

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

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ENERGY ASSESSMENT**

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BUREAU OF PUBLIC UTILITIES**

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1.0 INTRODUCTION & BACKGROUND

The South Plainfield Police Athletic League (PAL) facility is single floor building located at 1250 Maple Avenue. The 18,744 square foot structure was constructed in the 1970s; a 10,000 square foot extension was added in 2002. This report discusses the energy audit of the addition, or PAL recreation building, which shares a lobby with the original PAL building. The PAL recreational building consists of an entrance lobby, locker room, fitness center, wrestling gym, restrooms, concessions, and electrical room.

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) addition in South Plainfield, New Jersey. The recreation building addition, constructed in 2002, consists of a locker room, fitness center, wrestling gym, restrooms, concessions, and electrical room. The following areas were evaluated for energy conservation measures:

- Lighting replacement with occupancy sensors
- Demand control ventilation
- Variable speed drive/motor upgrades
- Domestic hot water heater upgrade

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Measures which are recommended for implementation have a payback of 10 years or less. This threshold is considered a viable return on investment. Potential annual savings of \$14,500 for the recommended ECMs may be realized with a payback of 3.5 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 Install Demand Control Ventilation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
12,200	0	9,490	3,730	6,000	6.4	NA	2.0	NA

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

ECM-2 Install Variable Speed Drives & Premium Motors – RTUs

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
22,300	0.3	20,130	0	3,300	1.7	400	6.8	6.6

*Incentive shown is per the New Jersey Smart Start Program, 2010 Premium Motors Applications.

ECM-3 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
6,400	4.5	10,050	(350)	1,600	3.5	100	4.0	3.9

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

ECM-6 Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
14,100	6.5	19,750	0	3,600	2.8	3,800	3.9	2.9

* 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) facility, a single story structure constructed in the 1970s. The original 18,744 square foot structure was expanded by 10,000 square feet in 2002. This report discusses the addition, or PAL recreation building, which shares a lobby with the original PAL building. The recreational building contains a locker room, fitness center, wrestling gym, restrooms, concessions, and an electrical room.

The PAL fitness center is open from 6:00 AM to 10:00 PM, Monday through Friday; 9:00 AM to 5:00 PM, Saturday; and 12:00 PM to 5:00 PM, Sunday. Occupancy of the fitness center is intermittent and fluctuates throughout the day. On average, there are about 20 people utilizing the space. The wrestling room is typically in use from 2:00 PM through 10:00 PM, Monday through Saturday. During wrestling meets, this space can have occupancy of several hundred people; however, average occupancy is typically about 40 people. The concessions area is only utilized on occasion to support a wrestling meet or other event. General occupancy increases after 3:00 PM with the end of the school and work day.

Exterior walls of the PAL recreation building are constructed of filled, light-weight concrete masonry unit (CMU) block on top of a concrete slab foundation. Supported by steel beam framing, the sloped roof of the building is comprised of steel decking, fiberglass batt insulation, with a vaulted suspended ceiling interior. There are two sets of double exterior doors in the lobby, consisting of steel construction and a half-light window. In addition, there are several steel security-type exit doors along the perimeter of the building, including a double door assembly on the south wall of the wrestling gym. There are no exterior windows in the PAL recreation building.

3.2 Utility Usage

Utilities include electricity, natural gas, and potable water. Electricity and natural gas are purchased from Public Service Electric & Gas Company (PSE&G); the building is connected to the municipal sewage system. Both buildings share a common electric meter; each has a dedicated gas service.

From July 2008 through June 2009, electric usage was approximately 260,720 kWh at a cost of about \$42,200. 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 during the summer due to AC equipment. During the same timeframe, the recreation building's heating and kitchen equipment required about 8,530 therms of natural gas. Based on the annual cost of about \$10,300, the blended price for natural gas was \$1.205 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.

3.3 HVAC Systems

HVAC for the PAL recreation building is provided by seven Lennox packaged rooftop units (RTU) with gas-fired heat and direct expansion cooling. Two units serve the fitness center; four serve the wrestling

gym; and remaining unit serves the support spaces such as the locker room, restrooms, lobby, and concessions. In total, the seven RTUs provide 50 tons of cooling to the building. Ductwork for the two units in the fitness center and the four units in the wrestling gym terminates just below the ceiling with a sheet metal box and four side wall double deflection grilles. The six units are equipped with economizers; the remaining unit serving the support spaces is not.

A Captive-Aire 3/4 HP, vertical upblast exhaust fan serves the range hood in the concessions area. Makeup air for the space is provided by a 1/3 HP, supply air fan with a mushroom top, also manufactured by Captive-Aire. This system is manually controlled at the hood.

3.4 Lighting/Electrical Systems

The majority of lighting within the recreation portion of the PAL facility is older T-12 fluorescent type and high bay 400 watt metal halide fixtures. In several locations, the fluorescent lighting has been upgraded to utilize more efficient T-8 technology. The exit signs within this portion of the building also utilize mostly older incandescent technology; one exit sign has been upgraded to efficient LED.

The exterior lighting for the facility was discussed in the main PAL building report.

3.5 Control Systems

Each RTU is controlled by a dedicated programmable thermostat mounted within the appropriate space. All seven thermostats have been programmed for nighttime temperature setback.

3.6 Plumbing Systems

Domestic hot water (DHW) for the PAL recreation building is generated by a 50 gallon, State Industries electric water heater. Located in the electrical room off the fitness center, the unit is equipped with a 4,500 watt heating element. Hot water in the PAL recreation building is primarily used for hand washing, occasional showers, concessions, and janitorial purposes.

The PAL recreation building has two, multi-stall restrooms off the lobby area, each equipped with several fixtures including a single shower. All plumbing fixtures are low-flow type per industry standards. The concessions area is equipped with a stainless steel hand sink and triple-bowl sink.

3.7 Concessions Equipment

The concession area utilizes several pieces of cooking and refrigeration equipment, including a four-burner stove and range combination unit, gas-fired griddle, and two large vertical coolers. A stainless steel range hood is positioned over the stove and griddle. The range hood is equipped with a Badger Range Guard fire-suppression system.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Install Demand Control Ventilation

The fitness center and wrestling gym are served by two and four RTUs, respectively. Per the 2006 International Mechanical Code (IMC), it was estimated that combined, these units supply 2,300 CFM of outdoor air (OA) to the fitness center, and 3,200 CFM OA to the wrestling gym. Each RTU draws fresh air in through an OA hood and blends it with return air prior to being treated and discharged into the respective space. The existing units constantly ventilate the areas for maximum occupancy. Since there is no control on the fresh air intake, the same amount of OA is treated regardless of the ventilation demand determined by occupancy. Utilizing a demand control ventilation (DCV) system would regulate the amount of OA induced to each space based on the CO₂ levels detected within the room. A DCV system is based on the principle that the number of people within the space is proportional to the concentration of CO₂. This ECM evaluates providing only the required fresh air to the fitness center and wrestling gym, decreasing the amount of OA necessary to be treated, and reducing the annual heating and cooling loads.

According to the 2006 IMC, the fitness center requires 20 CFM/person of OA. Therefore, based on the occupancy schedule for the room it was determined that the typical required amount of OA within the space is approximately 400 CFM. The wrestling gym also requires a minimum of 20 CFM/person OA. Therefore, it was established that this area requires an average of 800 CFM of OA. Calculating the energy required to condition the existing and proposed OA rates for each space yielded a combined annual savings of 3,730 therms and 9,490 kWh.

Implementation of this measure requires installation of OA controls on the six RTUs serving the fitness center and wrestling gym, including installing CO₂ sensors within the rooms and upgrades to the OA damper actuators. Additionally, a programmable logic controller (PLC) will be necessary to control the OA damper position based on the CO₂ readings.

DCV equipment has an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 55,950 therms and 142,350 kWh, totaling \$90,000.

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

ECM-1 Install Demand Control Ventilation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
12,200	0	9,490	3,730	6,000	6.4	NA	2.0	NA

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

This measure is recommended.

4.2 ECM-2 Install Variable Speed Drives & Premium Motors – RTUs

Supply air fans on the six RTUs serving the fitness center and wrestling gym are powered by 2 HP motors operating at constant rate. The remaining RTU is not considered for VSD and motor replacement because the motor horsepower is not sufficiently large to warrant upgrade. By installing variable speed drives (VSDs) on the fan motors of each unit, the amount of supply air delivered to each space can be adjusted

in accordance with the heating or cooling load. In addition, premium motors function at a higher efficiency and require less energy during operation. Applying this measure is expected to save energy year round.

Using bin weather data for Newark, NJ, the heating and cooling operating hours of the RTUs were determined per their corresponding space and applied to the power requirements of the fan motors. The existing annual electrical requirement for the two fan motors serving the fitness center was determined to be about 13,780 kWh; and the four fan motors serving the wrestling gym was about 14,230 kWh. The fan loads were then adjusted with OA temperature to determine the electrical requirements with VSDs installed. The existing fan motors are not inverter duty and incompatible with VSDs; therefore, the proposed energy requirement calculation utilized premium efficiency, inverter duty motors. The proposed energy consumption was found to be approximately 3,870 kWh for the fitness center and 4,000 kWh for the wrestling gym. The difference between the combined existing and proposed electrical consumptions was taken as the annual energy savings.

To implement this ECM, an inverter duty, premium efficiency motor and VSD would be installed on each of the six RTU supply air fans.

Premium efficiency motors and VSDs have an expected life of 18 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 362,340 kWh and \$59,400.

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

ECM-2 Install Variable Speed Drives & Premium Motors – RTUs

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
22,300	0.3	20,130	0	3,300	1.7	400	6.8	6.6

*Incentive shown is per the New Jersey Smart Start Program, 2010 Premium Motors Applications.

