

**TOWNSHIP OF KEARNY
DEPARTMENT OF PUBLIC WORKS
ENERGY ASSESSMENT**

for

**NEW JERSEY
BUREAU OF PUBLIC UTILITIES**

CHA PROJECT NO. 20711

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1.0 INTRODUCTION & BACKGROUND

This report summarizes the energy audit for the Kearny, NJ Department of Public Works (DPW) facility. The fenced-in DPW facility consists of two buildings, parking area, and gasoline and natural gas refueling stations. The buildings total approximately 17,400 square feet. The main building houses offices and garages. The garage building is used as a garage and repair shop.

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 Department of Public Works (DPW) facility in Kearny, NJ, consisting of two buildings, parking area, and gasoline and natural gas refueling stations. The buildings total approximately 17,400 square feet. The following areas were evaluated for energy conservation measures:

- Night setback
- Infrared garage heaters
- Domestic hot water heater
- Lighting replacements with occupancy sensors
- Insulation upgrades
- Window AC upgrade

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 \$11,000 for the recommended ECMs may be realized with a payback of 5.5 years.

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

ECM –1 Night Setback Office

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
300	0	340	240	400	19.0	NA	0.8	NA

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

ECM –1A Night Setback Garage

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
1,200	0	0	480	700	7.8	NA	1.7	NA

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

ECM-2 Install Infrared Garage Heaters – Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
9,600	(0.4)	(550)	990	1,300	1.4	NA	7.4	NA

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

ECM-2A Install Infrared Garage Heaters – Shop

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
14,600	(0.3)	(430)	1,360	1,900	1.3	NA	7.7	NA

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

ECM-3 Replace Domestic Hot Water Heater – Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
5,600	4.5	4,830	(130)	1,000	2.2	300	5.6	5.3

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

ECM-7 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
33,900	11.7	31,890	0	5,400	1.4	5,600	6.3	5.2

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

ECM-8 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
1,200	0.0	2,410	0	300	2.8	200	4.0	3.3

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

3.0 EXISTING CONDITIONS

3.1 Building General

3.1.1 Structure

The Kearny DPW facility consists of two buildings; a main building and a garage building. The main building houses offices and garages. The garage building is used as a garage and as a repair shop.

The main building is about 11 years' old. Within the building, slightly less than 20% of the total area is two stories and occupied by offices, restrooms, and a locker room. The offices are located on the first floor and the locker room is on the second floor directly above the offices. The remaining larger section of the building is a four bay garage. The building is constructed of a metal frame that is erected on a slab on grade concrete. The exterior walls are constructed of 12" CMU to about four feet high followed with metal siding backed up with insulation.

The offices and locker room have windows with double pane glass and metal frames. The entrance doors and the garage doors are insulated. The roof is flat installed on a metal frame and is insulated.

The garage building is an older structure consisting of a four bay garage, restroom, and interior supervisor office. The exterior walls are constructed of 12" CMU. The building has no windows, and the doors are insulated. The roof is constructed of plywood sheathing, felt paper, and asphalt shingles; and is not insulated.

3.1.2 Occupancy and Operating Hours

Both DPW buildings are occupied by about 40-45 total staff and are open for about nine hours, five days per week. The garage building is open from 7:00 AM- 4:00 PM and the main building is open from 8:00 AM – 5:00 PM. The buildings may be open after hours for emergencies.

3.2 Utility Usage

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

Electricity and natural gas are purchased from the Public Service Electric and Gas Company (PSE&G). For 2008, the buildings consumed a total of 112,000 kWh of electricity at an annual cost of about \$18,800. The annual natural gas usage for the garage building was about 6,330 therms at a cost of \$9,300. Natural gas bills for the main building were only available for a period of several months; however, available data was extrapolated over a year period and it was estimated at about 4,600 therms and a cost of \$6,800.

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

Electricity had an average blended rate of \$0.16 per kWh, with higher consumption during the summer cooling months. The majority of natural gas is used for building heat, primarily November through April. The average blended rate for natural gas was \$1.46 per therm.

Utility data is provided in Appendix A.

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

3.3 HVAC Systems

The main building's offices on the first floor and the locker area on the second floor are heated and cooled by individual packaged air handlers. Both York air handlers are mounted on the ground next to the building. The air handlers are gas fired heating and electric cooling units. The garage areas are heated with Renzor gas fired unit heaters. There is no cooling in the garage section.

The garage/repair shop building is heated with gas fired unit heaters. The supervisor's office is heated with an electric unit heater and cooled with a single window AC unit.

3.4 Lighting/Electrical Systems

The lighting system within the building is manually controlled by individual switches in the spaces and used based on occupancy. Most of the lighting within the office area of the main building and garage/repair shop is fluorescent using newer F32T8 32 watt lamps. Older fluorescent fixtures using F34T12 34 watt lamps are still used in the main building garage as well as the garage storage room. The main light source in the main DPW garage is provided by about 16-400 watt metal halide high bay fixtures. The garage/repair shop is lit by about (40) 8' fluorescent fixtures that utilize four F96T12 96 watt lamps each. The exit signs within the building have all been upgraded to LED technology.

Exterior lighting consists of a mixture of metal halide and incandescent fixtures controlled by timers.

3.5 Control Systems

Each air handler and unit heater is controlled by a dedicated thermostat, which is nonprogrammable. The occupants have the ability to adjust or disable HVAC equipment at their discretion. Current temperature setpoints are as follows:

Main Building Office: 70°F Heating; 74°F Cooling (no setback)

Main Building Garage: 65°F Heating (no setback)

Shop Building: 68°F Heating (manual setback to 62°F)

3.6 Domestic Hot Water Systems

Hot water for the main building is produced by an electric 50 gallon capacity, 4.5kW rated Rheem unit, and for the garage building by a natural gas-fired 40 gallon capacity A.O. Smith unit rated at 40,000 Btu/hr.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM- 1 & 1A Night Setback – Main Building

The existing thermostats in the office space and garage of the main DPW building are nonprogrammable and cannot be adjusted for unoccupied times. Night setback, therefore, is not performed and constant temperature is maintained for occupied and unoccupied periods. Significant energy is expended maintaining the unoccupied space temperatures at 70°F during heating and 74°F during cooling in the office; and 70°F during heating in the garage. Applying night setback in the main building will result in heating and cooling savings for the office space, and heating savings for the garage. This ECM proposes that the office be setback to 60°F during heating and 80°F during cooling; and the garage be setback to 60°F during heating. To implement this energy conservation measure, the existing thermostats should be replaced with programmable units and preprogrammed for unoccupied times.

In order to project savings for this measure, a base case building model was created that calculated heating and cooling energy consumptions under existing conditions taking into consideration outside weather, building envelope, occupancy, and operating hours. The base case model was reconciled to the average annual energy usage of utilities. To determine proposed energy consumption, the same model was used with different setpoints of temperatures for unoccupied operating hours. The temperatures for the unoccupied hours would be allowed to drift down in the winter and up in the summer. The difference in usage between the base case and proposed model is the energy saving.

Programmable thermostats have an expected life of 15 years, according to ASHRAE, and an energy savings over the life of the project are estimated at 5,100 kWh and 3,600 therms, totaling \$6,000, for the office area; and 7,200 therms, totaling \$10,500, for the garage area.

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

ECM –1 Night Setback - Office

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
300	0	340	240	400	19.0	NA	0.8	NA

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

ECM –1A Night Setback - Garage

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
1,200	0	0	480	700	7.8	NA	1.7	NA

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

This measure is recommended.

4.2 ECM-2 & 2A Install Infrared Garage Heating

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

For calculation purposes, a block load calculation was developed. It was determined that the existing garage area in the main building requires approximately 3,930 therms, and in the garage building 6,100 therms of energy. The proposed infrared heaters have an improved burner efficiency of 85% and transfer heat more effectively. Repeating the energy consumption calculation with the proposed values and calculating difference in energy consumptions between the existing and proposed models result with an annual natural gas savings of about 990 therms in the main building and 1,360 in the shop building.

Infrared heaters have a slightly higher electrical demand than the existing unit heaters; therefore, there will be a minor negative impact on electrical consumption. The change in electricity requirements were calculated by applying the annual heating operating hours from the bin data spreadsheet to the kW load of the existing unit heaters, and then the proposed infrared heaters. It was found that there will be about a 980 kWh per year increase in electrical consumption between the two buildings.

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

Infrared heaters have an expected life of 18 years, according to ASHRAE, and an energy savings over the life of the project are estimated at (9,900) kWh and 17,820 therms, totaling \$23,400, for the main building; and (7,790) kWh and 24,430 therms, totaling \$34,200, for the shop building.

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

ECM-2 Install Infrared Garage Heaters – Main

Budgetary Cost	Annual Utility Savings			ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas				
\$	kW	kWh	Therms	\$	\$	Years	Years
9,600	(0.4)	(550)	990	1,300	1.4	NA	7.4

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

ECM-2A Install Infrared Garage Heaters – Shop

Budgetary Cost	Annual Utility Savings			ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas				
\$	kW	kWh	Therms	\$	\$	Years	Years
14,600	(0.3)	(430)	1,360	1,900	1.3	NA	7.7

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

This measure is recommended.

4.3 ECM-3 Replace Domestic Hot Water Heater – Main

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

To calculate the savings for this measure, electricity consumption by the heater was estimated based on rating and operating hours. The consumption of electricity was converted to thermal units. The standby losses were then calculated for the hot water storage tank, and the annual energy required to meet the hot water demand was determined. This value was then applied to the proposed water heater efficiency of 92% to determine the projected annual energy consumption.

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

On demand hot water heaters have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 86,940 kWh and (2,340) therms, totaling \$18,000.

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

ECM-3 Replace Domestic Hot Water Heater – Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
5,600	4.5	4,830	(130)	1,000	2.2	300	5.6	5.3

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

This measure is recommended.

4.4 ECM-4 Increase Roof Insulation – Shop

The roof of the garage/repair shop building is not insulated, and heat loss significantly increases energy consumption of a building.

Heat conduction through the roof is a function of the resistance to heat flow and the difference between the indoor and outdoor temperature. The amount of heat conduction through the roof is proportional to its overall heat transfer coefficient and the temperature difference between the conditioned space and its surroundings. Adding thermal insulation increases the structural resistance to sensible heat transfer and, consequently, lowers the space-heating load. This ECM proposes to install 3" expanded polystyrene rigid board insulation (R-12) to the underside of the roof.

It has been calculated that the building will save about 740 therms of natural gas.

Insulation has an expected life of 24 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 17,860 therms, totaling \$26,400.

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

ECM – 4 Increase Roof Insulation – Shop

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
12,300	0	0	740	1,100	1.2	NA	11.2	NA

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

This measure is not recommended.

4.5 ECM-5 Increase Wall Insulation – Shop

The existing building walls are not insulated, resulting in significant heat loss. This measure assessed increasing insulation for the building by installing additional 1½” thick polyisocyanurate rigid board insulation to the inside of the walls.

To determine the heat losses, a base case block load was developed that calculated losses for all temperatures, according to bin weather data. The amount of heat conduction through walls is proportional to overall heat transfer coefficient, surface area, and the temperature difference between the space and surroundings. The base case takes the amount of heat loss through the walls and applies it to the annual hours.

The same process was utilized when modeling the proposed conditions with the exception that the heat transfer coefficient was adjusted to reflect added insulation. The difference in heat loss between the base case and the model is the energy savings.

Insulation is estimated to save 420 therms of natural gas annually.

Insulation has an expected life of 24 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 10,110 therms, totaling \$14,400.

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

ECM-5 Increase Wall Insulation – Shop

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
7,300	0	0	420	600	1.0	NA	12.2	NA

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

This measure is not recommended.

4.6 ECM-6 Replace Window AC Unit – Shop

The supervisor's office in the shop building uses a window air conditioner. This ECM evaluated replacement of the window unit with a ductless split system air conditioner. The office would have a fan unit installed in place of the window AC unit and the condenser unit would be installed outdoors.

The proposed ductless split system would have a higher efficiency rating than the existing window ACs. The energy savings are the difference in efficiency rating between existing window units and ductless systems; however, the low annual usage of the equipment unfavorably increases the payback period.

Split system AC units have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 6,080 kWh, totaling \$1,500.

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

ECM-6 Replace Window AC Unit – Shop

Budgetary Cost	Annual Utility Savings			ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas				
\$	kW	kWh	Therms	\$	\$	Years	Years
3,500	0	410	0	100	(0.6)	NA	NA

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

This measure is not recommended.

4.7 ECM-7 Lighting Replacements

The DPW main building contains approximately 12 fluorescent fixtures with inefficient T-12 lamps. Each fixture is equipped with either two or four - 4' F34T12 34 watt lamps. The garage area of the DPW main building is primarily lit by about (16) 400 watt high bay metal halide bulbs. The repair shop contains more than 40 fluorescent fixtures with two or four F96T12 96 watt lamps. The exterior lights within the DPW complex are primarily 400 watt metal halide wall pack fixtures. Overall energy consumption can be reduced by retrofitting the F34T12 fixtures to accommodate F32T8 lamps and electronic ballasts, and replacing the four lamp F96T12 fixtures with high bay T5 fixtures in the garage areas, which have 16' and 18' high ceilings.

The 400 watt high bay fixtures in the main garage can be replaced with 250 watt induction high bay fixtures, and the 400 watt metal halide wall pack fixtures can be replaced with two 100 watt induction fixtures. Induction lighting is a fairly new technology, and an induction lighting specialist should be consulted for the design.

To compute the annual savings for this ECM, the energy consumption of the lighting fixtures was established, and it was determined to be 91,922 kWh per year. To calculate the annual energy consumption utilizing replacement lamps and 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 H.

Existing lamps and ballasts of each F34T12 fixture would be replaced with electronic ballasts and T-8 fluorescent lamps; the quantity varies based on application. The four lamp F96T12 fixtures would be replaced with high bay T5 fixtures. The metal halide fixtures located throughout the complex would also be replaced with induction fixtures. This ECM will provide annual savings of 31,890 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 478,350 kWh and \$81,000.

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

ECM-7 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
33,900	11.7	31,890	0	5,400	1.4	5,600	6.3	5.2

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

This measure is recommended.

4.8 ECM-8 Install Occupancy Sensors

Lighting fixtures are manually switched on and off, and are operational with occupancy. The operating time of many of the interior lighting fixtures can be reduced by installing occupancy sensors in spaces such as locker rooms, restrooms and offices. Occupancy sensors were not considered for many areas because of safety concerns or low use.

Applying the same process used in the calculation of ECM-7, 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 2,410 kWh.

Approximately seven occupancy sensors and some standard electrical work are required to implement this measure in the spaces discussed above.

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 36,150 kWh, and \$4,500.

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

ECM-8 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
1,200	0.0	2,410	0	300	2.8	200	4.0	3.3

* 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 DPW is eligible for several incentives available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about \$6,100 towards a tankless water heater and upgrades to the lighting system.

When calculating the total incentive for the New Jersey Pay For Performance program, all energy conservation measures are applicable as the amount received is based on building wide energy improvements. Since the overall energy reduction for the two buildings is estimated to exceed the 15% minimum, the facility is eligible for Incentives #2 and #3 as previously discussed. This would result in a total incentive of about \$28,800, reducing the total project payback from 7.0 years to 4.7 years. See Appendix J for calculations.

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

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

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

The main building uses gas fired packaged air handling units with DX cooling, and both buildings utilize gas fired unit heaters in their garages. This existing equipment is not compatible with a geothermal energy source. Therefore, to take advantage of a GHP system, the existing mechanical equipment would have to be completely removed and a low temperature closed loop water source heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

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

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The DPW 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 K.

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

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero

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

In 2008, the DPW buildings had a maximum electricity demand of 44.0 kW and a minimum of 34.4 kW. The monthly average over the observed 12 month period was 38.1 kW. The existing load does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array; therefore, for calculations a 35 kW system size was selected. The system costs for PV installations were derived from the most recent NYSEDA (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 K and summarized below:

Photovoltaic (PV) Rooftop Solar Power Generation – 35 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	
350,000	0	41,410	0	6,900	6,900	35,000	20,200	>25	11.6

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 an electric water heater in the main building, and a natural gas fired water heater in the shop building; therefore, this measure would offer both site natural gas and electric savings.

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

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

Solar Thermal Domestic Hot Water Plant – Main Building

Budgetary Cost	Annual Utility Savings			Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas				
\$	kW	kWh	Therms	\$	\$	Years	Years
27,100	0	3,760	0	600	NA	>25	NA

Solar Thermal Domestic Hot Water Plant – Shop Building

Budgetary Cost	Annual Utility Savings			Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas				
\$	kW	kWh	Therms	\$	\$	Years	Years
27,100	0	0	130	200	NA	>25	NA

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

This measure is not recommended.

6.3 Wind

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

To avoid turbulence and capture greater wind energy, turbines are mounted on towers. Turbines should be mounted at least 30 feet above any structure or natural feature within 300 feet of the installation. Smaller

turbines can utilize shorter towers. For example, a 250-watt turbine may be mounted on a 30-50 foot tower, while a 10 kW turbine will usually need a tower of 80-120 feet. Tower designs include tubular or latticed, guyed or self-supporting. Wind turbine manufacturers also provide towers.

