BOROUGH OF SOUTH PLAINFIELD
POLICE ATHLETIC LEAGUE
MAIN BUILDING
ENERGY ASSESSMENT
for
NEW JERSEY
BUREAU OF PUBLIC UTILITIES

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CHA PROJECT NO. 20549

March 2010

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1.0 INTRODUCTION & BACKGROUND

The South Plainfield Police Athletic League (PAL) is single floor building located at 1250 Maple Avenue. Constructed in the 1970s, the original 18,744 square foot facility received a 10,000 square foot addition in 2002. This report discusses the original, or main PAL building, which shares a lobby with the addition, also known as the PAL recreation building. The main PAL building consists of an office area, entrance lobby, locker rooms, basketball court, meeting room, abandoned kitchen, several storage rooms, grounds keeping garage, and mechanical space.

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

2.0 EXECUTIVE SUMMARY

This report details the results of the energy audit for the South Plainfield Police Athletic League (PAL) in South Plainfield, New Jersey. The single story structure consists of the original 18,744 square foot building and 10,000 square foot addition. The main building shares a lobby with the addition, the PAL recreation building. This report entails the energy audit of the main PAL building, which includes an office area, locker rooms, basketball court, meeting room, and ancillary spaces. The following areas were evaluated for energy conservation measures:

- Lighting replacement with occupancy sensors
- Night setback
- Heating equipment upgrades
- Window AC unit upgrade
- Domestic hot water heater replacement/temperature reset
- Insulation upgrades

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 $6,600 for the recommended ECMs may be realized with a payback of 2.5 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

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
700	0	0	2,230	2,800	59.0	NA	0.3	NA

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

ECM-6 Furnace Replacement

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
9,500	0	0	1,230	1,500	1.8	800	6.3	5.8

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

ECM-9 Lighting Replacements with Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
8,500	2.9	14,540	0	2,300	3.1	1,600	3.7	3.0

* Incentive shown is per the New Jersey Smart Start Program, 2010 Prescriptive Lighting and Lighting Controls Applications.

3.0 EXISTING CONDITIONS

3.1 Building General

The South Plainfield Police Athletic League (PAL) single-story facility was constructed in the 1970s. The original 18,744 square foot facility was expanded by a 10,000 square foot addition in 2002. This report focuses on the original, or main PAL building, which shares a lobby with the addition. The main PAL building consists of an office area, locker rooms, basketball court, meeting room, abandoned kitchen, several storage rooms, grounds keeping garage, and a mechanical space.

The PAL office is open from 8:30 AM to 5:00 PM, Monday through Friday, and is typically occupied by three people. Occupancy of the basketball court fluctuates. Use of this space is generally from 10:00 AM to 10:00 PM, Monday through Friday; 9:00 AM to 5:00 PM, Saturdays; and 12:00 PM to 5:00 PM, Sundays. The two locker rooms serve the basketball court and wrestling room of the PAL recreation building, and each can hold about 20 people. General occupancy of the building increases after 3:00 PM when school ends and people begin to get out of work.

Exterior walls of the main PAL building are constructed of filled, light-weight concrete masonry unit (CMU) block. Walls running the length of the basketball court have an additional insulating panel on the interior and exterior of the CMU; and portions of the office and lobby walls have gypsum board along the interior of the CMU walls. Supported by steel framing, the sloped roof of the basketball court is comprised of asphalt shingles on top of felt paper and wood decking, insulated with a vaulted suspended ceiling interior. The lobby has a flat asphalt roof on top of felt paper and wood decking, insulated and finished with a gypsum board ceiling. The office area is the same with a suspended, acoustic tile ceiling. The two exterior doors in the lobby are steel construction with a half-light window. Windows in the lobby and office areas are vinyl double hung.

3.1 Utility Usage

Utilities include electricity, natural gas, and potable water. Electricity and natural gas are purchased from Public Service Electric & Gas Company (PSE&G), and the building is connected to the municipal sewage system. It should be noted that the main PAL building and PAL recreation building share a common electric meter, while each has a dedicated gas service.

From July 2008 through June 2009, electric usage for the PAL facility was approximately 260,720 kWh at a cost of about $42,200. Analyzing electricity bills during this period, the building was charged at the following rates: supply unit cost of $0.128 per kWh; demand unit cost of $13.30 per kW; and a blended unit cost of $0.162 per kWh. Electricity usage was the highest in the summer months when air conditioning equipment operates. During the same timeframe, the main building heat and domestic hot water (DHW) produced by natural gas-fired equipment required about 11,170 therms. Based on the annual cost of about $14,000, the blended price for natural gas was $1.251 per therm. Natural gas consumption is highest in the winter months for building heat. Utility data can be found 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.

3.2 HVAC Systems

3.2.1 Heating Hot Water System

Heating hot water (HHW) for hydronic equipment in the main PAL building is provided by a single HB Smith cast-iron, gas-fired, hot water boiler. Located in the mechanical room at the south end of the basketball court, the boiler is about 10 years' old and in good condition. The unit has an output of 208 MBh and produces HHW at 180°F. There are two hydronic heating zones in the building, each provided HHW by a dedicated fractional horsepower circulation pump. All hydronic heating equipment is baseboard fin-tube units, which are mainly located on exterior walls.

3.2.2 Heating and Ventilation System

The basketball court is heated by two Lennox gas-fired, forced-air furnaces located in the mechanical room at the end of the court and have an input of 165 MBh each. The two furnaces are original to the building's construction, share common supply and return air ductwork, and have no outdoor air intake. The court is ventilated by a large exhaust fan at the south end of the space. Make-up air for the exhaust fan is provided by two damper controlled openings at the northeast and northwest corners of the basketball court. These motor actuated dampers are linked to the operation of the exhaust fan. The ventilation system is rarely used and a wood frame is placed over the exhaust fan on the exterior of building during the winter months.

3.2.3 Window Air Conditioning (AC) Units

Four window AC units provide cooling. Two units, located in the office area, are approximately 10,000 Btuh and used on a regular basis during the summer months. Building personnel indicated that the two units do not adequately cool the space. Another air conditioner is in the meeting room at the north end of the basketball court. This unit is about 12,000 Btuh and operated very seldom. The fourth unit is about 8,000 Btuh, located in a storage room along the east wall of the basketball court, and is never used. All AC units are old, in poor condition, and have passed their useful life.

3.3 Lighting/Electrical Systems

Lighting within the PAL building is a mixture of T-12 fluorescent, T-8 fluorescent, incandescent and metal halide fixtures. In many cases, the older T-12 fixtures with magnetic ballasts have been upgraded to newer, more efficient T-8 fixtures with electronic ballasts. However, some areas still utilize inefficient lighting such as T-12 fluorescent fixtures with magnetic ballasts, incandescent screw type bulbs and high bay 400 watt metal halide fixtures. The exit signs are all efficient LED.

The exterior of the PAL building mainly utilizes lights that are owned and maintained by the electrical utility company. These light fixtures are on the power poles around the parking lot and entrances. Two 175-watt metal halide wall pack fixtures on the building exterior are owned by the facility. The front entrance light is operated 24 hours per day. There are also two, 6' T-12 lamps within the sign located on the front lawn of the facility.

3.4 Control Systems

Each hydronic heating zone is controlled by a non-programmable thermostat; the thermostat in the office area is set to maintain 75°F; and the unit in the storage room along the east side of basketball court is set

to 60°F. The two furnaces serving the court are controlled by a common digital, non-programmable thermostat set to 72°F.

3.5 Plumbing Systems

Domestic hot water (DHW) for the main PAL building is generated by a 75 gallon, State Industries gas-fired water heater. Located in a maintenance room along the east wall of the court, the unit has an input of 75,100 Btuh and a recovery rate of 68.3 gallons per hour. Hot water in the main PAL building is primarily used for hand washing and janitorial purposes.

The building has two, multi-stall restrooms along the east side of the basketball court. Toilet and urinal flush valves are low-flow type per industry standards. Hand sinks use a mixture of high-arc goose neck faucets and standard faucets. The old kitchen is equipped with a sink and ice machine that is still in use. The maintenance room which houses the DHW heater is also equipped with a utility sink

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Night Setback

Existing heating controls for the basketball court and office/lobby/locker room areas are non-programmable, digital thermostats. By replacing the two thermostats with programmable models, these areas can be programmed to set back the unoccupied space temperature to save heating energy. This ECM models the expected savings of reducing the unoccupied heating temperature setpoints by 10°F to 62°F in the basketball court; and 65°F in the office, lobby, and locker room areas. In the calculations for this measure, occupied temperature setpoints were maintained at those in use at the time of the energy audit.

To calculate the benefits of night setback, a block load building model was created to approximate the existing energy load for the building. Since the basketball court, office/lobby/locker room areas, and storage areas operate on different occupancy schedules, a block load was created for each of the three areas. The block loads, provided in Appendix B, model the maximum overall heating load for each space, taking into account various parameters such as roof, wall, and window construction; total envelope surface area; ventilation and infiltration loads; building occupancy; internal heat generation; and other sources of heat gains and losses. By entering this calculated maximum load into a spreadsheet containing bin temperature data, the total accumulated year-round heating energy requirement was determined for each area. The heating loads for the three areas were then combined and reconciled to building utility data to confirm the model's accuracy. Bin data for South Plainfield, NJ was not available; therefore, data from Newark, NJ was used. The bin temperature spreadsheets are included in Appendix B.

Temperature setback was not evaluated for the storage area because this space is continuously unoccupied and already at a minimum temperature. To determine the proposed energy usage in the basketball court and office/lobby/locker room areas during temperature setback, a second bin spreadsheet was created for the new accumulated load for each space. These models were identical to the existing usage spreadsheets except the unoccupied temperatures were adjusted as noted above. The difference in heating therms between the initial and proposed models is taken as the savings. Following implementation of this measure, it is expected the building's annual natural gas consumption will be reduced by approximately 2,230 therms.

Programmable thermostats for night setback have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 33,450 therms, totaling $42,000.

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

ECM-1 Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
700	0	0	2,230	2,800	59.0	NA	0.3	NA

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

This measure is recommended.

4.2 ECM-2 Replace Domestic Hot Water Heater

Domestic hot water for the building is generated by a 75 gallon, gas-fired hot water heater. Due to intermittent demand for hot water in the building, there are periods of time with little or no use. However, the unit must continue to heat the water within the storage tank. Energy required to maintain the hot water temperature setpoint during times of zero demand are known as standby losses. This measure evaluates replacing the existing DHW heater with a tankless, instantaneous, gas-fired, condensing hot water heater to eliminate standby losses.

According to the U.S. Department of Energy, 2.5% of stored capacity is lost every hour during hot water heater standby. This value was applied to the total volume of the existing hot water heater storage tank to determine the annual standby losses. Proposed efficiency was based on the Navien CR180 instantaneous, condensing hot water heater; it was calculated that 170 therms would be saved per year. A more detailed hot water demand analysis may be necessary to verify proper sizing. The new water heater will require gas and water piping modification, venting, and electrical connections.

Instantaneous water heaters have an expected life of 18 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 3,060 therms, totaling $3,600.

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

ECM-2 Replace Domestic Hot Water Heater

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
4,100	0	0	170	200	(0.1)	100	20.5	20.0

* Incentive shown is per the New Jersey Smart Start Program, 2010 Gas Water Heating Application. Incentive is based on the purchase of a tankless, instantaneous gas water heater.

This measure is not recommended.

4.3 ECM-3 Hot Water Temperature Reset

The boiler plant currently provides 180°F HHW to the building's hydronic heating system. This ECM evaluates installing a hot water temperature reset control system to adjust the supply temperature of the HHW with the outside air temperature. This would allow HHW to be generated at lower temperatures, decreasing heat losses from the hydronic piping system and minimizing energy losses.

Hot water temperature reset was evaluated by generating a spreadsheet that compares the hydronic piping system heat losses at the current average HHW temperature to the proposed average HHW temperature (Appendix D). Using information from the building's HHW hydronic piping system and bin weather data, with an average HHW temperature of 170°F, the current annual heat loss by the system was determined to be about 76,820 MBH. Utilizing a hot water reset control system, the average HHW temperature can be lowered to about 163°F. This temperature is limited by the capabilities of the boiler; cast-iron boilers typically cannot accept a return water temperature lower than 150°F. The resulting annual heat loss from the HHW piping system will be reduced to approximately 69,590 MBH. After factoring in the boiler plant's efficiency, the reduction in heat loss results in an annual savings of approximately 90 therms.

A hot water reset control system has an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 1,350 therms and $1,500.

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

ECM-3 Hot Water Temperature Reset

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
5,300	0	0	90	100	(0.7)	NA	>25	NA

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

This measure is not recommended.

4.4 ECM-4 Replace Window Air Conditioning Units

Two window AC units are utilized to cool office space in the main PAL building. On average, the units provide 10,000 Btus of cooling at an energy efficiency ratio (EER) of about 7.0 and are operated throughout the cooling season. This ECM assesses replacing the old window units with new, energy efficient models. Modern AC units have a much higher EER value than the existing units and are capable of cycling on and off with the room temperature which enhances their energy saving benefits.

Using bin weather data for Newark, NJ and the weekly occupancy schedule for the office area, the annual operating hours for the existing window AC units was established. Since new window AC units have built in thermostats and temperature controls, cycling was taken into account to determine the proposed unit's operating time. EER values were then converted to kWh and applied to the estimated hours of operation to determine the energy consumption for the existing and proposed cooling systems. Replacing the two window AC units will produce an annual savings of approximately 730 kWh.

Window AC units have an expected life of 10 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 7,300 kWh and $1,000.

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

ECM-4 Replace Window Air Conditioning Units

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
1,300	0	730	0	100	(0.2)	NA	13.0	NA

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

This measure is not recommended on energy savings alone but will result in savings when these units are replaced.

4.5 ECM-5 Add Wall Insulation

Exterior wall construction in most areas of the main PAL building consists of filled, light-weight CMU block which is very inefficient at preventing heat loss. Adding an insulated wall can lower the amount of heat transferred through the wall, and reduce the overall heating load. This ECM analyzed the potential energy savings from constructing an insulated wall along the interior surface of the existing block in the following spaces: west wall of office area; north and east wall of lobby; north wall of locker corridor; and the east wall of the storage rooms and restrooms along the basketball court.

To calculate the savings, heat loss through the exterior walls was found using R-values for the existing and proposed wall assemblies. The heat loss values for each case were then totaled and the difference was the overall annual savings. The annual energy savings of furring out the exterior walls of the areas discussed above and adding insulation is expected to be 490 therms.

Implementing this measure would require construction of a 3-5/8" metal frame wall along the interior of the existing CMU block walls. The new walls would be filled with loose-fill cellulose insulation and finished with 5/8" gypsum board. Additional requirements include framing around doors and windows and miscellaneous electrical modifications.

Insulation has an expected life of 25 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 12,250 therms, totaling $15,000.

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

ECM-5 Add Wall Insulation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
14,600	0	0	490	600	0	NA	24.3	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 Furnace Replacement

Heat for the basketball court is provided by two Lennox gas-fired, forced-air furnaces. These units have an input of 165 MBh each and operate at about 75% thermal efficiency. This ECM evaluates replacing the furnaces with two high efficiency, condensing furnaces. Modern condensing furnaces operate at much higher efficiencies. In addition, the burners on these units are capable of staged firing, enabling the furnace output to more accurately match the changing space load, saving energy.

Using the basketball court block load developed in section 4.1, it was estimated that the existing furnaces consume about 6,520 therms annually. Applying the existing furnaces' 75% thermal efficiency to the estimated natural gas usage, the annual heat load of the basketball court was found to be about 488,940 MBH. With an efficiency of 92.5%, the proposed condensing furnaces will require approximately 5,290 therms to meet the heat load, resulting in a savings of about 1,230 therms of natural gas per year. The proposed furnace efficiency rating is based on the use of two Trane XL-90, 120 MBh condensing

furnaces. These furnaces were used only as an example for calculation. Exact furnace selection and sizing cannot be completed without the generation of a load profile.

In addition to the two new condensing furnaces, other components of this measure include ductwork modifications, new exhaust flue system, and minor electrical modifications.

Condensing furnaces have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 22,140 therms, totaling $27,000.