This measure is recommended.

4.3 ECM-3 Replace Domestic Hot Water Heater

Domestic hot water for the building is generated by a 50 gallon, 4,500 watt electric hot water heater. The cost per Btuh of energy in New Jersey is higher for electricity than natural gas; therefore, it would be economically beneficial to eliminate electrical equipment wherever possible. Therefore, this measure evaluates replacing the existing electric DHW heater with a gas-fired, condensing hot water heater to produce DHW for the PAL recreation building more cost effectively.

A hot water usage analysis was performed to estimate the daily, then annual hot water demand of the building. The cost of producing the determined annual amount of hot water was then calculated for both the existing DHW heater and the proposed gas-fired, condensing DHW heater. Proposed thermal efficiency was based on the A.O. Smith BTX-100, condensing hot water heater; it was calculated that 10,050 kWh would be saved per year, while an expenditure of 350 therms would be required to produce the necessary hot water. A more detailed hot water demand analysis may be necessary to verify proper equipment sizing. The new water heater will require gas piping, venting, electrical connections, and minor water piping modifications.

Gas-fired 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 180,900 kWh and (6,300) therms, totaling \$28,800.

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

ECM-3 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
6,400	4.5	10,050	(350)	1,600	3.5	100	4.0	3.9

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

This measure is recommended.

4.4 ECM-4 Lighting Replacements

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

To calculate energy savings, existing and proposed fixture wattages were applied to the estimated time of operation. The difference resulted in an annual savings of 18,410 kWh per year. Supporting calculations, including assumptions for lighting hours and annual energy usage, are provided in Appendix E.

Retrofitting fixtures that utilize T-12 lamps would require replacement with electronic ballasts and T-8 lamps. High bay metal halide fixtures would be removed and replaced with high output T-5 fixtures. In addition, signs using fluorescent bulbs would be replaced with LED type signs.

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 276,150 kWh, totaling \$51,000.

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

ECM-4 Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
13,700	6.5	18,410	0	3,400	2.7	3,700	4.0	2.9

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

This measure is recommended when combined with ECM-5; see ECM-6.

4.5 ECM-5 Install Occupancy Sensors

Lighting fixtures throughout the building are all manually switched on and off. In the two restrooms and single locker room, lighting is only required when the space is occupied. Usage varies in the locker room and restrooms; however, typically lighting remains on throughout the day. Most areas within the PAL recreation building are not suited for occupancy sensors due to the height of the ceiling or safety concerns. The operating time of lighting fixtures within these spaces can be considerably reduced by installing occupancy sensors.

Using a process similar to that utilized in section 4.4, the energy savings for this measure were calculated by applying the known fixture wattages in the space to the estimated existing and proposed times of operation for each fixture. The difference between the two values resulted in an annual savings of about 1,950 kWh per year.

For this measure, the facility will install occupancy sensors in each applicable area. In total, three occupancy sensors and some standard electrical work is required.

Occupancy sensors have an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 29,250 kWh and \$3,000.

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

ECM-5 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
400	0	1,950	0	200	6.5	100	2.0	1.5

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

This measure is recommended when combined with ECM-4; see ECM-6.

4.6 ECM-6 Lighting Replacements with Occupancy Sensors

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 4 and 5 to allow for maximum energy and demand reduction.

The lighting retrofits and controls have an expected lifetime of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 296,250 kWh, totaling \$54,000.

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

ECM-6 Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
14,100	6.5	19,750	0	3,600	2.8	3,800	3.9	2.9

* 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 history with PSE&G. Customers who lease their business are eligible for program participation; however, landlord permission is required.

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

Eligible energy efficiency equipment upgrades include:

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

5.2 Building Incentives

The South Plainfield PAL recreation building is eligible for several incentives under New Jersey Smart Start Programs. The total amount of all qualified incentives is about \$4,300 and includes installing premium motors, a gas-fired water heater, and upgrades to the lighting system.

When calculating the total incentive for the New Jersey Pay For Performance program, all energy conservation measures are applicable since the amount received is based on building-wide energy improvements. The overall energy reduction for the building 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 \$33,600, reducing the total project payback from 3.8 years to 1.5 years. See Appendix H for calculations.

Under PSE&G’s direct install program, the PAL recreation building is potentially eligible to receive \$55,000, and would be required to repay \$11,000. Incentives cannot be accepted under multiple programs.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

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

The building uses packaged rooftop units with gas-fired heat and DX cooling to meet the HVAC requirements. This existing equipment is not compatible with a geothermal energy source. Therefore, to take advantage of a GHP system, the existing mechanical equipment would have to be completely removed and a low temperature closed loop water source heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

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

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The 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 I.

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

Installation of (PV) arrays in the state New Jersey will allow the owner to participate in the New Jersey solar renewable energy certificates program (SREC). This is a program that has been set up to allow entities with large amounts of environmentally unfriendly emissions to purchase credits from zero emission (PV) solar-producers. An alternative compliance penalty (ACP) is paid for by the high emission

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

The 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 I 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 an electric water heater and, therefore, this measure would provide site electricity savings.

Currently, an incentive is not available for installation of thermal solar systems. A Federal tax credit of 30% of installation cost for the thermal applications is available; however, the Township of 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 J 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				
\$	kW	kWh	Therms	\$	\$	Years	Years
27,100	0	0	120	200	200	NA	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 PAL recreation building, there are site restrictions. Parking lots, trees and surrounding structures would greatly affect a tower location.

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

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

6.4 Combined Heat and Power Generation (CHP)

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

Any proposed CHP project will need to consider many factors, such as existing system load, use of thermal energy produced, system size, natural gas fuel availability, and proposed plant location. The PAL recreation 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 PAL recreation 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 established 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/ft²/year. Several factors contribute to the unfavorable EUI, including, wasted energy from unnecessary ventilation, inefficient RTU motors, electric hot water heating, and inefficient lighting operation. By implementing the measures discussed in this report (for the PAL recreation building only), it is expected that the EUI can be reduced to approximately 70 kBTU/ft²/year; the national average for this building type is 65 kBTU/ft²/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 L.

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 lighting and occupancy sensor upgrades, demand control ventilation, variable speed drive/motor upgrades, and domestic hot water heater upgrade. Potential annual savings of \$14,500 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-1 Install Demand Control Ventilation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
12,200	0	9,490	3,730	6,000	6.4	NA	2.0	NA

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

ECM-2 Install Variable Speed Drives & Premium Motors – RTUs

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
22,300	0.3	20,130	0	3,300	1.7	400	6.8	6.6

* Incentive shown is per the New Jersey Smart Start Program, 2010 Premium Motors Applications.

ECM-3 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
6,400	4.5	10,050	(350)	1,600	3.5	100	4.0	3.9

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

ECM-6 Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
\$	kW	kWh	Therms	\$		\$	Years	Years
14,100	6.5	19,750	0	3,600	2.8	3,800	3.9	2.9

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

APPENDIX A

Utility Usage Analysis

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

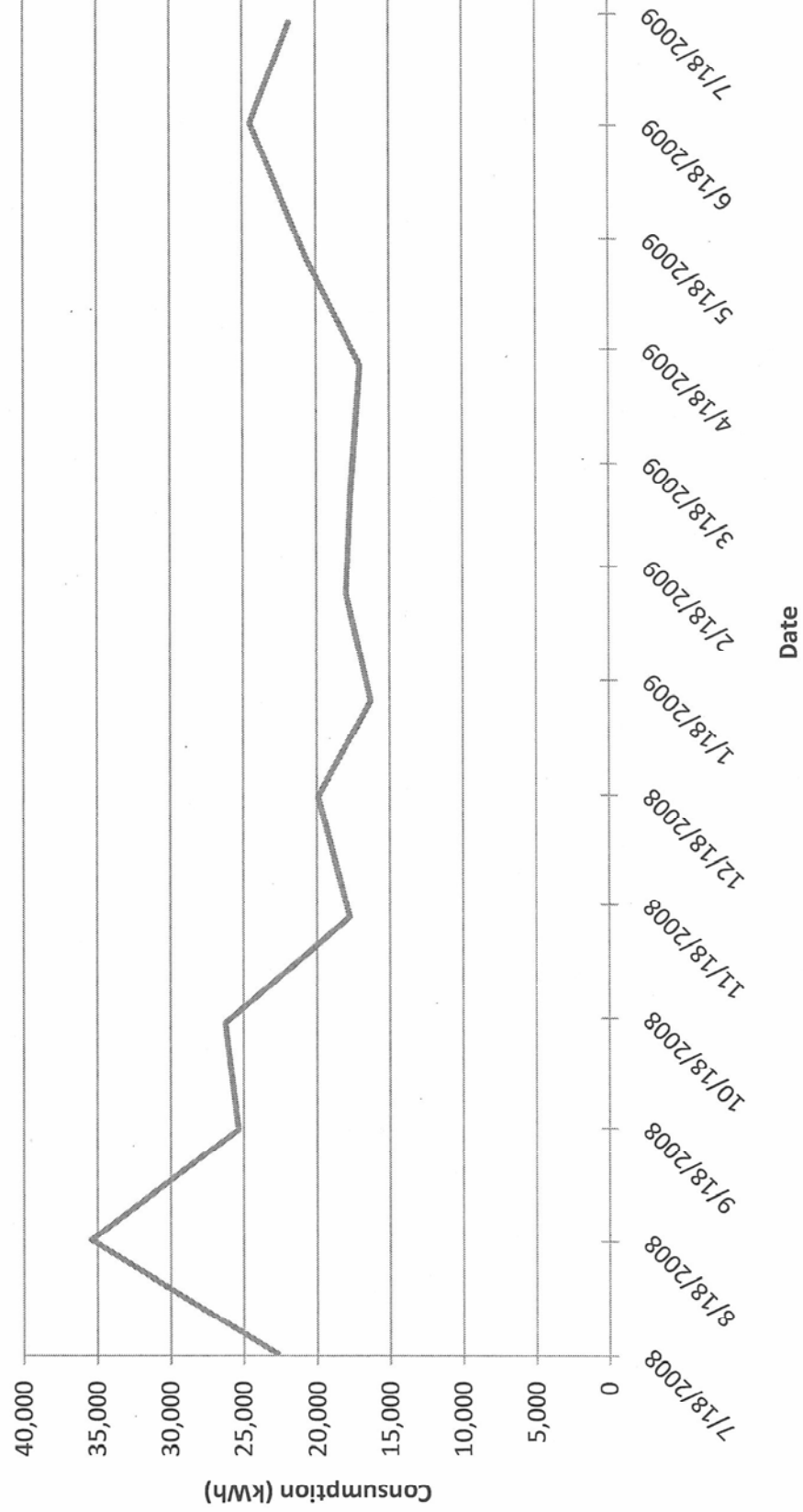
Account Number: 52 907 249 15
PSE&G - Electric Service

