BOROUGH OF SOUTH PLAINFIELD
DEPARTMENT OF PUBLIC WORKS BUILDING
ENERGY ASSESSMENT

for

NEW JERSEY
BUREAU OF PUBLIC UTILITIES

CHA PROJECT NO. 20549

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1.0 INTRODUCTION & BACKGROUND

The Department of Public Works (DPW) office and maintenance building is a single story 11,480 square foot facility located at 405 Spicer Avenue in South Plainfield, New Jersey. Constructed in the 1960s, the building houses the DPW offices, vehicle maintenance area, and a vehicle garage area.

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 Department of Public Works (DPW) office and maintenance building in South Plainfield, New Jersey. The facility houses the DPW offices, vehicle maintenance area, and a vehicle garage area. The following areas were evaluated for energy conservation measures:

- Lighting replacement with occupancy sensors
- Night setback
- Door seals
- Domestic hot water heater replacement
- Insulation upgrades
- Heating equipment upgrades
- Window AC unit 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 $8,000 for the recommended ECMs may be realized with a payback of 5.1 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-2 Increase Wall Insulation – Garage

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
15,800	0	0	1,560	2,000	1.5	NA	7.9	NA

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

ECM-3 Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,200	0	3,120	1,370	2,300	27.8	NA	0.5	NA

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

ECM-5 Install Door Seals

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
700	0	0	210	300	3.3	NA	2.3	NA

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

ECM-6 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
5,200	4.5	1,910	(50)	700	1.4	100	7.4	7.3

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

ECM-9 Combined 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
9,700	4.8	7,730	0	1,500	1.3	1,000	6.5	5.8

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

ECM-10 Install Gas-Fired Heating Equipment – Office

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
10,000	0	11,100	450	1,200	1.4	400	8.3	8.0

* Incentive shown is per the New Jersey Smart Start Program, 2010 Gas Heating Equipment Application. Incentive is based on the purchase of a 92% efficient gas-fired furnace.

3.0 EXISTING CONDITIONS

3.1 Building General

The Department of Public Works (DPW) office and maintenance building is a single story 11,480 square foot facility located at 405 Spicer Avenue in South Plainfield, New Jersey. The building, constructed in the 1960s, consists of DPW offices, vehicle maintenance area, and vehicle garage area. The office area includes the superintendent, administration, and foreman offices; parts department, and two restrooms. Within the maintenance area are three repair bays with vehicle lifts. The vehicle garage area consists of three heated garage bays and two unheated bays. Within the heated garage area is an employee lunch room, sign room, wash-up area, and restroom.

Normal hours of operation are from 7:00 AM through 3:30 PM, five days per week. There is also some intermittent operation dependent on emergency weather conditions and snow plowing. A total of 15 people are employed at the DPW. The office area has four full-time employees, and three full-time mechanics work in the maintenance area. Other employees are in the building intermittently throughout the day.

The building is slab on grade, constructed of concrete masonry unit (CMU) block; where the interior of the office area has been furred out, insulated and finished with gypsum board. Exterior walls of the maintenance and garage areas have no insulation. Additionally, the maintenance and heated garage areas have a flat membrane roof with 1-1/2 inches of foam board insulation; the office at the front of the building has a pitched asphalt shingle roof. Windows in the office area are double-hung with vinyl frames and double pane glazing. The main entrance to the office area is a single steel door. There are 11 large overhead doors of various sizes serving the maintenance and garage areas; three on the front and eight on the rear of the building. Several of these doors have worn bottom seals as evidenced by daylight filtering through to the interior.

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), and the building is connected to the municipal sewage system.