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

ECM-6 Furnace Replacement

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
9,500	0	0	1,230	1,500	1.8	800	6.3	5.8

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

This measure is recommended.

4.7 ECM-7 Lighting Replacements

A comprehensive fixture survey was conducted of the entire building. Each switch and circuit was identified, and the number of fixtures, locations, and existing wattage established. Efficient lighting fixtures within the facility utilize T-8 fluorescent lamps with electronic ballasts. The remaining fixtures use T-12 fluorescent lamps, incandescent screw type bulbs, and 400 watt metal halide high bay fixtures, all of which are considered inefficient by today's standards. Upgrading these lighting fixtures to more efficient technology provides year round energy savings.

Energy savings for this measure were calculated by applying the existing and proposed fixture wattages to the estimated time of operation. The difference resulted in an annual savings of 7,440 kWh per year. Supporting calculations, including assumptions for lighting hours and annual energy usage for each fixture, are provided in Appendix H.

Retrofitting fixtures that utilize T-12 lamps would require replacement with electronic ballasts and T-8 lamps. Incandescent lamps would be replaced with compact fluorescent spiral light bulbs. High bay metal halide fixtures would be removed and replaced with high output T-5 fixtures.

Lighting has an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 111,600 kWh, totaling $21,000.

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

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
6,900	3.1	7,440	0	1,400	2.0	1,400	4.9	3.9

* Incentive shown is per the New Jersey Smart Start Program, 2010 Prescriptive Lighting Application.

This measure is recommended when combined with ECM-8; see ECM-9.

4.8 ECM-8 Install Lighting Controls

Lighting at the main PAL building is currently controlled by manual wall switches in each area. Exterior building lighting and sign lighting are connected directly to the power breaker and operate 24 hours per day. This ECM proposes installing occupancy sensors in select rooms to turn off the lights when the area is unoccupied. In addition, installation of a timer to control the exterior building lighting and sign lighting can greatly reduce the operating time of these fixtures. Occupancy sensors were not considered in mechanical areas and other low use areas. Paths of egress were also not considered for safety concerns.

Using a process similar to that utilized in section 4.7, the energy savings for this measure were calculated by applying the known fixture wattages in each space to the estimated existing and proposed times of operation of the fixtures. The difference between the two values resulted in an annual savings of about 8,170 kWh.

For this energy conservation measure, eight occupancy sensors, two timers, and some standard electrical work are required.

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 122,550 kWh, totaling $15,000.

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

ECM-8 Install Lighting Controls

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	8,170	0	1,000	11.5	200	1.2	1.0

* Incentive shown is per the New Jersey Smart Start Program, 2010 Lighting Controls Application

This measure is recommended when combined with ECM-8; see ECM-9.

4.9 ECM-9 Lighting Replacements with Controls

Due to interactive effects, the energy and cost savings for occupancy sensors and lighting upgrades are not cumulative. This measure is a combination of ECMs 7 and 8 to allow for maximum energy and demand reduction.

Lighting and 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 218,100 kWh, totaling $34,500.

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

ECM-9 Lighting Replacements with Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
8,500	2.9	14,540	0	2,300	3.1	1,600	3.7	3.0

* Incentive shown is per the New Jersey Smart Start Program, 2010 Prescriptive Lighting and Lighting Controls Applications.

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 South Plainfield, 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 hi story 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 South Plainfield main PAL building is eligible for several incentives available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about $1,300 and includes installing a gas-fired water heater, new high efficiency furnaces, and upgrades to the lighting system.

When calculating the total incentive for the New Jersey Pay For Performance program, all energy conservation measures are applicable since the amount received is based on building-wide energy improvements. The overall energy reduction for the building is estimated to exceed the 15% minimum; therefore, the building is eligible for Incentives #2 and #3 as previously discussed. This would result in a total incentive of about $20,700, reducing the total project payback from 5.8 years to 3.1 years. See Appendix K for calculations.

Under PSE&G's direct install program, the main PAL building is potentially eligible to receive $44,000, and would be required to repay $8,800. Incentives cannot be accepted under multiple programs.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

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

The building uses a gas-fired, hot water boiler and furnaces to meet the heating requirements. With exception to the hydronic heating system, most of the 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 removed or overhauled; and either a low temperature closed loop water source heat pump system or a water to water heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

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 PAL facility was evaluated for the potential to install rooftop photovoltaic (PV) solar panels for power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC current is converted to alternating current (AC) with the use of an electrical device known as an inverter. The building's roof has sufficient room to install a large solar cell array. A structural analysis would be required to determine if the roof framing could support a cell array.

The PVWATTS solar power generation model was utilized to calculate PV power generation. The New Jersey Clean Power Estimator provided by the New Jersey Clean Energy Program is presently being updated; therefore, the site recommended use of the PVWATT solar grid analyzer version 1. The closest city available in the model is Newark, New Jersey and a fixed tilt array type was utilized to calculate energy production. The PVWATT solar power generation model is provided in Appendix L.

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

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

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

The entire PAL facility had a maximum electricity demand of 80.0 kW and a minimum of 41.6 kW, from July 2008 through June 2009. The monthly average over the observed 12 month period was 55.9 kW. The existing load justifies the use of the maximum incentive cap of 50 kW of installed PV solar array. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Agency) estimates of total cost of system installation. It should be noted that the cost of installation is currently $10 per watt or $10,000 per kW of installed system. This has increased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

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

Photovoltaic (PV) Rooftop Solar Power Generation – 50 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
500,000	0	59,150	0	9,600	9,600	50,000	28,800	>25	11.7

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

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

6.2.2 Solar Thermal Hot Water Plant

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

A standard solar hot water system is typically composed of solar collectors, heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed

on the roof of the building, oriented south, and tilted around the site's latitude, to maximize the amount of radiation collected on a yearly basis.

Several options exist for using active solar thermal systems for space heating. The most common method involves using glazed collectors to heat a liquid held in a storage tank (similar to an active solar hot water system). The most practical system would transfer the heat from the panels to thermal storage tanks and transfer solar produced thermal energy to use for domestic hot water production. DHW is presently produced by a natural gas fired water heater and, therefore, this measure would not save site electricity.

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

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

Solar Thermal Domestic Hot Water Plant

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
27,100	0	0	120	200	200	NA	>25	NA

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

This measure is not recommended.

6.3 Wind

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

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

The New Jersey Clean Energy Program for small wind installations has designated numerous pre-approved wind turbines for installation in the State of New Jersey. Incentives for wind turbine installations are based on kilowatt hours saved in the first year. Systems sized under 16,000 kWh per year of production will receive a $3.20 per kWh incentive. Systems producing over 16,000 kWh will receive $51,200 for the first 16,000 kWh of production with an additional $0.50 per kWh up to a maximum cap of 750,000 kWh per year. Federal tax credits are also available for renewable energy projects up to 30%

of installation cost for systems less than 100 kW. However, as noted previously, municipalities do not pay federal taxes and is, therefore, not eligible for the tax credit incentive.

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

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

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

6.4 Combined Heat and Power Generation (CHP)

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

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

This measure is not recommended.

6.5 Biomass Power Generation

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

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

- Wood wastes not adulterated with chemicals, glues or adhesives
- Agricultural residues (corn stover, rice hulls or nut shells, manures, poultry litter, horse manure, etc) and/or methane gases from landfills
- Food wastes

- Municipal tree trimming and grass clipping wastes
- Paper and cardboard wastes
- Non adulterated construction wood wastes, pallets

The NJDEP evaluates biomass resources not identified in the RPS.

Examples of eligible facilities for a CORE incentive include:

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

* from NJOCE Website

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

6.6 Demand Response Curtailment

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

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

A PSE&G pre-approved CSP will require a minimum of 100 kW of load reduction to participate in any curtailment program. The South Plainfield PAL facility had a monthly average electricity demand of 55.9 kW and a maximum demand of 80.0 kW from July 2008 through June 2009.

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

7.0 EPA PORTFOLIO MANAGER

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

Since the main PAL building and the PAL recreation building share an electric meter, an Energy Star Portfolio Manager account had to be created for the PAL facility as a whole. The PAL facility is considered an above average energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 89 kBTU/ft^2/year. Several factors in the main PAL building contribute to the unfavorable EUI, including, wasted energy from unnecessary heating during unoccupied hours, inefficient heating equipment, and inefficient lighting operation. By implementing the measures discussed in this report (for the main PAL building only), it is expected that the EUI can be reduced to approximately 72 kBTU/ft^2/year; the national average for this building type is 65 kBTU/ft^2/year. The EPA Portfolio Manager did not generate an energy rating score for this building because more than 10% of the floor area is of a type (Recreation) currently not eligible for an energy star rating.

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

The user name and password for the PAL facility's EPA Portfolio Manager Account has been provided to Glen Cullen of the Borough of South Plainfield.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Police Athletic League main building in South Plainfield, New Jersey identified potential ECMs for night setback, lighting and occupancy sensor upgrades, and heating equipment upgrades. Potential annual savings of $6,600 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-1 Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
700	0	0	2,230	2,800	59.0	NA	0.3	NA

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

ECM-6 Furnace Replacement

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
9,500	0	0	1,230	1,500	1.8	800	6.3	5.8

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

ECM-9 Lighting Replacements with Controls

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
8,500	2.9	14,540	0	2,300	3.1	1,600	3.7	3.0

* Incentive shown is per the New Jersey Smart Start Program, 2010 Prescriptive Lighting and Lighting Controls Application.

APPENDIX A

Utility Usage Analysis

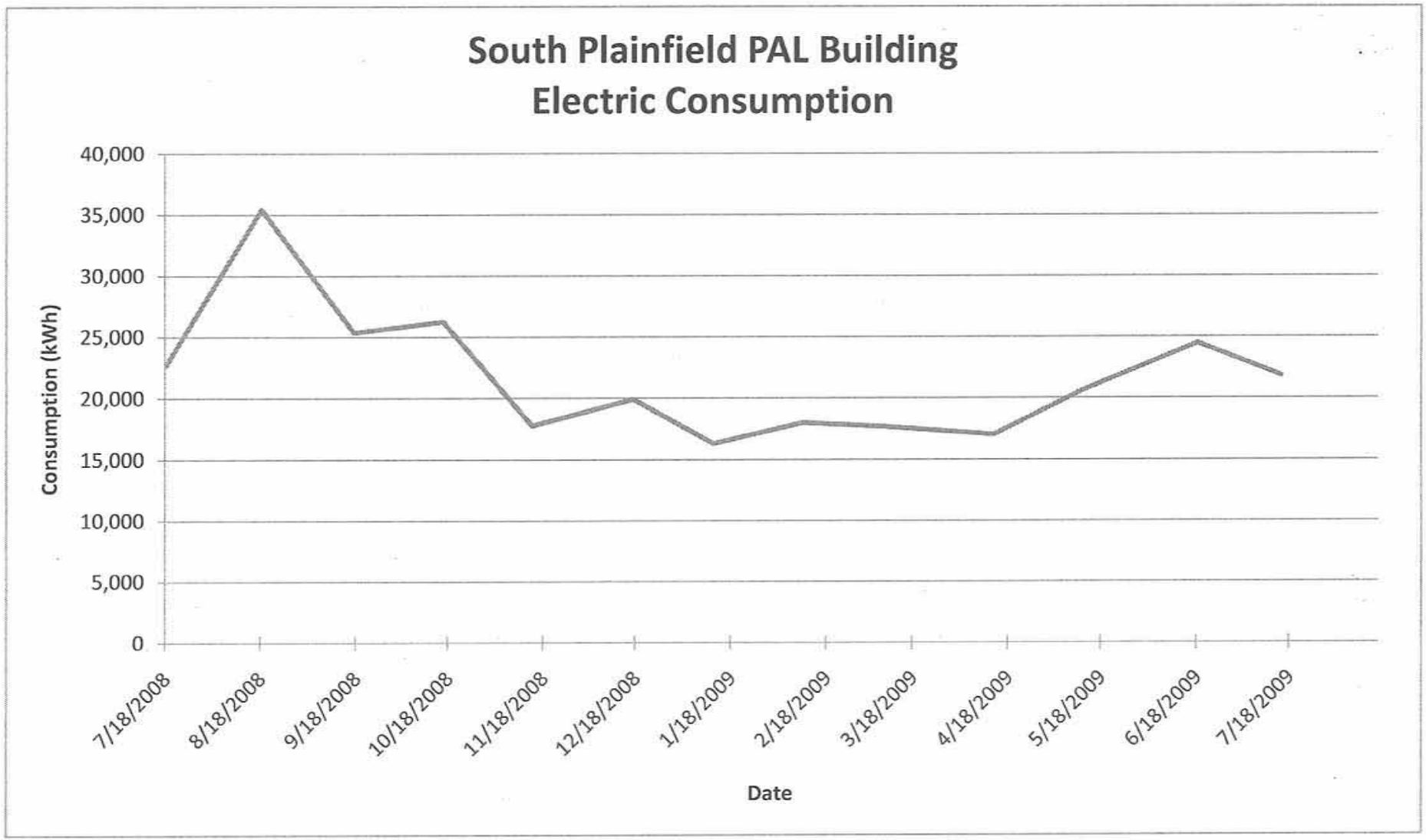
New Jersey BPU Energy Audit Program
CHA #20549
South Plainfield
PAL Building

Account Number: 52 907 249 15
PSE&G - Electric Service

Meter #: 728006166

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
7/18/2008	22,720	70.4	$4,347.23	$1,135.07	$3,212.16	0.1913	0.1414	16.12
8/18/2008	35,440	80.0	$6,329.59	$1,241.84	$5,087.75	0.1786	0.1436	15.52
9/17/2008	25,360	60.8	$4,833.05	$1,028.31	$3,804.74	0.1906	0.1500	16.91
10/16/2008	26,240	68.0	$4,870.79	$1,108.39	$3,762.40	0.1856	0.1434	16.30
11/14/2008	17,760	51.2	$2,597.94	$554.18	$2,043.76	0.1463	0.1151	10.82
12/17/2008	19,920	56.8	$2,821.78	$575.98	$2,245.80	0.1417	0.1127	10.14
1/12/2009	16,320	51.2	$2,373.36	$554.18	$1,819.18	0.1454	0.1115	10.82
2/10/2009	18,000	42.4	$2,596.45	$525.18	$2,071.27	0.1442	0.1151	12.39
3/9/2009	17,680	43.2	$2,664.69	$529.22	$2,135.47	0.1507	0.1208	12.25
4/13/2009	17,040	41.6	$2,560.08	$522.98	$2,037.10	0.1502	0.1195	12.57
5/12/2009	20,640	42.4	$2,949.36	$526.10	$2,423.26	0.1429	0.1174	12.41
6/18/2009	24,480	71.2	$3,484.21	$639.73	$2,844.48	0.1423	0.1162	8.98
7/15/2009	21,840	62.4	$4,163.48	$1,118.36	$3,045.12	0.1906	0.1394	17.92
Total	283,440	80.0	$46,592.01	$10,059.52	$36,532.49	0.1644	0.1289	13.56
Most Recent Yr	260,720	80.0	$42,244.78	$8,924.45	$33,320.33	0.1620	0.1278	13.30

*The PAL Main and Recreation buildings utilize a common electric meter.