Meter #: 728006166

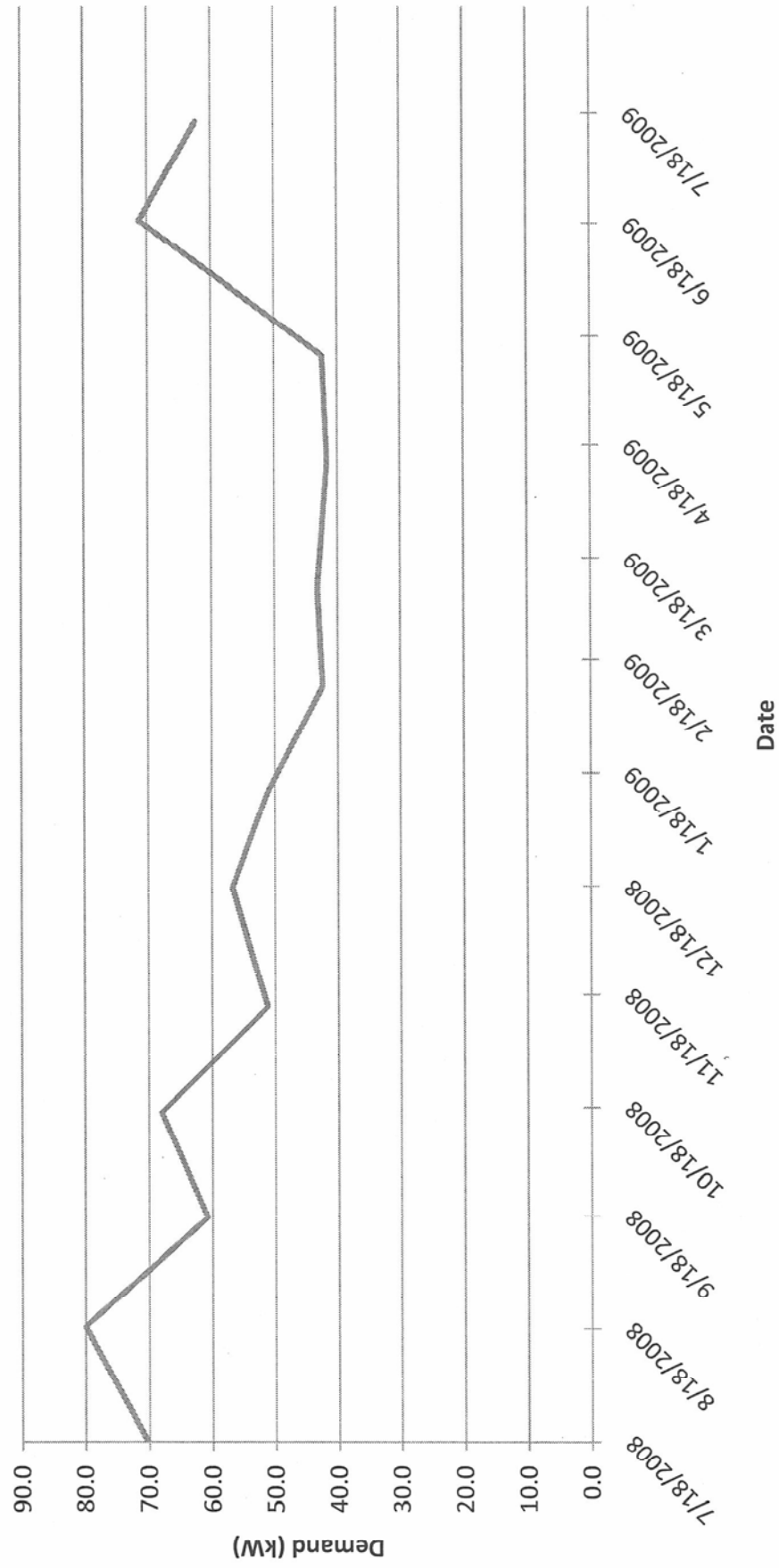
Date	Consumption (kWh)	Demand (kW)	Charges			Unit Costs		
			Total (\$)	Demand (\$)	Consumption (\$)	Blended Rate (\$/kWh)	Consumption (\$/kWh)	Demand (\$/kW)
7/18/2008	22,720	70.4	\$4,347.23	\$1,135.07	\$3,212.16	0.1913	0.1414	16.12
8/18/2008	35,440	80.0	\$6,329.59	\$1,241.84	\$5,087.75	0.1786	0.1436	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



South Plainfield PAL Building Electric Demand



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

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

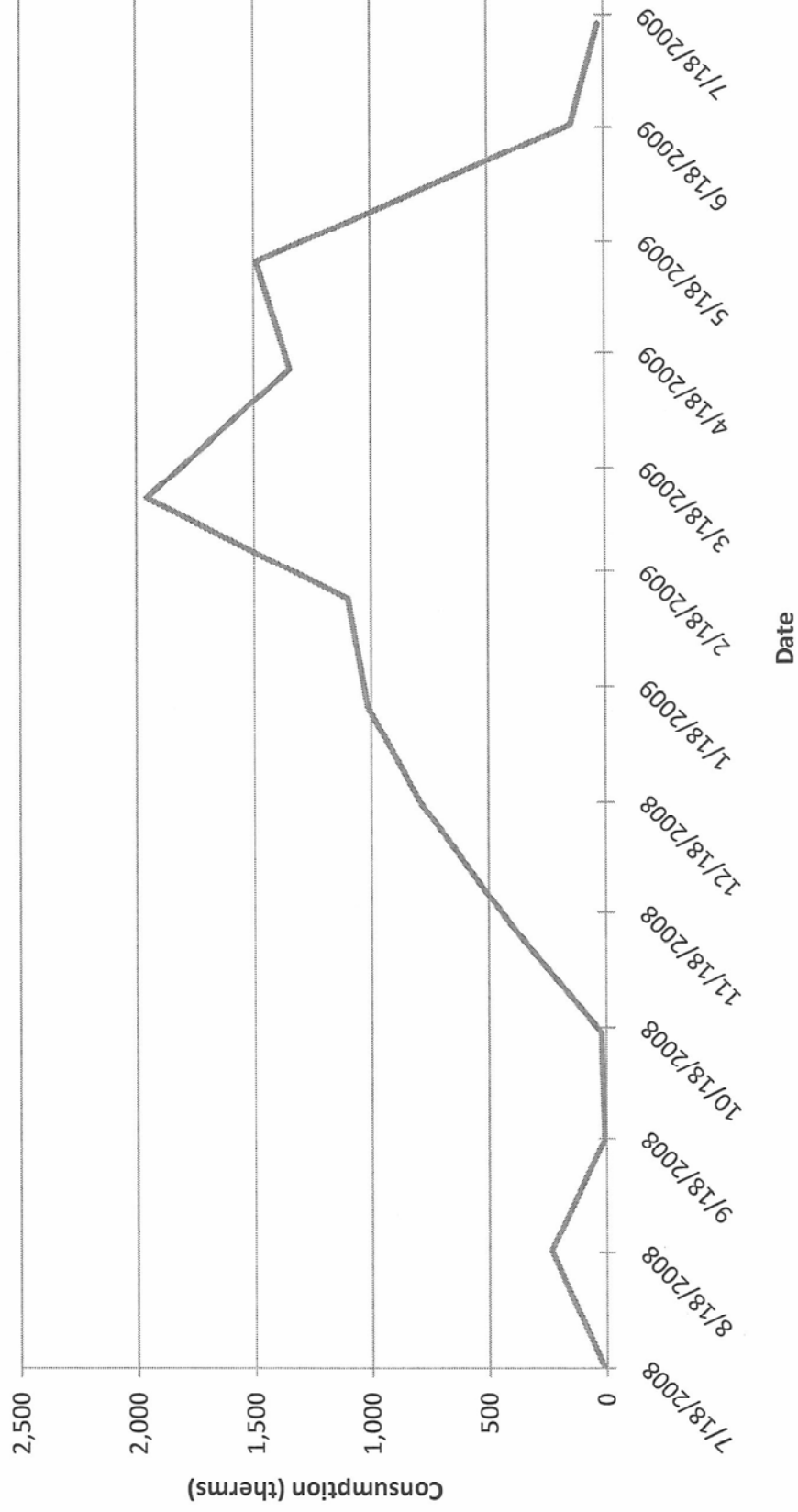
Meter #: 3345678

Date	Therms	Cost	(\$/Therm)
7/18/2008	14	\$34.50	2.546
8/18/2008	235	\$467.17	1.986
9/17/2008	9	\$24.12	2.556
10/16/2008	22	\$41.27	1.878
11/14/2008	405	\$543.00	1.342
12/17/2008	787	\$1,046.07	1.329
1/12/2009	1,015	\$1,396.58	1.376
2/10/2009	1,099	\$1,440.10	1.311
3/9/2009	1,959	\$2,293.76	1.171
4/13/2009	1,346	\$1,464.23	1.088
5/12/2009	1,489	\$1,395.19	0.937
6/18/2009	142	\$134.96	0.953
7/15/2009	25	\$32.34	1.293