From August 2008 through July 2009, electric usage was approximately 73,700 kWh at a cost of about $11,800. Analyzing electricity bills during this period, the building was charged at the following rates: supply unit cost of $0.123 per kWh; demand unit cost of $10.08 per kW; and a blended unit cost of $0.160 per kWh. Electricity usage was the highest in the winter months when electric heating equipment is utilized. During the same timeframe, the building heat and domestic hot water (DHW) produced by natural gas-fired equipment required about 7,100 therms. Based on the annual cost of about $9,200, the blended price for natural gas was $1.291 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

The office area of the DPW building is heated by a combined 48 linear feet (LF) of electric baseboard units at approximately 250 W/LF. The foreman's office utilizes a 5.0 kW electric unit heater suspended from the ceiling in the corner of the room. Cooling is provided by three window air conditioning (AC) units approximately 10,000 Btuh in capacity; one each in the administration, superintendent, and foreman's offices.

Heat for the vehicle garage area is provided by six 60 MBh, gas-fired, high-intensity, Dayton infrared radiant heaters. The remaining two vehicle storage bays are unheated. Two 250 MBh, gas-fired, Modine unit heaters provide heat to the vehicle maintenance bays. These units are suspended from the ceiling and directed at the overhead doors from the opposite side of the space. The unit heaters were not replaced with radiant heaters to maintain air circulation in the maintenance bays by the heater fan. A wall propeller fan provides summer ventilation to the first two maintenance bays.

The breakroom and sign room, located within the heated garage area, have dedicated heating and cooling systems. The breakroom utilizes a single 10' electric baseboard unit for heating and a new 18,000 Btuh, LG window AC unit for cooling. The sign room is equipped with a Friedrich room AC unit with combined electric heat. This unit is mounted on the exterior wall and has capacities of 10,100 Btuh cooling, and 8,100 Btuh heating.

3.4 Lighting/Electrical Systems

Interior lighting at the DPW building consists primarily of about 40 original T-12 fluorescent fixtures with magnetic ballasts. These fixtures use a mixture of inefficient 2'-F20T12, 20 watt lamps; 4'-F34T12, 34 watt lamps; and 8'-F96T12, 96 watt lamps. There are several areas where the original fluorescent fixtures have been upgraded to use more efficient T-8 lamps with electronic ballasts. The building also utilizes two inefficient incandescent bulbs. All lighting is controlled by manual, wall mounted switches.

Lighting for the exterior of the DPW building is owned and maintained by the electrical utility company. These light fixtures are on power poles around the parking lot and site entrances. Many are equipped with photovoltaic solar collection panels. In addition, there are light fixtures on the back side of the building above each overhead door that are owned by the facility but are not functional.

It was noted during the walkthrough of the building that all exit signs within the building were not illuminated. According to the New Jersey building code, all exit signs must be illuminated, with the exception of "Tactile" exit signs, as standardized in ICC A117.1. It is suggested that the owner reviews the existing nonilluminated exit signs within the facility against the referenced standard ICC A117.1 to verify code compliance.

3.5 Control Systems

Electric baseboard heating units in the office area are on two, outdated mechanical thermostats, set to 65°F with no capability of nighttime temperature setback. The electric baseboard unit in the breakroom is also controlled by an outdated mechanical thermostat; the electric unit heater in the foreman's office is operated by a dedicated integral thermostat.

The gas fired unit heater and infrared radiant heaters serving the maintenance and garage areas are controlled by dedicated, mechanical wall thermostats. The temperature in the maintenance area is set to 68°F, and the temperature in the garage area to 56°F.

All window AC units have integral controls and are manually operated. These units are used on an as-needed basis, and may be left on for extended periods of time depending on outside temperature. The sign room AC unit with combined electric heat also has integral controls and is manually operated. The unit is only utilized several days a month when the room is occupied and requires tempering.