South Plainfield PAL Building
Electric Consumption
Consumption (kWh)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
7/18/2008
8/18/2008
9/18/2008
10/18/2008
11/18/2008
12/18/2008
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2/18/2009
3/18/2009
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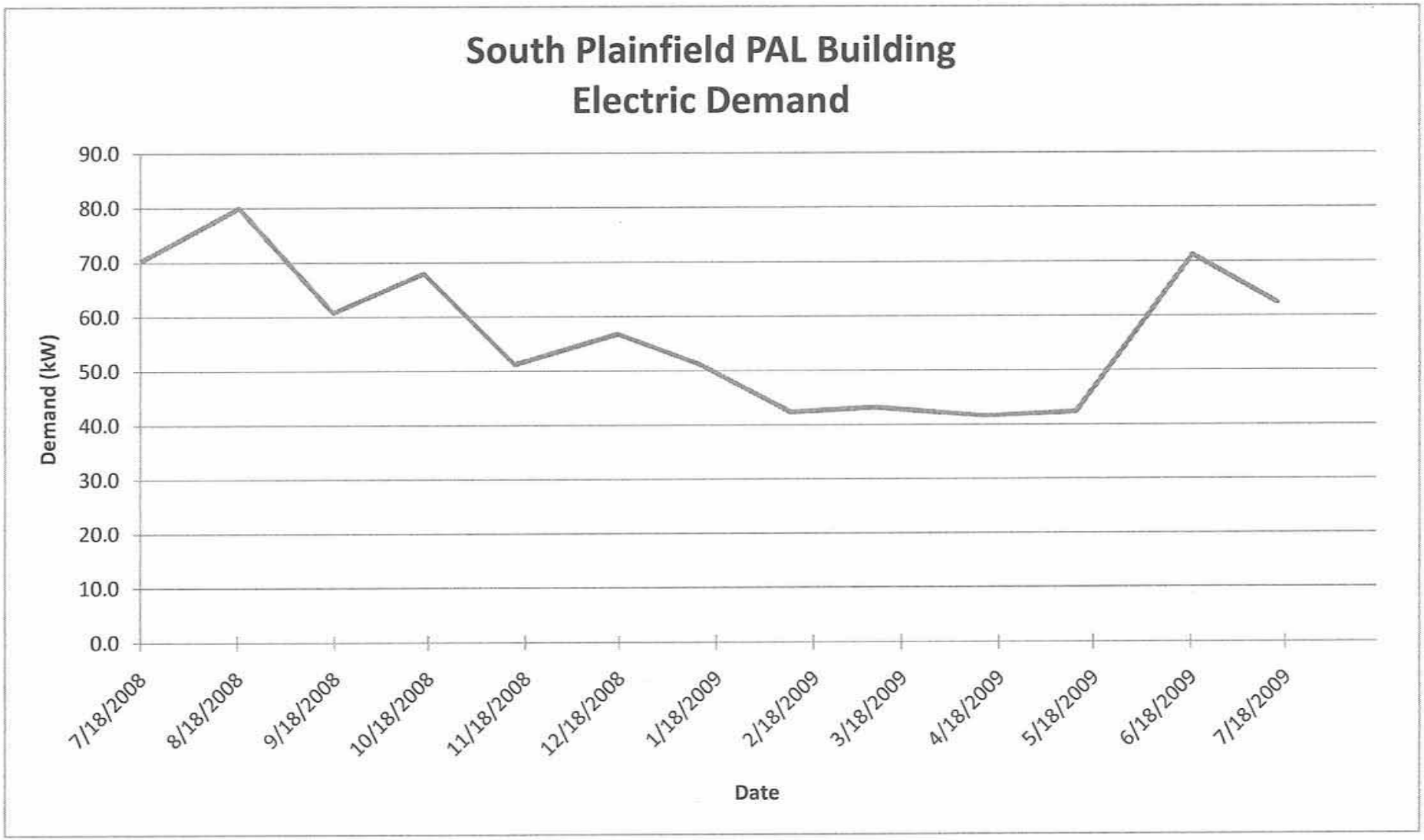
7/18/2009
Date


South Plainfield PAL Building
Electric Demand
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Demand (kW)
7/18/2008
8/18/2008
9/18/2008
10/18/2008
11/18/2008
12/18/2008
1/18/2009
2/18/2009
3/18/2009
4/18/2009
5/18/2009
6/18/2009
7/18/2009
Date

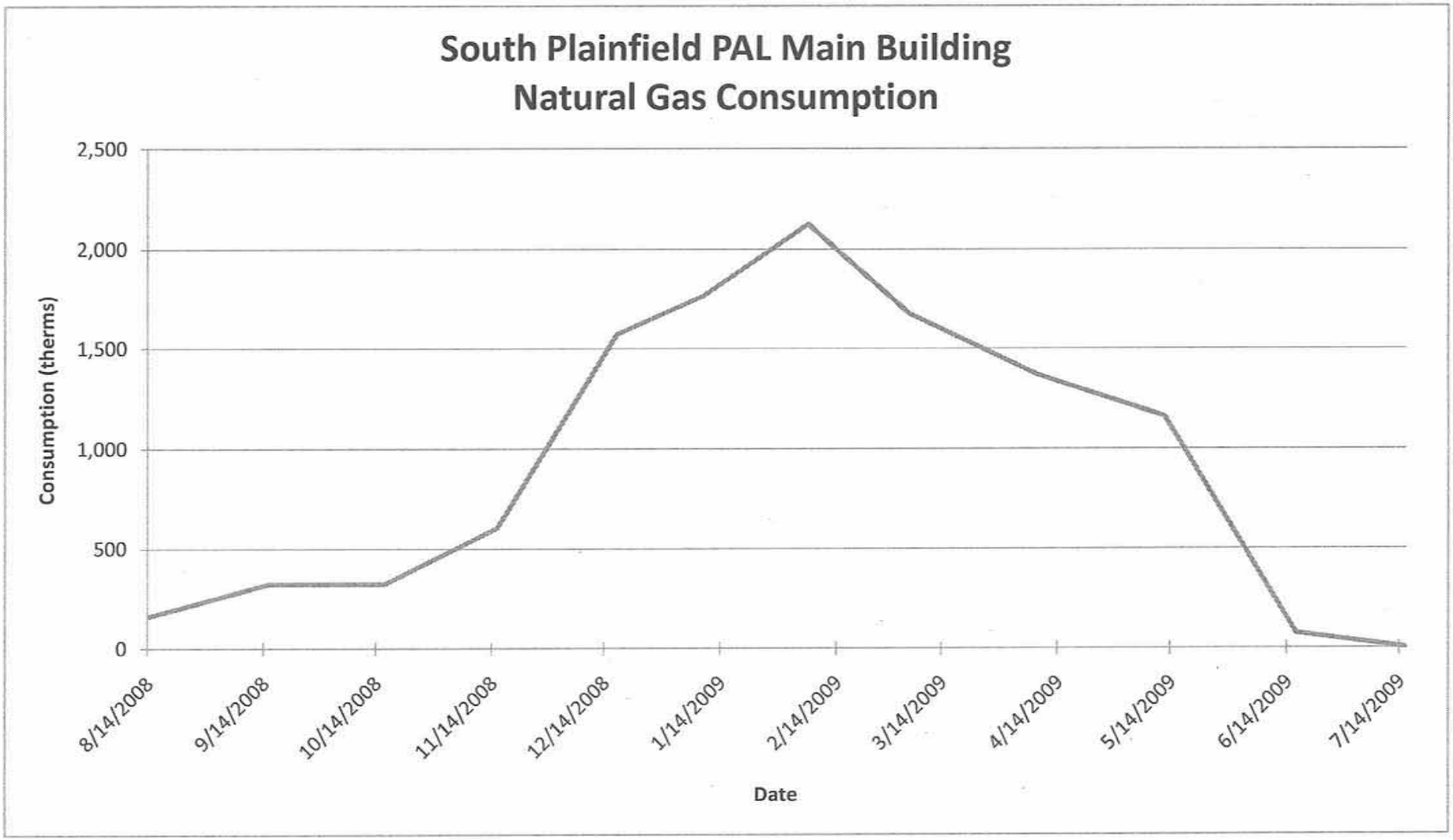
New Jersey BPU Energy Audit Program
CHA #20549
South Plainfield
PAL Main Building

Account Number: 52 907 249 15
PSE&G - Natural Gas Service

Meter #: 2916421

Date	Therms	Cost	($/Therm)
3/19/2008	1,793	$2,646.92	1.476
4/18/2009	1,201	$1,891.21	1.575
5/15/2008	606	$956.21	1.577
6/16/2008	307	$545.41	1.774
7/18/2008	49	$98.81	2.017
8/14/2008	163	$326.96	2.005
9/15/2008	324	$497.05	1.534
10/16/2008	324	$472.56	1.457
11/15/2008	605	$807.47	1.334
12/17/2008	1,573	$2,072.92	1.318
1/9/2009	1,764	$2,411.68	1.367
2/6/2009	2,126	$2,770.95	1.303
3/5/2009	1,675	$1,949.24	1.164
4/8/2009	1,372	$1,480.08	1.079
5/12/2009	1,164	$1,093.10	0.939
6/16/2009	75	$76.18	1.016
7/15/2009	4	$13.83	3.317

Total	15,127	$20,110.58	1.329
Most Recent Yr	11,171	$13,972.02	1.251


South Plainfield PAL Main Building
Natural Gas Consumption
2,500
2,000
1,500
1,000
500
0
Consumption (therms)
8/14/2008
9/14/2008
10/14/2008
11/14/2008
12/14/2008
1/14/2009
2/14/2009
3/14/2009
4/14/2009
5/14/2009
6/14/2009
7/14/2009
Date

ELECTRIC MARKETERS LIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Jan 14, 2009

GAS MARKETERS LIST

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

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

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

RPL Holdings, Inc
601 Carlson Pkwy
Minnetonka, MN 55305

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX B

ECM-1 Night Setback

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-1 Night Setback **Basketball Court**

Building Footprint	3,774	SF	Ex Occupied Clng Temp.	75	*F	Ex Occupied Htg Temp.	
Heating Efficiency	75%		Ex Unoccupied Clng Temp.	75	*F	Ex Unoccupied Htg Temp.	
Cooling Efficiency	1.2	kW/ton	Prop Occupied Clng Temp.	75	*F	Prop Occupied Htg Temp.	
Building Balance Temp.	60	*F	Prop Unoccupied Clng Temp.	75	*F	Prop Unoccupied Htg Temp.	
Internal Gains	16,680	btu/h	Occupied Cooling UA	-3,620	btu/hr/°F	Occupied Heating UA	
Unoc Internal Gain factor	0.03		Unoccupied Cooling UA	-3,620	btu/hr/°F	Unoccupied Heating UA	
Ave Occ Internal Gain Factor	0.35		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					
					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	Intern BT
A		B	C	D	E	F	G	H	I	
102.5	49.1	0	0	0	-99,547	-136,403	-5,838	-99,547	-124,003	-5
97.5	42.5	3	1	2	-81,448	-94,725	-5,838	-81,448	-86,113	-5
92.5	39.5	34	13	21	-63,348	-75,780	-5,838	-63,348	-68,891	-5
87.5	36.6	131	49	82	-45,249	-57,466	-5,838	-45,249	-52,242	-5
82.5	34	500	188	313	-27,149	-41,047	-5,838	-27,149	-37,316	-5
77.5	31.6	620	233	388	-9,050	-25,891	-5,838	-9,050	-23,538	-5
72.5	29.2	664	249	415	0	0	-5,838	0	0	-5
67.5	27	854	320	534	6,873	6,820	-5,838	6,873	6,200	-5
62.5	24.5	927	348	579	14,510	14,398	-5,838	14,510	13,089	-5
57.5	21.4	600	225	375	22,147	21,976	-5,838	22,147	19,978	-5
52.5	18.7	610	229	381	29,783	29,554	-5,838	29,783	26,867	-5
47.5	16.2	611	229	382	37,420	37,132	-5,838	37,420	33,756	-5
42.5	14.4	656	246	410	45,057	44,710	-5,838	45,057	40,645	-5
37.5	12.6	1,023	384	639	52,693	52,288	-5,838	52,693	47,535	-5
32.5	10.7	734	275	459	60,330	59,866	-5,838	60,330	54,424	-5
27.5	8.6	334	125	209	67,967	67,444	-5,838	67,967	61,313	-5
22.5	6.8	252	95	158	75,604	75,022	-5,838	75,604	68,202	-5
17.5	5.5	125	47	78	83,240	82,600	-5,838	83,240	75,091	-5
12.5	4.1	47	18	29	90,877	90,178	-5,838	90,877	81,980	-5
7.5	2.6	22	8	14	98,514	97,756	-5,838	98,514	88,869	-5
2.5	1	13	5	8	106,151	105,334	-5,838	106,151	95,758	-5
-2.5	0	0	0	0	113,787	112,912	-5,838	113,787	102,647	-5
-7.5	-1.5	0	0	0	121,424	120,490	-5,838	121,424	109,536	-5
TOTALS		8,760	3,285	5,475						

Existing Building Ventilation & Infiltration (occ)	**1,276**	**cfm**
Overheat Ventilation Factor	**1.10**	
Additional ventilation to offset overheat	**128**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**1,276**	**cfm**

From opening door to unheated storage area

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-1 Night Setback **Office, Lobby and Locker Room Areas**

Building Footprint	1,430	SF	Ex Occupied Clng Temp.	74	*F	Ex Occupied Htg Temp.	
Heating Efficiency	83%		Ex Unoccupied Clng Temp.	74	*F	Ex Unoccupied Htg Temp.	
Cooling Efficiency	1.2	kW/ton	Prop Occupied Clng Temp.	74	*F	Prop Occupied Htg Temp.	
Building Balance Temp.	60	*F	Prop Unoccupied Clng Temp.	74	*F	Prop Unoccupied Htg Temp.	
Internal Gains	17,287	btu/h	Occupied Cooling UA	-1,494	btu/hr/°F	Occupied Heating UA	
Unoc Internal Gain factor	0.03		Unoccupied Cooling UA	-1,277	btu/hr/°F	Unoccupied Heating UA	
Ave Occ Internal Gain Factor	0.6		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					
					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	Intern BT
A		B	C	D	E	F	G	H	I	
102.5	49.1	0	0	0	-42,592	-107,830	-10,372	-36,404	-53,915	-5
97.5	42.5	3	1	2	-35,119	-74,882	-10,372	-30,018	-37,441	-5
92.5	39.5	34	9	25	-27,647	-59,905	-10,372	-23,631	-29,953	-5
87.5	36.6	131	35	96	-20,175	-45,428	-10,372	-17,244	-22,714	-5
82.5	34	500	134	366	-12,703	-32,449	-10,372	-10,857	-16,224	-5
77.5	31.6	620	166	454	-5,231	-20,468	-10,372	-4,471	-10,234	-5
72.5	29.2	664	178	486	1,537	2,995	-10,372	1,537	1,498	-5
67.5	27	854	229	625	4,610	8,986	-10,372	4,610	4,493	-5
62.5	24.5	927	248	679	7,683	14,976	-10,372	7,683	7,488	-5
57.5	21.4	600	161	439	10,756	20,967	-10,372	10,756	10,483	-5
52.5	18.7	610	163	447	13,829	26,957	-10,372	13,829	13,479	-5
47.5	16.2	611	164	447	16,902	32,948	-10,372	16,902	16,474	-5
42.5	14.4	656	176	480	19,975	38,939	-10,372	19,975	19,469	-5
37.5	12.6	1,023	274	749	23,048	44,929	-10,372	23,048	22,465	-5
32.5	10.7	734	197	537	26,121	50,920	-10,372	26,121	25,460	-5
27.5	8.6	334	89	245	29,194	56,910	-10,372	29,194	28,455	-5
22.5	6.8	252	68	185	32,267	62,901	-10,372	32,267	31,450	-5
17.5	5.5	125	33	92	35,340	68,891	-10,372	35,340	34,446	-5
12.5	4.1	47	13	34	38,413	74,882	-10,372	38,413	37,441	-5
7.5	2.6	22	6	16	41,487	80,872	-10,372	41,487	40,436	-5
2.5	1	13	3	10	44,560	86,863	-10,372	44,560	43,431	-5
-2.5	0	0	0	0	47,633	92,853	-10,372	47,633	46,427	-5
-7.5	-1.5	0	0	0	50,706	98,844	-10,372	50,706	49,422	-5
TOTALS		8,760	2,346	6,414						

Existing Building Ventilation & Infiltration (occ)	**555**	**cfm**
Overheat Ventilation Factor	**2.00**	From doors constantly opening in lobby
Additional ventilation to offset overheat	**555**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**555**	**cfm**

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building **Basketball Court**