Total	8,546	\$10,313.29	1.207
Most Recent Yr	8,532	\$10,278.79	1.205

South Plainfield PAL Recreation Building

Natural Gas Consumption



ELECTRIC MARKETERS LIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Integrus Energy Services, Inc
99 Wood Avenue, Suite 802
Iselin, NJ 08830
www.integrusenergy.com

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

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

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

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

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

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

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

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

GAS MARKETERS LIST

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

Gateway Energy Services
44 Whispering Pines Lane
Lakewood, NJ 08701
(800) 805-8586
www.gcsc.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.greasterngas.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 Install Demand Control Ventilation

Borough of South Plainfield
CHA #20549
Building: PAL Recreation Building
ECM-1 Install Demand Control Ventilation
Fitness Center

Description:
Outside air can be significantly reduced for most of the time that the building is occupied.
Savings will result from the avoided heating and cooling of excessive outside air.

Method:
The outdoor air introduced into the spaces is currently constant based on design occupancy conditions.
This ECM proposes the installation of CO2 sensors in the space to allow for reduced outdoor air flows when conditions allow.
The DCV system will automatically adjust the outdoor air damper position based on indoor CO2 levels.

	Total CFM	O.A. CFM	O.A. %
Org. scheduled CFM*	7,000	2,330	33%
Derated CFM**	7,000	400	6%
SA Enthalpy	21.0 BTU/lbma	AA	
SA Set point, Winter	70.0 °F	BB	
SA Set point, Summer	75.0 °F		
Balance Point	65.0 °F	BP	
Cooling System Eff.	1.09 kW/Ton		
Heating System Eff.	80%		

(Includes ancillary equipment)
(Includes distribution losses)

*Per 2006 International Mechanical Code (20 CFM/person, 20 people)
**Per 2006 International Mechanical Code (20 CFM/person, 20 people)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Avg. DB Bin Temp °F	OA Enthalpy Btu/lb	Occupied Bin HOURS	Existing			Proposed Demand Ventilation			Savings					
			OA CFM	Cooling Load MBH	Heating Load MBH	Cooling kWh	Heating therms	Derated O.A. CFM	Cooling Load MBH	Heating Load MBH	Cooling kWh	Heating therms	Cooling kWh	Heating therms
102.5	49.1	0	2,330	295	0	0	-	400	51	0	0	-	0	-
97.5	42.5	2	2,330	225	0	34	-	400	39	0	6	-	28	-
92.5	39.5	19	2,330	194	0	332	-	400	33	0	57	-	275	-
87.5	36.6	73	2,330	164	0	1,077	-	400	28	0	185	-	892	-
82.5	34	277	2,330	136	0	3,427	-	400	23	0	588	-	2839	-
77.5	31.6	343	2,330	111	0	3,465	-	400	19	0	595	-	2870	-
72.5	29.2	368	2,330	0	0	0	-	400	0	0	0	-	0	-
67.5	27	473	2,330	0	6	0	37	400	0	1	0	6	0	31
62.5	24.5	513	2,330	0	19	0	121	400	0	3	0	21	0	100
57.5	21.4	332	2,330	0	31	0	131	400	0	5	0	22	0	108
52.5	18.7	338	2,330	0	44	0	186	400	0	8	0	32	0	154
47.5	16.2	338	2,330	0	57	0	239	400	0	10	0	41	0	198
42.5	14.4	363	2,330	0	59	0	314	400	0	12	0	54	0	260
37.5	12.6	566	2,330	0	32	0	479	400	0	14	0	99	0	480
32.5	10.7	406	2,330	0	94	0	579	400	0	16	0	82	0	397
27.5	8.6	185	2,330	0	107	0	247	400	0	18	0	42	0	205
22.5	6.8	140	2,330	0	120	0	208	400	0	21	0	36	0	173
17.5	5.5	69	2,330	0	132	0	114	400	0	23	0	20	0	95
12.5	4.1	26	2,330	0	145	0	47	400	0	25	0	8	0	39
7.5	2.6	12	2,330	0	157	0	24	400	0	27	0	4	0	20
2.5	1	7	2,330	0	170	0	15	400	0	29	0	3	0	13
-2.5	0	0	2,330	0	182	0	-	400	0	31	0	-	0	-
-7.5	-1.5	0	2,330	0	195	0	-	400	0	33	0	-	0	-
Total		4,849		1125.0		8,335	2,743		193.1		1,431	471	6,904	2,272

100% Energy Cost Savings		
Heating Savings	2,272	therms
Cooling Savings	6,904	kWh

Comments:
A-B Newark, NJ Bin
C Proposed AHU occupied hours of operation based on a schedules. Bin Hours for different OCC may be found in bin data spread sheet
D Design outside air requirements are based on blueprint drawings or field observations
E Existing Cooling Load. Calculated based on outdoor air enthalpy.
F Existing Heating Load. = 1.08 * [col D] - [col A] / 1000
G Existing Cooling kWh = [col E] / 12 Mbtu/Ton-Hr * Chiller Plant Efficiency * [col C].
H Existing Heating Usage Therms Gas = [col F] / 100 Mbtu/Therm / Boiler Efficiency * [col C].
I Proposed Derated OA CFM: [col D] * (1 - 0.5)
J Proposed Cooling Load = 4.5 * [col I] * [col B] - [AA] / 1000
K Proposed Heating Load = 1.08 * [col I] * [col B] - [col A] / 1000
L Proposed Cooling kWh = [col J] / 12 Mbtu/Ton-Hr * Chiller Plant Efficiency * [col C].
M Proposed Heating Usage Therms Gas = [col K] / 100 Mbtu/Therm / Boiler Efficiency * [col C].
N Cooling kWh Savings: [col G] - [col L]
O Heating Usage Savings = [col H] - [col M]

Borough of South Plainfield
CHA #20549
Building: PAL Recreation Building
ECM-1 Install Demand Control Ventilation

Wrestling Gym

Description:

Outside air can be significantly reduced for most of the time that the building is occupied. Savings will result from the avoided heating and cooling of excessive outside air.

Method:

The outdoor air introduced into the spaces is currently constant based on design occupancy conditions. This ECM proposes the installation of CO2 sensors in the space to allow for reduced outdoor air flows when conditions allow. The DCV system will automatically adjust the outdoor air damper position based on indoor CO2 levels

	Total CFM	O.A. CFM	O.A. %
Org. scheduled CFM*	9,600	3,200	33%
Derated CFM**	9,600	800	8%
SA Enthalpy	21.0 BTU/lbma	AA	
SA Set point, Winter	70.0 °F	BB	
SA Set point, Summer	78.0 °F	BP	
Balance Point	65.0 °F		
Cooling System Eff.	1.06 KWTon		
Heating System Eff.	80%		

(Includes ancillary equipment)
(Includes distribution losses)

*Per 2006 International Mechanical Code (40 people/1,000 sqft - 20 CFM/person)

**Per 2006 International Mechanical Code (20 CFM/person, 40 people)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Avg. DB Bin Temp °F	OA Enthalpy Btu/lb	Occupied Bin HOURS	OA CFM	Cooling Load MBH	Heating Load MBH	Cooling kWh	Heating therms	Derated O.A. CFM	Cooling Load MBH	Heating Load MBH	Cooling kWh	Heating therms	Cooling kWh	Heating therms
102.5	49.1	0	3,200	405	0	0	-	800	101	0	0	-	0	-
97.5	42.5	1	3,200	310	0	24	-	800	77	0	6	-	18	-
92.5	39.5	10	3,200	286	0	235	-	800	67	0	59	-	176	-
87.5	36.6	37	3,200	225	0	764	-	800	56	0	191	-	573	-
82.5	34	143	3,200	187	0	2,429	-	800	47	0	607	-	1822	-
77.5	31.6	177	3,200	0	0	0	-	800	0	0	0	-	0	-
72.5	29.2	190	3,200	0	0	0	-	800	0	0	0	-	0	-
67.5	27	244	3,200	0	9	0	26	800	0	2	0	7	0	20
62.5	24.5	265	3,200	0	26	0	86	800	0	6	0	21	0	64
57.5	21.4	171	3,200	0	43	0	93	800	0	11	0	23	0	69
52.5	18.7	174	3,200	0	60	0	132	800	0	15	0	33	0	99
47.5	16.2	175	3,200	0	78	0	170	800	0	19	0	42	0	127
42.5	14.4	187	3,200	0	95	0	223	800	0	24	0	56	0	167
37.5	12.6	292	3,200	0	112	0	410	800	0	28	0	103	0	308
32.5	10.7	210	3,200	0	130	0	340	800	0	32	0	85	0	255
27.5	8.6	95	3,200	0	147	0	175	800	0	37	0	44	0	131
22.5	6.8	72	3,200	0	164	0	148	800	0	41	0	37	0	111
17.5	5.5	36	3,200	0	181	0	81	800	0	45	0	20	0	61
12.5	4.1	13	3,200	0	199	0	33	800	0	50	0	8	0	25
7.5	2.6	6	3,200	0	216	0	17	800	0	54	0	4	0	13
2.5	1	4	3,200	0	233	0	11	800	0	58	0	3	0	8
-2.5	C	0	3,200	0	251	0	-	800	0	63	0	-	0	-
-7.5	-1.5	0	3,200	0	268	0	-	800	0	67	0	-	0	-
Total		2,503		1392.5		3,452	1,944		348.1		863	486	2,589	1,458