3.6 Plumbing Systems

Domestic hot water for the building is produced by a 40 gallon, 4,500 watt electric hot water heater located on the mezzanine in the maintenance area. This unit has been wrapped with 1" insulation to decrease energy loss to the surrounding space. Hot water demand by the DPW building is low and primarily used for hand washing and other basic needs. All water utilizing fixtures in the restrooms are low flow type per industry standards. A three compartment stainless steel sink is located outside the office area and is used by building personnel for hand washing and clean up.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Increase Roof Insulation – Garage

The roof of the DPW vehicle maintenance and storage areas consists of a steel deck with 1-1/2" foam board insulation and rubber membrane. This construction assembly has a thermal resistance, or R-value, of about 7.2, which is considered low. Installing additional insulation to the roof assembly would minimize heat energy losses in the winter. Therefore, this ECM addresses the thermal energy savings to be expected from the addition of 3" expanded polystyrene board insulation (R-12.0) to the underside of the existing roof deck in the vehicle maintenance and heated garage areas. This insulation must have a flame spread resistant backing in order to comply with local fire codes.

To calculate the savings, the heat losses through the roof were found using the existing assembly's R-value and bin weather data for Newark, NJ. The values were totaled to determine the existing annual heat losses. Heat loss values were then determined with a thermal resistance which included the additional R-12.0 insulation. The annual energy savings of adding insulation to the roof of the vehicle maintenance and heated garage areas is expected to be about 800 therms.

Roof insulation has an expected life of 20 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 16,000 therms and $20,000.

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

ECM-1 Increase Roof Insulation – Garage

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
16,400	0	0	800	1,000	0.2	NA	16.4	NA

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

This measure is not recommended.

4.2 ECM-2 Increase Wall Insulation – Garage

The exterior walls of the building's vehicle garage areas are constructed of uninsulated CMU block which has an R-value of 2.7. The CMU block is very poor at resisting heat transfer or loss. Therefore, this ECM addresses adding 2" expanded polystyrene board insulation (R-7.6) to the interior side of the CMU block walls in the vehicle maintenance and heated garage areas to minimize energy losses. As with the insulation proposed in section 4.1, this insulation must also have a flame spread resistant backing in order to comply with local fire codes.

The savings for this measure were calculated using the same methodology as section 4.1. The heat losses through the existing exterior walls of garage areas were found using the existing block wall's R-value and bin weather data for Newark, NJ and totaled to determine the existing annual heat losses. Then, the heat loss values were determined with a thermal resistance which included the additional R-7.6 insulation. The annual thermal energy savings of adding insulation to the exterior block walls is expected to be 1,560 therms.

Wall insulation has an expected life of 20 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 31,200 therms and $40,000.

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

ECM-2 Increase Wall Insulation – Garage

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
15,800	0	0	1,560	2,000	1.5	NA	7.9	NA

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

This measure is recommended.

4.3 ECM-3 Night Setback

Electric baseboard heating units in the office area are controlled by two outdated, non-programmable, mechanical thermostats set to 65°F. Additionally, the unit heaters in the maintenance area are operated by similar mechanical thermostats set to 68°F; average garage area temperature is 62°F. Installing programmable thermostats to control the electric heating units and gas-fired unit heaters will allow the temperature setpoints to be scheduled according to occupancy for the corresponding areas. Therefore, it is proposed that during periods when the building is closed, the heating temperature setpoint be programmed to 58°F in the office area and 56°F in the vehicle maintenance area to reduce annual energy consumption. Programmable thermostats will not need to be installed in the heated vehicle garage area because this space is already set to 56°F.

To calculate the benefits of night setback, block load building models were created to approximate the existing energy load for the office and garage areas. The block loads, provided in Appendix D, model the maximum overall heating load for the space, taking into account various parameters such as roof, wall, and window construction; total envelope surface area; ventilation and infiltration loads; building occupancy; internal heat generation; and other sources of heat gain and loss. By entering this calculated maximum load into a spreadsheet containing bin temperature data, the total accumulated year-round heating energy requirement was determined for each space. Bin data for South Plainfield, NJ was not available; therefore, data from nearby Newark, NJ was used. The bin temperature spreadsheets are included in Appendix D.

