Gas (kBtu)[4]	270,300
Total Energy (kBtu)	450,590
Energy Intensity[5]	
Site (kBtu/ft²/yr)	100
Source (kBtu/ft²/yr)	197
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	42
Electric Distribution Utility	
Public Service Elec & Gas Co	
National Average Comparison	
National Average Site EUI	59
National Average Source EUI	134
% Difference from National Average Source EUI	47%
Building Type	Medical 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.

Certifying Professional
N/A

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

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

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	Health Department	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Medical Office	Is this an accurate description of the space in question?		☐
Location	645 Kearny Avenue, Kearny, NJ 07032	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		☐
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		☐
Health Department (Medical Office)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	4,500 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Number of Workers	8	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.		☐
Weekly operating hours	45 Hours	Is this the total number of hours per week that the Medical 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.		☐
Percent Cooled	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	100 %	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

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

Fuel Type: Electricity

Meter: PSE&G Electricity (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	2,000.00
11/01/2008	11/30/2008	3,560.00
10/01/2008	10/31/2008	3,560.00
09/01/2008	09/30/2008	11,720.00
08/01/2008	08/31/2008	6,320.00
07/01/2008	07/31/2008	7,080.00
06/01/2008	06/30/2008	5,400.00
05/01/2008	05/31/2008	3,440.00
04/01/2008	04/30/2008	2,400.00
03/01/2008	03/31/2008	2,360.00
02/01/2008	02/29/2008	2,600.00
01/01/2008	01/31/2008	2,400.00
PSE&G Electricity Consumption (kWh (thousand Watt-hours))		**52,840.00**
PSE&G Electricity Consumption (kBtu (thousand Btu))		**180,290.08**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**180,290.08**
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	500.00
11/01/2008	11/30/2008	367.00
10/01/2008	10/31/2008	129.00
09/01/2008	09/30/2008	75.00
08/01/2008	08/31/2008	65.00
07/01/2008	07/31/2008	56.00
06/01/2008	06/30/2008	64.00
05/01/2008	05/31/2008	101.00
04/01/2008	04/30/2008	150.00
03/01/2008	03/31/2008	454.00

02/01/2008	02/29/2008	338.00
01/01/2008	01/31/2008	404.00
PSE&G Natural Gas Consumption (therms)		**2,703.00**
PSE&G Natural Gas Consumption (kBtu (thousand Btu))		**270,300.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**270,300.00**
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
Health Department
645 Kearny Avenue
Kearny, NJ 07032

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

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

General Information

Health Department	
Gross Floor Area Excluding Parking: (ft^2)	4,500
Year Built	1967
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Health Department	
Space Type	Medical Office
Gross Floor Area(ft^2)	4,500
Number of Workers	8
Weekly operating hours	45
Percent Cooled	100
Percent Heated	100

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)	100	100	52	N/A	59
Source (kBtu/ft2)	197	197	102	N/A	134
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	42	42	22	N/A	25
$kgCO_2e/ft^2$/year	9	9	5	N/A	5

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

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

APPENDIX N

Equipment Inventory

New Jersey BPU Energy Audit Program
CHA #20711
Kearny
Department of Health

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Areas Served	Date Installed	Useable Life Expectancy (years)
Boiler	Peerless	75-8-W, Serial 75-2492	Gas fired, hot water	Input 525 MBH, output 420 MBH, set at 180F	Basement	Entire building	1967	-12
Air handler	Carrier	39BA050A12, Serial 67501852	Hot water heating, electric cooling	1Hp, 1740 cfm	Attic	East side	1967	-22
Air handler	Carrier	39BA050A12, Serial 67501851	Hot water heating, electric cooling	1Hp, 1740 cfm	Attic	West side	1967	-22
Air handler	Carrier	39BA060A12, Serial 67501870	Hot water heating, electric cooling	2Hp,	Attic	Meeting room	1967	-22
DHWH	AC Smith	PGXL40 246, Serial M000-0023939-246	Gas fired, hot water	40 gallon, Input 40,000btu/hr	Basement	Entire building	1996	7
Condensing unit	Carrier	38GF005410, Serial 7309523	Electric condensing unit	5 ton, 208, 3ph,60Hz	Outside	Meeting room	1967	-22
Condensing unit	Carrier	38BA0080400, Serial 7302078	Electric condensing unit	EER 9, 7.5 ton, 208, 3ph,60Hz	Outside	East side	1967	-22
Condensing unit	Carrier	38BA0080400, Serial 7302086	Electric condensing unit	EER9, 7.5 ton, 208, 3ph,60Hz	Outside	West side	1967	-22
Unit heater	Carrier	46UA034100, Serial 7282283	Hot water unit heater	115 V, 1 ph, 60 Hz	Storage space	Storage space	1967	-22