100% Energy Cost Savings		
Heating Savings	1,458	therms
Cooling Savings	2,589	kWh

Comments:

- A-B Newark, NJ Bin
C Proposed AHU occupied hours of operation based on a schedules. Bin Hours for different OCC may be found in bin data spread sheet
D Design outside air requirements are based on blueprint drawings or field observations
E Existing Cooling Load. Calculated based on outdoor air enthalpy.
F Existing Heating Load. = 1.08 * [col D] * [BB] - [col A] / 1000
G Existing Cooling kWh = [col E] / 12 Mbtu/Ton-Hr * Chiller Plant Efficiency * [col C].
H Existing Heating Usage Therms Gas = [col F] / 100 Mbtu/Therm / Boiler Efficiency * [col C].
I Proposed Derated OA CFM: [col D] * (1 - 0.5)
J Proposed Cooling Load = 4.5 * [col I] * [col B] - [AA] / 1000
K Proposed Heating Load = 1.08 * [col I] * [BB] - [co A] / 1000
L Proposed Cooling kWh = [col J] / 12 Mbtu/Ton-Hr * Chiller Plant Efficiency * [col C].
M Proposed Heating Usage Therms Gas = [col K] / 100 Mbtu/Therm / Boiler Efficiency * [col C].
N Cooling kWh Savings: [col G] - [col L]
O Heating Usage Savings = [col H] - [col M]

Borough of South Plainfield
CHA #20549
Building: PAL Recreation Building
ECM-1 Install Demand Control Ventilation

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

	QTY	UNIT COSTS			SUBTOTAL COSTS				TOTAL COST	REMARKS
		UNIT	MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
CO2 sensor	4	EA	\$ 400	\$ 100	\$ -	\$ 1,568	\$ 484	\$ -	\$ 2,052	2 per room
Replace OA damper actuators	6	EA	\$ 300	\$ 50	\$ -	\$ 1,764	\$ 363	\$ -	\$ 2,127	
PLC Controller and Programming	1	LS	\$ 1,000	\$ 1,500	\$ -	\$ 980	\$ 1,815	\$ -	\$ 2,795	
Electrical/wiring	1	LS	\$ 1,500	\$ 2,000	\$ -	\$ 1,470	\$ 2,420	\$ -	\$ 3,890	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	

Subtotal	\$ 8,812
10% OH, 10% Profit	\$ 1,762
15% Contingency	\$ 1,586
Total	\$ 12,160

APPENDIX C

ECM-2 Install Variable Speed Drives & Premium Motors – RTUs

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

ECM-2 Install Variable Speed Drives & Premium Motors - RTUs

Fitness Center

Summary

AHU's supplies constant volume air to the space.

The fan motor will also be replaced with a premium efficiency motor.

Control strategy is to permit the RTU fan to ramp speed linearly between 100% and 50% as OAT varies between the design heating or cooling load and building balance point. System static pressure will be permitted to float with fan speed. Pressure will not be controlled or monitored.

UNIT	HP	Existing Motor Eff (Note 1)	New Motor Eff (Note 1)	Existing Motor kW	New Motor kW	Building Balance Point
RTU-1	2.0	84.0%	87.1%	1.42	1.37	65.0
RTU-2	2.0	84.0%	87.1%	1.42	1.37	
				2.84	2.74	VFD Eff. (CC) 98.5%

OAT - DB Avg Temp F	Bin Hours	Occupied Hours in Bin	AHU Hours in Bin	Existing Fan Kw	Existing Fan kWh	Fan Load %	Proposed Fan kW	Proposed Fan kWh	Savings Fan kWh
(A)	(B)	(C)	(D)	(F)	(F)	(E)	(G)	(H)	(I)
102.5	0	0	0	2.8	0	100%	2.78	0	0
97.5	3	2	2	2.8	5	93%	2.23	4	1
92.5	34	19	19	2.8	53	86%	1.75	33	21
87.5	131	73	73	2.8	206	79%	1.35	98	108
82.5	500	277	277	2.8	787	71%	1.01	281	506
77.5	620	343	343	2.8	975	64%	0.74	254	722
72.5	664	368	368	2.8	1,045	57%	0.52	191	854
67.5	854	473	473	2.8	1,344	50%	0.35	164	1,179
62.5	927	513	513	2.8	1,458	52%	0.39	200	1,258
57.5	600	332	332	2.8	944	56%	0.48	160	784
52.5	610	338	338	2.8	960	60%	0.59	199	761
47.5	611	338	338	2.8	961	63%	0.71	241	721
42.5	656	363	363	2.8	1,032	67%	0.85	308	724
37.5	1,023	566	566	2.8	1,609	71%	1.00	568	1,042
32.5	734	406	406	2.8	1,155	75%	1.17	477	678
27.5	334	185	185	2.8	525	79%	1.36	252	273
22.5	252	140	140	2.8	396	83%	1.57	219	177
17.5	125	69	69	2.8	197	87%	1.80	125	72
12.5	47	26	26	2.8	74	90%	2.05	53	20
7.5	22	12	12	2.8	35	94%	2.33	28	6
2.5	13	7	7	2.8	20	98%	2.63	19	2
-2.5	0	0	0	2.8	0	100%	2.78	0	0
-7.5	0	0	0	2.8	0	100%	2.78	0	0
TOTALS		4,849	4,849	65	13,781			3,874	9,907

Notes:

- Existing motor power based on operation with existing motor efficiency, operating at 80% load factor when at full load. Formula: Motor HP x 0.746 x 0.8 / Exist. Motor Eff.,
New motor power is based on same formula using the new motor efficiency.
- Weather data for Newark, NJ
- Occupied & AHU Bin Hours are based upon existing schedule.
- The required VFD motor power draw is based on a 3.0 power relationship to load, since system static pressure will not be controlled.

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

ECM-2 Install Variable Speed Drives & Premium Motors - RTUs

Wrestling Gym

Summary

AHU's supplies constant volume air to the space.

The fan motor will also be replaced with a premium efficiency motor.

Control strategy is to permit the RTU fan to ramp speed linearly between 100% and 50% as OAT varies between the design heating or cooling load and building balance point. System static pressure will be permitted to float with fan speed. Pressure will not be controlled or monitored.

UNIT	HP	Existing Motor Eff (Note 1)	New Motor Eff (Note 1)	Existing Motor kW	New Motor kW	Building Balance Point
RTU-3	2.0	84.0%	87.1%	1.42	1.37	65.0
RTU-4	2.0	84.0%	87.1%	1.42	1.37	
RTU-5	2.0	84.0%	87.1%	1.42	1.37	
RTU-6	2.0	84.0%	87.1%	1.42	1.37	
				5.68	5.48	VFD Eff. (CC) 98.5%

OAT - DB Avg Temp F	Bin Hours	Occupied Hours in Bin	AHU Hours in Bin	Existing Fan Kw	Existing Fan kWh	Fan Load %	Proposed Fan kW	Proposed Fan kWh	Savings Fan kWh
(A)	(B)	(C)	(D)	(F)	(F)	(E)	(G)	(H)	(I)
102.5	0	0	0	5.7	0	100%	5.56	0	0
97.5	3	1	1	5.7	5	93%	4.46	4	1
92.5	34	10	10	5.7	55	86%	3.50	34	21
87.5	131	37	37	5.7	213	79%	2.70	101	112
82.5	500	143	143	5.7	812	71%	2.03	290	522
77.5	620	177	177	5.7	1,007	64%	1.48	262	745
72.5	664	190	190	5.7	1,078	57%	1.04	197	881
67.5	854	244	244	5.7	1,387	50%	0.70	170	1,217
62.5	927	265	265	5.7	1,505	52%	0.78	206	1,299
57.5	600	171	171	5.7	974	56%	0.97	165	809
52.5	610	174	174	5.7	991	60%	1.18	205	785
47.5	611	175	175	5.7	992	63%	1.42	248	744
42.5	656	187	187	5.7	1,065	67%	1.70	318	747
37.5	1,023	292	292	5.7	1,661	71%	2.00	586	1,075
32.5	734	210	210	5.7	1,192	75%	2.35	492	700
27.5	334	95	95	5.7	542	79%	2.73	260	282
22.5	252	72	72	5.7	409	83%	3.15	227	183
17.5	125	36	36	5.7	203	87%	3.61	129	74
12.5	47	13	13	5.7	76	90%	4.11	55	21
7.5	22	6	6	5.7	36	94%	4.66	29	6
2.5	13	4	4	5.7	21	98%	5.25	20	2
-2.5	0	0	0	5.7	0	100%	5.56	0	0
-7.5	0	0	0	5.7	0	100%	5.56	0	0
TOTALS		2,503	2,503	131	14,226			3,999	10,227

Notes:

- Existing motor power based on operation with existing motor efficiency, operating at 80% load factor when at full load. Formula: Motor HP x 0.746 x 0.8 / Exist. Motor Eff., New motor power is based on same formula using the new motor efficiency.
- Weather data for Newark, NJ
- Occupied & AHU Bin Hours are based upon existing schedule.
- The required VFD motor power draw is based on a 3.0 power relationship to load, since system static pressure will not be controlled.