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

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

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

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

6.4 Combined Heat and Power Generation (CHP)

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

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

This measure is not recommended.

6.5 Biomass Power Generation

Biomass power generation is a process in which waste organic materials are used to produce electricity or thermal energy. These materials would otherwise be sent to the landfill or expelled to the atmosphere. To

participate in NJCEP's Customer On-Site Renewable Energy program, participants must install an on-site sustainable biomass or fuel cell energy generation system. Incentives for bio-power installations are available to support up to 1MW-dc of rated capacity.

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

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

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

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

* from NJOCE Website

This measure is not recommended because of noise issues, potential zoning issues and high initial equipment costs.

6.5 Demand Response Curtailment

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

Utility Curtailment is an agreement with the PSE&G regional transmission organization and an approved Curtailment Service Provider (CSP) to shed electrical load by either turning major equipment off or energizing all or part of a facility utilizing an emergency generator; therefore, reducing the electrical demand on the utility grid. This program is to benefit the utility company during high demand periods and 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. In 2008, the DPW buildings had a monthly average electricity demand of 38.1 kW and a maximum demand of 44.0 kW.

This measure is not recommended because neither building at the facility has an adequate load to meet the required minimum load reduction.

7.0 EPA PORTFOLIO MANAGER

The Environmental 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 DPW facility is considered a low energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 85 kBTU/ft²/year. The EUI can still be improved upon by addressing wasted energy from a lack of insulation, excessive heating during unoccupied times, an electric water heater, inefficient lighting systems, etc. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 54 kBTU/ft²/year; the national average for this building type is 104 kBTU/ft²/year. The EPA Portfolio Manager did not generate an energy rating score for this building because the building type (Other) is not eligible for an energy star rating.

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

The user name and password for the DPW'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 Department of Public Works, in Kearny, New Jersey identified potential ECMs for lighting upgrades with occupancy sensors, night setback, infrared garage heaters, and domestic hot water heater replacement. Potential annual savings of \$11,000 may be realized for the recommended ECMs, with a summary of the cost, savings, and payback as follows:

ECM –1 Night Setback Office

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
300	0	340	240	400	19.0	NA	0.8	NA

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

ECM –1A Night Setback Garage

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
1,200	0	0	480	700	7.8	NA	1.7	NA

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

ECM-2 Install Infrared Garage Heaters – Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
9,600	(0.4)	(550)	990	1,300	1.4	NA	7.4	NA

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

ECM-2A Install Infrared Garage Heaters – Shop

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
14,600	(0.3)	(430)	1,360	1,900	1.3	NA	7.7	NA

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

ECM-3 Replace Domestic Hot Water Heater – Main

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
5,600	4.5	4,830	(130)	1,000	2.2	300	5.6	5.3

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

ECM-7 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
33,900	11.7	31,890	0	5,400	1.4	5,600	6.3	5.2

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

ECM-8 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
1,200	0.0	2,410	0	300	2.8	200	4.0	3.3

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

APPENDIX A

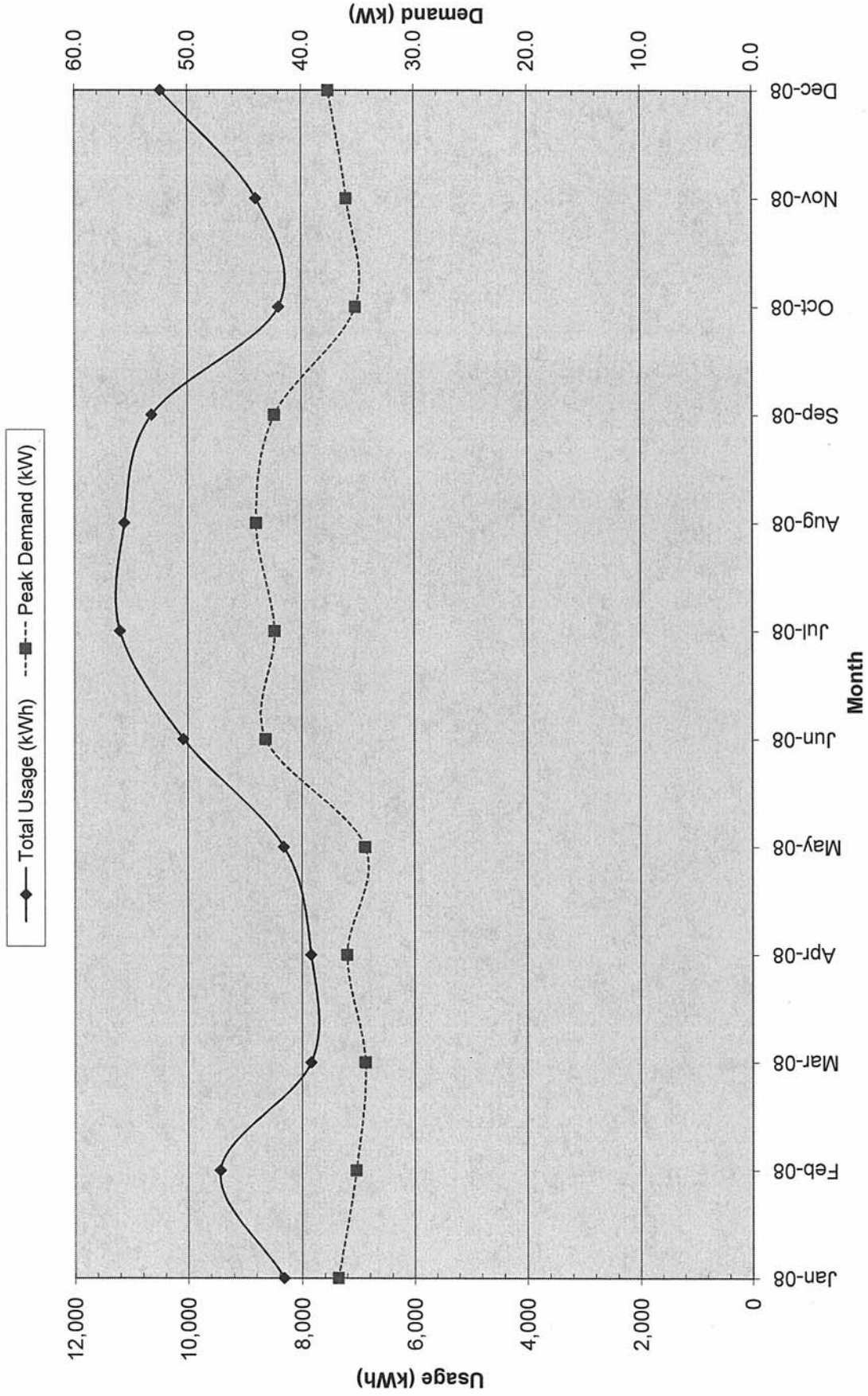
Utility Usage Analysis

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

DPW - 357 Bergen Ave.
Account No.: 11 862 043 03
Meter No.: 728006742

Month	Charges		Unit Costs	
	Consumption (kWh)	Demand (kW)	Blended Rate (\$/kWh)	Demand (\$/kW)
January-08	8,320	36.8	0.1351	0.1085
February-08	9,440	35.2	0.1345	0.1117
March-08	7,840	34.4	0.1362	0.1091
April-08	7,840	36.0	0.1352	0.1073
May-08	8,320	34.4	0.1343	0.1088
June-08	10,080	43.2	0.2081	0.1407
July-08	11,200	42.4	0.2040	0.1438
August-08	11,120	44.0	0.2123	0.1500
September-08	10,640	42.4	0.2070	0.1436
October-08	8,400	35.2	0.1560	0.1153
November-08	8,800	36.0	0.1524	0.1132
December-08	10,480	37.6	0.1452	0.1117
Most Recent Yr	112,480	44.0	0.1668	0.1237
				10.57

Electric Usage - Town of Kearny DPW Building



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

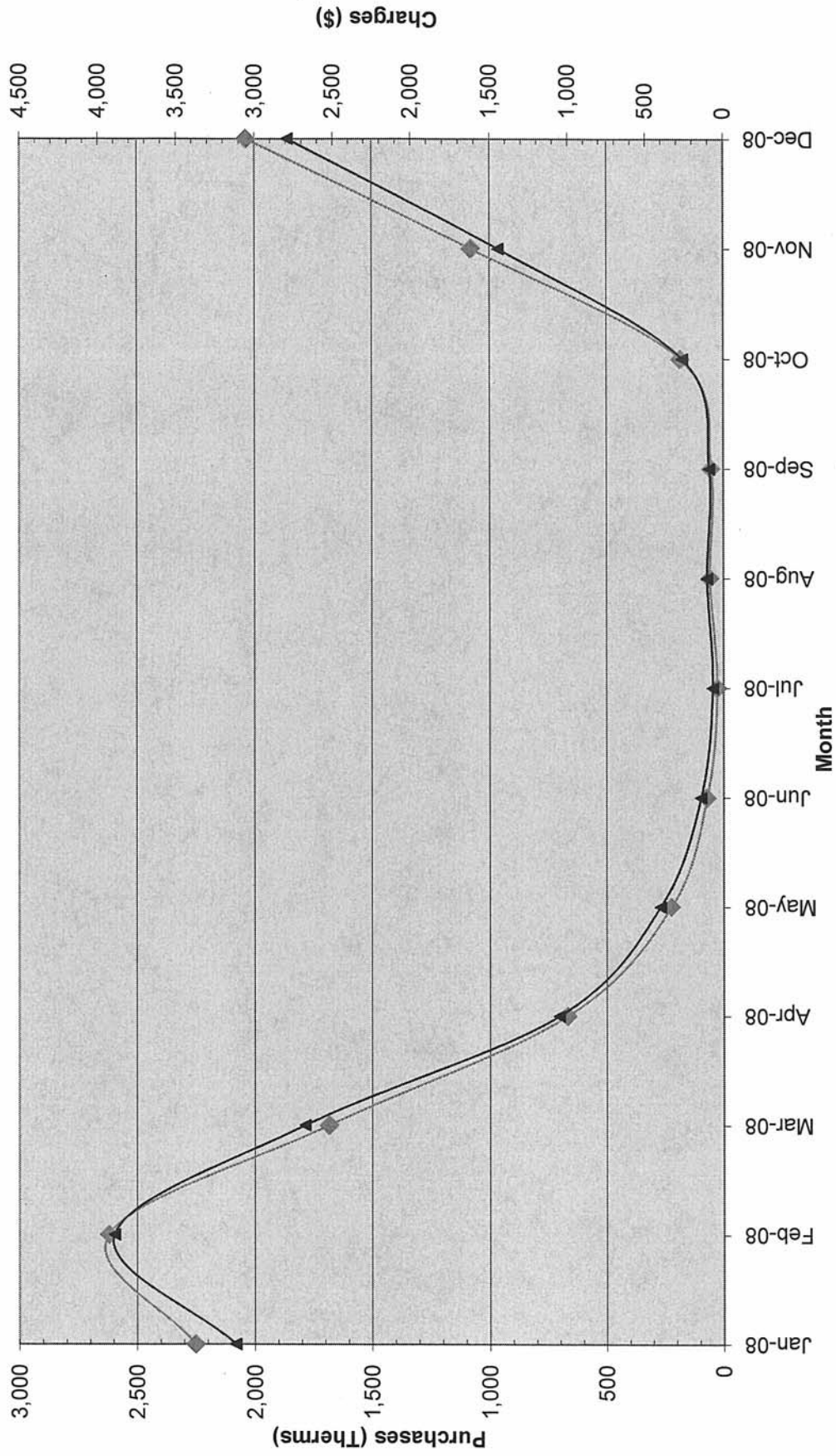
DPW - 357 Bergen Ave.				DPW - 361 Bergen Ave.			
Account No.: 11 862 043 03				Account No.: 11 862 391 07			
Meter No.: 2805360				Meter No.: 2258923			
Month	Therms	Charges (\$)	(\$/Therm)	Therms	Charges (\$)	(\$/Therm)	
January-08	1,302	1,804.96	1.387	951	1,317.97	1.387	
February-08	1,515	2,251.46	1.486	1,106	1,644.00	1.486	
March-08	974	1,548.09	1.590	711	1,130.40	1.590	
April-08	387	610.92	1.580	282	446.09	1.580	
May-08	129	233.52	1.814	94	170.51	1.814	
June-08	41	83.49	2.051	30	60.96	2.051	
July-08	15	39.96	2.587	11	29.18	2.587	
August-08	33	60.35	1.818	24	44.07	1.818	
September-08	30	52.53	1.761	22	38.36	1.761	
October-08	106	149.49	1.411	77	111.84	1.411	
November-08	624	836.54	1.340	456	610.84	1.340	
December-08	1,177	1,613.58	1.371	860	1,178.22	1.371	
Most Recent Yr	6,332	9,285	1.466	4,624	6,782	1.467	Estimated

Total (both meters)

Month	Therms	Charges (\$)	(\$/Therm)
January-08	2,252	3,122.93	1.387
February-08	2,621	3,895.46	1.486
March-08	1,684	2,678.49	1.590
April-08	669	1,057.01	1.580
May-08	223	404.03	1.814
June-08	70	144.45	2.051
July-08	27	69.14	2.587
August-08	57	104.42	1.818
September-08	52	90.89	1.761
October-08	183	261.33	1.426
November-08	1,080	1,447.38	1.340
December-08	2,037	2,791.80	1.371
Most Recent Yr	10,956	16,067	1.467

Natural Gas Usage - Town of Kearny DPW Building

◆ Total Natural Gas Purchases (therms)
 ▲ Total Natural Gas Charges (\$)



ELECTRIC MARKETERS LIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Integrays Energy Services, Inc
99 Wood Avenue, Suite 802
Iselin, NJ 08830
www.integraysenergy.com

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

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

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

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

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

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

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

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

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.tignaturalgas.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 & 1A Night Setback – Main

earny NJ
CHA #20711
Building: DPW- Main Building

CM-1 Night Setback Office - Main

light setback energy conservation strategy for first floor

Building Footprint	1,800	SF
Heating Efficiency	76%	
Cooling Efficiency	1.2	kW/ton
Building Balance Temp.	60	*F
Internal Gains	12,054	btu/h
Inoc Internal Gain factor	0.03	
Ive Occ Internal Gain Factor	0.7	

Ex Occupied Cng Temp.	74	*F
Ex Unoccupied Cng Temp.	74	*F
Prop Occupied Cng Temp.	74	*F
Prop Unoccupied Cng Temp.	80	*F
Occupied Cooling UA	-564	btu/hr/*F
Unoccupied Cooling UA	-345	btu/hr/*F
Cooling Occ Enthalpy Setpoint	27.5	Btu/lb
Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb

Ex Occupied Htg Temp.	70	*F
Ex Unoccupied Htg Temp.	70	*F
Prop Occupied Htg Temp.	70	*F
Prop Unoccupied Htg Temp.	60	*F
Occupied Heating UA	201	btu/hr/*F
Unoccupied Heating UA	201	btu/hr/*F

Heating Energy Savings	243	therms
Cooling Energy Savings	344	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	-16,074	-62,990	-8,438	-9,847	-28,970	-362	-16,074	-62,990	-8,438	-7,774	-28,970	-362	0	0	0	0
97.5	42.5	3	1	2	-13,254	-43,743	-8,438	-8,119	-20,118	-362	-13,254	-43,743	-8,438	-6,046	-20,118	-362	12	11	0	0
92.5	39.5	34	10	24	-10,434	-34,995	-8,438	-6,392	-16,095	-362	-10,434	-34,995	-8,438	-4,319	-16,095	-362	109	104	0	0
87.5	36.6	131	39	92	-7,614	-26,538	-8,438	-4,664	-12,205	-362	-7,614	-26,538	-8,438	-2,591	-12,205	-362	325	306	0	0
82.5	34	500	149	351	-4,794	-18,955	-8,438	-2,937	-8,718	-362	-4,794	-18,955	-8,438	-864	-8,718	-362	901	828	0	0
77.5	31.6	620	185	435	-1,974	-11,957	-8,438	-1,209	-5,499	-362	-1,974	-11,957	-8,438	0	0	-362	721	428	0	0
72.5	29.2	664	198	466	0	0	-8,438	0	0	-362	0	0	-8,438	0	0	-362	184	184	0	0
67.5	27	854	254	600	502	1,750	-8,438	502	805	-362	502	1,750	-8,438	0	0	-362	157	179	0	0
62.5	24.5	927	276	651	1,505	5,249	-8,438	1,505	2,414	-362	1,505	5,249	-8,438	0	0	-362	46	70	0	0
57.5	21.4	600	179	421	2,508	8,749	-8,438	2,508	4,024	-362	2,508	8,749	-8,438	502	805	-362	0	0	41	12
52.5	18.7	610	182	428	3,511	12,248	-8,438	3,511	5,633	-362	3,511	12,248	-8,438	1,505	2,414	-362	0	0	67	38
47.5	16.2	611	182	429	4,514	15,748	-8,438	4,514	7,243	-362	4,514	15,748	-8,438	2,508	4,024	-362	0	0	93	63
42.5	14.4	656	195	461	5,518	19,247	-8,438	5,518	8,852	-362	5,518	19,247	-8,438	3,511	5,633	-362	0	0	127	95
37.5	12.6	1,023	304	719	6,521	22,747	-8,438	6,521	10,462	-362	6,521	22,747	-8,438	4,514	7,243	-362	0	0	241	191
32.5	10.7	734	218	516	7,524	26,246	-8,438	7,524	12,071	-362	7,524	26,246	-8,438	5,518	8,852	-362	0	0	203	168
27.5	8.6	334	99	235	8,527	29,745	-8,438	8,527	13,680	-362	8,527	29,745	-8,438	6,521	10,462	-362	0	0	106	90
22.5	6.8	252	75	177	9,531	33,245	-8,438	9,531	15,290	-362	9,531	33,245	-8,438	7,524	12,071	-362	0	0	91	79
17.5	5.5	125	37	88	10,534	36,744	-8,438	10,534	16,899	-362	10,534	36,744	-8,438	8,527	13,680	-362	0	0	50	44
12.5	4.1	47	14	33	11,537	40,244	-8,438	11,537	18,509	-362	11,537	40,244	-8,438	9,531	15,290	-362	0	0	21	19
7.5	2.6	22	7	15	12,540	43,743	-8,438	12,540	20,118	-362	12,540	43,743	-8,438	10,534	16,899	-362	0	0	11	10
2.5	1	13	4	9	13,543	47,243	-8,438	13,543	21,728	-362	13,543	47,243	-8,438	11,537	18,509	-362	0	0	7	6
-2.5	0	0	0	0	14,547	50,742	-8,438	14,547	23,337	-362	14,547	50,742	-8,438	12,540	20,118	-362	0	0	0	0
-7.5	-1.5	0	0	0	15,550	54,242	-8,438	15,550	24,947	-362	15,550	54,242	-8,438	13,543	21,728	-362	0	0	0	0
TOTALS		8,760	2,607	6,153													2,454	2,110	1,057	814