To determine the proposed energy usage during temperature setback, a second bin spreadsheet was created for the new accumulated heating load, which was identical to the existing usage spreadsheet except the unoccupied temperature was adjusted as discussed above. The difference in heating kWh for the office and therms for the garage between the two models is taken as the savings. Following implementation of this measure, it is expected the building's annual electricity consumption will be reduced by approximately 3,120 kWh and 1,370 therms.

Programmable thermostats have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 46,700 kWh and 20,500 therms, totaling $34,500.

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

ECM-3 Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
1,200	0	3,120	1,370	2,300	27.8	NA	0.5	NA

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

This measure is recommended.

4.4 ECM-4 Replace Window AC Units – Office

Three window air conditioning units are utilized to cool the office area of the DPW. On average, the units provide 10,000 Btus of cooling at an energy efficiency ratio (EER) of about 8.5 and are operated throughout the cooling season. This ECM assesses replacing the window units with ductless split system AC units. Split system units have a much higher EER value than window units and are programmable to operate when desired.

Using bin weather data for Newark, NJ and the weekly occupancy schedule for the office, the annual operating hours for the existing window AC units was established. Since split system AC units have built in thermostats and temperature controls, cycling was taken into account to determine the proposed unit's operating time. EER values were then converted to kWh and applied to the estimated hours of operation to determine the energy consumption for the existing and proposed cooling systems. Replacing the three window AC units with split system AC units will produce an annual savings of approximately 410 kWh.

Ductless split system AC units have an expected life of 15 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 6,200 kWh and $1,500.

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

ECM-4 Replace Window AC Units – Office

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
14,900	0	410	0	100	(0.9)	300	>25	>25

* Incentive shown is per the New Jersey Smart Start Program, 2010 Electric Unitary HVAC Application. Incentive is based on the installation of a Unitary HVAC/Split System unit < 5.4 tons in capacity.

This measure is not recommended.

4.5 ECM-5 Install Door Seals

The bottom seal for each of the six overhead doors on the east side of the building have noticeably deteriorated and are no longer effective at preventing air transfer. The door seals on the three steel man doors in the garage area are also visibly worn. Poor seals on the doors serving the heated garage areas

result in air infiltration and heat loss. Installing new door seals would minimize infiltration and reduce heating energy consumption.

The energy savings calculation compared the existing infiltration rate of 0.7 CFM/LF to the proposed infiltration rate of 0.3 CFM/LF, based on installation of the new door seals. It is assumed that the infiltration air is constant throughout the year and weather bin data was used to determine the annual heating load generated as a result. In conclusion, it was determined that the proposed measure will save an estimated 210 therms annually.

Door seals have an expected life of 10 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 2,100 therms and $3,000.

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

ECM-5 Install Door Seals

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
700	0	0	210	300	3.3	NA	2.3	NA

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

This measure is recommended.

4.6 ECM-6 Replace Domestic Hot Water Heater

Domestic hot water for the building is generated by a 40 gallon, 4,500 watt electric hot water heater. Due to a low demand for hot water in the building, there are extended periods of time with little or no use. However, the unit must still heat the water within the storage tank. Energy required to maintain the hot water temperature setpoint during times of zero demand are known as standby losses. This measure evaluates replacing the existing DHW heater with a tankless, instantaneous, gas-fired, condensing hot water heater to eliminate standby losses.

According to the U.S. Department of Energy, 2.5% of stored capacity is lost every hour during hot water heater standby. This value was adjusted to 1.5% to account for the 1" insulation wrap and applied to the total volume of the existing hot water heater storage tank determined the annual standby losses. Proposed efficiency was based on the Navien CR180 instantaneous, condensing hot water heater; it was calculated that 1,910 kWh would be saved per year. A more detailed hot water demand analysis may be necessary to verify proper sizing. The new water heater will require gas piping, venting, electrical connections, and minor water piping.

Instantaneous water heaters have an expected life of 18 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 34,400 kWh and (800) therms, totaling $12,600.