ECM-2 Install Variable Speed Drives & Premium Motors - RTUs

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

[illegible]

\$	16,145	Subtotal
\$	3,229	20% Contingency
\$	2,906	Contractor 15% O&P
\$	-	0% Engineering
\$	22,280	Total

New Jersey Smart Start Incentive	QTY	UNIT	\$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
2 HP Premium Efficiency Motor	6	EA	\$60	\$360	\$ 2,307	\$ 1,947
				\$360	\$2,307	\$1,947

Total ECM Cost w/ Incentives	\$21,920
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APPENDIX D

ECM-3 Replace Domestic Hot Water Heater

Borough of South Plainfield
CHA #20549
Building: PAL Recreation Building
ECM-3: Replace Domestic Hot Water Heater

Summary

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

Item	Value	Units	Formula/Comments
Occupied days per week	7	days/wk	
Water supply Temperature	50	°F	Temperature of water coming into building
Hot Water Temperature	120	°F	
Hot Water Usage per day	137	gal/day	Calculated from usage below
Annual Hot Water Energy Demand	29,051	MBTU/yr	Energy required to heat annual quantity of hot water to setpoint
Existing Tank Size	50	Gallons	Per manufacturer nameplate
Hot Water Temperature	120	°F	Per building personnel
Average Room Temperature	70	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.5	MBH	
Annual Standby Hot Water Load	4,563	MBTU/yr	
Total Annual Hot Water Demand (w/ standby losses)	33,614	MbtU/yr	Building demand plus standby losses
Existing Water Heater Efficiency	98%		Per Manufacturer
Total Annual Energy Required	34,300	MbtU/yr	
Total Annual Electric Required	10,050	kWh/yr	Electrical Savings
Average Annual Electric Demand	1.15	kW	
Peak Electric Demand	4.50	kW	Per Manufacturer's Nameplate (Demand Savings)
New Tank Size	50	Gallons	
Hot Water Temperature	120	°F	
Average Room Temperature	70	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.5	MBH	
Annual Standby Hot Water Load	4,563	MBTU/yr	
Prop Annual Hot Water Demand (w/ standby losses)	33,614	MBTU/yr	
Proposed Avg. Hot water heater efficiency	96%		Based on AO Smith BTX-100 condensing DHW Heater
Proposed Total Annual Energy Required	35,015	MBTU/yr	
Proposed Fuel Use	350	Therms/yr	
Elac Utility Demand Unit Cost	\$13.30	\$/kW	
Elac Utility Supply Unit Cost	\$0.13	\$/kWh	
NG Utility Unit Cost	\$1.21	\$/Therm	
Existing Operating Cost of DHW	\$2,003	\$/yr	
Proposed Operating Cost of DHW	\$422	\$/yr	
Annual Utility Cost Savings	\$1,581	\$/yr	

Daily Hot Water Demand

FIXTURE	*BASE WATER USE GPM	DURATION OF USE (MIN)	#USES PER DAY	FULL TIME OCCUPANTS**				% HOT WATER	TOTAL HW GAL/DAY
			MALE	FEMALE	MALE	FEMALE	TOTAL GAL/DAY		
LAVATORY (Low-Flow Lavs use 0.5 G	2.5	0.25	3	3	20	20	75	50%	38
SHOWER	2.5	5	1	1	5	5	125	75%	94
KITCHEN SINK	2.5	0.5	1	1	1	1	3	75%	2
MOP SINK	2.5	2	1	1	1	0	5	75%	4
Dishwasher	(ga 10	1	1	0	0	0	0	100%	0
TOTAL							208		137

*GPM is per standard fixtures, adjust as necessary if actual GPM is known.
**These are the occupant that use the fixtures. If fixture does not exist change to (0).

Borough of South Plainfield
CHA #20549
Building: PAL Recreation Building
ECM-3: 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.		
Electric DHW Heater Removal	1	LS		\$ 50		\$ -	\$ 61	\$ -	\$ 61	
Condensing DHW Heater*	1	EA	\$ 2,800	\$ 300		\$ 2,744	\$ 363	\$ -	\$ 3,107	
Miscellaneous Electrical	1	LS	\$ 200	\$ 150		\$ 196	\$ 182	\$ -	\$ 378	
Venting	1	EA	\$ 300	\$ 250		\$ 294	\$ 303	\$ -	\$ 597	
Water Piping and Valves	1	LS	\$ 100	\$ 200		\$ 98	\$ 242	\$ -	\$ 340	
Gas Piping and Valves	1	LS	\$ 200	\$ 300		\$ 196	\$ 363	\$ -	\$ 559	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	
						\$ -	\$ -	\$ -	\$ -	

*Cost estimate per AO Smith BTX-100 condensing DHW Heater

\$ 5,041	Subtotal
\$ 756	15% Contingency
\$ 580	10% Contractor O&P
\$ -	0% Engineering
\$ 6,376	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	\$ 3,107	\$ 3,057
				\$50	\$3,107	\$3,057

Total ECM Cost w/ Incentives	\$6,326
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APPENDIX E

ECM-4 Lighting Replacements

Energy Audit of South Plainfield Facilities
 CHA Project No. 20549 - PAL Recreation Facility
 ECM-4 Lighting Replacements

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

EXISTING CONDITIONS										
Field Code	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures
	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
9	Weight Room	6	High Bay MH 400 35 Feet High	MH400/1	458	2.7	SW	2912	8,002	6
9	Weight Room	6	High Bay MH 400 35 Feet High	MH400/1	458	2.7	SW	2912	8,002	6
189	Weight Room	2	X 7.0 W 1	ECF7/1	10	0.0	Breaker	2912	58	2
6	Small Locker Room	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2912	839	2
6	Electrical Utility Room	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	1000	144	1
9	Wrestling Room	10	High Bay MH 400 35 Feet High	MH400/1	458	4.6	SW	2912	13,337	10
9	Wrestling Room	10	High Bay MH 400 35 Feet High	MH400/1	458	4.6	SW	2912	13,337	10
189	Wrestling Room	3	X 7.0 W 1	ECF7/1	10	0.0	Breaker	2912	87	3
194	Front Lobby	3	W 34 C F 2 (MAG)	F42EE	72	0.2	SW	3000	648	3
6	Front Lobby	10	T 34 R F 4 (MAG)	F44EE	144	1.4	SW	3000	4,320	10
189	Front Lobby	1	X 7.0 W 1	ECF7/1	10	0.0	Breaker	3000	30	1
X1	Front Lobby	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	3000	5	1
63	Front Lobby	1	S 32 R F 1	F41LL	32	0.0	SW	3000	96	1
6	Men's Room	5	T 34 R F 4 (MAG)	F44EE	144	0.7	SW	2080	1,498	5
5	Men's Room	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2080	125	1
6	Women's Room	5	T 34 R F 4 (MAG)	F44EE	144	0.7	SW	2080	1,498	5
5	Women's Room	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2080	125	1
Total		68				18.4			52,150	68

APPENDIX F

ECM-5 Install Occupancy Sensors

Energy Audit of South Plainfield Facilities
 CHA Project No. 20549 - PAL Recreation Facility
 ECM-5 Install Occupancy Sensors

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

EXISTING CONDITIONS											
Field Code	Area Description	No. of Fixtures	Standard Fixture Code	NYSEDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures	Number of Fixtures after the retrofit
	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) - 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"Lighting Fixture Code" Example
9	Weight Room	6	High Bay MH 400 35 Feet High	MH400/1	458	2.7	SW	2912	8,002.2	6	High Bay MH 400 35 Feet High
9	Weight Room	6	High Bay MH 400 35 Feet High	MH400/1	458	2.7	SW	2912	8,002.2	6	High Bay MH 400 35 Feet High
189	Weight Room	2	X 7.0 W 1	ECF7/1	10	0.0	Breaker	2912	58.2	2	X 7.0 W 1
6	Small Locker Room	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2912	836.7	2	T 34 R F 4 (MAG)
6	Electrical Utility Room	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	2912	144.0	1	T 34 R F 4 (MAG)
9	Wrestling Room	10	High Bay MH 400 35 Feet High	MH400/1	458	4.6	SW	2912	13,337.0	10	High Bay MH 400 35 Feet High
9	Wrestling Room	10	High Bay MH 400 35 Feet High	MH400/1	458	4.6	SW	2912	13,337.0	10	High Bay MH 400 35 Feet High
189	Wrestling Room	3	X 7.0 W 1	ECF7/1	10	0.0	Breaker	2912	87.4	3	X 7.0 W 1
194	Front Lobby	3	W 34 C F 2 (MAG)	F42EE	72	0.2	SW	2912	648.0	3	W 34 C F 2 (MAG)
6	Front Lobby	10	T 34 R F 4 (MAG)	F44EE	144	1.4	SW	1000	4,320.0	10	T 34 R F 4 (MAG)
189	Front Lobby	1	X 7.0 W 1	ECF7/1	10	0.0	Breaker	2912	30.0	1	X 7.0 W 1
X1	Front Lobby	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	2912	4.5	1	X 1.5 W LED
63	Front Lobby	1	S 32 R F 1	F41LL	32	0.0	SW	2912	96.0	1	S 32 R F 1
6	Men's Room	5	T 34 R F 4 (MAG)	F44EE	144	0.7	SW	3000	1,497.6	5	T 34 R F 4 (MAG)
5	Men's Room	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	3000	124.8	1	2T 32 R F 2 (u) (ELE)
5	Women's Room	5	T 34 R F 4 (MAG)	F44EE	144	0.7	SW	3000	1,497.6	5	T 34 R F 4 (MAG)
5	Women's Room	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	3000	124.8	1	2T 32 R F 2 (u) (ELE)
Total		68				18.4			52,150	68	