Existing Building Ventilation & Infiltration (occ)	648	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	298	cfm

Kearny NJ
CHA #20711
Building: DPW- Main Building

ECM-1A Night Setback Garage - Main

Building Footprint	9,600	SF	Ex Occupied Cing Temp.	74	*F	Ex Occupied Htg Temp.	65	*F	Heating Energy Savings	475	therms
Heating Efficiency	76%		Ex Unoccupied Cing Temp.	74	*F	Ex Unoccupied Htg Temp.	65	*F	Cooling Energy Savings	-94	kWh
Cooling Efficiency	1.2	kW/ton	Prop Occupied Cing Temp.	74	*F	Prop Occupied Htg Temp.	65	*F			
Building Balance Temp.	60	*F	Prop Unoccupied Cing Temp.	74	*F	Prop Unoccupied Htg Temp.	60	*F			
Internal Gains	48,071	btu/h	Occupied Cooling UA	-3,751	btu/hr/*F	Occupied Heating UA	1,515	btu/hr/*F			
Unoc Internal Gain factor	0.03		Unoccupied Cooling UA	-3,295	btu/hr/*F	Unoccupied Heating UA	1,515	btu/hr/*F			
Ave Occ Internal Gain Factor	0.7		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb						
			Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb						

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

					EXISTING LOADS						PROPOSED LOADS						Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
					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				
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	-106,894	-176,337	-33,650	-93,915	-72,657	-1,442	-106,894	-176,337	-33,650	-93,915	-72,657	-1,442	0	0	0	0
97.5	42.5	3	1	2	-88,141	-122,456	-33,650	-77,438	-50,456	-1,442	-88,141	-122,456	-33,650	-77,438	-50,456	-1,442	49	49	0	0
92.5	39.5	34	10	24	-69,388	-97,965	-33,650	-60,962	-40,365	-1,442	-69,388	-97,965	-33,650	-60,962	-40,365	-1,442	449	449	0	0
87.5	36.6	131	39	92	-50,634	-74,290	-33,650	-44,486	-30,610	-1,442	-50,634	-74,290	-33,650	-44,486	-30,610	-1,442	1,322	1,322	0	0
82.5	34	500	149	351	-31,881	-53,064	-33,650	-28,010	-21,864	-1,442	-31,881	-53,064	-33,650	-28,010	-21,864	-1,442	3,567	3,567	0	0
77.5	31.6	620	185	435	-13,127	-33,471	-33,650	-11,533	-13,791	-1,442	-13,127	-33,471	-33,650	-11,533	-13,791	-1,442	2,646	2,646	0	0
72.5	29.2	664	198	466	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	732	732	0	0
67.5	27	854	254	600	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	942	942	0	0
62.5	24.5	927	276	651	3,789	4,898	-33,650	3,789	2,018	-1,442	3,789	4,898	-33,650	0	0	-1,442	689	783	0	0
57.5	21.4	600	179	421	11,366	14,695	-33,650	11,366	6,055	-1,442	11,366	14,695	-33,650	3,789	2,018	-1,442	136	136	0	0
52.5	18.7	610	182	428	18,943	24,491	-33,650	18,943	10,091	-1,442	18,943	24,491	-33,650	11,366	6,055	-1,442	0	0	179	113
47.5	16.2	611	182	429	26,520	34,288	-33,650	26,520	14,128	-1,442	26,520	34,288	-33,650	18,943	10,091	-1,442	0	0	286	221
42.5	14.4	656	195	461	34,097	44,084	-33,650	34,097	18,164	-1,442	34,097	44,084	-33,650	26,520	14,128	-1,442	0	0	423	352
37.5	12.6	1,023	304	719	41,675	53,881	-33,650	41,675	22,201	-1,442	41,675	53,881	-33,650	34,097	18,164	-1,442	0	0	838	728
32.5	10.7	734	218	516	49,252	63,677	-33,650	49,252	26,237	-1,442	49,252	63,677	-33,650	41,675	22,201	-1,442	0	0	730	651
27.5	8.6	334	99	235	56,829	73,474	-33,650	56,829	30,274	-1,442	56,829	73,474	-33,650	49,252	26,237	-1,442	0	0	391	355
22.5	6.8	252	75	177	64,406	83,270	-33,650	64,406	34,310	-1,442	64,406	83,270	-33,650	56,829	30,274	-1,442	0	0	339	312
17.5	5.5	125	37	88	71,984	93,067	-33,650	71,984	38,347	-1,442	71,984	93,067	-33,650	64,406	34,310	-1,442	0	0	190	177
12.5	4.1	47	14	33	79,561	102,863	-33,650	79,561	42,383	-1,442	79,561	102,863	-33,650	71,984	38,347	-1,442	0	0	80	75
7.5	2.6	22	7	15	87,138	112,660	-33,650	87,138	46,420	-1,442	87,138	112,660	-33,650	79,561	42,383	-1,442	0	0	41	39
2.5	1	13	4	9	94,715	122,456	-33,650	94,715	50,456	-1,442	94,715	122,456	-33,650	87,138	46,420	-1,442	0	0	27	25
-2.5	0	0	0	0	102,292	132,253	-33,650	102,292	54,493	-1,442	102,292	132,253	-33,650	94,715	50,456	-1,442	0	0	0	0
-7.5	-1.5	0	0	0	109,870	142,049	-33,650	109,870	58,529	-1,442	109,870	142,049	-33,650	102,292	54,493	-1,442	0	0	0	0
TOTALS		8,760	2,607	6,153													10,532	10,626	3,524	3,049

Existing Building Ventilation & Infiltration (occ)	1,814	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	748	cfm

Kearny NJ

CHA #20711

Building: DPW- Main Building

Reconcile Thermal Model

Building Footprint	9,600 SF
Heating Efficiency	76%
Cooling Efficiency	1.20 kWton
Internal Gains	48,071 btu/h
Unoc Internal Gain factor	0.03
Ave Occ Internal Gain Factor	0.7
Economizer available (Y/N)	No

Ex Occupied Cing Temp.	74 °F
Ex Unoccupied Cing Temp.	74 °F
Occupied Cooling UA	(3,751) btu/hr°F
Unoccupied Cooling UA	(3,295) btu/hr°F
Cooling Occ Enthalpy Setpoint	27.5 Btu/lb
Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb

Ex Occupied Htg Temp.	65 °F
Ex Unoccupied Htg Temp.	65 °F
Occupied Heating UA	1,515 btu/hr°F
Unoccupied Heating UA	1,515 btu/hr°F

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																			
			Envelope Load		Ventilation		Internal Gain	Unoccupied Envelope Load		Ventilation		Internal Gain															
			BTUH	Load	BTUH	Load	BTUH	BTUH	Load	BTUH	Load	BTUH	BTUH														
			E	F	G	H	I	J	K	L	M	M	M														
Avg Outdoor Air Temp. Bins °F	A	Total Bin Hours	B	Occupied Equipment Bin Hours	C	Unoccupied Equipment Bin Hours	D	Envelope Load BTUH	E	Ventilation Load BTUH	F	Internal Gain BTUH	G	Unoccupied Envelope Load BTUH	H	Ventilation Load BTUH	I	Internal Gain BTUH	J	Available Economizer Cooling kWh	K	Necessary Cooling Energy kWh	L	Existing Cooling Energy kWh	M	Existing Heating Energy therms	M
102.5	49.1	0	0	0	0	0	0	-106,894	-176,337	-33,650	-93,915	-72,657	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
97.5	42.5	3	3	1	2	2	2	-88,141	-122,456	-33,650	-77,438	-50,456	-1,442	0	49	49	49	49	49	0	0	0	0	0	0	0	
92.5	39.5	34	34	10	24	24	24	-69,388	-97,965	-33,650	-60,962	-40,365	-1,442	0	449	449	449	449	449	0	0	0	0	0	0	0	
87.5	36.6	131	131	39	92	92	92	-50,634	-74,290	-33,650	-44,486	-30,610	-1,442	0	1,322	1,322	1,322	1,322	1,322	0	0	0	0	0	0	0	
82.5	34.0	500	500	149	351	351	351	-31,881	-53,064	-33,650	-28,010	-21,864	-1,442	0	3,567	3,567	3,567	3,567	3,567	0	0	0	0	0	0	0	
77.5	31.6	620	620	185	435	435	435	-13,127	-33,471	-33,650	-11,533	-13,791	-1,442	0	2,646	2,646	2,646	2,646	2,646	0	0	0	0	0	0	0	
72.5	29.2	864	864	198	466	466	466	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
67.5	27.0	854	854	254	600	600	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
62.5	24.5	927	927	276	651	651	651	3,789	4,898	-33,650	3,789	2,018	-1,442	0	689	689	689	689	689	0	0	0	0	0	0	0	
57.5	21.4	600	600	179	421	421	421	11,366	14,696	-33,650	11,366	6,055	-1,442	0	136	136	136	136	136	0	0	0	0	0	0	0	
52.5	18.7	610	610	182	428	428	428	18,943	24,491	-33,650	18,943	10,091	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
47.5	16.2	429	611	182	429	429	429	26,520	34,288	-33,650	26,520	14,128	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
42.5	14.4	656	611	195	461	461	461	34,097	44,084	-33,650	34,097	18,164	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
37.5	12.6	1,023	734	304	719	719	719	41,675	53,881	-33,650	41,675	22,201	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
32.5	10.7	734	734	218	516	516	516	49,252	63,677	-33,650	49,252	26,237	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
27.5	8.6	334	334	99	235	235	235	56,829	73,474	-33,650	56,829	30,274	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
22.5	6.8	252	252	75	177	177	177	64,406	83,270	-33,650	64,406	34,310	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
17.5	5.5	125	125	37	88	88	88	71,984	93,067	-33,650	71,984	38,347	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
12.5	4.1	47	47	14	33	33	33	79,561	102,863	-33,650	79,561	42,383	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
7.5	2.6	22	22	7	15	15	15	87,138	112,660	-33,650	87,138	46,420	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
2.5	1.0	13	13	4	9	9	9	94,715	122,456	-33,650	94,715	50,456	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
-2.5	0.0	0	0	0	0	0	0	102,292	132,263	-33,650	102,292	54,493	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
-7.5	-1.5	0	0	0	0	0	0	109,870	142,049	-33,650	109,870	58,529	-1,442	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTALS		8,760	2,607	6,153																	10,532	10,532		10,532		3,524	

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

1,814 cfm
1,000 cfm
748 cfm
1,067 cfm

Energy Use Indices (calculated)

Heating	Base Case
Target ->	4,581
	4,604
	99.5%

Cooling	Base Case
Target ->	10,532
	300
	3610.7%

HEAT GAIN/LOSS WORKSHEET

Project Name: **Keamy NJ**
 Location: **DPW- Main Building**
 Building Name: **ND**
 Engineer: **ND**

Project No.: **CHA #20711**
 Site Elevation: **480** Feet
 Date:

Specific Volume **14.00** CF/#

Building/Facility Designation **Garage section**

Outdoor Winter Design DB Temperature **14** °F
 Outdoor Summer Design DB Temperature **91** °F
 Outdoor Summer Design WB Temperature **73** °F
 Outdoor Summer Humidity Ratio **0.0121** ##

Indoor Winter Design DB Temperature **65** °F
 Indoor Summer Design DB Temperature **74** °F
 Indoor Summer Design WB Temperature **60** °F
 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

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	
☒ Steel deck, 4" insul., metal siding	16.00	

Windows (Select One)

	U Value
☐ Aluminum Frame, 1/8" SP Glazing	1.05
☒ 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 **8,800** SF
 Occupied Area **9,600** SF

Return Plenum? **n**

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	80 Ft	20.0 Ft	18.0 Ft	0 SF	0 SF	1,600 SF
East Exposure	80 Ft	20.0 Ft	18.0 Ft	0 SF	0 SF	1,600 SF
South Exposure	80 Ft	20.0 Ft	18.0 Ft	54 SF	21 SF	1,525 SF
West Exposure	120 Ft	20.0 Ft	18.0 Ft	100 SF	833 SF	1,467 SF

Forced Ventilation **1,067** cfm

HEAT GAIN/LOSS WORKSHEET

Project Name: **Keamy NJ**
 Location: **DPW- Main Building**
 Building Name: **ND**
 Engineer: **ND**

Project No.: **CHA #20711**
 Site Elevation: **460** Feet
 Date:

Specific Volume **14.00** CF/#

Building/Facility Designation **Garage section**

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor	Glass Type	Solar Heat Gain
North Exposure	0	38 btu/h/sf	0.8	0.75	Glass Type C	0 Btu/hr
East Exposure	0	216 btu/h/sf	0.8	0.31	Glass Type C	0 Btu/hr
South Exposure	54	109 btu/h/sf	0.8	0.58	Glass Type C	2,731 Btu/hr
West Exposure	100	216 btu/h/sf	0.8	0.29	Glass Type C	5,011 Btu/hr
						7,742 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	1,440	0.07	20 °F	1.0	1,901 Btu/hr
East Exposure	1,440	0.07	39 °F	1.0	3,707 Btu/hr
South Exposure	1,365	0.07	27 °F	1.0	2,432 Btu/hr
West Exposure	1,227	0.07	22 °F	1.0	1,782 Btu/hr
Roof	8,800	0.06	73 °F	1.0	40,150 Btu/hr
Fenestration	154	0.60	17 °F		1,571 Btu/hr
Doors	854	0.14	27 °F		3,220 Btu/hr
Ceiling	9,600	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	9,600	0.04	0 °F		0 Btu/hr
					54,763 Btu/h

INTERNAL HEAT GAINS

Lights	1.00 w/sf x	9,600 Occ Area =	9.6 kW x 3.4x	1.0 RAF =	32,765 Btu/h
Plug Load	0.25 w/sf x	9,600 Occ Area =	2.4 kW x 3.4x	1.0 RAF =	8,191 Btu/h
People	32 people x	255 btu/person x	37% time in space =		3,019 Btu/h
Computer Work Stations		10 Units x	120 W/Unit x 3414 =		4,096 Btu/h
Equipment		kW x 3.413 =			0 Btu/h
Misc.					0 Btu/h
					48,071 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain
Walls	5,472 SF	0.10 CFM/SF		1.04	17 °F	10,487 Btu/h
Doors	854 SF	0.35 CFM/LF	0.33 LF/SF	1.04	17 °F	1,918 Btu/h
Windows	154 SF	0.20 CFM/LF	0.92 LF/SF	1.04	17 °F	540 Btu/h
Ventilation	1,067 cfm			1.04	17 °F	20,442 Btu/h
						33,387 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	160	0.07	20	1.0	211 Btu/hr
East Exposure	160	0.07	39	1.0	412 Btu/hr
South Exposure	160	0.07	27	1.0	285 Btu/hr
West Exposure	240	0.07	22	1.0	348 Btu/hr
Roof	8,800	0.06	73	0.0	0 Btu/hr
					1,257 Btu/h

INTERNAL HEAT GAINS

Lights	1.00 w/sf x	9,600 Occ Area =	9.6 kW x3413x	0.00 RAF =	0 Btu/h
Misc.					0 Btu/h
					0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT

Solar	7,742
Conduction to Room	54,763
Conduction to Plenum	1,257
Ventilation and Infiltration	33,387
Sub Total	97,149