Building Footprint	7,548	SF	Ex Occupied Clng Temp.	75	°F	Ex Occupied Htg Temp.	72 °F
Heating Efficiency	75%		Ex Unoccupied Clng Temp.	75	°F	Ex Unoccupied Htg Temp.	72 °F
Cooling Efficiency	1.20	kW/ton	Occupied Cooling UA	(3,620)	btu/hr/°F	Occupied Heating UA	1,527 btu/hr/°F
Internal Gains	16,680	btu/h	Unoccupied Cooling UA	(3,620)	btu/hr/°F	Unoccupied Heating UA	1,527 btu/hr/°F
Unoc Internal Gain factor	0.03		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb		
Ave Occ Internal Gain Factor	0.4		Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb		
Economizer available (Y/N)	No						

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

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-99,547	-136,403	-5,838	-99,547	-124,003	-500	0	0	0	0
97.5	42.5	3	1	2	-81,448	-94,725	-5,838	-81,448	-86,113	-500	0	52	52	0
92.5	39.5	34	13	21	-63,348	-75,780	-5,838	-63,348	-68,891	-500	0	467	467	0
87.5	36.6	131	49	82	-45,249	-57,466	-5,838	-45,249	-52,242	-500	0	1,336	1,336	0
82.5	34.0	500	188	313	-27,149	-41,047	-5,838	-27,149	-37,316	-500	0	3,418	3,418	0
77.5	31.6	620	233	388	-9,050	-25,891	-5,838	-9,050	-23,538	-500	0	2,230	2,230	0
72.5	29.2	664	249	415	0	0	-5,838	0	0	-500	0	166	166	0
67.5	27.0	854	320	534	6,873	6,820	-5,838	6,873	6,200	-500	0	0	0	123
62.5	24.5	927	348	579	14,510	14,398	-5,838	14,510	13,089	-500	0	0	0	316
57.5	21.4	600	225	375	22,147	21,976	-5,838	22,147	19,978	-500	0	0	0	323
52.5	18.7	610	229	381	29,783	29,554	-5,838	29,783	26,867	-500	0	0	0	449
47.5	16.2	611	229	382	37,420	37,132	-5,838	37,420	33,756	-500	0	0	0	570
42.5	14.4	656	246	410	45,057	44,710	-5,838	45,057	40,645	-500	0	0	0	741
37.5	12.6	1,023	384	639	52,693	52,288	-5,838	52,693	47,535	-500	0	0	0	1,357
32.5	10.7	734	275	459	60,330	59,866	-5,838	60,330	54,424	-500	0	0	0	1,119
27.5	8.6	334	125	209	67,967	67,444	-5,838	67,967	61,313	-500	0	0	0	575
22.5	6.8	252	95	158	75,604	75,022	-5,838	75,604	68,202	-500	0	0	0	483
17.5	5.5	125	47	78	83,240	82,600	-5,838	83,240	75,091	-500	0	0	0	264
12.5	4.1	47	18	29	90,877	90,178	-5,838	90,877	81,980	-500	0	0	0	109
7.5	2.6	22	8	14	98,514	97,756	-5,838	98,514	88,869	-500	0	0	0	55
2.5	1.0	13	5	8	106,151	105,334	-5,838	106,151	95,758	-500	0	0	0	35
-2.5	0.0	0	0	0	113,787	112,912	-5,838	113,787	102,647	-500	0	0	0	0
-7.5	-1.5	0	0	0	121,424	120,490	-5,838	121,424	109,536	-500	0	0	0	0
TOTALS		8,760	3,285	5,475								7,669	7,669	6,519

Existing Building Ventilation & Infiltration (occ)	**1,276**	**cfm**
Overheat Ventilation Factor	**1.10**	
Additional ventilation to offset overheat	**128**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**1,276**	**cfm**
Economizer Ventilation (from AHU's)	**0**	**cfm**

From opening door to unheated storage area

Energy Use Indices (calculated)

Heating	Base Case
Court	6,519
Office	2,912
Storage	1,140
Total	**10,571**
Target ->	**10,570**
	100.0%

	Base Case
Cooling	7,669
Target ->	300
	2556.4%

HEAT GAIN/LOSS WORKSHEET

Project Name:	NJ BPU Clean Energy Program	Project No.:	CHA#20549		
Location	Borough of South Plainfield, NJ	Site Elevation:	60 Feet	Specific Volume	13.50 CF/#
Building Name	Main PAL Building	Date:	02/22/10		
Engineer:	CAA				

Building/Facility Designation: Basketball Court

Outdoor Winter Design DB Temperature	14 *F	Indoor Winter Design DB Temperature	72 *F
Outdoor Summer Design DB Temperature	91 *F	Indoor Summer Design DB Temperature	75 *F
Outdoor Summer Design WB Temperature	73 *F	Indoor Summer Design WB Temperature	60 *F
Outdoor Summer Humidity Ratio	0.0121 ###	Indoor Air (70*F) Humidity Ratio	0.0078 ###

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	8" LW CMU (filled) and partial gypsum board or insulation	5.8	

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	Ceiling, 3" Insulation, Wood Deck, Felt & Shingles	15.50	

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	Vinyl Frame, 1/4" DP 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	7,860 SF		
Occupied Area	7,548 SF	Return Plenum?	no

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	136 Ft	8.5 Ft	24.0 Ft	0 SF	0 SF	1,156 SF
East Exposure	109 Ft	8.3 Ft	24.0 Ft	0 SF	0 SF	905 SF
South Exposure	136 Ft	12.0 Ft	24.0 Ft	0 SF	224 SF	1,408 SF
West Exposure	109 Ft	8.3 Ft	24.0 Ft	0 SF	0 SF	905 SF

Forced Ventilation: 0 cfm

HEAT GAIN/LOSS WORKSHEET

Project Name:	NJ BPU Clean Energy Program	Project No.:	CHA#20549		
Location	Borough of South Plainfield, NJ	Site Elevation:	60 Feet	Specific Volume	13.50 CF/#
Building Name	Main PAL Building	Date:	02/22/10		
Engineer:	CAA				

Building/Facility Designation: Basketball Court

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF		Shade Coef	Cooling Load Factor		Solar Heat Gain	
North Exposure	0	38	btu/h/sf	0.8	0.75	Glass Type C	0 Btu/hr	
East Exposure	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	0	216	btu/h/sf	0.8	0.29	Glass Type C	0 Btu/hr	
								0 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain	
North Exposure	3,264	0.17	20 °F	1.0	11,255 Btu/hr	
East Exposure	2,616	0.17	39 °F	1.0	17,590 Btu/hr	
South Exposure	3,040	0.17	27 °F	1.0	14,152 Btu/hr	
West Exposure	2,616	0.17	22 °F	1.0	9,923 Btu/hr	
Roof	7,860	0.06	73 °F	1.0	37,018 Btu/hr	
Fenestration	0	0.55	16 °F		0 Btu/hr	
Doors	224	0.14	27 °F		845 Btu/hr	
Ceiling	7,548	0.14	0 °F		0 Btu/hr	
Partition	1,125	0.66	0 °F		0 Btu/hr	
Floor	7,548	0.04	0 °F		0 Btu/hr	
						90,783 Btu/h

INTERNAL HEAT GAINS

								Room Heat Gain
Lights	0.40	w/sf x	7,548	Occ Area =	3.0	kW x 3.4x	1.0 RAF =	10,305 Btu/h
Plug Load	0.00	w/sf x	7,548	Occ Area =	0.0	kW x 3.4x	1.0 RAF =	0 Btu/h
People	50	people x	255	btu/person x	50%	time in space =		6,375 Btu/h
Computer Work Stations			0	Units x	120	W/Unit x 3414 =		0 Btu/h
Equipment	0.0	kW x 3.413 =						0 Btu/h
Misc.								0 Btu/h
								16,680 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor		Perimeter Ratio		Coef	Temp. Diff.	Room Heat Gain	
Walls	11,536 SF	0.28	CFM/SF			1.08	16 °F	60,408	Btu/h
Doors	224 SF	0.40	CFM/LF	0.57	LF/SF	1.08	16 °F	958	Btu/h
Windows	0 SF	0.30	CFM/LF	0.00	LF/SF	1.08	16 °F	0	Btu/h
Ventilation	0 cfm					1.08	16 °F	0	Btu/h
									61,365 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	-2,108	0.17	20	1.0	-7,269 Btu/hr	
East Exposure	-1,711	0.17	39	1.0	-11,507 Btu/hr	
South Exposure	-1,632	0.17	27	1.0	-7,597 Btu/hr	
West Exposure	-1,711	0.17	22	1.0	-6,491 Btu/hr	
Roof	7,860	0.06	73	0.0	0 Btu/hr	
						-32,864 Btu/h

INTERNAL HEAT GAINS

							Room Heat Gain
Lights	0.40	w/sf x	7,548	Occ Area =	3.0	kW x3413x 0.00 RAF =	0 Btu/h
Misc.							0 Btu/h
							0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT		SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Solar	0	Internal Gains to Room	16,680
Conduction to Room	90,783	Internal Gains to Plenum	0
Conduction to Plenum	-32,864		
Ventilaton and Infiltration	61,365		
Sub Total	119,283	Sub Total	16,680

HEAT GAIN/LOSS WORKSHEET

Project Name:	NJ BPU Clean Energy Program	Project No.:	CHA#20549		
Location	Borough of South Plainfield, NJ	Site Elevation:	60 Feet	Specific Volume	13.50 CF/#
Building Name	Main PAL Building	Date:	02/22/10		
Engineer:	CAA				

Building/Facility Designation: Basketball Court

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	697 SF	0.28 CFM/SF	4,800	0.0043 ##/##	4,071 Btu/h
Doors	224 SF	0.40 CFM/LF	4,800	0.0043 ##/##	1,067 Btu/h
Windows	0 SF	0.30 CFM/LF	4,800	0.0043 ##/##	0 Btu/h
Ventilation	0 cfm		4,800	0.0043 ##/##	0 Btu/h
People	50 people	0.50 time in space		250 Btu/hr/person	6,250 Btu/h
					11,388 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	
Temperature Dependent Gains	119,283	11,388	130,671	
Temperature Indep. Gains	16,680		16,680	SHR= 0.92
Total	135,963	11,388	147,351	

Building Cooling Load: 12.3 Tons at 615 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is: 13,000 CFM; 1.72 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	1,156	0.17	58	11,560 Btu/h
East Exposure	905	0.17	58	9,047 Btu/h
South Exposure	1,408	0.17	58	14,080 Btu/h
West Exposure	905	0.17	58	9,047 Btu/h
Fenestration	0	0.55	58	0 Btu/h
Roof	7,860	0.06	58	29,412 Btu/h
Doors	224	0.14	58	1,815 Btu/h
Ceiling	7,548	0.14	0	0 Btu/h
Partition	1,125	0.66	12	8,910 Btu/h
Floor	7,860	0.04	15	4,716 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	4,373 SF	0.28 CFM/SF	1.08	58	1,225 cfm	76,867 Btu/h
Doors	224 SF	0.40 CFM/LF	1.08	58	51 cfm	3,214 Btu/h
Windows	0 SF	0.30 CFM/LF	1.08	58	0 cfm	0 Btu/h
Ventilation Load	0 cfm		1.08	58	0 cfm	0 Btu/h
Total Ventilation & Infiltration Load					1,276 cfm	80,081 Btu/h

Building Heating Load	168,667	btu/h
	22.3	btu/sf

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building
Basketball Court

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
			Sub-total	0.0	0.0
South	10.0	14.0	1	140.0	48.0
	3.0	7.0	4	84.0	80.0
				0.0	0.0
				0.0	0.0
			Sub-total	224.0	128.0
West				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
			Total	**224.0**	**128.0**

LF/SF
0.57

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	68.0	11.0	1	748.0	158.0		All wall quantities must remain equal to 1
	68.0	6.0	1	408.0	148.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	136.0			1156.0	306.0	8.5	Average height wall automatically linked to
East	109.0	8.3	1	904.7	234.6		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	109.0			904.7	234.6	8.3	Average height wall automatically linked to
South	68.0	18.0	1	1224.0	172.0		
	68.0	6.0	1	408.0	148.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	136.0			1632.0	320.0	12.0	Average height wall automatically linked to
West	109.0	8.3	1	904.7	234.6		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	109.0			904.7	234.6	8.3	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				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	
			Total	0.0	0.0	LF/SF 0.00

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building **Office, Lobby and Locker Room Areas**

Building Footprint	2,860	SF	Ex Occupied Clng Temp.	74	*F	Ex Occupied Htg Temp.	75	*F
Heating Efficiency	83%		Ex Unoccupied Clng Temp.	74	*F	Ex Unoccupied Htg Temp.	75	*F
Cooling Efficiency	1.20	kW/ton	Occupied Cooling UA	(1,494)	btu/hr/*F	Occupied Heating UA	615	btu/hr/*F
Internal Gains	17,287	btu/h	Unoccupied Cooling UA	(1,277)	btu/hr/*F	Unoccupied Heating UA	615	btu/hr/*F
Unoc Internal Gain factor	0.03		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb			
Ave Occ Internal Gain Factor	0.6		Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb			
Economizer available (Y/N)	No							

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

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins *F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-42,592	-107,830	-10,372	-36,404	-53,915	-519	0	0	0	0
97.5	42.5	3	1	2	-35,119	-74,882	-10,372	-30,018	-37,441	-519	0	25	25	0
92.5	39.5	34	9	25	-27,647	-59,905	-10,372	-23,631	-29,953	-519	0	224	224	0
87.5	36.6	131	35	96	-20,175	-45,428	-10,372	-17,244	-22,714	-519	0	655	655	0
82.5	34.0	500	134	366	-12,703	-32,449	-10,372	-10,857	-16,224	-519	0	1,754	1,754	0
77.5	31.6	620	166	454	-5,231	-20,468	-10,372	-4,471	-10,234	-519	0	1,290	1,290	0
72.5	29.2	664	178	486	1,537	2,995	-10,372	1,537	1,498	-519	0	104	104	0
67.5	27.0	854	229	625	4,610	8,986	-10,372	4,610	4,493	-519	0	0	0	74
62.5	24.5	927	248	679	7,683	14,976	-10,372	7,683	7,488	-519	0	0	0	157
57.5	21.4	600	161	439	10,756	20,967	-10,372	10,756	10,483	-519	0	0	0	151
52.5	18.7	610	163	447	13,829	26,957	-10,372	13,829	13,479	-519	0	0	0	204
47.5	16.2	611	164	447	16,902	32,948	-10,372	16,902	16,474	-519	0	0	0	255
42.5	14.4	656	176	480	19,975	38,939	-10,372	19,975	19,469	-519	0	0	0	328
37.5	12.6	1,023	274	749	23,048	44,929	-10,372	23,048	22,465	-519	0	0	0	596
32.5	10.7	734	197	537	26,121	50,920	-10,372	26,121	25,460	-519	0	0	0	489
27.5	8.6	334	89	245	29,194	56,910	-10,372	29,194	28,455	-519	0	0	0	250
22.5	6.8	252	68	185	32,267	62,901	-10,372	32,267	31,450	-519	0	0	0	209
17.5	5.5	125	33	92	35,340	68,891	-10,372	35,340	34,446	-519	0	0	0	114
12.5	4.1	47	13	34	38,413	74,882	-10,372	38,413	37,441	-519	0	0	0	47
7.5	2.6	22	6	16	41,487	80,872	-10,372	41,487	40,436	-519	0	0	0	24
2.5	1.0	13	3	10	44,560	86,863	-10,372	44,560	43,431	-519	0	0	0	15
-2.5	0.0	0	0	0	47,633	92,853	-10,372	47,633	46,427	-519	0	0	0	0
-7.5	-1.5	0	0	0	50,706	98,844	-10,372	50,706	49,422	-519	0	0	0	0
TOTALS		8,760	2,346	6,414								4,051	4,051	2,912

Existing Building Ventilation & Infiltration (occ)	**555**	**cfm**
Overheat Ventilation Factor	**2.00**	From doors constantly opening in lobby
Additional ventilation to offset overheat	**555**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**555**	**cfm**
Economizer Ventilation (from AHU's)	**0**	**cfm**

Energy Use Indices (calculated)

Heating	Base Case
Court	6,519
Office	2,912
Storage	1,140
Total	**10,571**
Target ->	**10,570**
	100.0%