APPENDIX G

ECM-6 Lighting Replacements with Occupancy Sensors

Energy Audit of South Plainfield Facilities
 CHA Project No. 20549 - PAL Recreation Facility
 ECM-6 Lighting Replacements with Occupancy Sensors

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

EXISTING CONDITIONS										
Field Code	Area Description	No. of Fixtures	Standard Fixture Code	NYSERDA Fixture Code	Watts per Fixture	kW/Space	Exist Control	Annual Hours	Annual kWh	Number of Fixtures
	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
9	Weight Room	6	High Bay MH 400 35 Feet High	MH400/1	458	2.7	SW	2912	8,002	6
9	Weight Room	6	High Bay MH 400 35 Feet High	MH400/1	458	2.7	SW	2912	8,002	6
189	Weight Room	2	X 7.0 W 1	ECF7/1	10	0.0	Breaker	2912	58	2
6	Small Locker Room	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2912	839	2
6	Electrical Utility Room	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	1000	144	1
9	Wrestling Room	10	High Bay MH 400 35 Feet High	MH400/1	458	4.6	SW	2912	13,337	10
9	Wrestling Room	10	High Bay MH 400 35 Feet High	MH400/1	458	4.6	SW	2912	13,337	10
189	Wrestling Room	3	X 7.0 W 1	ECF7/1	10	0.0	Breaker	2912	87	3
194	Front Lobby	3	W 34 C F 2 (MAG)	F42EE	72	0.2	SW	3000	648	3
6	Front Lobby	10	T 34 R F 4 (MAG)	F44EE	144	1.4	SW	3000	4,320	10
189	Front Lobby	1	X 7.0 W 1	ECF7/1	10	0.0	Breaker	3000	30	1
X1	Front Lobby	1	X 1.5 W LED	ELED1.5/1	1.5	0.0	Breaker	3000	5	1
63	Front Lobby	1	S 32 R F 1	F41LL	32	0.0	SW	3000	96	1
6	Men's Room	5	T 34 R F 4 (MAG)	F44EE	144	0.7	SW	2080	1,498	5
5	Men's Room	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2080	125	1
6	Women's Room	5	T 34 R F 4 (MAG)	F44EE	144	0.7	SW	2080	1,498	5
5	Women's Room	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2080	125	1
Total		68				18.4			52,150	68

APPENDIX H

New Jersey Pay For Performance Incentive Program

Borough of South Plainfield
CHA #20549
Building: PAL Recreation 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 governments or non-profit organizations.

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

	Annual Utilities	
	kWh*	Therms
Existing Usage (from utility)	90,704	8,530
Proposed Savings	59,420	3,380
Existing Total MMBtus	1,163	
Proposed Savings MMBtus	540.800	
% Reduction	46.5%	
Proposed Annual Savings	\$14,500	

* PAL Rec bldg shares electric meter w/ PAL main 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	\$13,072	\$7,436	\$20,508
Incentive #3	\$8,319	\$4,732	\$13,051
Totals	\$21,391	\$12,168	\$33,559

Total Project Cost	\$55,000
% Incentives of Project Cost*	61.0%
Project Cost w/ Incentives*	\$21,441

Project Payback (years)	
w/o Incentives	w/ Incentives
3.8	1.5

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

APPENDIX I

Photovoltaic (PV) Rooftop Solar Power Generation



AC Energy & Cost Savings



Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	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/m ² /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](#)

*

[Output Results as Text](#)
[About the Hourly Performance Data](#)
[Saving Text from a Browser](#)

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

Please send questions and comments regarding PVWATTS to Webmaster

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 $\pm 30\%$ for monthly values and $\pm 10\%$ for yearly values. How the solar radiation might vary for your location may be evaluated by examining the tables in the *Solar Radiation Data Manual for Flat-Plate and Concentrating Collectors* (http://rredc.nrel.gov/solar/old_data/nsrdb/redbook/).

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

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

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

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

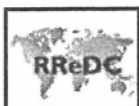
If net-metering isn't available and the PV system sends surplus electricity to the utility grid, the utility generally buys the electricity from the owner at a lower price than the owner pays the utility for electricity. In this case, the cost savings shown in the table should be reduced.

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

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

Please send questions and comments to Webmaster

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Return to RREDc Home Page (<http://rredc.nrel.gov/>)

**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	\$						
\$500,000	0.0	59,150	0	\$9,600	0	\$9,600	\$	\$28,800	Years 52.1	Years 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

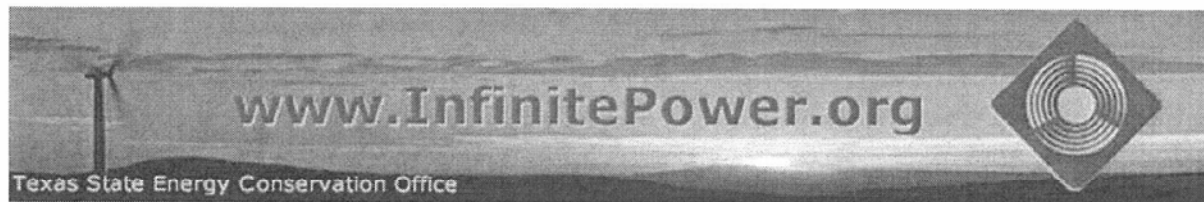
** Estimated Solar Renewable Energy Certificate Program (SREC) for 15 Years= \$487/1000kwh

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

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

APPENDIX J

Solar Thermal Domestic Hot Water Plant


[Home](#)
[What Can I Do?](#)
[Electric Choice](#)
[Home Energy](#)
[FAQs](#)
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Interactive Energy Calculators

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

[Carbon Pollution Calculator](#)
[Electric Power Pollution Calculator](#)
[PV System Economics](#)
[Solar Water Heating](#)
[What's a Watt?](#)

RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS

Solar Water Heating Calculator

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

Water Heater Characteristics			
Physical		Thermal	
1.5 Diameter (feet)	1.5	55 Water Inlet Temperature (Degrees F)	55
50 Capacity (gallons)	50	70 Ambient Temperature (Degrees F)	70
21.36 Surface Area (calculated - sq ft)	21.36	120 Hot Water Temperature (Degrees F)	120
NaN Effective R-value	NaN	137 Hot Water Usage (Gallons per Day)	137
Energy Use			
3046		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
3808 BTU/hr	Power Into Water Heater	3108 BTU/hr
Cost		
\$ 1.205 /Therm	Utility Rates	\$ 0.1620 /kWh
\$ 401.964	Yearly Water Heating Cost	\$ 1291.76
How Does Solar Compare?		
Solar Water Heater Cost: \$ 27100		Percentage Solar: 70
96.3126 years for gas	Payback Time for Solar System	29.9701 years for electric

NJBPU Energy Audits
CHA #20549
PAL Recreation Building

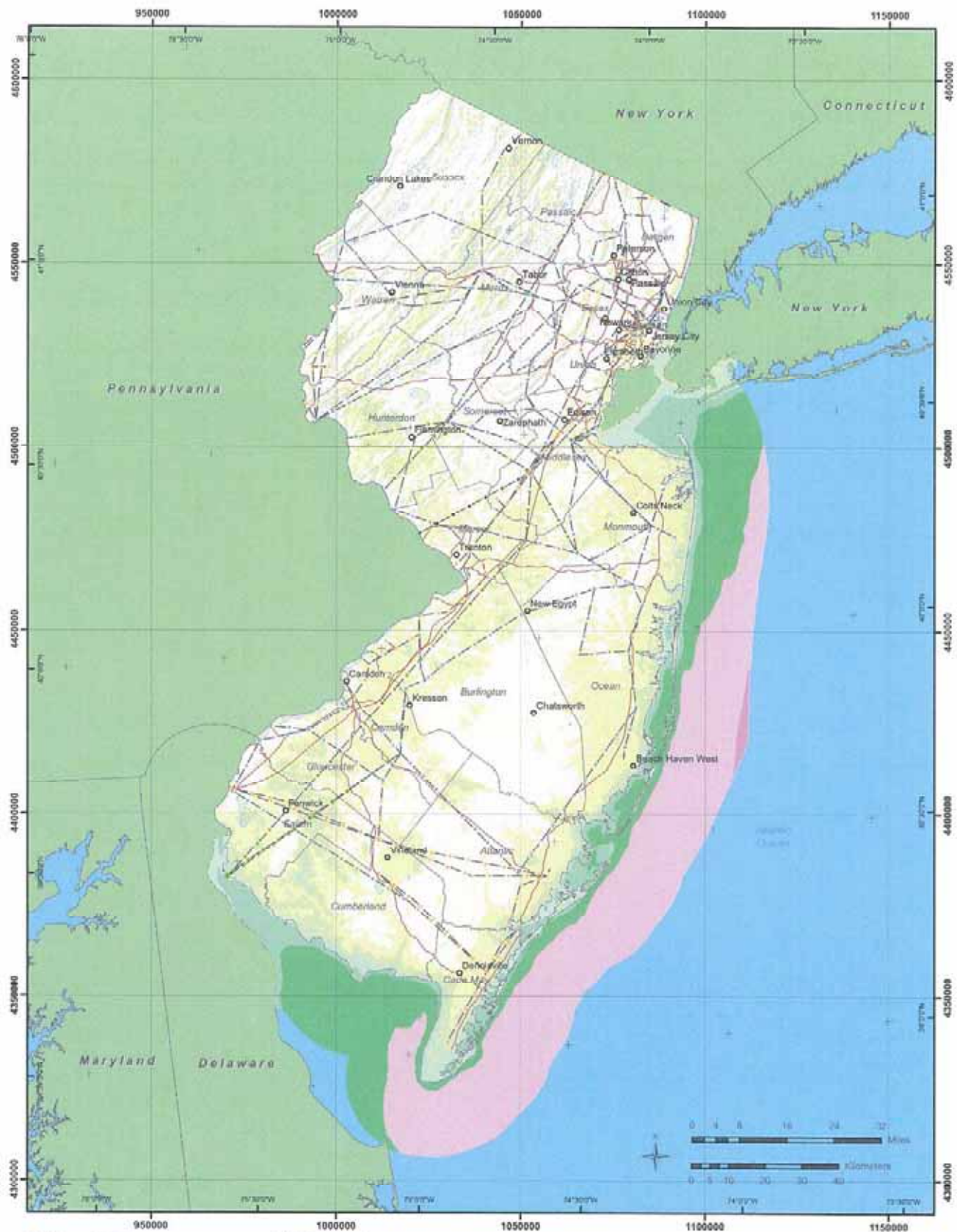
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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