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

Internal Gains to Room	48,071
Internal Gains to Plenum	0
Sub Total	48,071

HEAT GAIN/LOSS WORKSHEET

Project Name: Kearny NJ
 Location: DPW- Main Building
 Building Name: ND
 Engineer: ND

Project No.: CHA #20711
 Site Elevation: 460 Feet
 Date:

Specific Volume 14.00 CF/#

Building/Facility Designation Garage section

LATENT COOLING LOADS

Infiltration		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	9,520 SF	0.10 CFM/SF	4,629	0.0042 ##	18,696 Btu/h
Doors	854 SF	0.35 CFM/LF	4,629	0.0042 ##	1,966 Btu/h
Windows	154 SF	0.20 CFM/LF	4,629	0.0042 ##	554 Btu/h
Ventilation	1,067 cfm		4,629	0.0042 ##	20,948 Btu/h
People	32 people	0.37 time in space		250 Btu/hr/person	2,960 Btu/h
					45,123 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	SHR=	
Temperature Dependent Gains	97,149	45,123	142,272		
Temperature Indep. Gains	48,071		48,071	0.76	
Total	145,220	45,123	190,343		

Building Cooling Load 15.9 Tons at 605 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

11,493 CFM
1.20 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	1,600	0.07	51	5,386 Btu/h
East Exposure	1,600	0.07	51	5,386 Btu/h
South Exposure	1,525	0.07	51	5,133 Btu/h
West Exposure	1,467	0.07	51	4,938 Btu/h
Fenestration	154	0.60	51	4,712 Btu/h
Roof	8,800	0.06	51	28,050 Btu/h
Doors	854	0.14	51	6,083 Btu/h
Ceiling	9,600	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	8,800	0.04	50	17,600 Btu/h

Ventilation and Infiltration

	Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	6,192 SF	0.10 CFM/SF	51	619 cfm	32,963 Btu/h
Doors	854 SF	0.35 CFM/LF	51	100 cfm	5,329 Btu/h
Windows	154 SF	0.20 CFM/LF	51	28 cfm	1,501 Btu/h
Ventilation Load	1,067 cfm	1.04	51	1,067 cfm	61,326 Btu/h
Total Ventilation & Infiltration Load				1,814 cfm	101,118 Btu/h

Building Heating Load	178,406	btu/h
		18.6 btu/sf

HEAT GAIN/LOSS WORKSHEET

Project Name: **Keamy NJ**
 Location: **DPW- Main Building**
 Building Name: **ND**
 Engineer: **ND**

Project No.: **CHA #20711**
 Site Elevation: **460** Feet
 Date:

Specific Volume **14.00** CF/#

Building/Facility Designation **Office section**

Outdoor Winter Design DB Temperature **14** °F
 Outdoor Summer Design DB Temperature **91** °F
 Outdoor Summer Design WB Temperature **73** °F
 Outdoor Summer Humidity Ratio **0.0121** ##

Indoor Winter Design DB Temperature **70** °F
 Indoor Summer Design DB Temperature **74** °F
 Indoor Summer Design WB Temperature **60** °F
 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

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
☒ Steel Deck, 4" Insul., metal siding	18.0	
☐ Wood Deck, 6" Insulation, Felt & Membrane	14.50	

Windows (Select One)	U Value
☒ Aluminum Frame, 1/8" SP Glazing	1.05
☐ Aluminum Frame, 1/4" DP Glazing	0.60
☐ Aluminum Frame, 3/16" DP Glazing	0.62
☐ Aluminum Frame, 1/2" DP Glazing	0.50
☐ Skylight	0.90
☐ Other	

	No Storm
Flat Glass	1.05
Flat Glass (e=.6)	1.00
Flat Glass (e=.4)	0.90
Flat Glass (e=.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=.4)	0.42
Double Glaze (e=.2)	0.35
Triple Glaze (1/4 in air)	0.42
Triple Glaze (1/2 in air)	0.35

BUILDING CHARACTERISTICS
 Roof Area **1,600** SF
 Occupied Area SF

Return Plenum? **n**

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	40 Ft	18.0 Ft	16.0 Ft	0 SF	0 SF	720 SF
East Exposure	40 Ft	18.0 Ft	16.0 Ft	0 SF	0 SF	720 SF
South Exposure	40 Ft	18.0 Ft	16.0 Ft	14 SF	21 SF	685 SF
West Exposure	40 Ft	18.0 Ft	16.0 Ft	60 SF	25 SF	636 SF
Forced Ventilation	350 cfm					

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor	Glass Type	Solar Heat Gain
North Exposure	0	38	0.8	0.75	Glass Type C	0 Btu/hr
East Exposure	0	216	0.8	0.31	Glass Type C	0 Btu/hr
South Exposure	14	109	0.8	0.58	Glass Type C	708 Btu/hr
West Exposure	60	216	0.8	0.29	Glass Type C	3,007 Btu/hr
						3,715 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	640	0.07	20 °F	1.0	845 Btu/hr
East Exposure	640	0.07	39 °F	1.0	1,647 Btu/hr
South Exposure	605	0.07	27 °F	1.0	1,078 Btu/hr
West Exposure	556	0.07	22 °F	1.0	807 Btu/hr
Roof	1,600	0.07	0 °F	1.0	0 Btu/hr
Fenestration	74	0.60	17 °F		755 Btu/hr
Doors	46	0.14	27 °F		172 Btu/hr
Ceiling	1,600	0.14	0 °F		0 Btu/hr
Partition	400	0.05	0 °F		0 Btu/hr
Floor	1,600	0.04	0 °F		0 Btu/hr
					5,303 Btu/h

INTERNAL HEAT GAINS

Lights	1.00	w/sf x	1,600	Occ Area =	1.6	kW x 3.4x	1.0	RAF =	5,461	Btu/h
Plug Load	0.25	w/sf x	1,600	Occ Area =	0.4	kW x 3.4x	1.0	RAF =	1,365	Btu/h
People	12	people x	255	btu/person x	37%	time in space =			1,132	Btu/h
Computer Work Stations			10	Units x	120	W/Unit x	3414 =		4,096	Btu/h
Equipment									0	Btu/h
Misc.									0	Btu/h
									12,054	Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain
Walls	2,441 SF	0.10 CFM/SF		1.04	17 °F	4,677 Btu/h
Doors	46 SF	0.20 CFM/LF	0.90 LF/SF	1.04	17 °F	157 Btu/h
Windows	74 SF	0.20 CFM/LF	0.93 LF/SF	1.04	17 °F	264 Btu/h
Ventilation	350 cfm			1.04	17 °F	6,708 Btu/h
						11,806 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	80	0.07	20	1.0	106 Btu/hr
East Exposure	80	0.07	39	1.0	206 Btu/hr
South Exposure	80	0.07	27	1.0	143 Btu/hr
West Exposure	80	0.07	22	1.0	116 Btu/hr
Roof	1,600	0.07	0	0.0	0 Btu/hr
					570 Btu/h

INTERNAL HEAT GAINS

Lights	1.00 w/sf x	1,600 Occ Area =	1.6 kW x3413x	0.00 RAF =	0 Btu/h	
Misc.					0 Btu/h	
						0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT

Solar	3,715
Conduction to Room	5,303
Conduction to Plenum	570
Ventilation and Infiltration	11,806
Sub Total	21,394

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

Internal Gains to Room	12,054
Internal Gains to Plenum	0
Sub Total	12,054

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	1,920 SF	0.10 CFM/SF	4,629	0.0042 ##	3,771 Btu/h
Doors	46 SF	0.20 CFM/LF	4,629	0.0042 ##	161 Btu/h
Windows	74 SF	0.20 CFM/LF	4,629	0.0042 ##	271 Btu/h
Ventilation	350 cfm		4,629	0.0042 ##	6,873 Btu/h
People	12 people	0.37 time in space		250 Btu/hr/person	1,110 Btu/h
					12,186 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	SHR=	
Temperature Dependent Gains	21,394	12,186	33,580		
Temperature Indep. Gains	12,054		12,054	0.73	
Total	33,448	12,186	45,634		

Building Cooling Load 3.8 Tons at 421 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

2,625 CFM
1.64 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	720	0.07	5	238 Btu/h
East Exposure	720	0.07	5	238 Btu/h
South Exposure	685	0.07	56	2,532 Btu/h
West Exposure	636	0.07	56	2,349 Btu/h
Fenestration	74	0.60	56	2,486 Btu/h
Roof	1,600	0.07	0	0 Btu/h
Doors	46	0.14	31	194 Btu/h
Ceiling	1,600	0.14	0	0 Btu/h
Partition	400	0.05	0	0 Btu/h
Floor	1,600	0.04	50	3,200 Btu/h

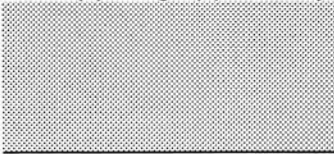
Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	2,761 SF	0.10 CFM/SF	1.04	56	276 cfm	16,136 Btu/h
Doors	46 SF	0.20 CFM/LF	1.04	56	14 cfm	479 Btu/h
Windows	74 SF	0.20 CFM/LF	1.04	56	14 cfm	807 Btu/h
Ventilation Load	350 cfm		1.04	56	350 cfm	22,095 Btu/h
Total Ventilation & Infiltration Load					648 cfm	39,517 Btu/h

Building Heating Load	50,753	btu/h
		31.7 btu/sf

Kearny NJ
CHA #20711
Building: DPW- Main Building

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	Sub-total			0.0	0.0	
East				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
Sub-total				0.0	0.0	
South	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	
Sub-total				21.0	20.0	
West	3.5	7.0	2	49.0	42.0	
	14.0	14.0	4	784.0	224.0	
Sub-total				833.0	266.0	
Total				854.0	286.0	
				LF/SF 0.33		1st fl
						0.90

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North	80.0	20.0	1	1600.0	200.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	80.0			1600.0	200.0	

All wall quantities must remain equal to 1

Ave. height
20.0

Average height wall automatically linked to

East	120.0	20.0	1	2400.0	280.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	120.0			2400.0	280.0	

Ave. height
20.0

Average height wall automatically linked to

South	80.0	20.0	1	1600.0	200.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	80.0			1600.0	200.0	

Ave. height
20.0

Average height wall automatically linked to

West	120.0	20.0	1	2400.0	280.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	120.0			2400.0	280.0	

Ave. height
20.0

Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0

East				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0

South	3.5	4.0	1	14.0	15.0
	4.0	5.0	2	40.0	36.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	54.0	51.0

West	4.0	5.0	3	60.0	54.0
	4.0	5.0	2	40.0	36.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	100.0	90.0

Total

154.0

141.0

LF/SF
0.92

1 st fl

2nd fl

0.93

0.90

ECM-1 Night Setback Office - Main

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

[illegible]

\$	239	Subtotal
\$	24	10% Contingency
		Contractor
	\$26	10% O&P
\$	-	0% Engineering
\$	289	Total

Kearny NJ

CHA #20711

Building: DPW- Main Building

ECM-1A Night Setback Garage - Main

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	4	ea	\$ 120	\$ 50	\$ -	\$ 470	\$ 242	\$ -	\$ 712	
Pre program	4	ea	\$ -	\$ 50	\$ -	\$ -	\$ 242	\$ -	\$ 242	per temperature program
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	

\$ 954	Subtotal
\$95	10% Contingency
\$105	Contractor 10% O&P
\$ -	0% Engineering
\$ 1,155	Total

APPENDIX C

ECM-2 & 2A Install Infrared Garage Heating

Kearny NJ
CHA #20711
Building: DPW- Main Building

ECM-2 Install Infrared Garage Heaters - Main

Building Footprint	6,400	SF
Steam Heat Content	100,000	Btu/Therm
Building Balance Temp.	60	*F
Internal Gains	48,071	btu/h
Unoc Internal Gain factor	0.03	
Ave Occ Internal Gain Factor	0.7	
Existing Heating Efficiency	76%	
Existing Heat Distribution Effectiveness	85%	
Proposed Burner Efficiency	85%	
Proposed Heat Distribution Effectiveness	100%	

Ex Occupied Htg Temp.	65	*F
Ex Unoccupied Htg Temp.	65	*F
Occupied Heating UA	1,515	btu/hr°F
Unoccupied Heating UA	1,515	btu/hr°F

Heating Energy Savings	995	Therms/yr
Electric Energy Savings	(552)	kWh/yr
Electric Demand Savings	(0.37)	kW

					EXISTING LOADS						PROPOSED LOADS							
					Occupied			Unoccupied			Occupied			Unoccupied				
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin	Occupied Equipment Bin	Unoccupied Equipment Bin	Envelope Load	Ventilation	Internal Gain	Unoccupied Envelope	Ventilation	Internal Gain	Envelope Load	Ventilation	Internal Gain	Unoccupied Envelope	Ventilation	Internal Gain	Existing Heating Energy	Proposed Heating Energy
		Hours	Hours	Hours	BTUH	Load	BTUH	BTUH	Load	BTUH	Load	BTUH	BTUH	Load	BTUH	BTUH	Therms	Therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	M	N
102.5	49.1	0	0	0	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0	0
97.5	42.5	3	1	2	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0	0
92.5	39.5	34	10	24	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0	0
87.5	36.6	131	39	92	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0	0
82.5	34.0	500	149	351	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0	0
77.5	31.6	620	185	435	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0	0
72.5	29.2	664	198	466	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0	0
67.5	27.0	854	254	600	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0	0
62.5	24.5	927	276	651	3,789	4,898	-33,650	3,789	2,018	-1,442	3,789	4,898	-33,650	3,789	2,018	-1,442	0	0
57.5	21.4	600	179	421	11,366	14,695	-33,650	11,366	6,055	-1,442	11,366	14,695	-33,650	11,366	6,055	-1,442	0	0
52.5	18.7	610	182	428	18,943	24,491	-33,650	18,943	10,091	-1,442	18,943	24,491	-33,650	18,943	10,091	-1,442	211	160
47.5	16.2	611	182	429	26,520	34,288	-33,650	26,520	14,128	-1,442	26,520	34,288	-33,650	26,520	14,128	-1,442	337	256
42.5	14.4	656	195	461	34,097	44,084	-33,650	34,097	18,164	-1,442	34,097	44,084	-33,650	34,097	18,164	-1,442	497	378
37.5	12.6	1,023	304	719	41,675	53,881	-33,650	41,675	22,201	-1,442	41,675	53,881	-33,650	41,675	22,201	-1,442	986	750
32.5	10.7	734	218	516	49,252	63,677	-33,650	49,252	26,237	-1,442	49,252	63,677	-33,650	49,252	26,237	-1,442	859	653
27.5	8.6	334	99	235	56,829	73,474	-33,650	56,829	30,274	-1,442	56,829	73,474	-33,650	56,829	30,274	-1,442	460	349
22.5	6.8	252	75	177	64,406	83,270	-33,650	64,406	34,310	-1,442	64,406	83,270	-33,650	64,406	34,310	-1,442	399	303
17.5	5.5	125	37	88	71,984	93,067	-33,650	71,984	38,347	-1,442	71,984	93,067	-33,650	71,984	38,347	-1,442	224	170
12.5	4.1	47	14	33	79,561	102,863	-33,650	79,561	42,383	-1,442	79,561	102,863	-33,650	79,561	42,383	-1,442	94	71
7.5	2.6	22	7	15	87,138	112,660	-33,650	87,138	46,420	-1,442	87,138	112,660	-33,650	87,138	46,420	-1,442	48	37
2.5	1.0	13	4	9	94,715	122,456	-33,650	94,715	50,456	-1,442	94,715	122,456	-33,650	94,715	50,456	-1,442	31	24
-2.5	0.0	0	0	0	102,292	132,253	-33,650	102,292	54,493	-1,442	102,292	132,253	-33,650	102,292	54,493	-1,442	0	0
-7.5	-1.5	0	0	0	109,870	142,049	-33,650	109,870	58,529	-1,442	109,870	142,049	-33,650	109,870	58,529	-1,442	0	0
TOTALS		8,760	2,607	6,153													4,146	3,151

Existing Building Ventilation & Infiltration (occ)	1,814	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	748	cfm

Unit Heater Fan Savings

#	Description	Voltage	Load Factor	Existing HP	Existing Efficiency	Proposed FLA	Existing # of Units	Proposed # of Units	Existing kW	Proposed kW	Annual Hours	Existing Use kWh	Proposed Use kWh	Savings kWh
UH-1	Blower Motor	115	0.8	0.055	82.5%		1		0.04	0.00	1,496	60	0	60
UH-2	Blower Motor	115	0.8	0.055	82.5%		1		0.04	0.00	1,496	60	0	60
UH-3	Blower Motor	115	0.8	0.055	82.5%		1		0.04	0.00	1,496	60	0	60
UH-4	Blower Motor	115	0.8	0.055	82.5%		1		0.04	0.00	1,496	60	0	60
Infrared	Blower Motor	120	0.8	0.000	82.5%	1.1		5	0.00	0.53	1,496	0	790	(790)
Total				0.220			4	5	0.16	0.53		238	790	(552)