	Base Case
Cooling	4,051
Target ->	300
	1350.4%

HEAT GAIN/LOSS WORKSHEET

Project Name:	NJ BPU Clean Energy Program	Project No.:	CHA#20549		
Location	Borough of South Plainfield, NJ	Site Elevation:	60 Feet	Specific Volume	13.50 CF/#
Building Name	Main PAL Building	Date:	02/22/10		
Engineer:	CAA				

Building/Facility Designation: Office, Lobby and Locker Room Areas

Outdoor Winter Design DB Temperature	14 *F	Indoor Winter Design DB Temperature	75 *F
Outdoor Summer Design DB Temperature	91 *F	Indoor Summer Design DB Temperature	74 *F
Outdoor Summer Design WB Temperature	73 *F	Indoor Summer Design WB Temperature	60 *F
Outdoor Summer Humidity Ratio	0.0121 ##	Indoor Air (70*F) Humidity Ratio	0.0078 ##

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	8" LW CMU (filled) and partial gypsum board or insulation	5.8	

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	Ceiling, 3" Insulation, Wood Deck, Felt & Shingles	15.50	

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	Vinyl Frame, 1/4" DP 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: 2,860 SF
Occupied Area: 2,860 SF
Return Plenum? no

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	54 Ft	9.0 Ft	8.0 Ft	30 SF	0 SF	456 SF
East Exposure	16 Ft	9.0 Ft	8.0 Ft	0 SF	42 SF	98 SF
South Exposure	38 Ft	9.0 Ft	8.0 Ft	0 SF	0 SF	342 SF
West Exposure	107 Ft	9.0 Ft	8.0 Ft	60 SF	0 SF	903 SF

Forced Ventilation: 0 cfm

HEAT GAIN/LOSS WORKSHEET

Project Name:	NJ BPU Clean Energy Program	Project No.:	CHA#20549		
Location	Borough of South Plainfield, NJ	Site Elevation:	60 Feet	Specific Volume	13.50 CF/#
Building Name	Main PAL Building	Date:	02/22/10		
Engineer:	CAA				

Building/Facility Designation: Office, Lobby and Locker Room Areas

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	30	38 btu/h/sf	0.8	0.75	Glass Type C	684 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	60	216 btu/h/sf	0.8	0.29	Glass Type C	3,007 Btu/hr
						3,691 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	402	0.17	20 *F	1.0	1,386 Btu/hr
East Exposure	82	0.17	39 *F	1.0	551 Btu/hr
South Exposure	304	0.17	27 *F	1.0	1,415 Btu/hr
West Exposure	796	0.17	22 *F	1.0	3,019 Btu/hr
Roof	2,860	0.06	73 *F	1.0	13,470 Btu/hr
Fenestration	90	0.55	17 *F		842 Btu/hr
Doors	42	0.14	27 *F		158 Btu/hr
Ceiling	2,860	0.14	0 *F		0 Btu/hr
Partition	1,125	0.66	0 *F		0 Btu/hr
Floor	2,860	0.04	0 *F		0 Btu/hr
					20,842 Btu/h

INTERNAL HEAT GAINS

							Room Heat Gain
Lights	1.25 w/sf x	2,860 Occ Area =	3.6 kW x 3.4x		1.0 RAF =		12,201 Btu/h
Plug Load	0.10 w/sf x	2,860 Occ Area =	0.3 kW x 3.4x		1.0 RAF =		976 Btu/h
People	4 people x	255 btu/person x	75% time in space =				765 Btu/h
Computer Work Stations		4 Units x	120 W/Unit x	3414 =			1,638 Btu/h
Equipment	0.5 kW x 3,413 =						1,707 Btu/h
Misc.							0 Btu/h
							17,287 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain
Walls	1,584 SF	0.28 CFM/SF		1.08	17 *F	8,813 Btu/h
Doors	42 SF	0.40 CFM/LF	0.95 LF/SF	1.08	17 *F	318 Btu/h
Windows	90 SF	0.30 CFM/LF	1.30 LF/SF	1.08	17 *F	697 Btu/h
Ventilation	0 cfm			1.08	17 *F	0 Btu/h
						9,828 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	54	0.17	20	1.0	186 Btu/hr
East Exposure	16	0.17	39	1.0	104 Btu/hr
South Exposure	38	0.17	27	1.0	177 Btu/hr
West Exposure	107	0.17	22	1.0	406 Btu/hr
Roof	2,860	0.06	73	0.0	0 Btu/hr
					873 Btu/h

INTERNAL HEAT GAINS

Lights	1.25 w/sf x	2,860 Occ Area =	3.6 kW x3413x	0.00 RAF =		0 Btu/h
Misc.						0 Btu/h
						0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT	
Solar	3,691
Conduction to Room	20,842
Conduction to Plenum	873
Ventilaton and Infiltration	9,828
Sub Total	35,234

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Internal Gains to Room	17,287
Internal Gains to Plenum	0
Sub Total	17,287

HEAT GAIN/LOSS WORKSHEET

Project Name:	NJ BPU Clean Energy Program	Project No.:	CHA#20549		
Location	Borough of South Plainfield, NJ	Site Elevation:	60 Feet	Specific Volume	13.50 CF/#
Building Name	Main PAL Building	Date:	02/22/10		
Engineer:	CAA				

Building/Facility Designation: Office, Lobby and Locker Room Areas

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	3,075 SF	0.28 CFM/SF	4,800	0.0043 ##/#	17,945 Btu/h
Doors	42 SF	0.40 CFM/LF	4,800	0.0043 ##/#	334 Btu/h
Windows	90 SF	0.30 CFM/LF	4,800	0.0043 ##/#	732 Btu/h
Ventilation	0 cfm		4,800	0.0043 ##/#	0 Btu/h
People	4 people	0.75 time in space		250 Btu/hr/person	750 Btu/h
					19,760 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	
Temperature Dependent Gains	35,234	19,760	54,994	
Temperature Indep. Gains	17,287		17,287	SHR= 0.73
Total	52,521	19,760	72,282	

Building Cooling Load: 6.0 Tons at 475 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is: 3,977 CFM; 1.39 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	456	0.17	61	4,796 Btu/h
East Exposure	98	0.17	61	1,025 Btu/h
South Exposure	342	0.17	61	3,597 Btu/h
West Exposure	903	0.17	61	9,497 Btu/h
Fenestration	90	0.55	61	3,020 Btu/h
Roof	2,860	0.06	61	11,255 Btu/h
Doors	42	0.14	61	358 Btu/h
Ceiling	2,860	0.14	0	0 Btu/h
Partition	1,125	0.66	3	2,228 Btu/h
Floor	2,860	0.04	15	1,716 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	1,799 SF	0.28 CFM/SF	1.08	61	504 cfm	33,245 Btu/h
Doors	42 SF	0.40 CFM/LF	1.08	61	16 cfm	1,056 Btu/h
Windows	90 SF	0.30 CFM/LF	1.08	61	35 cfm	2,317 Btu/h
Ventilation Load	0 cfm		1.08	61	0 cfm	0 Btu/h
Total Ventilation & Infiltration Load					555 cfm	36,619 Btu/h

Building Heating Load	74,111	btu/h
	25.9	btu/sf

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building
Office, Lobby and Locker Room Areas

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
East	3.0	7.0	2	42.0	40.0
				0.0	0.0
				0.0	0.0
			Sub-total	42.0	40.0
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
West				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
			Total	42.0	40.0

LF/SF
0.95

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	31.5	9.0	1	283.5	81.0		All wall quantities must remain equal to 1
	22.5	9.0	1	202.5	63.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	54.0			486.0	144.0	9.0	Average height wall automatically linked to
East	15.5	9.0	1	139.5	49.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	15.5			139.5	49.0	9.0	Average height wall automatically linked to
South	38.0	9.0	1	342.0	94.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	38.0			342.0	94.0	9.0	Average height wall automatically linked to
West	25.0	9.0	1	225.0	68.0		
	82.0	9.0	1	738.0	182.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	107.0			963.0	250.0	9.0	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North	2.5	4.0	3	30.0	39.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	30.0	39.0	
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	2.5	4.0	6	60.0	78.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	60.0	78.0	
			Total	**90.0**	**117.0**	LF/SF 1.30

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building **Storage and Restrooms**

Building Footprint	2,300	SF	Ex Occupied Clng Temp.	75	*F	Ex Occupied Htg Temp.	60 *F
Heating Efficiency	63%		Ex Unoccupied Clng Temp.	75	*F	Ex Unoccupied Htg Temp.	60 *F
Cooling Efficiency	1.20	kW/ton	Occupied Cooling UA	(1,277)	btu/hr/*F	Occupied Heating UA	463 btu/hr/*F
Internal Gains	9,556	btu/h	Unoccupied Cooling UA	(1,277)	btu/hr/*F	Unoccupied Heating UA	463 btu/hr/*F
Unoc Internal Gain factor*	0		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb		
Ave Occ Internal Gain Factor*	0.0		Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb		
Economizer available (Y/N)	No						

*Very little internal gains in this space. Cannot be contributed towards heat load.
Heating and cooling energy are unrelated in this model. If the building being analyzed is not cooled, disregard cooling energy calculations

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins *F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-35,124	-45,081	0	-35,124	-45,081	0	0	0	0	0
97.5	42.5	3	3	0	-28,737	-31,307	0	-28,737	-31,307	0	0	18	18	0
92.5	39.5	34	34	0	-22,351	-25,045	0	-22,351	-25,045	0	0	161	161	0
87.5	36.6	131	131	0	-15,965	-18,993	0	-15,965	-18,993	0	0	458	458	0
82.5	34.0	500	500	0	-9,579	-13,566	0	-9,579	-13,566	0	0	1,157	1,157	0
77.5	31.6	620	620	0	-3,193	-8,557	0	-3,193	-8,557	0	0	729	729	0
72.5	29.2	664	664	0	0	0	0	0	0	0	0	0	0	0
67.5	27.0	854	854	0	0	0	0	0	0	0	0	0	0	0
62.5	24.5	927	927	0	0	0	0	0	0	0	0	0	0	0
57.5	21.4	600	600	0	1,158	1,252	0	1,158	1,252	0	0	0	0	17
52.5	18.7	610	610	0	3,474	3,757	0	3,474	3,757	0	0	0	0	53
47.5	16.2	611	611	0	5,790	6,261	0	5,790	6,261	0	0	0	0	89
42.5	14.4	656	656	0	8,106	8,766	0	8,106	8,766	0	0	0	0	133
37.5	12.6	1,023	1,023	0	10,422	11,270	0	10,422	11,270	0	0	0	0	267
32.5	10.7	734	734	0	12,738	13,775	0	12,738	13,775	0	0	0	0	234
27.5	8.6	334	334	0	15,055	16,279	0	15,055	16,279	0	0	0	0	126
22.5	6.8	252	252	0	17,371	18,784	0	17,371	18,784	0	0	0	0	110
17.5	5.5	125	125	0	19,687	21,288	0	19,687	21,288	0	0	0	0	62
12.5	4.1	47	47	0	22,003	23,793	0	22,003	23,793	0	0	0	0	26
7.5	2.6	22	22	0	24,319	26,297	0	24,319	26,297	0	0	0	0	13
2.5	1.0	13	13	0	26,635	28,802	0	26,635	28,802	0	0	0	0	9
-2.5	0.0	0	0	0	28,951	31,307	0	28,951	31,307	0	0	0	0	0
-7.5	-1.5	0	0	0	31,267	33,811	0	31,267	33,811	0	0	0	0	0
TOTALS		8,760	8,760	0								2,523	2,523	1,140

Existing Building Ventilation & Infiltration (occ)	**464**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**464**	**cfm**
Economizer Ventilation (from AHU's)	**0**	**cfm**

Energy Use Indices (calculated)

Heating	Base Case
Court	6,519
Office	2,912
Storage	1,140
Total	**10,571**
Target ->	**10,570**
	100.0%

	Base Case
Cooling	**2,523**
Target ->	**300**
	841.0%

HEAT GAIN/LOSS WORKSHEET

Project Name:	NJ BPU Clean Energy Program	Project No.:	CHA#20549		
Location	Borough of South Plainfield, NJ	Site Elevation:	60 Feet	Specific Volume	13.50 CF/#
Building Name	Main PAL Building	Date:	02/22/10		
Engineer:	CAA				

Building/Facility Designation: Storage Rooms and Restrooms

Outdoor Winter Design DB Temperature	14 *F	Indoor Winter Design DB Temperature	60 *F
Outdoor Summer Design DB Temperature	91 *F	Indoor Summer Design DB Temperature	75 *F
Outdoor Summer Design WB Temperature	73 *F	Indoor Summer Design WB Temperature	60 *F
Outdoor Summer Humidity Ratio	0.0121 #/#	Indoor Air (70*F) Humidity Ratio	0.0078 #/#

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	8" LW CMU (filled) and partial gypsum board or insulation	5.8	

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	Ceiling, 3" Insulation, Wood Deck, Felt & Shingles	15.50	

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	Vinyl Frame, 1/4" DP 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: 2,300 SF
Occupied Area: 2,300 SF
Return Plenum? no

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	37 Ft	9.0 Ft	8.0 Ft	0 SF	0 SF	331 SF
East Exposure	127 Ft	9.0 Ft	8.0 Ft	0 SF	21 SF	1,118 SF
South Exposure	21 Ft	9.0 Ft	8.0 Ft	0 SF	0 SF	187 SF
West Exposure	0 Ft	0.0 Ft	8.0 Ft	0 SF	0 SF	0 SF

Forced Ventilation: 0 cfm

HEAT GAIN/LOSS WORKSHEET

Project Name:	NJ BPU Clean Energy Program	Project No.:	CHA#20549		
Location	Borough of South Plainfield, NJ	Site Elevation:	60 Feet	Specific Volume	13.50 CF/#
Building Name	Main PAL Building	Date:	02/22/10		
Engineer:	CAA				

Building/Facility Designation: Storage Rooms and Restrooms

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	0	38 btu/h/sf	0.8	0.75	Glass Type C	0 Btu/hr
East Exposure	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	0	216 btu/h/sf	0.8	0.29	Glass Type C	0 Btu/hr
						0 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	294	0.17	20 °F	1.0	1,014 Btu/hr
East Exposure	991	0.17	39 °F	1.0	6,664 Btu/hr
South Exposure	166	0.17	27 °F	1.0	773 Btu/hr
West Exposure	0	0.17	22 °F	1.0	0 Btu/hr
Roof	2,300	0.06	73 °F	1.0	10,832 Btu/hr
Fenestration	0	0.55	16 °F		0 Btu/hr
Doors	21	0.14	27 °F		79 Btu/hr
Ceiling	2,300	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	2,300	0.04	0 °F		0 Btu/hr
					19,362 Btu/h

INTERNAL HEAT GAINS

							Room Heat Gain
Lights	1.00 w/sf x	2,300 Occ Area =	2.3 kW x 3.4x		1.0 RAF =		7,850 Btu/h
Plug Load	0.00 w/sf x	2,300 Occ Area =	0.0 kW x 3.4x		1.0 RAF =		0 Btu/h
People	0 people x	255 btu/person x	50% time in space =				0 Btu/h
Computer Work Stations		0 Units x	120 W/Unit x	3414 =			0 Btu/h
Equipment	0.5 kW x 3.413 =						1,707 Btu/h
Misc.							0 Btu/h
							9,556 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain
Walls	1,451 SF	0.28 CFM/SF		1.08	16 °F	7,598 Btu/h
Doors	21 SF	0.30 CFM/LF	0.95 LF/SF	1.08	16 °F	112 Btu/h
Windows	0 SF	0.30 CFM/LF	0.00 LF/SF	1.08	16 °F	0 Btu/h
Ventilation	0 cfm			1.08	16 °F	0 Btu/h
						7,710 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	37	0.17	20	1.0	127 Btu/hr
East Exposure	127	0.17	39	1.0	851 Btu/hr
South Exposure	21	0.17	27	1.0	97 Btu/hr
West Exposure	0	0.17	22	1.0	0 Btu/hr
Roof	2,300	0.06	73	0.0	0 Btu/hr
					1,074 Btu/h

INTERNAL HEAT GAINS

Lights	1.00 w/sf x	2,300 Occ Area =	2.3 kW x3413x	0.00 RAF =	0 Btu/h
Misc.					0 Btu/h
					0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT		SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Solar	0	Internal Gains to Room	9,556
Conduction to Room	19,362	Internal Gains to Plenum	0
Conduction to Plenum	1,074		
Ventilaton and Infiltration	7,710		
Sub Total	28,146	Sub Total	9,556