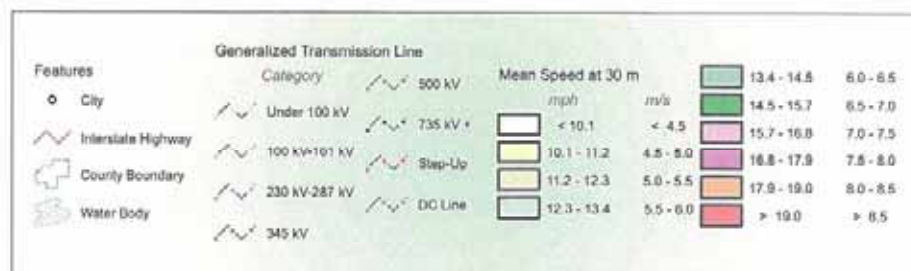
\$17,489	Subtotal
\$ 2,623	15% Contingency
\$ 2,623	15% Contractor O&P
\$ 4,372	25% Engineering
\$27,108	Total

APPENDIX K

Wind



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



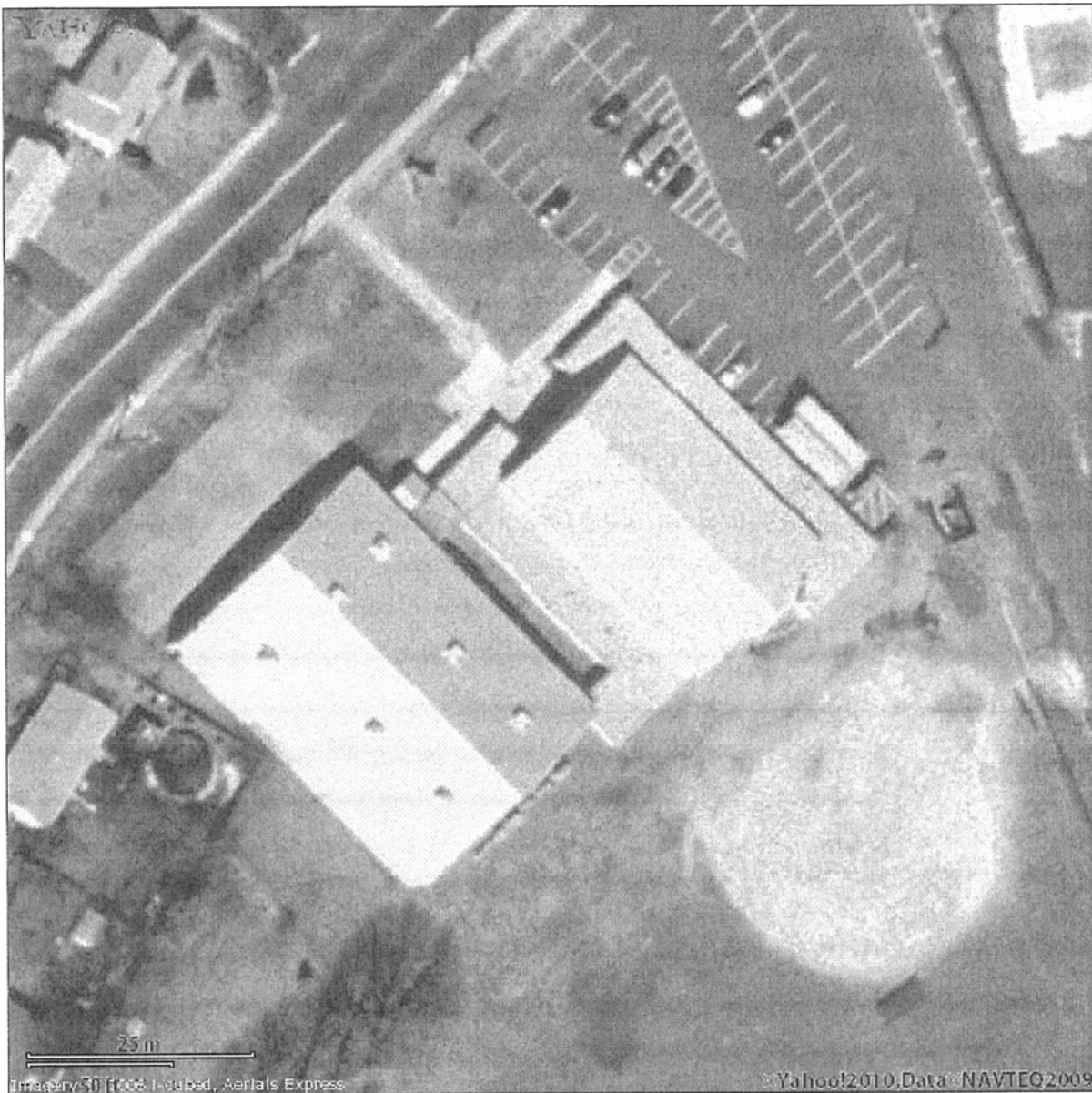
AWS Truewind

Projection: Transverse Mercator,
UTM Zone 17 WG84

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 **YAHOO!**



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

APPENDIX L

EPA Portfolio Manager



STATEMENT OF ENERGY PERFORMANCE

PAL Athletic Facility

Building ID: 1926627
 For 12-month Period Ending: June 30, 2009¹
 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: 1972²
Gross Floor Area (ft²): 28,744

Energy Performance Rating² (1-100) N/A

Site Energy Use Summary³

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

Energy Intensity⁵

Site (kBtu/ft ² /yr)	89
Source (kBtu/ft ² /yr)	139

Emissions (based on site energy use)
 Greenhouse Gas Emissions (MtCO₂e/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.

Meets Industry Standards⁶ for Indoor Environmental Conditions:

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

Certifying Professional
 N/A

Notes:

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☒
Building Name	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: (ft ²)	28,744
Year Built	1972
For 12-month Evaluation Period Ending Date:	June 30, 2009

Facility Space Use Summary

Office		Main Bldg	
Space Type	Office	Space Type	Other - Recreation
Gross Floor Area(ft ²)	2,860	Gross Floor Area(ft ²)	15,884
Weekly operating hours	45	Number of PCs*	0
Workers on Main Shift	4	Weekly operating hours*	63
Number of PCs	4	Workers on Main Shift*	4
Percent Cooled	50% or more	Wrestling Gym	
Percent Heated	50% or more	Space Type	Other - Recreation
Fitness Center		Gross Floor Area(ft ²)	5,365
Space Type	Other - Recreation	Number of PCs*	0
Gross Floor Area(ft ²)	4,635	Weekly operating hours*	48
Number of PCs*	0	Workers on Main Shift*	4
Weekly operating hours*	93		
Workers on Main Shift*	1		

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	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/ft ²)	89	89	48	N/A	65
Source (kBtu/ft ²)	139	139	76	N/A	136
Energy Cost					
\$/year	N/A	N/A	N/A	N/A	N/A
\$/ft ² /year	N/A	N/A	N/A	N/A	N/A
Greenhouse Gas Emissions					
MtCO ₂ e/year	193	193	105	N/A	141
kgCO ₂ e/ft ² /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 M

Equipment Inventory

South Plainfield BPU Energy Audit Program

Borough of South Plainfield, NJ

CHA#20549

PAL Recreation Building										
Item	Qty.	Manuf	Model No.	Serial No.	Capacity	Condition	Gas	MBH	Refrig.	Comments
Packaged Rooftop Units										
1	1	Lennox	GCS16-090-200-1G	5600H 06549	7.5 Ton	G	X	200	HCFC-22	
2	1	Lennox	GCS16-090-200-1G	5600H 09523	7.5 Ton	G	X	200	HCFC-22	
3	1	Lennox	GCS16-090-200-1G	5600K 00839	7.5 Ton	G	X	200	HCFC-22	
4	1	Lennox	GCS16-090-200-1G	5600K 03854	7.5 Ton	G	X	200	HCFC-22	
5	1	Lennox	GCS16-090-200-1G	5600M 06274	7.5 Ton	G	X	200	HCFC-22	
6	1	Lennox	GCS16-090-200-1G	5600K 00840	7.5 Ton	G	X	200	HCFC-22	
7	1	Lennox	GCS16-060-120-2G	5600M 04362	5 Ton	G	X	120	HCFC-22	
Rooftop Exhaust Fan										
8	1	Captive-Aire	NCA14FA		3/4 HP	E				2007
Rooftop Supply Air Fan										
9	1	Captive-Aire	DMUA18FA		1/3 HP	E				2007
Domestic Hot Water Heater										
10	1	State Industries	P6522ORT2	E01401510	50 Gallon	G				4,500 Watts

E = Excellent
G = Good
P = Poor