Kearny NJ
CHA #20711
DPW- Main Building

Garage Base Case

Garage Building Footprint	9,600	SF
Heat Content	100,000	Btu/Therm
Building Balance Temp.	60	*F
Internal Gains	48,071	btu/h
Unoc Internal Gain factor	0.03	
Ave Occ Internal Gain Factor	0.7	
Existing Heating Efficiency	85%	
Existing Heat Distribution Effectiveness	80%	

Ex Occupied Htg Temp.	65	*F
Ex Unoccupied Htg Temp.	65	*F
Occupied Heating UA	1,515	btu/hr/*F
Unoccupied Heating UA	1,515	btu/hr/*F

Heating Energy Consumption	3,938	Therms/yr
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					EXISTING LOADS						PROPOSED LOADS						Existing Heating Energy Therms
					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	
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	M
102.5	49	0	0	0	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0
97.5	43	3	1	2	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0
92.5	40	34	10	24	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0
87.5	37	131	39	92	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0
82.5	34	500	149	351	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0
77.5	32	620	185	435	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0
72.5	29	664	198	466	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0
67.5	27	854	254	600	0	0	-33,650	0	0	-1,442	0	0	-33,650	0	0	-1,442	0
62.5	25	927	276	651	3,789	4,898	-33,650	3,789	2,018	-1,442	3,789	4,898	-33,650	3,789	2,018	-1,442	0
57.5	21	600	179	421	11,366	14,695	-33,650	11,366	6,055	-1,442	11,366	14,695	-33,650	11,366	6,055	-1,442	0
52.5	19	610	182	428	18,943	24,491	-33,650	18,943	10,091	-1,442	18,943	24,491	-33,650	18,943	10,091	-1,442	200
47.5	16	611	182	429	26,520	34,288	-33,650	26,520	14,128	-1,442	26,520	34,288	-33,650	26,520	14,128	-1,442	320
42.5	14	656	195	461	34,097	44,084	-33,650	34,097	18,164	-1,442	34,097	44,084	-33,650	34,097	18,164	-1,442	472
37.5	13	1,023	304	719	41,675	53,881	-33,650	41,675	22,201	-1,442	41,675	53,881	-33,650	41,675	22,201	-1,442	937
32.5	11	734	218	516	49,252	63,677	-33,650	49,252	26,237	-1,442	49,252	63,677	-33,650	49,252	26,237	-1,442	816
27.5	9	334	99	235	56,829	73,474	-33,650	56,829	30,274	-1,442	56,829	73,474	-33,650	56,829	30,274	-1,442	437
22.5	7	252	75	177	64,406	83,270	-33,650	64,406	34,310	-1,442	64,406	83,270	-33,650	64,406	34,310	-1,442	379
17.5	6	125	37	88	71,984	93,067	-33,650	71,984	38,347	-1,442	71,984	93,067	-33,650	71,984	38,347	-1,442	212
12.5	4	47	14	33	79,561	102,863	-33,650	79,561	42,383	-1,442	79,561	102,863	-33,650	79,561	42,383	-1,442	89
7.5	3	22	7	15	87,138	112,660	-33,650	87,138	46,420	-1,442	87,138	112,660	-33,650	87,138	46,420	-1,442	46
2.5	1	13	4	9	94,715	122,456	-33,650	94,715	50,456	-1,442	94,715	122,456	-33,650	94,715	50,456	-1,442	30
-2.5	0	0	0	0	102,292	132,253	-33,650	102,292	54,493	-1,442	102,292	132,253	-33,650	102,292	54,493	-1,442	0
-7.5	-2	0	0	0	109,870	142,049	-33,650	109,870	58,529	-1,442	109,870	142,049	-33,650	109,870	58,529	-1,442	0
TOTALS		8,760	2,607	6,153													3,938

Existing Building Ventilation & Infiltration (occ)	1,814	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	748	cfm

Kearny NJ

CHA #20711

DPW- Main Building

ECM-2 Install Infrared Garage Heaters - Main

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	4	ea		\$ 300		\$ -	\$ -	\$ -	\$ -	
NG Infrared Tube Heater garage area (50MBH)	4	ea	\$ 450	\$ 158		\$ 1,764	\$ 765	\$ -	\$ 2,529	
Gas Piping etc.	40	lf	12.5	6.1		\$ 490	\$ 295	\$ -	\$ 785	
4" Class B Vent Piping	60	lf	\$ 6.70	\$ 10		\$ 394	\$ 726	\$ -	\$ 1,120	
T-stats (w/setback, control wiring)	4	ea	\$ 95	\$ 30		\$ 372	\$ 145	\$ -	\$ 518	
Electric wiring for ignition	4	ea	\$ 30	\$ 90		\$ 118	\$ 436	\$ -	\$ 553	

Note: Unit selections and budgetary pricing are per Reznor VR series infrared tube heaters.
Vent penetration assumed to be reused

\$6,957	Subtotal
\$1,391	20% Contingency
\$1,252	15% Contractor O&P
\$0	0% Engineering
\$9,600	Total

Kearny NJ
CHA #20711
Building: DPW- Main Building

ECM-2A Install Infrared Garage Heaters - Shop

Building Footprint	2,352	SF
Steam Heat Content	100,000	Btu/Therm
Building Balance Temp.	60	*F
Internal Gains	19,348	btu/h
Unoc Internal Gain factor	0.03	
Ave Occ Internal Gain Factor	0.7	
Existing Heating Efficiency	78%	
Existing Heat Distribution Effectiveness	85%	
Proposed Burner Efficiency	85%	
Proposed Heat Distribution Effectiveness	100%	

Ex Occupied Htg Temp.	68	*F
Ex Unoccupied Htg Temp.	62	*F
Occupied Heating UA	2,098	btu/hr/*F
Unoccupied Heating UA	2,098	btu/hr/*F

Heating Energy Savings	1,357	Therms/yr
Electric Energy Savings	(433)	kWh/yr
Electric Demand Savings	(0.29)	kW

					EXISTING LOADS						PROPOSED LOADS							
					Occupied			Unoccupied			Occupied			Unoccupied				
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Heating Energy Therms	Proposed Heating Energy Therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	M	N
102.5	49.1	0	0	0	0	0	-13,543	0	0	-580	0	0	-13,543	0	0	-580	0	0
97.5	42.5	3	1	2	0	0	-13,543	0	0	-580	0	0	-13,543	0	0	-580	0	0
92.5	39.5	34	10	24	0	0	-13,543	0	0	-580	0	0	-13,543	0	0	-580	0	0
87.5	36.6	131	39	92	0	0	-13,543	0	0	-580	0	0	-13,543	0	0	-580	0	0
82.5	34.0	500	149	351	0	0	-13,543	0	0	-580	0	0	-13,543	0	0	-580	0	0
77.5	31.6	620	185	435	0	0	-13,543	0	0	-580	0	0	-13,543	0	0	-580	0	0
72.5	29.2	664	198	466	0	0	-13,543	0	0	-580	0	0	-13,543	0	0	-580	0	0
67.5	27.0	854	254	600	1,049	1,477	-13,543	0	0	-580	1,049	1,477	-13,543	0	0	-580	0	0
62.5	24.5	927	276	651	11,537	16,246	-13,543	0	0	-580	11,537	16,246	-13,543	0	0	-580	54	42
57.5	21.4	600	179	421	22,025	31,015	-13,543	9,439	3,572	-580	22,025	31,015	-13,543	9,439	3,572	-580	185	145
52.5	18.7	610	182	428	32,514	45,784	-13,543	19,928	7,541	-580	32,514	45,784	-13,543	19,928	7,541	-580	351	274
47.5	16.2	611	182	429	43,002	60,553	-13,543	30,416	11,510	-580	43,002	60,553	-13,543	30,416	11,510	-580	515	401
42.5	14.4	656	195	461	53,490	75,323	-13,543	40,904	15,480	-580	53,490	75,323	-13,543	40,904	15,480	-580	727	567
37.5	12.6	1,023	304	719	63,978	90,092	-13,543	51,392	19,449	-580	63,978	90,092	-13,543	51,392	19,449	-580	1,407	1,097
32.5	10.7	734	218	516	74,466	104,861	-13,543	61,881	23,418	-580	74,466	104,861	-13,543	61,881	23,418	-580	1,205	940
27.5	8.6	334	99	235	84,955	119,630	-13,543	72,369	27,387	-580	84,955	119,630	-13,543	72,369	27,387	-580	637	497
22.5	6.8	252	75	177	95,443	134,399	-13,543	82,857	31,356	-580	95,443	134,399	-13,543	82,857	31,356	-580	548	427
17.5	5.5	125	37	88	105,931	149,168	-13,543	93,345	35,325	-580	105,931	149,168	-13,543	93,345	35,325	-580	305	238
12.5	4.1	47	14	33	116,419	163,937	-13,543	103,834	39,294	-580	116,419	163,937	-13,543	103,834	39,294	-580	127	99
7.5	2.6	22	7	15	126,908	178,707	-13,543	114,322	43,264	-580	126,908	178,707	-13,543	114,322	43,264	-580	65	51
2.5	1.0	13	4	9	137,396	193,476	-13,543	124,810	47,233	-580	137,396	193,476	-13,543	124,810	47,233	-580	42	33
-2.5	0.0	0	0	0	147,884	208,245	-13,543	135,298	51,202	-580	147,884	208,245	-13,543	135,298	51,202	-580	0	0
-7.5	-1.5	0	0	0	158,372	223,014	-13,543	145,787	55,171	-580	158,372	223,014	-13,543	145,787	55,171	-580	0	0
TOTALS		8,760	2,607	6,153													6,169	4,812

Existing Building Ventilation & Infiltration (occ)	2,735	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	735	cfm

Unit Heater Fan Savings

#	Description	Voltage	Load Factor	Existing HP	Existing Efficiency	Proposed FLA	Existing # of Units	Proposed # of Units	Existing kW	Proposed kW	Annual Hours	Existing Use kWh	Proposed Use kWh	Savings kWh
UH-1	Blower Motor	115	0.8	0.055	82.5%		1		0.04	0.00	1,496	60	0	60
UH-2	Blower Motor	115	0.8	0.055	82.5%		1		0.04	0.00	1,496	60	0	60
UH-3	Blower Motor	115	0.8	0.055	82.5%		1		0.04	0.00	1,496	60	0	60
UH-4	Blower Motor	115	0.8	0.055	82.5%		1		0.04	0.00	1,496	60	0	60
UH-5	Blower Motor	115	0.8	0.055	82.5%		1		0.04	0.00	1,496	60	0	60
UH-6	Blower Motor	115	0.8	0.055	82.5%		1		0.04	0.00	1,496	60	0	60
Infrared	Blower Motor	120	0.8	0.000	82.5%	1.1		5	0.00	0.53	1,496	0	790	(790)
Total				0.330			6	5	0.24	0.53		357	790	(433)

Kearny NJ
CHA #20711
Building: DPW - Shop Building

Reconcile Thermal Model

Building Footprint	5,000	SF
Heating Efficiency	78%	
Cooling Efficiency	1.20	kWton
Internal Gains	19,348	btuh
Unoc Internal Gain factor	0.03	
Ave Occ Internal Gain Factor	0.7	
Economizer available (Y/N)	No	
Existing Distribution Effectiveness	85%	

Ex Occupied Cing Temp.	74 °F
Ex Unoccupied Cing Temp.	74 °F
Occupied Cooling UA	(5,318) btuh/°F
Unoccupied Cooling UA	(5,212) btuh/°F
Cooling Occ Enthalpy Setpoint	27.5 Btu/lb
Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb

Ex Occupied Htg Temp.	68 °F
Ex Unoccupied Htg Temp.	62 °F
Occupied Heating UA	2,098 btuh/°F
Unoccupied Heating UA	2,098 btuh/°F

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

Avg Outdoor Air Temp. Bins °F		Avg Outdoor Air Enthalpy	EXISTING LOADS										Available Economizer Cooling kWh				Existing Cooling Energy kWh	Existing Heating Energy M
			Occupied					Unoccupied										
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P			
102.5	0	0	0	-151,575	-265,844	-13,543	-148,550	-71,444	-580	0	0	0	0	0	0			
97.5	3	1	2	-124,983	-184,614	-13,543	-122,489	-49,614	-580	0	65	86	0	0	0			
92.5	34	10	24	-98,391	-147,691	-13,543	-96,427	-39,691	-580	0	589	589	0	0	0			
87.5	131	39	92	-71,799	-111,989	-13,543	-70,366	-30,089	-580	0	1,689	1,689	0	0	0			
82.5	500	149	351	-45,207	-79,999	-13,543	-44,305	-21,499	-580	0	4,396	4,396	0	0	0			
77.5	620	185	435	-18,614	-50,461	-13,543	-18,243	-13,561	-580	0	2,935	2,935	0	0	0			
72.5	664	198	466	0	0	-13,543	0	0	-580	0	295	295	0	0	0			
67.5	854	254	600	1,049	1,477	-13,543	0	0	-580	0	315	315	0	0	0			
62.5	927	276	651	11,537	16,246	-13,543	0	0	-580	0	0	0	0	54	0			
57.5	600	179	421	22,025	31,015	-13,543	9,439	3,572	-580	0	0	0	0	185	0			
52.5	610	182	428	32,514	45,784	-13,543	19,928	7,541	-580	0	0	0	0	351	0			
47.5	611	182	429	43,002	60,553	-13,543	30,416	11,510	-580	0	0	0	0	515	0			
42.5	656	195	461	53,490	75,323	-13,543	40,904	15,480	-580	0	0	0	0	727	0			
37.5	1,023	304	719	63,978	90,092	-13,543	51,392	19,449	-580	0	0	0	0	1,407	0			
32.5	734	218	516	74,466	104,861	-13,543	61,881	23,418	-580	0	0	0	0	1,205	0			
27.5	334	99	235	84,955	119,630	-13,543	72,369	27,387	-580	0	0	0	0	637	0			
22.5	252	75	95	95,443	134,399	-13,543	82,857	31,356	-580	0	0	0	0	548	0			
17.5	125	37	88	105,931	149,168	-13,543	93,345	35,325	-580	0	0	0	0	305	0			
12.5	47	14	33	116,419	163,937	-13,543	103,834	39,294	-580	0	0	0	0	127	0			
7.5	22	7	15	126,908	178,707	-13,543	114,322	43,264	-580	0	0	0	0	65	0			
2.5	13	4	9	137,396	193,476	-13,543	124,810	47,233	-580	0	0	0	0	42	0			
-2.5	0	0	0	147,884	208,245	-13,543	135,298	51,202	-580	0	0	0	0	0	0			
-7.5	0	0	0	158,372	223,014	-13,543	145,787	55,171	-580	0	0	0	0	0	0			
TOTALS	8,760	2,607	6,153								10,934	10,294		6,169				

Existing Building Ventilation & Infiltration (occ)
Overheat Ventilation Factor
Additional Ventilation to offset overheat
Existing Building Ventilation & Infiltration (unocc)
Economizer Ventilation (from AHU's)

2,735 cfm
1.00
0 cfm
735 cfm
2,000 cfm

Energy Use Indices (calculated)

Heating	Base Case
Target ->	6,169
	100.5%

Cooling	Base Case
Target ->	10,294
	300
	3431.3%

HEAT GAIN/LOSS WORKSHEET

Project Name: Kearny NJ
 Location: DPW - Shop Building
 Building Name: ND
 Engineer: ND

Project No.: CHA #20711
 Site Elevation: 460 Feet
 Date: 01/08/10

Specific Volume 14.00 CF/#

Building/Facility Designation Entire bldg

Outdoor Winter Design DB Temperature 14 °F
 Outdoor Summer Design DB Temperature 91 °F
 Outdoor Summer Design WB Temperature 73 °F
 Outdoor Summer Humidity Ratio 0.0121 ##

Indoor Winter Design DB Temperature 68 °F
 Indoor Summer Design DB Temperature 74 °F
 Indoor Summer Design WB Temperature 60 °F
 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 12" CMU	5.5	

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 Wood Deck, Felt & Membrane	6.50	

Windows (Select One)

	U Value
Aluminum Frame, 1/8" SP Glazing	1.05
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
x wood frame, dbl glazing	0.55

	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 5,000 SF
 Occupied Area 5,000 SF

Return Plenum? n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	50 Ft	16.0 Ft	16.0 Ft	0 SF	0 SF	800 SF
East Exposure	100 Ft	16.0 Ft	16.0 Ft	0 SF	0 SF	1,600 SF
South Exposure	50 Ft	16.0 Ft	16.0 Ft	0 SF	0 SF	800 SF
West Exposure	100 Ft	16.0 Ft	16.0 Ft	36 SF	809 SF	756 SF

Forced Ventilation 2,000 cfm

HEAT GAIN/LOSS WORKSHEET

Project Name: Kearny NJ
 Location: DPW - Shop Building
 Building Name: DPW - Shop Building
 Engineer: ND