HEAT GAIN/LOSS WORKSHEET

Project Name:	NJ BPU Clean Energy Program	Project No.:	CHA#20549		
Location	Borough of South Plainfield, NJ	Site Elevation:	60 Feet	Specific Volume	13.50 CF/#
Building Name	Main PAL Building	Date:	02/22/10		
Engineer:	CAA				

Building/Facility Designation: Storage Rooms and Restrooms

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	2,484 SF	0.28 CFM/SF	4,800	0.0043 #/#	14,499 Btu/h
Doors	21 SF	0.30 CFM/LF	4,800	0.0043 #/#	125 Btu/h
Windows	0 SF	0.30 CFM/LF	4,800	0.0043 #/#	0 Btu/h
Ventilation	0 cfm		4,800	0.0043 #/#	0 Btu/h
People	0 people	0.50 time in space		250 Btu/hr/person	0 Btu/h
					14,624 Btu/h

Cooling Load Summary

	Sensible	Latent	Total		
Temperature Dependent Gains	28,146	14,624	42,770		
Temperature Indep. Gains	9,556		9,556	SHR=	0.72
Total	37,702	14,624	52,326		

Building Cooling Load: 4.4 Tons at 527 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is: 2,820 CFM (1.23 CFM/sf)

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	331	0.17	46	2,623 Btu/h
East Exposure	1,118	0.17	46	8,863 Btu/h
South Exposure	187	0.17	46	1,481 Btu/h
West Exposure	0	0.17	46	0 Btu/h
Fenestration	0	0.55	46	0 Btu/h
Roof	2,300	0.06	46	6,826 Btu/h
Doors	21	0.14	46	135 Btu/h
Ceiling	2,300	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	2,300	0.04	15	1,380 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	1,635 SF	0.28 CFM/SF	1.08	46	458 cfm	22,791 Btu/h
Doors	21 SF	0.30 CFM/LF	1.08	46	6 cfm	299 Btu/h
Windows	0 SF	0.30 CFM/LF	1.08	46	0 cfm	0 Btu/h
Ventilation Load	0 cfm		1.08	46	0 cfm	0 Btu/h
Total Ventilation & Infiltration Load					464 cfm	23,090 Btu/h

Building Heating Load	44,398	btu/h
		19.3 btu/sf

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building
Storage Rooms and Restrooms

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
East	3.0	7.0	1	21.0	20.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	21.0	20.0	
South				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
West				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
			Total	**21.0**	**20.0**	LF/SF 0.95

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	36.8	9.0	1	330.8	91.5		All wall quantities must remain equal to 1
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
	36.8			330.8	91.5	Ave. height 9.0	Average height wall automatically linked to
East	126.5	9.0	1	1138.5	271.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
	126.5			1138.5	271.0	Ave. height 9.0	Average height wall automatically linked to
South	20.8	9.0	1	186.8	59.5		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
	20.8			186.8	59.5	Ave. height 9.0	Average height wall automatically linked to
West				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	Ave. height 0.0	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				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	
			Total	**0.0**	**0.0**	LF/SF 0.00

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-1 Night Setback

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Programmable thermostat	2	EA	$ 100	$ 150	$ -	$ 196	$ 363	$ -	$ 559	
Miscellaneous Electrical	1	LS	$ -	$ 100	$ -	$ -	$ 121	$ -	$ 121	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 680	Subtotal	
$ 34	5%	Contingency
$ 36	5%	Contractor O&P
$ -	0%	Engineering
$ 750	**Total**	

APPENDIX C

ECM-2 Replace Domestic Hot Water Heater

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-2: Replace Domestic Hot Water heater

Summary

* Replace DHW Heater w/ Instantaneous, Condensing, Gas-Fired DHW Heater

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	50	Therms/month	Calculated from utility bill
Total Annual Utility Demand by Water Heater	60,000	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	80%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	48,000	MBTU/yr	
Existing Tank Size	75	Gallons	Per manufacturer nameplate
Hot Water Piping System Capacity	0	Gallons	Estimated Per existing system (Only include if system has HWR)
Hot Water Temperature	120	°F	Per building personnel
Room Temperature	60	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.9	MBH	
Annual Standby Hot Water Load	8,213	MBTU/yr	
New Tank Size	0	Gallons	Instantaneous DHW Heater
Hot Water Piping System Capacity	0	Gallons	Estimated Per existing system (Only include if system has HWR)
Hot Water Temperature	120	°F	
Room Temperature	60	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.0	MBH	
Annual Standby Hot Water Load	0	MBTU/yr	
Total Annual Hot Water Demand	39,788	MBTU/yr	
Proposed Avg. Hot water heater efficiency	92%		Based on Navien CR180 instantaneous, condensing DHW Heater
Proposed Fuel Use	434	Therms	Standby Losses and inefficient DHW heater eliminated
Utility Cost	$1.25	$/Therm	
Existing Operating Cost of DHW	$751	$/yr	
Proposed Operating Cost of DHW	$543	$/yr	

Savings Summary:

Utility	Energy Savings	Cost Savings
Therms/yr	166	$208

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-2: Replace Domestic Hot Water heater

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
DHW Heater Removal	1	LS		$ 50		$ -	$ 61	$ -	$ 61	
						$ -	$ -	$ -	$ -	
Tankless condensing DHW Heater	1	EA	$ 1,175	$ 280		$ 1,152	$ 339	$ -	$ 1,490	Navien CR180
Miscellaneous Electrical	1	LS	$ 300			$ 294	$ -	$ -	$ 294	
Venting Kit	1	EA	$ 400	$ 500		$ 392	$ 605	$ -	$ 997	
Water Piping and Valves	1	LS	$ 100	$ 150		$ 98	$ 182	$ -	$ 280	
Gas Piping and Valves	1	LS	$ 100	$ 150		$ 98	$ 182	$ -	$ 280	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 3,401		Subtotal
$ 340	10%	Contingency
$ 374	10%	Contractor O&P
$ -	0%	Engineering
$ 4,115		**Total**

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
Gas Water Heater ≤ 50 Gallons	1	EA	$50	$50	$ 1,490	$ 1,440
				$50	$1,490	$1,440

Total ECM Cost w/ Incentives	**$4,065**

APPENDIX D

ECM-3 Hot Water Temperature Reset

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-3 Hot Water Temperature Reset

Description
Existing heating hot water (HHW) supply setpoint is 180°F.
Proposed:
Vary heating hot water supply temperature as building heating load decreases in relation to outside air temperature.

A	B	C	D	E	F	G	H	I
					Proposed Usage		Utility Usage	
Amb. Bin Temp °F	Avg. DB Bin Temp °F	Bin Hours	Heating Bin HOURS	Existing Heat Loss In Piping MBH	Avg. HHW Temp @ OA Temp °F	Proposed Heat Loss In Piping MBH	Existing Utility Use Therms/Yr	Proposed Utility Use Therms/Yr
100-104	102.0	0	0	0	0	0	0	0
95-99	97.0	3	0	0	0	0	0	0
90-94	92.0	34	0	0	0	0	0	0
85-89	87.0	131	0	0	0	0	0	0
80-84	82.0	500	0	0	0	0	0	0
75-79	77.0	620	0	0	0	0	0	0
70-74	72.0	664	0	0	0	0	0	0
65-69	67.0	854	0	0	0	0	0	0
60-64	62.0	927	927	11,961	160	10,834	144	131
55-59	57.0	600	600	7,742	161	7,013	93	84
50-54	52.0	610	610	7,871	162	7,129	95	86
45-49	47.0	611	611	7,884	163	7,141	95	86
40-44	42.0	656	656	8,464	163	7,667	102	92
35-39	37.0	1,023	1,023	13,200	164	11,956	159	144
30-34	32.0	734	734	9,471	165	8,579	114	103
25-29	27.0	334	334	4,310	166	3,904	52	47
20-24	22.0	252	252	3,252	167	2,945	39	35
15-19	17.0	125	125	1,613	168	1,461	19	18
10-14	12.0	47	47	606	168	549	7	7
5-9	7.0	22	22	284	169	257	3	3
0-4	2.0	13	13	168	170	152	2	2
-5- -1	-3.0	0	0	0	170	0	0	0
-10- -6	-8.0	0	0	0	170	0	0	0
Totals		**8,760**	**5,954**	**76,824**		**69,587**	**926**	**838**

Annual Energy Savings	**87**	**Therms/yr**
Annual Cost Savings	**$ 109**	**/yr**

Existing Boiler Efficiency	83%	

Building HHW Piping System		
Heating On Temperature	65	°F
Total Length of Pipe	1100	LF
Existing HHW Setpoint High	180	°F
Existing HHW Setpoint Low	160	°F
Avg HHW Temp	170	°F
Avg Pipe Size	1	Inches
Avg Insul Thickness	1	Inches
Existing Heat Loss	13.8	Btu/Hr/LF
Percent in Uncond. Space	85%	
Existing System Heat Loss	12,903	Btu/Hr
Proposed Min HHW Return*	150	°F
Avg Prop HHW Supply Temp	163	°F
Proposed Heat Loss	12.5	Btu/Hr/LF
Proposed System Heat Loss	11,688	Btu/Hr

*Refer to existing boiler capabilities

Size (in)	Length (ft)
3/4	500
1	500
1 1/2	100
1	**Average**

Comments:

A-C	Newark, NJ weather bins
D	Based on building balance points and bin data.
E	Existing heat loss in piping system based on current average HHW temperature.
F	Estimated Average HHW temperature with HW reset based on OA temperature.
G	Proposed heat loss in piping system based on estimated average HW temperature.
H-I	Utility usage to overcome heat loss in HHW piping system based on boiler efficiency.

Borough of South Plainfield
CHA #20549
Building: Main PAL Building

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

ECM-3 Hot Water Temperature Reset

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Boiler Energy Management System*	1	EA	$ 2,300	$ 1,500		$ 2,254	$ 1,815	$ -	$ 4,069	Controls HW temp reset
						$ -	$ -	$ -	$ -	
Miscellaneous Electrical	1	LS		$ 250		$ -	$ 303	$ -	$ 303	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

*Pricing based on Aerco Boiler Management System II

$ 4,372	Subtotal
$ 437	10% Contingency
$ 481	10% Contractor O&P
$ -	0% Engineering
$ 5,290	**Total**

APPENDIX E

ECM-4 Replace Window Air Conditioning Units

Borough of South Plainfield
CHA #20549
Building: Main PAL Building

ECM-4 Replace Window AC Units

Install new energy star window AC units

ASSUMPTIONS			Comments
Electric Cost	$0.162	/ kWh	
Average run hours per Week	60	Hours	Unit is manually turned on (even if after hours) and sometimes left on over night
Space Temperature Setpoint	74	deg F	setpoint
Avg. BTU / Hr Rating of existing AC unit	10,000	Btu / Hr	(typical size for cooling office spaces in this type of building)
Average EER	7.0	Btu / W hr	Units more than 10 years old. 8.0 when new

Item	Value	Units	Comments
Total Number of Units	2		
Existing Annual Electric Usage	1,314	kWh	Existing Units do not cycle on and off w/ room temp
Proposed EER	9.8		New Window AC Units (per manufacturer)
Proposed Annual Electric Usage	583	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Savings	731	kWh
Annual Cost Savings	$118	

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	91%	1
92.5	34	12	82%	10
87.5	131	47	74%	34
82.5	500	179	65%	116
77.5	620	221	56%	124
72.5	664	0	0%	0
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	460	62%	286

Borough of South Plainfield
CHA #20549
Building: Main PAL Building

ECM-4 Replace Window AC Units

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Window AC Unit Removal	2	EA		$ 50		$ -	$ 121	$ -	$ 121	
						$ -	$ -	$ -	$ -	
New Window AC Unit	2	EA	$ 475	$ 75		$ 931	$ 182	$ -	$ 1,113	10,000 Btuh capacity
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 1,234	Subtotal
$ 62	5% Contingency
$ -	0% Contractor O&P
$ -	0% Engineering
$ 1,295	**Total**

APPENDIX F

ECM-5 Add Wall Insulation

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-5 Add Wall Insulation Office, Lobby and Corridor Areas

Total Existing Wall Area	1,224	sf	Office west wall, Lobby north and east walls, Locker corridor north wall.
Existing U-value	0.17	Btu/hr/(sf*F)	
Proposed U-value	0.06	Btu/hr/(sf*F)	Adding 3.5" of Loose-fill Cellulose Insulation at R3.5/inch and 5/8" Drywall
Heating Efficiency	83%		
Cooling Efficiency	1.20	kW/ton	

Existing Cooling

Max. North Wall Cooling Load	1,386	Btu/hr
Max. East Wall Cooling Load	551	Btu/hr
Max. South Wall Cooling Load	1,415	Btu/hr
Max. West Wall Cooling Load	3,019	Btu/hr

Existing Heating

Existing Heating Load Temp Diff	61	F
Existing Max. Wall Heating Load	12,873	Btu/hr

Proposed Cooling

Max. North Wall Cooling Load	442	Btu/hr
Max. East Wall Cooling Load	176	Btu/hr
Max. South Wall Cooling Load	451	Btu/hr
Max. West Wall Cooling Load	963	Btu/hr

Proposed Heating

Proposed Max. Heating Load	4,107	Btu/hr

Occupied Cooling Setpoint	74	F
Unoccupied Cooling Setpoint	80	F

Occupied Heating Setpoint	75	F
Unoccupied Heating Setpoint	75	F

Existing Cooling Total	152	kWh/yr
Proposed Cooling Total	49	kWh/yr
Savings	104	kWh/yr

Existing Heating Total	40,422,600	Btu/yr
Proposed Heating Total	13,006,561	Btu/yr
Savings	27,416,039	Btu/yr
Input	330	therms

				Occupied				Unoccupied							
Avg Outdoor Air Temp. Bins *F	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Cooling Load	Existing Heating Load	Proposed Cooling Load	Proposed Heating Load
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
97.5	3	1	2	6,372	2,033	-	-	6,372	2,033	-	-	2	-	1	-
92.5	34	13	21	5,016	1,600	-	-	4,551	1,452	-	-	16	-	5	-
87.5	131	49	82	3,661	1,168	-	-	2,731	871	-	-	40	-	13	-
82.5	500	188	313	2,305	735	-	-	910	290	-	-	72	-	23	-
77.5	620	233	388	949	303	-	-	-	-	-	-	22	-	7	-
72.5	664	249	415	-	-	528	168	-	-	528	168	-	350,317	-	111,751
67.5	854	320	534	-	-	1,583	505	-	-	1,583	505	-	1,351,676	-	431,185
62.5	927	348	579	-	-	2,638	842	-	-	2,638	842	-	2,445,362	-	780,071
57.5	600	225	375	-	-	3,693	1,178	-	-	3,693	1,178	-	2,215,862	-	706,860
52.5	610	229	381	-	-	4,748	1,515	-	-	4,748	1,515	-	2,896,448	-	923,967
47.5	611	229	382	-	-	5,803	1,851	-	-	5,803	1,851	-	3,545,907	-	1,131,144
42.5	656	246	410	-	-	6,859	2,188	-	-	6,859	2,188	-	4,499,255	-	1,435,262
37.5	1,023	384	639	-	-	7,914	2,525	-	-	7,914	2,525	-	8,095,810	-	2,582,564
32.5	734	275	459	-	-	8,969	2,861	-	-	8,969	2,861	-	6,583,221	-	2,100,047
27.5	334	125	209	-	-	10,024	3,198	-	-	10,024	3,198	-	3,348,062	-	1,068,032
22.5	252	95	158	-	-	11,079	3,534	-	-	11,079	3,534	-	2,791,986	-	890,644
17.5	125	47	78	-	-	12,134	3,871	-	-	12,134	3,871	-	1,516,810	-	483,863
12.5	47	18	29	-	-	13,190	4,208	-	-	13,190	4,208	-	619,914	-	197,753
7.5	22	8	14	-	-	14,245	4,544	-	-	14,245	4,544	-	313,386	-	99,970
2.5	13	5	8	-	-	15,300	4,881	-	-	15,300	4,881	-	198,900	-	63,449
-2.5	0	0	0	-	-	16,355	5,217	-	-	16,355	5,217	-	-	-	-
-7.5	0	0	0	-	-	17,410	5,554	-	-	17,410	5,554	-	-	-	-
TOTALS	**8,760**	**3,285**	**5,475**									**152**	**40,772,917**	**49**	**13,006,561**