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

ECM-6 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
5,200	4.5	1,910	(50)	700	1.4	100	7.4	7.3

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

This measure is recommended.

4.7 ECM-7 Lighting Replacements

A comprehensive fixture survey was conducted of the entire building. Each switch and circuit was identified; as well as the number of fixtures, locations, approximate operating times and existing wattage consumption. The majority of lighting in the facility utilizes inefficient T-12 lamps with magnetic ballasts and incandescent bulbs; the remaining areas have been upgraded to use T-8 lamps with electronic ballasts and compact fluorescent bulbs. Energy can be saved by upgrading the inefficient fixtures to use more energy effective lighting technology.

Energy savings for this measure were calculated by applying the existing and proposed fixture wattages to the estimated time of operation. The difference resulted in an annual savings of 7,540 kWh per year. Supporting calculations, including all assumptions for lighting hours, and the annual energy usage for each fixture can be found in Appendix H.

Retrofitting fixtures that utilize T-12 lamps would require replacement with electronic ballasts and T-8 lamps. Incandescent lamps would be replaced with compact fluorescent spiral light bulbs.

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 113,100 kWh, totaling $22,500.

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

ECM-7 Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
9,500	4.8	7,540	0	1,500	1.4	1,000	6.3	5.7

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

This measure is not recommended in lieu of ECM-9.

4.8 ECM-8 Install Occupancy Sensors

Review of the comprehensive lighting survey determined that lighting in the breakroom is operated continuously throughout the day regardless of occupancy. Therefore, it is proposed that an occupancy sensor be installed in the breakroom to turn off lights when the area is unoccupied. While other spaces are also not occupied throughout the day, due to safety concerns, occupancy sensors were not considered in vehicle maintenance areas, mechanical spaces, and paths of egress.

Using a process similar to that utilized in section 4.7, the energy savings for this measure were calculated by applying the known fixture wattages in 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 450 kWh per year. One wall-mounted occupancy sensor and some electrical work are required for this measure.

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 6,800 kWh and $1,500.

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

ECM-8 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
100	0	450	0	100	14.0	0	1.0	1.0

* The incentive available through the New Jersey Smart Start program Lighting Controls Application for this ECM is less than $50.

This measure is not recommended in lieu of ECM-9.

4.9 ECM-9 Combined 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 7 and 8 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 116,000 kWh, totaling $22,500.

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

ECM-9 Combined 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
9,700	4.8	7,730	0	1,500	1.3	1,000	6.5	5.8

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

This measure is recommended.

4.10 ECM-10 Install Gas-Fired Heating Equipment – Office

As previously noted, the office area is heated by electric baseboard heating units and an electric unit heater. The cost per Btuh of heat is less for natural gas than electricity; therefore, energy costs can be reduced by removing the electric heating units and installing high efficiency gas-fired heating equipment.

Using the block load energy analysis generated in section 4.3 for the office area, the annual energy required to heat the space was determined in kWh and therms. The efficiency of a high efficiency furnace (92%) was applied to the heating requirement to find the annual natural gas consumption required to meet the heating load of the space. It was determined that it would require approximately 450 therms of natural gas to heat the office space annually; about 11,100 kWh of electricity would be saved.

To implement this ECM, a new high efficiency, horizontal condensing furnace would be installed in the ceiling of the office area. The new furnace will require gas piping, venting, electrical connections, supply diffusers, return grilles, and supply and return ductwork.

Gas-fired furnaces have an expected life of 20 years, according to ASHRAE, and total energy savings over the life of the project are estimated at 221,800 kWh and (8,800) therms, totaling $24,000.

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

ECM-10 Install Gas-Fired Heating Equipment – Office

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$		$	Years	Years
10,000	0	11,100	450	1,200	1.4	400	8.3	8.0

* Incentive shown is per the New Jersey Smart Start Program, 2010 Gas Heating Equipment Application. Incentive is based on the purchase of a 92% efficient gas-fired furnace.