Project No.: CHA #20711
 Site Elevation: 460 Feet
 Date: 01/08/10

Specific Volume 14.00 CF/#

Building/Facility Designation: Entire bldg

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor	Glass Type	Solar Heat Gain
North Exposure	0	38 btu/h/sf	0.8	0.75	Glass Type C	0 Btu/hr
East Exposure	0	216 btu/h/sf	0.8	0.31	Glass Type C	0 Btu/hr
South Exposure	0	109 btu/h/sf	0.8	0.58	Glass Type C	0 Btu/hr
West Exposure	36	216 btu/h/sf	0.8	0.29	Glass Type C	1,804 Btu/hr
						1,804 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	800	0.18	20 °F	1.0	2,909 Btu/hr
East Exposure	1,600	0.18	39 °F	1.0	11,345 Btu/hr
South Exposure	800	0.18	27 °F	1.0	3,927 Btu/hr
West Exposure	756	0.18	22 °F	1.0	3,022 Btu/hr
Roof	5,000	0.15	73 °F	1.0	56,154 Btu/hr
Fenestration	36	0.55	17 °F		337 Btu/hr
Doors	809	0.50	27 °F		10,915 Btu/hr
Ceiling	5,000	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	5,000	0.04	0 °F		0 Btu/hr
					88,609 Btu/h

INTERNAL HEAT GAINS

Lights	0.80 w/sf x	5,000 Occ Area =	4.0 kW x 3.4x	1.0 RAF =	13,652 Btu/h
Plug Load	0.25 w/sf x	5,000 Occ Area =	1.3 kW x 3.4x	1.0 RAF =	4,266 Btu/h
People	8 people x	255 btu/person x	50% time in space =		1,020 Btu/h
Computer Work Stations		1 Units x	120 W/Unit x	3414 =	410 Btu/h
Equipment		kW x 3.413 =			0 Btu/h
Misc.					0 Btu/h
					19,348 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain
Walls	3,956 SF	0.15 CFM/SF		1.04	17 °F	11,371 Btu/h
Doors	809 SF	0.50 CFM/LF	0.30 LF/SF	1.04	17 °F	2,348 Btu/h
Windows	36 SF	0.20 CFM/LF	2.67 LF/SF	1.04	17 °F	368 Btu/h
Ventilation	2,000 cfm			1.04	17 °F	38,329 Btu/h
						52,415 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	0	0.18	20	1.0	0 Btu/hr
East Exposure	0	0.18	39	1.0	0 Btu/hr
South Exposure	0	0.18	27	1.0	0 Btu/hr
West Exposure	0	0.18	22	1.0	0 Btu/hr
Roof	5,000	0.15	73	0.0	0 Btu/hr
					0 Btu/h

INTERNAL HEAT GAINS

Lights	0.80 w/sf x	5,000 Occ Area =	4.0 kW x3413x	0.00 RAF =	0 Btu/h	
Misc.					0 Btu/h	
						0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT

Solar	1,804
Conduction to Room	88,609
Conduction to Plenum	0
Ventilation and Infiltration	52,415
Sub Total	142,828

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT

Internal Gains to Room	19,348
Internal Gains to Plenum	0
Sub Total	19,348

HEAT GAIN/LOSS WORKSHEET

Project Name: Kearny NJ
 Location:
 Building Name: DPW - Shop Building
 Engineer: ND

Project No.: CHA #20711
 Site Elevation: 460 Feet
 Date: 01/08/10

Specific Volume 14.00 CF/#

Building/Facility Designation Entire bldg

LATENT COOLING LOADS

Infiltration		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	5,000 SF	0.15 CFM/SF	4,629	0.0042 ##	14,729 Btu/h
Doors	809 SF	0.50 CFM/LF	4,629	0.0042 ##	2,406 Btu/h
Windows	36 SF	0.20 CFM/LF	4,629	0.0042 ##	377 Btu/h
Ventilation	2,000 cfm		4,629	0.0042 ##	39,277 Btu/h
People	8 people	0.50 time in space		250 Btu/hr/person	1,000 Btu/h
					57,788 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	SHR=	
Temperature Dependent Gains	142,828	57,788	200,616		
Temperature Indep. Gains	19,348		19,348	0.74	
Total	162,176	57,788	219,964		

Building Cooling Load 18.3 Tons at 273 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is

12,947 CFM
2.59 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	800	0.18	54	7,855 Btu/h
East Exposure	1,600	0.18	54	15,709 Btu/h
South Exposure	800	0.18	54	7,855 Btu/h
West Exposure	756	0.18	54	7,418 Btu/h
Fenestration	36	0.55	54	1,069 Btu/h
Roof	5,000	0.15	54	41,538 Btu/h
Doors	809	0.50	54	21,830 Btu/h
Ceiling	5,000	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	5,000	0.04	50	10,000 Btu/h

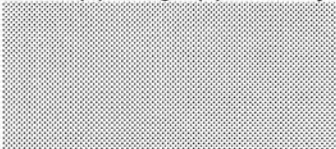
Ventilation and Infiltration

	Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	3,956 SF	0.15 CFM/SF	54	593 cfm	33,443 Btu/h
Doors	809 SF	0.50 CFM/LF	54	123 cfm	6,905 Btu/h
Windows	36 SF	0.20 CFM/LF	54	19 cfm	1,082 Btu/h
Ventilation Load	2,000 cfm		54	2,000 cfm	121,750 Btu/h
Total Ventilation & Infiltration Load				2,735 cfm	163,180 Btu/h

Building Heating Load	276,453	btu/h
		55.3 btu/sf

Kearny NJ
CHA #20711
Building: DPW - Shop Building

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
Sub-total			0.0	0.0	
East				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
Sub-total			0.0	0.0	
LF/SF #DIV/0!					
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
Sub-total			0.0	0.0	
West	3.5	7.0	1	24.5	21.0
	14.0	14.0	4	784.0	224.0
	Sub-total			808.5	245.0
Total			808.5	245.0	
LF/SF 0.30					

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North	50.0	16.0	1	800.0	132.0	All wall quantities must remain equal to 1
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	50.0			800.0	132.0	Ave. height 16.0
						Average height wall automatically linked to

East	100.0	16.0	1	1600.0	232.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	100.0			1600.0	232.0	Ave. height 16.0
						Average height wall automatically linked to

South	50.0	16.0	1	800.0	132.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	50.0			800.0	132.0	Ave. height 16.0
						Average height wall automatically linked to

West	100.0	16.0	1	1600.0	232.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
	100.0			1600.0	232.0	Ave. height 16.0
						Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0

East				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0

South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0

West	3.0	1.0	12	36.0	96.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	36.0	96.0

			Total	36.0	96.0
					LF/SF 2.67

Kearny NJ

CHA #20711

DPW - Shop Building

ECM-2A Install Infrared Garage Heaters - Shop

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	5	ea		\$ 150		\$ -	\$ -	\$ -	\$ -	
NG Infrared Tube Heater garage area (60MBH)	4	ea	\$ 540	\$ 178		\$ -	\$ 908	\$ -	\$ 908	
Miscellaneous Gas Piping, Valves, etc.	1	ls	\$ 2,700	\$ 1,800		\$ 2,117	\$ 862	\$ -	\$ 2,978	
4" Class B Vent Piping	40	lf	\$ 6.70	\$ 10		\$ 2,646	\$ 2,178	\$ -	\$ 4,824	
4" Chimney Cap	4	ea	\$ 11	\$ 10		\$ 263	\$ 484	\$ -	\$ 747	
T-stats (w/setback, control wiring)	4	ea	\$ 95	\$ 30		\$ 43	\$ 48	\$ -	\$ 92	
Electric wiring for ignition	4	ea	\$ 15	\$ 90		\$ 372	\$ 145	\$ -	\$ 518	
						\$ 59	\$ 436	\$ -	\$ 494	

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

\$10,560	Subtotal
\$2,112	20% Contingency
\$1,901	15% Contractor O&P
\$0	0% Engineering
\$14,573	Total

APPENDIX D

ECM-3 Replace Domestic Hot Water Heater – Main

Kearny NJ
CHA #20711
Building: DPW- Main Building

ECM-3 Replace DHW Heater - Main

Summary

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

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	402	kWh/month	Estimated base on energy tag rating
Electric Demand	4.5	kW	
Total Annual Utility Demand by Water Heater	16,473	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	100%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	16,473	MBTU/yr	
Existing Tank Size	50	Gallons	Per manufacturer nameplate
Hot Water Piping System Capacity	5	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	'F	Per building personnel
Room Temperature	70	'F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.6	MBH	
Annual Standby Hot Water Load	5,019	MBTU/yr	
New Tank Size	0	Gallons	Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Hot Water Piping System Capacity	5	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	'F	
Room Temperature	70	'F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.1	MBH	
Annual Standby Hot Water Load	456	MBTU/yr	
Total Annual Hot Water Demand	11,911	MBTU/yr	
Proposed Avg. Hot water heater efficiency	92%		Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Proposed Fuel Use	12,946	MBTU/yr	Standby Losses and inefficient DHW heater eliminated
Electricity cost	0.166	\$/kWh	
Gas Cost	\$1.46	\$/Therm	
Existing Operating Cost of DHW	\$801	\$/yr	
Proposed Operating Cost of DHW	\$189	\$/yr	

Savings Summary:

Utility	Energy	Cost Savings
Electric (kWh)	4,828	\$1,382
Natural Gas (therms)	(129)	(\$189)
Cost savings		\$1,193

Kearny NJ
CHA #20711
Building: DPW- Main Building
ECM-3 Replace DHW Heater - Main

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Electric DHW Heater Removal	1	LS		\$ 75		\$ -	\$ 91	\$ -	\$ 91	
Instantaneous Gas-Fired DHW Heater	1	EA	\$ 2,500	\$ 280		\$ 2,450	\$ 339	\$ -	\$ 2,789	
Gas piping	1	LS	\$ 150	\$ 320		\$ 147	\$ 387	\$ -	\$ 534	
Venting Kit	1	EA	\$ 350	\$ 300		\$ 343	\$ 363	\$ -	\$ 706	
Miscellaneous Electrical	1	LS	\$ 100	\$ 200		\$ 98	\$ 242	\$ -	\$ 340	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	

\$ 4,460	Subtotal
\$ 446	10% Contingency Contractor
\$ 736	15% O&P
\$ -	0% Engineering
\$ 5,642	Total

New Jersey Smart Start Incentive	QTY	UNIT	\$/UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE		Cost W/ INCENTIVE	
					E		E	
Tankless unit heater	1	ea	\$300	\$300	\$ -	\$ -	\$ 2,789	\$ 2,489
					\$ -	\$ -	\$ -	\$ -
				\$300			\$2,789	\$2,489

Total ECM Cost w/ Incentives	\$5,342
------------------------------	---------

APPENDIX E

ECM-4 Increase Roof Insulation – Shop

Kearny NJ
CHA #20711
Building: DPW - Shop Building

ECM-4 Install Roof Insulation - Shop

Existing Roof Area 5,000 sf
Existing U-value 0.15 Btu/hr/(sf°F)
Proposed U-value 0.05 Btu/hr/(sf°F)
Heating System Efficiency 78%
Cooling System Efficiency 1.20 kWton

WI 3" Expanded Polystyrene board insulation (R-12)

Existing Cooling
Existing Cooling Load Temp Diff. 73 F
Existing Max. Roof Cooling Load 55,154 Btu/hr
Proposed Cooling
Proposed Cooling Load 18,250 Btu/hr
Occupied Cooling Setpoint 74 F
Unoccupied Cooling Setpoint 80 F

Existing Heating
Existing Heating Load Temp Diff. 54 F
Existing Max. Roof Heating Load 41,538 Btu/hr
Proposed Heating
Proposed Heating Load 13,500 Btu/hr
Occupied Heating Setpoint 68 F
Unoccupied Heating Setpoint 60 F

Existing Heating Total 85,970,032 Btu/yr
Proposed Heating Total 27,940,260 Btu/yr
Savings 58,029,772 Btu/yr
Input 744 therms
Existing Cooling Total 350 kWh/yr
Proposed Cooling Total 114 kWh/yr
Savings 236 kWh/yr

Avg Outdoor Air Temp. Bins °F	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Occupied				Unoccupied						Existing Heating Load (Btu/yr)	Proposed Heating Load (Btu/yr)	Existing Cooling Load (kWh/yr)	Proposed Cooling Load (kWh/yr)	Proposed Heating Load (Btu/yr)
				Existing Heat Gain (Btu/yr)	Proposed Heat Gain (Btu/yr)	Existing Heat Loss (Btu/yr)	Proposed Heat Loss (Btu/yr)	Existing Heat Gain (Btu/yr)	Proposed Heat Gain (Btu/yr)	Existing Heat Loss (Btu/yr)	Proposed Heat Loss (Btu/yr)	Existing Heat Gain (Btu/yr)	Proposed Heat Gain (Btu/yr)					
102.5	0	0	0	21,923	7,125	-	-	17,308	5,625	-	-	-	-	-	-	-	-	-
97.5	3	1	2	18,077	5,875	-	-	13,462	4,375	-	-	-	-	-	-	-	-	-
92.5	34	10	24	14,231	4,625	-	-	9,615	3,125	-	-	-	-	-	-	-	-	-
87.5	131	39	92	10,385	3,375	-	-	5,769	1,875	-	-	-	-	-	-	-	-	-
82.5	500	149	351	6,538	2,125	-	-	1,923	825	-	-	-	-	-	-	-	-	-
77.5	620	185	435	2,692	875	-	-	-	-	-	-	-	-	-	-	-	-	-
72.5	664	198	466	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
67.5	854	254	600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62.5	927	276	651	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57.5	600	179	421	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
52.5	610	182	428	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
47.5	611	182	429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42.5	656	195	461	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37.5	1,023	304	719	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32.5	734	218	516	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.5	334	99	235	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22.5	252	75	177	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17.5	125	37	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.5	47	14	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.5	22	7	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.5	13	4	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-2.5	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-7.5	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTALS	8,760	2,607	6,153	-	-	-	-	-	-	-	-	-	-	-	-	350	114	27,940,260

Kearny NJ
 CHA #20711
 Building: DPW - Shop Building
 ECM-4 Install Roof Insulation - Shop

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.		
3" Expanded Polystyrene Board R-12	3024	sf	\$ 0.95	\$ 0.55		\$ 2,815	\$ 2,012	\$ -	\$ 4,828	W/ flame resistant backing
Misc attachments	1	ls	\$ 800	\$ 1,200		\$ 784	\$ 1,452	\$ -	\$ 2,236	
Project difficulty	1	ls		\$ 1,500		\$ -	\$ 1,815	\$ -	\$ 1,815	High ceilings
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	

\$8,879	Subtotal
\$1,776	20% Contingency
\$1,598	15% Contractor O&P
\$0	Engineering
\$12,253	Total

APPENDIX F

ECM-5 Increase Wall Insulation – Shop

Kearny NJ
CHA #20711
Building: DPW - Shop Building

ECM-5 Increase Wall Insulation - Shop

Total Existing Wall Area	2,359 sf
Existing U-value	0.18 Btu/hr/(sf°F)
Proposed U-value	0.08 Btu/hr/(sf°F)
Heating Efficiency	78%
Cooling Efficiency	1.20 kW/ton

Existing Cooling	2,909 Btu/hr
Max. North Wall Cooling Load	11,345 Btu/hr
Max. East Wall Cooling Load	3,927 Btu/hr
Max. South Wall Cooling Load	3,022 Btu/hr
Max. West Wall Cooling Load	

Proposed Cooling	912 Btu/hr
Max. North Wall Cooling Load	3,557 Btu/hr
Max. East Wall Cooling Load	1,231 Btu/hr
Max. South Wall Cooling Load	947 Btu/hr
Max. West Wall Cooling Load	

Occupied Cooling Setpoint	74 F
Unoccupied Cooling Setpoint	60 F

Existing Cooling Total	469 kWh/yr
Proposed Cooling Total	147 kWh/yr
Savings	322 kWh/yr

Existing Heating	54 F
Existing Heating Load Temp Diff	39,836 Btu/hr
Existing Max. Wall Heating Load	

Proposed Heating	12,175 Btu/hr
Proposed Max. Heating Load	

Occupied Heating Setpoint	68 F
Unoccupied Heating Setpoint	60 F

Existing Heating Total	47,864,206 Btu/yr
Proposed Heating Total	15,005,429 Btu/yr
Savings	32,858,777 Btu/yr
Input	421 therms