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-5 Add Wall Insulation Storage Areas

Total Existing Wall Area	1,139	sf	East wall of storage rooms, restrooms, etc. along basketball court.
Existing U-value	0.17	Btu/hr/(sf*F)	
Proposed U-value	0.06	Btu/hr/(sf*F)	Adding 3.5" of Loose-fill Cellulose Insulation at R3.5/inch and 5/8" Drywall
Heating Efficiency	63%		
Cooling Efficiency	1.20	kW/ton	

Existing Cooling

Max. North Wall Cooling Load	1,014	Btu/hr
Max. East Wall Cooling Load	6,664	Btu/hr
Max. South Wall Cooling Load	773	Btu/hr
Max. West Wall Cooling Load	0	Btu/hr

Existing Heating

Existing Heating Load Temp Diff	46	F
Existing Max. Wall Heating Load	9,029	Btu/hr

Proposed Cooling

Max. North Wall Cooling Load	323	Btu/hr
Max. East Wall Cooling Load	2,128	Btu/hr
Max. South Wall Cooling Load	247	Btu/hr
Max. West Wall Cooling Load	-	Btu/hr

Proposed Heating

Proposed Max. Heating Load	2,880	Btu/hr

Occupied Cooling Setpoint	75	F	Occupied Heating Setpoint	60	F
Unoccupied Cooling Setpoint	80	F	Unoccupied Heating Setpoint	60	F
Existing Cooling Total	189	kWh/yr	Existing Heating Total	19,265,677	Btu/yr
Proposed Cooling Total	60	kWh/yr	Proposed Heating Total	6,145,751	Btu/yr
Savings	129	kWh/yr	Savings	13,119,926	Btu/yr
			Input	158	**therms**

				Occupied				Unoccupied							
Avg Outdoor Air Temp. Bins *F	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Cooling Load	Existing Heating Load	Proposed Cooling Load	Proposed Heating Load
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
97.5	3	1	2	8,450	2,696	-	-	8,450	2,696	-	-	3	-	1	-
92.5	34	13	21	6,572	2,097	-	-	6,036	1,925	-	-	21	-	7	-
87.5	131	49	82	4,695	1,498	-	-	3,622	1,155	-	-	53	-	17	-
82.5	500	188	313	2,817	899	-	-	1,207	385	-	-	91	-	29	-
77.5	620	233	388	939	300	-	-	-	-	-	-	22	-	7	-
72.5	664	249	415	-	-	-	-	-	-	-	-	-	-	-	-
67.5	854	320	534	-	-	-	-	-	-	-	-	-	-	-	-
62.5	927	348	579	-	-	-	-	-	-	-	-	-	-	-	-
57.5	600	225	375	-	-	491	157	-	-	491	157	-	294,440	-	93,926
52.5	610	229	381	-	-	1,472	470	-	-	1,472	470	-	898,041	-	286,475
47.5	611	229	382	-	-	2,454	783	-	-	2,454	783	-	1,499,189	-	478,241
42.5	656	246	410	-	-	3,435	1,096	-	-	3,435	1,096	-	2,253,445	-	718,849
37.5	1,023	384	639	-	-	4,417	1,409	-	-	4,417	1,409	-	4,518,177	-	1,441,298
32.5	734	275	459	-	-	5,398	1,722	-	-	5,398	1,722	-	3,962,176	-	1,263,934
27.5	334	125	209	-	-	6,380	2,035	-	-	6,380	2,035	-	2,130,762	-	679,713
22.5	252	95	158	-	-	7,361	2,348	-	-	7,361	2,348	-	1,854,970	-	591,735
17.5	125	47	78	-	-	8,342	2,661	-	-	8,342	2,661	-	1,042,807	-	332,655
12.5	47	18	29	-	-	9,324	2,974	-	-	9,324	2,974	-	438,224	-	139,794
7.5	22	8	14	-	-	10,305	3,287	-	-	10,305	3,287	-	226,719	-	72,323
2.5	13	5	8	-	-	11,287	3,601	-	-	11,287	3,601	-	146,729	-	46,807
-2.5	0	0	0	-	-	12,268	3,914	-	-	12,268	3,914	-	-	-	-
-7.5	0	0	0	-	-	13,250	4,227	-	-	13,250	4,227	-	-	-	-
TOTALS	**8,760**	**3,285**	**5,475**									**189**	**19,265,677**	**60**	**6,145,751**

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-5 Add Wall Insulation

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
3-1/2" Blown in Cellulose Insulation	2,363	sq.ft	$ 0.23	$ 0.15	$ 0.06	$ 535	$ 440	$ 142	$ 1,117	
5/8" Sheetrock	2,363	sq.ft.	$ 0.38	$ 0.66		$ 880	$ 1,887	$ -	$ 2,766	
3-5/8" Metal Stud	1,700	LF	$ 0.35	$ 0.37		$ 583	$ 761	$ -	$ 1,344	
Painting	1	LS	$ 500	$ 2,000		$ 490	$ 2,420	$ -	$ 2,910	
Door Framing and Trim	3	EA	$ 200	$ 100		$ 588	$ 363	$ -	$ 951	
Window Framing and Trim	7	EA	$ 100	$ 50		$ 686	$ 424	$ -	$ 1,110	
Miscellaneous Electrical	1	LS	$ 250	$ 500		$ 245	$ 605	$ -	$ 850	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 11,048	Subtotal	
$ 1,657	15%	Contingency
$ 1,906	15%	Contractor O&P
$ -		Engineering
$ 14,611	**Total**	

APPENDIX G

ECM-6 Furnace Replacement

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-6 Furnace Replacement

Existing Fuel	Nat.Gas
Proposed Fuel	Nat.Gas

Item	Value	Units	Formula/Comments
Baseline Fuel Cost	$ 1.25		
Proposed Fuel Cost	$ 1.25		
Baseline Fuel Use	6,519	Therms	Per basketball court block load
Existing Furnace Efficiency	75%		Estimated or Measured
Baseline Furnace Load	488,942	Mbtu/yr	Baseline Fuel Use x Existing Efficiency x 100 Mbtu/Therms
Baseline Fuel Cost	$ 8,156		
Proposed Furnace Efficiency	92.5%		New Furnace Efficiency
Proposed Fuel Use	5,286	Therms	Baseline Furnace Load / Proposed Efficiency / 100 Mbtu/Therms
Proposed Fuel Cost	$ 6,613		
Annual Savings	1,233	Therms	
Annual Savings	**$ 1,543**	**/yr**	

Comments:

Completely remove two existing gas-fired furnaces serving basketball court and replace with two high-efficiency condensing furnaces.

Proposed furnace efficiency based on the use of two Trane XL-90, 120 MBH condensing furnaces.

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

ECM-6 Furnace Replacement

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Remove Existing Furnace	2	EA		$ 400	$ -	$ -	$ 968	$ -	$ 968	
						$ -	$ -	$ -	$ -	
New Condensing Furnace*	2	EA	$ 2,000	$ 500		$ 3,920	$ 1,210	$ -	$ 5,130	Includes Controls
Project Conditions	1	LS		$ 1,000						Obstacles in mech room
Venting Kit	2	EA	$ 400	$ 250						
Ductwork Modifications	1	LS	$ 250	$ 300		$ 245	$ 363	$ -	$ 608	
Miscellaneous Electrical	1	LS		$ 300		$ -	$ 363	$ -	$ 363	
Gas Piping and valves	1	LS	$ 200	$ 200		$ 196	$ 242	$ -	$ 438	
						$ -	$ -	$ -	$ -	

*Cost estimate based on the installation of two Trane XL-90, 120 MBH condensing furnaces.

$ 7,507	Subtotal
$ 1,126.05	15% Contingency
$ 863.31	Contractor 10% O&P
$ -	0% Engineering
$ 9,496	**Total**

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIV
Gas-Fired Furnace ≥ 92% Efficient	2	EA	$400	$800	$ 5,130	$ 4,330
				$800	$5,130	$4,330

Total ECM Cost w/ Incentives	**$8,696**

APPENDIX H

ECM-7 Lighting Replacements

Energy Audit of South Plainfield Facilities
CHA Project No. 20549 - PAL Main Building
ECM-7 Lighting Replacements

Cost of Electricity: $0.162 $/kWh blended
$0.128 $/kWh supply
$13.300 $/kW

		EXISTING CONDITIONS									
	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	
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Li 2T w F
8	Exterior Walls/Doors	3	MH 175	MH175/1	215	0.6	Breaker	8760	5,650	3	MH
246	Front Lawn PAL Sign	2	S61SF1 (MAG)	F61SS	84	0.2	Breaker	8760	1,472	2	S6
9	Basketball Gym	12	High Bay MH 400 35 Feet High	MH400/1	458	5.5	SW	2912	16,004	12	P 5
X1	Basketball Gym	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	26	2	X 1
30	Storage Rm 1	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	1000	227	1	T 2
6	Women's Room	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	899	3	T 2
6	Men's Room	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	899	3	T 2
194	Storage Rm 2	2	W 34 C F 2 (MAG)	F42EE	72	0.1	SW	1000	144	2	W
71	Storage Rm 3	4	I 60	I60/1	60	0.2	SW	1000	240	4	CF
194	Athletic Storage Rm	6	W 34 C F 2 (MAG)	F42EE	72	0.4	SW	1000	432	6	W
194	Rear Maint./Storage Garage	3	W 34 C F 2 (MAG)	F42EE	72	0.2	SW	1000	216	3	W
46	Boiler Room	2	W 32 C F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	W
194	Storage Rm 4	4	W 34 C F 2 (MAG)	F42EE	72	0.3	SW	1000	288	4	W
244	Rear Locker Rm/Storage	3	T 32 R F 3 (ELE)	F43LE	110	0.3	SW	1000	330	3	T 3
244	Rear Conference Room	8	T 32 R F 3 (ELE)	F43LE	110	0.9	SW	2600	2,288	8	T 3
244	Rear Corridor	2	T 32 R F 3 (ELE)	F43LE	110	0.2	SW	2600	572	2	T 3
244	Rear Corridor	2	T 32 R F 3 (ELE)	F43LE	110	0.2	SW	2600	572	2	T 3
244	Director's Office	8	T 32 R F 3 (ELE)	F43LE	110	0.9	SW	2600	2,288	8	T 3
244	Front Office	10	T 32 R F 3 (ELE)	F43LE	110	1.1	SW	2600	2,860	10	T 3
117	Front Office	1	CF 23	CFS23/1	23	0.0	SW	2600	60	1	CF
6	Meeting Room	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	749	2	T 2
16	Meeting Room	1	T 34 R F 2 (MAG)	F42EE	72	0.1	SW	2600	187	1	T 2
71	Meeting Room	1	I 60	I60/1	60	0.1	SW	2600	156	1	CF
71	Meeting Room	1	I 60	I60/1	60	0.1	SW	2600	156	1	CF
	Total	86				13.0			36,954	86	

APPENDIX I

ECM-8 Install Lighting Controls

Energy Audit of South Plainfield Facilities
CHA Project No. 20549 - PAL Main Building
ECM-8 Install Lighting Controls

Cost of Electricity: $0.162 $/kWh blended
$0.128 $/kWh supply
$13.300 $/kW

		EXISTING CONDITIONS									
	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	
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	"L 2T w F
8	Exterior Walls/Doors	3	MH 175	MH175/1	215	0.6	Breaker	8760	5,650.2	3	MH
246	Front Lawn PAL Sign	2	S61SF1 (MAG)	F61SS	84	0.2	Breaker	8760	1,471.7	2	S6
9	Basketball Gym	12	High Bay MH 400 35 Feet High	MH400/1	458	5.5	SW	2912	16,004.4	12	Hig
X1	Basketball Gym	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	26.3	2	X 1
30	Storage Rm 1	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	1000	227.0	1	1 B
6	Women's Room	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	898.6	3	T 3
6	Men's Room	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	898.6	3	T 3
194	Storage Rm 2	2	W 34 C F 2 (MAG)	F42EE	72	0.1	SW	1000	144.0	2	W
71	Storage Rm 3	4	I 60	I60/1	60	0.2	SW	1000	240.0	4	I 6
194	Athletic Storage Rm	6	W 34 C F 2 (MAG)	F42EE	72	0.4	SW	1000	432.0	6	W
194	Rear Maint./Storage Garage	3	W 34 C F 2 (MAG)	F42EE	72	0.2	SW	1000	216.0	3	W
46	Boiler Room	2	W 32 C F 2 (ELE)	F42LL	60	0.1	SW	2000	240.0	2	W
194	Storage Rm 4	4	W 34 C F 2 (MAG)	F42EE	72	0.3	SW	1000	288.0	4	W
244	Rear Locker Rm/Storage	3	T 32 R F 3 (ELE)	F43LE	110	0.3	SW	1000	330.0	3	T 3
244	Rear Conference Room	8	T 32 R F 3 (ELE)	F43LE	110	0.9	SW	2600	2,288.0	8	T 3
244	Rear Corridor	2	T 32 R F 3 (ELE)	F43LE	110	0.2	SW	2600	572.0	2	T 3
244	Rear Corridor	2	T 32 R F 3 (ELE)	F43LE	110	0.2	SW	2600	572.0	2	T 3
244	Director's Office	8	T 32 R F 3 (ELE)	F43LE	110	0.9	SW	2600	2,288.0	8	T 3
244	Front Office	10	T 32 R F 3 (ELE)	F43LE	110	1.1	SW	2600	2,860.0	10	T 3
117	Front Office	1	CF 23	CFS23/1	23	0.0	SW	2600	59.8	1	CF
6	Meeting Room	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	748.6	2	T 3
16	Meeting Room	1	T 34 R F 2 (MAG)	F42EE	72	0.1	SW	2600	187.2	1	T 3
71	Meeting Room	1	I 60	I60/1	60	0.1	SW	2600	156.0	1	I 6
71	Meeting Room	1	I 60	I60/1	60	0.1	SW	2600	156.0	1	I 6
	Total	86				13.0			36,954	86	

APPENDIX J

ECM-9 Lighting Replacements with Controls

Energy Audit of South Plainfield Facilities
CHA Project No. 20549 - PAL Main Building
ECM-9 Lighting Replacements with Controls

Cost of Electricity: $0.162 $/kWh blended
$0.128 $/kWh supply
$13.300 $/kW

		EXISTING CONDITIONS									
	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	
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"L 2T w F
8	Exterior Walls/Doors	3	MH 175	MH175/1	215	0.6	Breaker	8760	5,650	3	MH
246	Front Lawn PAL Sign	2	S61SF1 (MAG)	F61SS	84	0.2	Breaker	8760	1,472	2	S6
9	Basketball Gym	12	High Bay MH 400 35 Feet High	MH400/1	458	5.5	SW	2912	16,004	12	P 5
X1	Basketball Gym	2	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	8760	26	2	X 1
30	Storage Rm 1	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	1000	227	1	T 2
6	Women's Room	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	899	3	T 2
6	Men's Room	3	T 34 R F 4 (MAG)	F44EE	144	0.4	SW	2080	899	3	T 2
194	Storage Rm 2	2	W 34 C F 2 (MAG)	F42EE	72	0.1	SW	1000	144	2	W
71	Storage Rm 3	4	I 60	I60/1	60	0.2	SW	1000	240	4	CF
194	Athletic Storage Rm	6	W 34 C F 2 (MAG)	F42EE	72	0.4	SW	1000	432	6	W
194	Rear Maint./Storage Garage	3	W 34 C F 2 (MAG)	F42EE	72	0.2	SW	1000	216	3	W
46	Boiler Room	2	W 32 C F 2 (ELE)	F42LL	60	0.1	SW	2000	240	2	W
194	Storage Rm 4	4	W 34 C F 2 (MAG)	F42EE	72	0.3	SW	1000	288	4	W
244	Rear Locker Rm/Storage	3	T 32 R F 3 (ELE)	F43LE	110	0.3	SW	1000	330	3	T 3
244	Rear Conference Room	8	T 32 R F 3 (ELE)	F43LE	110	0.9	SW	2600	2,288	8	T 3
244	Rear Corridor	2	T 32 R F 3 (ELE)	F43LE	110	0.2	SW	2600	572	2	T 3
244	Rear Corridor	2	T 32 R F 3 (ELE)	F43LE	110	0.2	SW	2600	572	2	T 3
244	Director's Office	8	T 32 R F 3 (ELE)	F43LE	110	0.9	SW	2600	2,288	8	T 3
244	Front Office	10	T 32 R F 3 (ELE)	F43LE	110	1.1	SW	2600	2,860	10	T 3
117	Front Office	1	CF 23	CFS23/1	23	0.0	SW	2600	60	1	CF
6	Meeting Room	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	749	2	T 2
16	Meeting Room	1	T 34 R F 2 (MAG)	F42EE	72	0.1	SW	2600	187	1	T 2
71	Meeting Room	1	I 60	I60/1	60	0.1	SW	2600	156	1	CF
71	Meeting Room	1	I 60	I60/1	60	0.1	SW	2600	156	1	CF
	Total	86				13.0			36,954	86	

APPENDIX K

New Jersey Pay For Performance Incentive Program

Borough of S. Plainfield
CHA #20549
Building: Main PAL Building

New Jersey Pay For Performance Incentive Program

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

	Annual Utilities	
	kWh	Therms
Existing Usage (from utility)	170,016	11,170
Proposed Savings	15,270	4,210
Existing Total MMBtus	1,697	
Proposed Savings MMBtus	473	
% Reduction	27.9%	
Proposed Annual Savings	$7,600	

* Main PAL bldg shares electric meter w/ PAL Rec bldg.
Total annual electric usage (260,720 kWh) broken up by square footage.

	≥ %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	$3,359	$9,262	$12,621
Incentive #3	$2,138	$5,894	$8,032
Totals	**$5,497**	**$15,156**	**$20,653**

Total Project Cost	$44,000
% Incentives of Project Cost*	46.9%
Project Cost w/ Incentives*	$23,347

Project Payback (years)	
w/o Incentives	w/ Incentives
5.8	3.1

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

APPENDIX L

Photovoltaic (PV) Rooftop Solar Power Generation

PVWatts *** AC Energy & Cost Savings

Cautions for Interpreting the Results

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	50.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	38.5 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	16.2 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.36	4139	670.52
2	4.05	4469	723.98
3	4.58	5422	878.36
4	4.84	5299	858.44
5	5.30	5838	945.76
6	5.33	5506	891.97
7	5.27	5561	900.88
8	5.25	5503	891.49
9	5.06	5338	864.76
10	4.46	5027	814.37
11	3.15	3588	581.26
12	2.87	3460	560.52
Year	4.46	59150	9582.30

Output Hourly Performance Data

About the Hourly Performance Data

*

Output Results as Text

Saving Text from a Browser

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

Please send questions and comments regarding PVWATTS to Webmaster

Disclaimer and copyright notice

Cautions for Interpreting the Results

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

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

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

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

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

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

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

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

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

Township of South Plainfield
PAL Facility

Cost of Electricity $0.162 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-50kW System

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	New Jersey Renewable * Energy Incentive	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$500,000	**0.0**	**59,150**	**0**	**$9,600**	**0**	**$9,600**	**$50,000**	**$28,800**	**52.1**	**11.7**

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

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

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

Estimated Solar Renewable Energy Certificate Program (SREC) payments for 15 Years from RR Renewable Energy Consultants

Year	SREC
1	600
2	600
3	600
4	500
5	500
6	500
7	500
8	500
9	500
10	500
11	400
12	400
13	400
14	400
15	400
AVG	**487**

APPENDIX M

Solar Thermal Domestic Hot Water Plant

Interactive Energy Calculators

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

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

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

Solar Water Heating Calculator

Water heating is a major energy consumer. Although the energy consumed daily is often less than for air conditioning or heating, it is required year round, making it a good application of solar energy. Use this calculator to explore the energy usage of your water heater, and to estimate whether a solar water heater could save you money.

Water Heater Characteristics			
Physical		**Thermal**	
? Diameter (feet)	2.0	? Water Inlet Temperature (Degrees F)	55
? Capacity (gallons)	75	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	26.34	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	50
Energy Use			
1112		? Heat Delivered in Hot Water (BTU/hr)	
0		? Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		**Electric**
0.8	? Overall Efficiency	0.98
0.8	? Conversion Efficiency	0.98
1390 BTU/hr	? Power Into Water Heater	1135 BTU/hr
Cost		
$ 1.251 /Therm	? Utility Rates	$ .162 /kWh
$ 152.326	? Yearly Water Heating Cost	$ 471.734
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
254.152 years for gas	? Payback Time for Solar System	82.0680 years for electric

NJBPU Energy Audits
CHA #20549
Main PAL Building

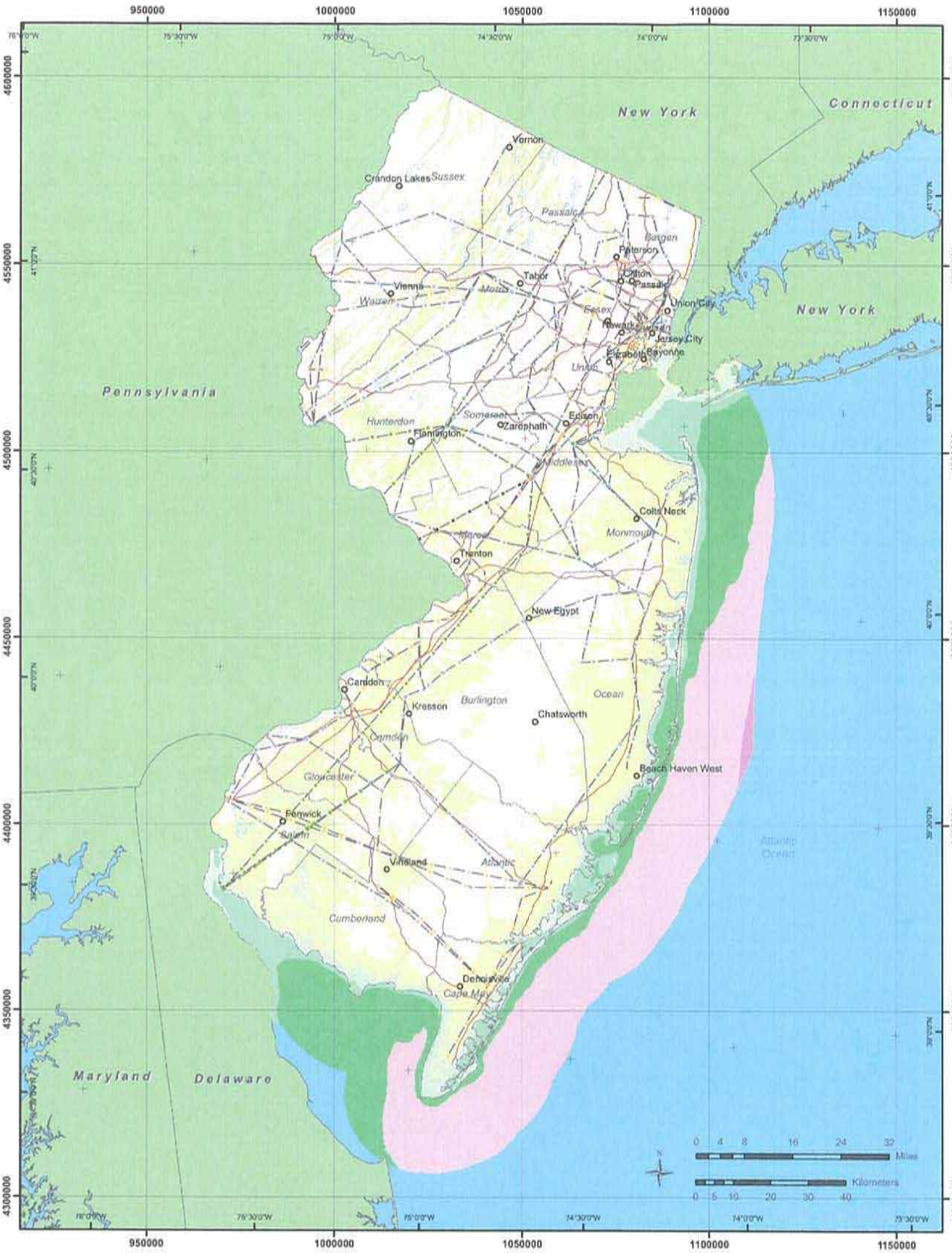
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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

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

APPENDIX N

Wind



Wind Resource of New Jersey

Mean Annual Wind Speed at 30 Meters

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

Generalized Transmission Line

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

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

AWS Truewind

Projection: Tranverse Mercator,
UTM Zone 17 WGS84
Spatial Resolution of Wind Resource Data: 200m
This map was created by AWS Truewind using the MesoMap system and historical weather data. Although it is believed to represent an accurate overall picture of the wind energy resource, estimates at any location should be confirmed by measurement.
The transmission line information was obtained by AWS Truewind from the Global Energy Decisions Velocity Suite. AWS does not warrant the accuracy of the transmission line information.

Map of 1250 Maple Ave, South Plainfield, NJ 07080-4539

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

APPENDIX O

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
PAL Athletic Facility

Building ID: 1926627
For 12-month Period Ending: June 30, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: February 25, 2010

Facility
PAL Athletic Facility
1250 Maple Avenue
South Plainfield, NJ 07054

Facility Owner
Borough of South Plainfield
South Plainfield
2480 Plainfield Avenue, NJ 07080

Primary Contact for this Facility
Glen Cullen
2480 Plainfield Avenue
South Plainfield, NJ 07080

Year Built: 1972
Gross Floor Area (ft²): 28,744

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	581,118
Natural Gas (kBtu)[4]	1,972,200
Total Energy (kBtu)	2,553,318

Energy Intensity[5]

Site (kBtu/ft²/yr)	89
Source (kBtu/ft²/yr)	139

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	193

Electric Distribution Utility
Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	65
National Average Source EUI	136
% Difference from National Average Source EUI	3%
Building Type	Recreation

Stamp of Certifying Professional

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

Certifying Professional
N/A

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

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

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	PAL Athletic Facility	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Recreation	Is this an accurate description of the space in question?		☐
Location	1250 Maple Avenue, South Plainfield, NJ 07054	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		☐

Office (Office)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	2,860 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	4	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	4	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?		☐

Fitness Center (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑

Gross Floor Area	4,635 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	0(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	93Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	1(Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		☐

Main Bldg (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	15,884 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	0(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	63Hours(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	4(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.		☐

Wrestling Gym (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	5,365 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	0(Optional)	Is this the number of personal computers in the space?		☐

Weekly operating hours	48Hours(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	4(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: Electric Meter - Pal Facility (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
05/13/2009	06/18/2009	15,963.00
04/14/2009	05/12/2009	13,459.00
03/10/2009	04/13/2009	11,112.00
02/11/2009	03/09/2009	11,528.00
01/13/2009	02/10/2009	11,738.00
12/18/2008	01/12/2009	10,642.00
11/15/2008	12/17/2008	12,990.00
10/17/2008	11/14/2008	11,581.00
09/18/2008	10/16/2008	17,111.00
08/18/2008	09/17/2008	16,537.00
07/18/2008	08/18/2008	23,110.00
Electric Meter - Pal Facility Consumption (kWh (thousand Watt-hours))		**155,771.00**
Electric Meter - Pal Facility Consumption (kBtu (thousand Btu))		**531,490.65**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**531,490.65**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Gas Meter - Pal Main (therms)
Space(s): Main Bldg, Office

Start Date	End Date	Energy Use (therms)
05/13/2009	06/16/2009	75.00
04/09/2009	05/12/2009	1,164.00
03/06/2009	04/08/2009	1,372.00
02/07/2009	03/05/2009	1,675.00
01/10/2009	02/06/2009	2,126.00
12/18/2008	01/09/2009	1,764.00
11/16/2008	12/17/2008	1,573.00
10/17/2008	11/15/2008	605.00
09/16/2008	10/16/2008	324.00
08/15/2008	09/15/2008	324.00
07/19/2008	08/14/2008	163.00

Gas Meter - Pal Main Consumption (therms)	**11,165.00**
Gas Meter - Pal Main Consumption (kBtu (thousand Btu))	**1,116,500.00**

Meter: Gas Meter - PAL Recreation (therms)
Space(s): Fitness Center, Wrestling Gym

Start Date	End Date	Energy Use (therms)
05/13/2009	06/18/2009	142.00
04/14/2009	05/12/2009	1,489.00
03/10/2009	04/13/2009	1,346.00
02/11/2009	03/09/2009	1,959.00
01/13/2009	02/10/2009	1,099.00
12/18/2008	01/12/2009	1,015.00
11/15/2008	12/17/2008	787.00
10/17/2008	11/14/2008	405.00
09/18/2008	10/16/2008	22.00
08/19/2008	09/17/2008	9.00
07/19/2008	08/18/2008	235.00

Gas Meter - PAL Recreation Consumption (therms)	**8,508.00**
Gas Meter - PAL Recreation Consumption (kBtu (thousand Btu))	**850,800.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**1,967,300.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?	☐

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

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

Certifying Professional

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

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

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

Facility
PAL Athletic Facility
1250 Maple Avenue
South Plainfield, NJ 07054

Facility Owner
Borough of South Plainfield
South Plainfield
2480 Plainfield Avenue, NJ 07080

Primary Contact for this Facility
Glen Cullen
2480 Plainfield Avenue
South Plainfield, NJ 07080

General Information

PAL Athletic Facility	
Gross Floor Area Excluding Parking: (ft²)	28,744
Year Built	1972
For 12-month Evaluation Period Ending Date:	June 30, 2009

Facility Space Use Summary

Office	
Space Type	Office
Gross Floor Area(ft²)	2,860
Weekly operating hours	45
Workers on Main Shift	4
Number of PCs	4
Percent Cooled	50% or more
Percent Heated	50% or more

Fitness Center	
Space Type	Other - Recreation
Gross Floor Area(ft²)	4,635
Number of PCs[o]	0
Weekly operating hours[o]	93
Workers on Main Shift[o]	1

Main Bldg	
Space Type	Other - Recreation
Gross Floor Area(ft²)	15,884
Number of PCs[o]	0
Weekly operating hours[o]	63
Workers on Main Shift[o]	4

Wrestling Gym	
Space Type	Other - Recreation
Gross Floor Area(ft²)	5,365
Number of PCs[o]	0
Weekly operating hours[o]	48
Workers on Main Shift[o]	4

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 06/30/2009)	**Baseline** (Ending Date 06/30/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	89	89	48	N/A	65
Source (kBtu/ft²)	139	139	76	N/A	136
Energy Cost					
$/year	N/A	N/A	N/A	N/A	N/A
$/ft²/year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
$MtCO_2e$/year	193	193	105	N/A	141
$kgCO_2e$/ft²/year	7	7	4	N/A	5

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

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

APPENDIX P

Equipment Inventory

South Plainfield BPU Energy Audit Program

Borough of South Plainfield, NJ

CHA#20549

Main PAL Building										
Item	Qty.	Manuf	Model No.	Serial No.	Capacity	Condition	Gas	MBH	Refrig.	Comments
Hot Water Boiler										
1	1	HB Smith	GB100-W-11 COND	GB2009-209	208 MBH	G	X	260		
Gas Fired Furnace										
2	2	Lennox	G1205-165-6		132 MBH	G	X	165		
Exhaust Fan										
3	1				2 HP	P				Basketball Court (HP Estimated)
Domestic Hot Water Heater										
4	1	State Industries	PRV 75 NRRTO	J95613436	75 Gallon	G	X	75.1		1994
Window AC Unit										
5	2				10,000 MBH	P				Offices
6	1				12,000 MBH	P				Meeting Room
7	1				8,000 MBH	P				Storage Room

E = Excellent
G = Good
P = Poor