Avg Outdoor Air Temp, Bins °F	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Occupied						Unoccupied						Existing Cooling Load (kW/yr)	Proposed Cooling Load (kW/yr)	Existing Heating Load (Btu/yr)	Proposed Heating Load (Btu/yr)
				Existing Heat Gain (Btu/hr)	Proposed Heat Gain (Btu/hr)	Existing Heat Loss (Btu/hr)	Proposed Heat Loss (Btu/hr)	Existing Heat Gain (Btu/hr)	Proposed Heat Gain (Btu/hr)	Existing Heat Loss (Btu/hr)	Proposed Heat Loss (Btu/hr)	Existing Heat Gain (Btu/hr)	Proposed Heat Gain (Btu/hr)	Existing Heat Loss (Btu/hr)	Proposed Heat Loss (Btu/hr)				
97.5	3	1	2	21,204	6,647	-	-	21,204	6,647	-	-	21,204	6,647	-	-	6	2	-	-
92.5	34	10	24	16,692	5,233	-	-	16,146	4,748	-	-	15,146	4,748	-	-	53	17	-	-
87.5	131	39	92	12,181	3,819	-	-	9,087	2,849	-	-	9,087	2,849	-	-	131	41	-	-
82.5	500	149	351	7,669	2,404	-	-	3,028	950	-	-	3,028	950	-	-	221	69	-	-
77.5	620	185	435	3,158	990	-	-	-	-	-	-	-	-	-	-	58	18	-	-
72.5	664	198	466	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
67.5	854	254	600	-	-	-	214	-	-	-	67	-	-	-	-	-	-	-	-
62.5	927	276	651	-	-	-	2,356	-	-	-	738	-	-	-	-	-	-	-	-
57.5	600	179	421	-	-	-	4,497	-	-	-	1,410	-	-	-	-	-	-	-	-
52.5	610	182	428	-	-	-	6,638	-	-	-	2,081	-	-	-	-	-	-	-	-
47.5	611	182	429	-	-	-	8,780	-	-	-	2,752	-	-	-	-	-	-	-	-
42.5	656	195	461	-	-	-	10,921	-	-	-	3,424	-	-	-	-	-	-	-	-
37.5	1,023	304	719	-	-	-	13,062	-	-	-	4,095	-	-	-	-	-	-	-	-
32.5	734	218	516	-	-	-	15,204	-	-	-	4,766	-	-	-	-	-	-	-	-
27.5	334	99	235	-	-	-	17,345	-	-	-	5,438	-	-	-	-	-	-	-	-
22.5	252	75	177	-	-	-	19,486	-	-	-	6,109	-	-	-	-	-	-	-	-
17.5	125	37	88	-	-	-	21,628	-	-	-	6,780	-	-	-	-	-	-	-	-
12.5	47	14	33	-	-	-	23,789	-	-	-	7,452	-	-	-	-	-	-	-	-
7.5	22	7	15	-	-	-	25,911	-	-	-	8,123	-	-	-	-	-	-	-	-
2.5	13	4	9	-	-	-	28,052	-	-	-	8,794	-	-	-	-	-	-	-	-
-2.5	0	0	0	-	-	-	30,193	-	-	-	9,466	-	-	-	-	-	-	-	-
-7.5	0	0	0	-	-	-	32,335	-	-	-	10,137	-	-	-	-	-	-	-	-
TOTALS	8,760	2,607	6,153													469	147	47,864,206	15,005,429

Kearny NJ
 CHA #20711
 Building: DPW - Shop Building
ECM-5 Increase Wall Insulation - Shop

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
Polyisocyanurate 1.5" R-10	2,356	sf	\$ 0.70	\$ 0.44	\$ 0.06	\$ 1,625	\$ 1,254	\$ 141	\$ 3,020	exposed
Misc	1	ls	\$ 1,000	\$ 1,280		\$ 980	\$ 1,549	\$ -	\$ 2,529	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	

Insulation attached to interior wall without finish									
\$	5,549	Subtotal							
\$	832	15% Contingency							
\$	957	Contractor 15% O&P							
\$	-	Engineering							
\$	7,339	Total							

APPENDIX G

ECM-6 Replace Window AC Units – Shop

Kearny NJ
CHA #20711
Building: DPW - Shop Building

ECM-6 Replace Window AC units w/ Ductless Splits - Shop
(utilize remote outdoor condensers)

ASSUMPTIONS		Comments
Electric Cost	\$0.166 / kWh	
Average run hours per Week	70 Hours	Unit is manually turned on (even if after hours)
Space Balance Point	55 F	
Space Temperature Setpoint	70 deg F	setpoint
Avg. BTU / Hr Rating of existing AC unit	14,000 Btu / Hr	(typical size for cooling office spaces in this type of building)
Average EER	7.0	Units appear to average 10 years old, EER was 8 when new

Item	Value	Units	Comments
Total Number of Units	1		
Existing Annual Electric Usage	789	kWh	
Proposed EER	14.4		New ductless mini-splits (per manufacturer)
Proposed Annual Electric Usage	384	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS	
Annual Savings	406 kWh
Annual Cost Savings	\$67

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

Kearny NJ
CHA #20711
Building: DPW - Shop Building

ECM-6 Replace Window AC units w/ Ductless Splits - Shop

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Window AC Unit Removal	1	LS		\$ 25		\$ -	\$ -	\$ -	\$ -	
Indoor wall unit	1	ea	\$ 745	\$ 210		\$ -	\$ 30	\$ -	\$ 30	
Condensing unit	1	ea	\$ 1,080	\$ 290		\$ 730	\$ 254	\$ -	\$ 984	
Extensions	1	ea	\$ 120	\$ 80		\$ 1,058	\$ 351	\$ -	\$ 1,409	
Misc	1	LS	\$ 20	\$ 30		\$ 118	\$ 97	\$ -	\$ 214	
						\$ 20	\$ 36	\$ -	\$ 56	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	

\$ 2,694	Subtotal
\$ 404	15% Contingency
\$ 404	Contractor
\$ -	15% O&P
\$ -	0% Engineering
\$ 3,502	Total

APPENDIX H

ECM-7 Lighting Replacements

APPENDIX I

ECM-8 Install Occupancy Sensors

0 \$0.123 \$/kWh
\$10.75 \$/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
9	GARAGE	4	HB400MH1	MH400/1	458	1.8	SW	2400	4,396.8	4	HB400MH1	MH400/1	458	1.8	None	2400	4,396.8	0.0	0.0	\$0.00	\$0.00	\$0.00		
9	GARAGE	4	HB400MH1	MH400/1	458	1.8	SW	2400	4,396.8	4	HB400MH1	MH400/1	458	1.8	None	2400	4,396.8	0.0	0.0	\$0.00	\$0.00	\$0.00		
9	GARAGE	4	HB400MH1	MH400/1	458	1.8	SW	2400	4,396.8	4	HB400MH1	MH400/1	458	1.8	None	2400	4,396.8	0.0	0.0	\$0.00	\$0.00	\$0.00		
9	GARAGE	4	HB400MH1	MH400/1	458	1.8	SW	2400	4,396.8	4	HB400MH1	MH400/1	458	1.8	None	2400	4,396.8	0.0	0.0	\$0.00	\$0.00	\$0.00		
193	GARAGE	8	W 34 P F 2 (MAG)	F42EE	72	0.6	SW	2400	1,382.4	8	W 34 P F 2 (MAG)	F42EE	72	0.6	None	2400	1,382.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
X1	GARAGE	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8736	13.1	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8736	13.1	0.0	0.0	\$0.00	\$0.00	\$0.00		
6	GARAGE	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2400	691.2	2	T 34 R F 4 (MAG)	F44EE	144	0.3	None	2400	691.2	0.0	0.0	\$0.00	\$0.00	\$0.00		
46	REAR VEST/ STAIRWAY	1	W 32 C F 2 (ELE)	F42LL	60	0.1	SW	2080	124.8	1	W 32 C F 2 (ELE)	F42LL	60	0.1	None	2080	124.8	0.0	0.0	\$0.00	\$0.00	\$0.00		
46	REAR VEST/ STAIRWAY	2	W 32 C F 2 (ELE)	F42LL	60	0.1	SW	2080	249.6	2	W 32 C F 2 (ELE)	F42LL	60	0.1	None	2080	249.6	0.0	0.0	\$0.00	\$0.00	\$0.00		
46	UPSTAIRS LOCKER ROOM	20	W 32 C F 2 (ELE)	F42LL	60	1.2	SW	2080	2,496.0	20	W 32 C F 2 (ELE)	F42LL	60	1.2	C-OCC	1040	1,248.0	1,248.0	0.0	\$153.50	\$202.50	\$70.00	1.3	0.9
X1	UPSTAIRS LOCKER ROOM	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8736	13.1	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8736	13.1	0.0	0.0	\$0.00	\$0.00	\$0.00		
18	UPSTAIRS LOCKER ROOM OFFICE	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	SW	2080	931.8	4	T 32 R F 4 (ELE)	F44ILL	112	0.4	None	2080	931.8	0.0	0.0	\$0.00	\$0.00	\$0.00		
193	GARAGE STORAGE	2	W 34 P F 2 (MAG)	F42EE	72	0.1	SW	1000	144.0	2	W 34 P F 2 (MAG)	F42EE	72	0.1	None	1000	144.0	0.0	0.0	\$0.00	\$0.00	\$0.00		
18	SIDE VESTIBULE	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2080	465.9	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	OCC	1040	233.0	233.0	0.0	\$28.65	\$118.75	\$20.00	4.1	3.4
18	RECEPTION OFFICE	17	T 32 R F 4 (ELE)	F44ILL	112	1.9	SW	2080	3,960.3	17	T 32 R F 4 (ELE)	F44ILL	112	1.9	None	2080	3,960.3	0.0	0.0	\$0.00	\$0.00	\$0.00		
18	RECEPTION OFFICE	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2080	698.9	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	None	2080	698.9	0.0	0.0	\$0.00	\$0.00	\$0.00		
X1	RECEPTION OFFICE	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8736	26.2	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8736	26.2	0.0	0.0	\$0.00	\$0.00	\$0.00		
18	MENS BATH	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	\$21.49	\$118.75	\$20.00	5.5	4.6
18	WOMANS BATH	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	\$21.49	\$118.75	\$20.00	5.5	4.6
18	LEFT OFFICE	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2080	465.9	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	C-OCC	1040	233.0	233.0	0.0	\$28.65	\$202.50	\$35.00	7.1	5.8
18	FRONT OFFICE	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	SW	2080	465.9	2	T 32 R F 4 (ELE)	F44ILL	112	0.2	C-OCC	1040	233.0	233.0	0.0	\$28.65	\$202.50	\$35.00	7.1	5.8
18	FRONT OFFICE	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	SW	2080	233.0	1	T 32 R F 4 (ELE)	F44ILL	112	0.1	C-OCC	1040	116.5	116.5	0.0	\$14.33	\$202.50	\$35.00	14.1	11.7
229	EXTERIOR LIGHTING ROAD	1	WP100 I 1	I100/1	100	0.1	SW	4368	436.8	1	WP100 I 1	I100/1	100	0.1	None	4368	436.8	0.0	0.0	\$0.00	\$0.00	\$0.00		
229	EXTERIOR LIGHTING FRONT	2	WP100 I 1	I100/1	100	0.2	SW	4368	873.6	2	WP100 I 1	I100/1	100	0.2	None	4368	873.6	0.0	0.0	\$0.00	\$0.00	\$0.00		
230	EXTERIOR LIGHTING LEFT	1	WP400MH1	MH400/1	458	0.5	SW	4368	2,000.5	1	WP400MH1	MH400/1	458	0.5	None	4368	2,000.5	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	Breaker	2400	4,358.4	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	None	2400	4,358.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	SW	2400	4,358.4	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	None	2400	4,358.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	SW	2400	4,358.4	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	None	2400	4,358.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	SW	2400	4,358.4	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	None	2400	4,358.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	SW	2400	4,358.4	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	None	2400	4,358.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	SW	2400	4,358.4	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	None	2400	4,358.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	SW	2400	4,358.4	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	None	2400	4,358.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	SW	2400	4,358.4	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	None	2400	4,358.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	SW	2400	4,358.4	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	None	2400	4,358.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE ENTRANCE	1	W 96 CF 4 (MAG)	F84EHS	454	0.5	Breaker	2400	1,089.6	1	W 96 CF 4 (MAG)	F84EHS	454	0.5	None	2400	1,089.6	0.0	0.0	\$0.00	\$0.00	\$0.00		
221	MECHANICS GARAGE ENTRANCE	1	W96WF 2 (MAG)	F82SHS	257	0.3	SW	2400	616.8	1	W96WF 2 (MAG)	F82SHS	257	0.3	None	2400	616.8	0.0	0.0	\$0.00	\$0.00	\$0.00		
221	MECHANICS GARAGE BATH	1	W96WF 2 (MAG)	F82SHS	257	0.3	SW	1560	400.9	1	W96WF 2 (MAG)	F82SHS	257	0.3	None	1560	400.9	0.0	0.0	\$0.00	\$0.00	\$0.00		
46	MECHANICS GARAGE OFFICE	4	W 32 C F 2 (ELE)	F42LL	60	0.2	SW	2080	499.2	4	W 32 C F 2 (ELE)	F42LL	60	0.2	None	2080	499.2	0.0	0.0	\$0.00	\$0.00	\$0.00		
20	MECHANICS GARAGE OFFICE	4	S 32 C F 1 (ELE)	F41LL	32	0.1	SW	2080	266.2	4	S 32 C F 1 (ELE)	F41LL	32	0.1	None	2080	266.2	0.0	0.0	\$0.00	\$0.00	\$0.00		
46	MECHANICS GARAGE OFFICE	4	W 32 C F 2 (ELE)	F42LL	60	0.2	SW	2080	499.2	4	W 32 C F 2 (ELE)	F42LL	60	0.2	None	2080	499.2	0.0	0.0	\$0.00	\$0.00	\$0.00		
222	MECHANICS GARAGE R.	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	SW	1000	1,816.0	4	W 96 CF 4 (MAG)	F84EHS	454	1.8	None	1000	1,816.0	0.0	0.0	\$0.00	\$0.00	\$0.00		
221	MECHANICS GARAGE SIDE WALLS	3	W96WF 2 (MAG)	F82SHS	257	0.8	SW	2400	1,850.4	3	W96WF 2 (MAG)	F82SHS	257	0.8	None	2400	1,850.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
X1	MECHANICS GARAGE SIDE WALLS	4	X 1.5 W LED	ELED1.5/1	1.5	0.0	SW	8736	52.4	4	X 1.5 W LED	ELED1.5/1	1.5	0.0	None	8736	52.4	0.0	0.0	\$0.00	\$0.00	\$0.00		
230	MECHANICS EXTERIOR FRONT	4	WP400MH1	MH400/1	458	1.8	SW	4368	8,002.2	4	WP400MH1	MH400/1	458	1.8	None	4368	8,002.2	0.0	0.0	\$0.00	\$0.00	\$0.00		
230	MECHANICS EXTERIOR LEFT	4	WP400MH1	MH400/1	458	1.8	SW	4368	8,002.2	4	WP400MH1	MH400/1	458	1.8	None	4368	8,002.2	0.0	0.0	\$0.00	\$0.00	\$0.00		
Total		160				36.8			91,922	160				37			89,509	2,413	0	297	\$1,166	235		
																		Demand Savings						
																		kWh Savings				0.0		
																						\$297		
																		Total Savings				\$297		

APPENDIX J

New Jersey Pay For Performance Incentive Program

Kearny NJ

CHA #20711

Building: DPW - Both Buildings

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 governments or non-profit organizations.

The incentive values represented below are applicable through December 31, 2010.

	Annual Utilities	
	kWh	Therms
Existing Usage (from utility)	112,480	10,960
Proposed Savings	38,893	4,102
Existing Total MMBtus	1,480	
Proposed Savings MMBtus	543	
% Reduction	36.7%	
Proposed Annual Savings	\$12,800	

	≥ %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	\$8,556	\$9,025	\$17,582
Incentive #3	\$5,445	\$5,743	\$11,188
Totals	\$14,001	\$14,769	\$28,770

Total Project Cost	\$89,500
% Incentives of Project Cost*	32.1%
Project Cost w/ Incentives*	\$60,730

Project Payback (years)	
w/o Incentives	w/ Incentives
7.0	4.7

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

APPENDIX K

Photovoltaic (PV) Rooftop Solar Power Generation



AC Energy & Cost Savings



Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	35.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	26.9 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	16.7 ¢/kWh

Results			
Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	3.36	2897	483.22
2	4.05	3129	521.92
3	4.58	3795	633.01
4	4.84	3709	618.66
5	5.30	4087	681.71
6	5.33	3854	642.85
7	5.27	3892	649.19
8	5.25	3852	642.51
9	5.06	3737	623.33
10	4.46	3519	586.97
11	3.15	2511	418.83
12	2.87	2422	403.99
Year	4.46	41405	6906.35

[Output Hourly Performance Data](#)
[Output Results as Text](#)

*

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

Please send questions and comments regarding PVWATTS to Webmaster

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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 $\pm 30\%$ for monthly values and $\pm 10\%$ 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.

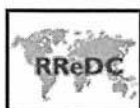
If net-metering isn't available and the PV system sends surplus electricity to the utility grid, the utility generally buys the electricity from the owner at a lower price than the owner pays the utility for electricity. In this case, the cost savings shown in the table should be reduced.

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.

Please send questions and comments to Webmaster

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**Township of Kearny
Department of Public Works**

Cost of Electricity \$0.166 \$/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-35kW 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						
\$350,000	0.0	41,410	0	\$6,900	\$0	\$35,000	\$20,200	50.7	11.6

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 L

Solar Thermal Domestic Hot Water Plant


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RENEWABLE ENERGY
 THE INFINITE POWER
 OF TEXAS

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	
1.5 Diameter (feet)	1.5	50 Water Inlet Temperature (Degrees F)	50
50 Capacity (gallons)	50	70 Ambient Temperature (Degrees F)	70
21.36 Surface Area (calculated - sq ft)	21.36	120 Hot Water Temperature (Degrees F)	120
NaN Effective R-value	NaN	60 Hot Water Usage (Gallons per Day)	60
Energy Use			
1437		0 Heat Delivered in Hot Water (BTU/hr)	
0		0 Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		Electric
0.8	0.98 Overall Efficiency	0.98
0.8	0.98 Conversion Efficiency	0.98
1796 BTU/hr	1466 Power Into Water Heater	1466 BTU/hr
Cost		
\$ 1.467 /Therm	\$ 0.1668 Utility Rates	\$ 0.1668 /kWh
\$ 230.802	\$ 627.359 Yearly Water Heating Cost	\$ 627.359
How Does Solar Compare?		
\$ 27100 Solar Water Heater Cost: \$ 27100		70 Percentage Solar: 70
167.737 years for gas	61.7098 Payback Time for Solar System	61.7098 years for electric

NJBPU Energy Audits

CHA # 20711

Township of Kearny

Department of Public Works - Main Building

Multipliers		
Material:	0.98	
Labor:	1.21	
Equipment:	1.09	

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Synergy Solar Thermal System	2	ea			\$ 3,600	\$ -	\$ -	\$ 7,848	\$ 7,848	
Piping modifications	1	ls	\$ 2,000	\$ 3,500		\$ 1,960	\$ 4,235	\$ -	\$ 6,195	
Electrical modifications	1	ls	\$ 1,000	\$ 1,000		\$ 980	\$ 1,210	\$ -	\$ 2,190	
65 Gallon Storage 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


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RENEWABLE ENERGY
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OF TEXAS

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	
1.5 Diameter (feet)	1.5	50 Water Inlet Temperature (Degrees F)	50
40 Capacity (gallons)	40	70 Ambient Temperature (Degrees F)	70
17.79 Surface Area (calculated - sq ft)	17.79	120 Hot Water Temperature (Degrees F)	120
NaN Effective R-value	NaN	50 Hot Water Usage (Gallons per Day)	50
Energy Use			
1197		0 Heat Delivered in Hot Water (BTU/hr)	
0		0 Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		Electric
0.8	0.98 Overall Efficiency	0.98
0.8	0.98 Conversion Efficiency	0.98
1496 BTU/hr	1221 Power Into Water Heater	1221 BTU/hr
Cost		
\$ 1.467 /Therm	\$ 0.1668 Utility Rates	\$ 0.1668 /kWh
\$ 192.249	\$ 522.514 Yearly Water Heating Cost	\$ 522.514
How Does Solar Compare?		
\$ 27100 Solar Water Heater Cost: \$27100		70 Percentage Solar: 70
201.374 years for gas	74.0923 Payback Time for Solar System	74.0923 years for electric

NJBPU Energy Audits
CHA # 20711
Township of Kearny
Department of Public Works - Shop Building

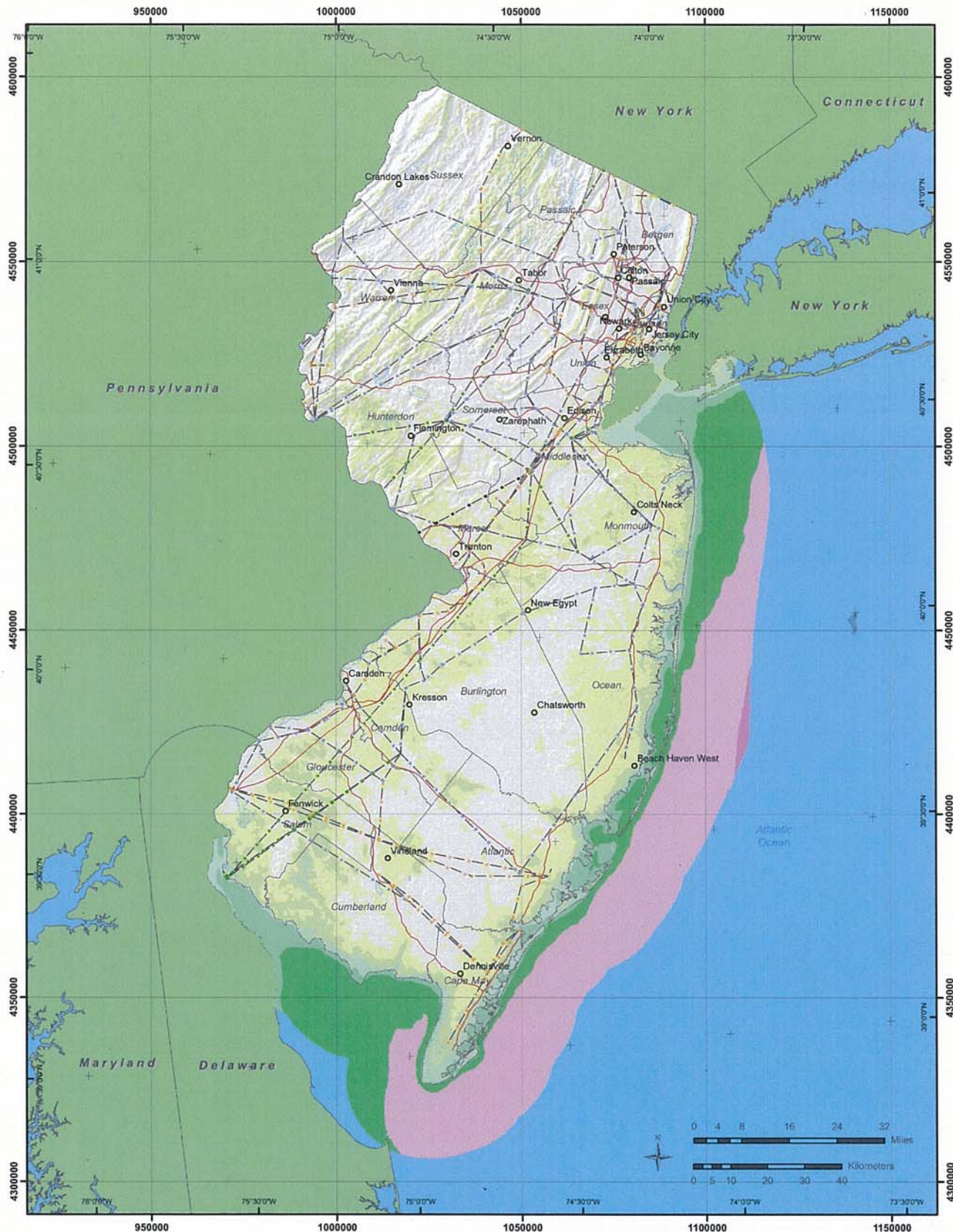
Multipliers		
	Material:	0.98
	Labor:	1.21
	Equipment:	1.09

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

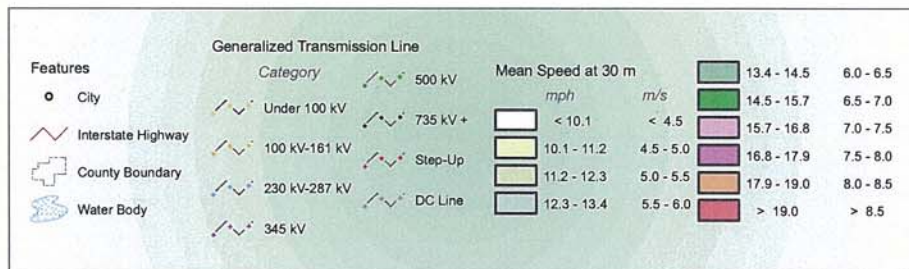
\$17,489	Subtotal
\$ 2,623	15% Contingency
\$ 2,623	15% Contractor O&P
\$ 4,372	25% Engineering
\$27,108	Total

APPENDIX M

Wind



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



AWS Truewind

Projection: Transverse Mercator,
UTM Zone 17 WGS84

Spatial Resolution of Wind Resource Data: 200m

This map was created by AWS Truewind using the MesosMap 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

357 Bergen Ave, Kearny, NJ 07032-3920

My Notes

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APPENDIX N

EPA Portfolio Manager



STATEMENT OF ENERGY PERFORMANCE

Department of Public Works

Building ID: 2246085
 For 12-month Period Ending: December 31, 2008¹
 Date SEP becomes ineligible: N/A

Date SEP Generated: March 19, 2010

Facility
 Department of Public Works
 357 Bergen 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: 1990
Gross Floor Area (ft²): 17,400

Energy Performance Rating² (1-100) N/A

Site Energy Use Summary³

Electricity - Grid Purchase(kBtu)	383,782
Natural Gas (kBtu) ⁴	1,095,700
Total Energy (kBtu)	1,479,482

Energy Intensity⁵

Site (kBtu/ft ² /yr)	85
Source (kBtu/ft ² /yr)	140

Emissions (based on site energy use)

Greenhouse Gas Emissions (MtCO ₂ e/year)	117
---	-----

Electric Distribution Utility

Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	104
National Average Source EUI	213
% Difference from National Average Source EUI	-34%
Building Type	Other

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

Meets Industry Standards⁶ for Indoor Environmental Conditions:

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

Certifying Professional
 N/A

Notes:

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.

NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Building Name	Department of Public Works	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Other	Is this an accurate description of the space in question?		☐
Location	357 Bergen 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		☐
Main Building-Office (Office)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Gross Floor Area	1,600 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Weekly operating hours	45 Hours	Is this the total number of hours per week that the Office space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	12	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100. The normal worker density ranges between 0.3 and 10 workers per 1000 square feet (92.8 square meters)		☐
Number of PCs	10	Is this the number of personal computers in the Office?		☐
Percent Cooled	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐
Main Building-Garage (Other)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒

Gross Floor Area	9,600 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Number of PCs	10(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	45Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	10(Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		☐
Shop (Other)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Gross Floor Area	6,200 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Number of PCs	1(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	45Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	8(Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

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

Fuel Type: Electricity		
Meter: PSE&G Electric (kWh (thousand Watt-hours)) Space(s): Entire Facility Generation Method: Grid Purchase		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
12/01/2008	12/31/2008	10,480.00
11/01/2008	11/30/2008	8,800.00
10/01/2008	10/31/2008	8,400.00
09/01/2008	09/30/2008	10,640.00
08/01/2008	08/31/2008	11,120.00
07/01/2008	07/31/2008	11,200.00
06/01/2008	06/30/2008	10,080.00
05/01/2008	05/31/2008	8,320.00
04/01/2008	04/30/2008	7,840.00
03/01/2008	03/31/2008	7,840.00
02/01/2008	02/29/2008	9,440.00
01/01/2008	01/31/2008	8,320.00
PSE&G Electric Consumption (kWh (thousand Watt-hours))		112,480.00
PSE&G Electric Consumption (kBtu (thousand Btu))		383,781.76
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		383,781.76
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas		
Meter: PSE&G Gas - Main (therms) Space(s): Main Building-Garage, Main Building-Office		
Start Date	End Date	Energy Use (therms)
12/01/2008	12/31/2008	1,177.00
11/01/2008	11/30/2008	624.00
10/01/2008	10/31/2008	106.00
09/01/2008	09/30/2008	30.00
08/01/2008	08/31/2008	33.00
07/01/2008	07/31/2008	15.00
06/01/2008	06/30/2008	41.00
05/01/2008	05/31/2008	129.00
04/01/2008	04/30/2008	387.00
03/01/2008	03/31/2008	974.00

02/01/2008	02/29/2008	1,515.00
01/01/2008	01/31/2008	1,302.00
PSE&G Gas - Main Consumption (therms)		6,333.00
PSE&G Gas - Main Consumption (kBtu (thousand Btu))		633,300.00
Meter: PSE&G Gas - Shop (therms) Space(s): Shop		
Start Date	End Date	Energy Use (therms)
12/01/2008	12/31/2008	860.00
11/01/2008	11/30/2008	456.00
10/01/2008	10/31/2008	77.00
09/01/2008	09/30/2008	22.00
08/01/2008	08/31/2008	24.00
07/01/2008	07/31/2008	11.00
06/01/2008	06/30/2008	30.00
05/01/2008	05/31/2008	94.00
04/01/2008	04/30/2008	282.00
03/01/2008	03/31/2008	711.00
02/01/2008	02/29/2008	1,106.00
01/01/2008	01/31/2008	951.00
PSE&G Gas - Shop Consumption (therms)		4,624.00
PSE&G Gas - Shop Consumption (kBtu (thousand Btu))		462,400.00
Total Natural Gas Consumption (kBtu (thousand Btu))		1,095,700.00
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

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

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

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
Department of Public Works
357 Bergen 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

Department of Public Works	
Gross Floor Area Excluding Parking: (ft ²)	17,400
Year Built	1990
For 12-month Evaluation Period Ending Date:	December 31, 2008

Facility Space Use Summary

Main Building-Office		Shop	
Space Type	Office		Other - Service (Vehicle Repair/Service, Postal Service)
Gross Floor Area(ft ²)	1,600		
Weekly operating hours	45	Space Type	
Workers on Main Shift	12	Gross Floor Area(ft ²)	6,200
Number of PCs	10	Number of PCs*	1
Percent Cooled	50% or more	Weekly operating hours*	45
Percent Heated	50% or more	Workers on Main Shift*	8
Main Building-Garage			
Space Type	Other - Other		
Gross Floor Area(ft ²)	9,600		
Number of PCs*	10		
Weekly operating hours*	45		
Workers on Main Shift*	10		

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 12/31/2008)	Baseline (Ending Date 11/30/2008)	Rating of 75	Target	National Average
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft ²)	85	78	81	N/A	104
Source (kBtu/ft ²)	140	131	132	N/A	213
Energy Cost					
\$/year	N/A	N/A	N/A	N/A	N/A
\$/ft ² /year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
MtCO ₂ e/year	117	109	111	N/A	143
kgCO ₂ e/ft ² /year	7	6	7	N/A	9

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

Notes:

o - This attribute is optional.

d - A default value has been supplied by Portfolio Manager.

APPENDIX O

Equipment Inventory

Description	Manufacturer Name	Model No.	Equipment Type	Capacity/Size	Location	Areas Served	Date Installed	Useable Life Expectancy (years)	Other Info.
DPW-Main									
Outdoor HVAC	York	DHUC-T060N 125A Serial# NDGM047620	Gas fired, electric cooling air handler	Cooling - 16,200 Btu/hr, 2,070 W Heating - 20,100 Btu/hr, 2,150 W	Ground south wall	Lockers on 2nd floor	1996	7	R-22, min amp 279, control circ 75VA
Outdoor HVAC	York	DHUC-T060N 125A Serial# NDGM047618	Gas fired, electric cooling air handler	Cooling - 16,200 Btu/hr, 2,070 W Heating - 20,100 Btu/hr, 2,150 W	Ground south wall	Lockers on 2nd floor	1996	7	R-22, min amp 279, control circ 75VA
DHWH	Rheem	81V52D C, Serial 0899B03418	Electric hot water heater	50 gal, 4500 watts	Back office room	Entire building	1999	5	N/A
Unit heater	Renzor	XL 125-3	Gas fired unit heater	Input 125 MBH, output 96 MBH	Garage section	Garage	1996	7	Both fans no longer being used
Unit heater	Renzor	XL 125-3	Gas fired unit heater	Input 125 MBH, output 96 MBH	Garage section	Garage	1996	7	Both fans no longer being used
Unit heater	Renzor	XL 125-3	Gas fired unit heater	Input 125 MBH, output 96 MBH	Garage section	Garage	1996	7	Both fans no longer being used
Air compressor	Ingersoll-Rand	S# 072270108	Compressor for tools	13.2 CFM @ 40 psig, 11.2 CFM @ 90 psig	Garage section	Tools	N/A	N/A	Random use not effect on heating or cooling
DPW-Shop									
DHWH	AO Smith	FSGL 40242, Serial ME99-0020297-242	Gas fired hot water heater	40 gal 40,000 btu/hr	Mezzanine	Entire building	1999	5	N/A
Unit heater	Emerson-Chromalox	LUH -D-02-81-34-00 2.6 KW 2	Electric unit heater	2.6 KW, 115V, 1P, 60 Hz	Forman office	Forman office	2002	13	
Unit heater	Modine	PD 125 AA 0111 Serial # 39011011306-7251	Gas fired unit heater	Input 125 MBH, output 100 MBH	Garage section	Garage	2004	15	115V, 1ph, 60Hz
Unit heater	Renzor	XL 125-3 Serial ALK 31H3N75096	Gas fired unit heater	Input 125,000 Btu/hr, Output 96,250 Btu/hr	Garage section	Garage	1996	7	Natural Gas fired
Unit heater	Renzor	XL 125-3 Serial ALK 31H3N75093	Gas fired unit heater	Input 125,000 Btu/hr, Output 96,250 Btu/hr	Garage section	Garage	1996	7	Natural Gas fired
Unit heater	Renzor	XL 125-3 Serial ALK 31H3N75090	Gas fired unit heater	Input 125,000 Btu/hr, Output 96,250 Btu/hr	Garage section	Garage	1996	7	Natural Gas fired
Unit heater	Modine	PA 130 A Serial 180810117H	Gas fired unit heater	Input 130 MBH, output 104 MBH	Garage section	Garage	2004	15	115V, 1ph, 60Hz
Air compressor	Saylor-Beall	Model 705 Serial 5-6-207	Compressor for tools	17.3 CFM @ 175	Garage section	Tools	N/A	N/A	Random use not effect on heating or cooling