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 DPW is eligible for several incentives available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about $1,800 and includes installing a gas-fired DHW heater and furnace, replacing AC units, and upgrades to the lighting system.

When calculating the total incentive for the New Jersey Pay For Performance program, all energy conservation measures are applicable 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 $21,100, reducing the total project payback from 8.1 years to 5.8 years. See Appendix L for calculations.

Under PSE&G's direct install program, the DPW is potentially eligible to receive $73,900, and would be required to repay $14,800. Incentives cannot be accepted under multiple programs.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

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

The building uses gas-fired unit heaters, electric baseboard heaters and window AC units 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 DPW building 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 M.

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

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

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

The building had a maximum electricity demand of 32.6 kW and a minimum of 16.4 kW, from August 2008 through July 2009. The monthly average over the observed 12 month period was 22.4 kW. The existing load does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array; therefore, a 20 kW system size was selected for the calculations. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Agency) estimates of total cost of system installation. It should be noted that the cost of installation is currently $10 per watt or $10,000 per kW of installed system. This has increased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

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

Photovoltaic (PV) Rooftop Solar Power Generation – 20 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
200,000	0	23,660	0	3,800	3,800	20,000	11,500	>25	11.8

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

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

6.2.2 Solar Thermal Hot Water Plant

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

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

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

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

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

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

Solar Thermal Domestic Hot Water Plant

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
27,100	0	1,570	0	300	300	NA	>25	NA

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

This measure is not recommended.

6.3 Wind

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

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

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

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

The most important part of any small wind generation project is the mean annual wind speed at the height of which the turbine will be installed. In the South Plainfield area, the map indicates a mean annual wind speed of 10 miles per hour. For the DPW 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 O.

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 DPW 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 DPW does not have a steady waste stream year round 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 DPW had a monthly average electricity demand of 22.4 kW and a maximum demand of 32.6 kW from August 2008 through July 2009.

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

7.0 EPA PORTFOLIO MANAGER

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

The DPW is considered an above average energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 84 kBTU/ft^2/year. Several factors contribute to the unfavorable EUI, including, wasted energy from poor roof and wall insulation, worn door seals, unnecessary heating during unoccupied hours, and inefficient lighting operation. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 47 kBTU/ft^2/year; the national average for this building type is 77 kBTU/ft^2/year. The EPA Portfolio Manager did not generate an energy rating score for this building because the building type (service) is currently not eligible for an energy star rating.

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

The user name and password for the DPW building'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 Department of Public Works office and maintenance building in South Plainfield, New Jersey identified potential ECMs for night setback, lighting and occupancy sensor upgrades, door seals, domestic hot water heater replacement, heating equipment upgrades, and insulation upgrades. Potential annual savings of $8,000 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-2 Increase Wall Insulation – Garage

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
15,800	0	0	1,560	2,000	1.5	NA	7.9	NA

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

ECM-3 Night Setback

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
1,200	0	3,120	1,370	2,300	27.8	NA	0.5	NA

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

ECM-5 Install Door Seals

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
700	0	0	210	300	3.3	NA	2.3	NA

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

ECM-6 Replace Domestic Hot Water Heater

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
5,200	4.5	1,910	(50)	700	1.4	100	7.4	7.3

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

ECM-9 Combined Lighting Replacements with Occupancy Sensors

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
9,700	4.8	7,730	0	1,500	1.3	1,000	6.5	5.8

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

ECM-10 Install Gas-Fired Heating Equipment – Office

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total	ROI			
$	kW	kWh	Therms	$		$	Years	Years
10,000	0	11,100	450	1,200	1.4	400	8.3	8.0

* Incentive shown is per the New Jersey Smart Start Program, 2010 Gas Heating Equipment Application. Incentive is based on the purchase of a 92% efficient gas-fired furnace.

APPENDIX A

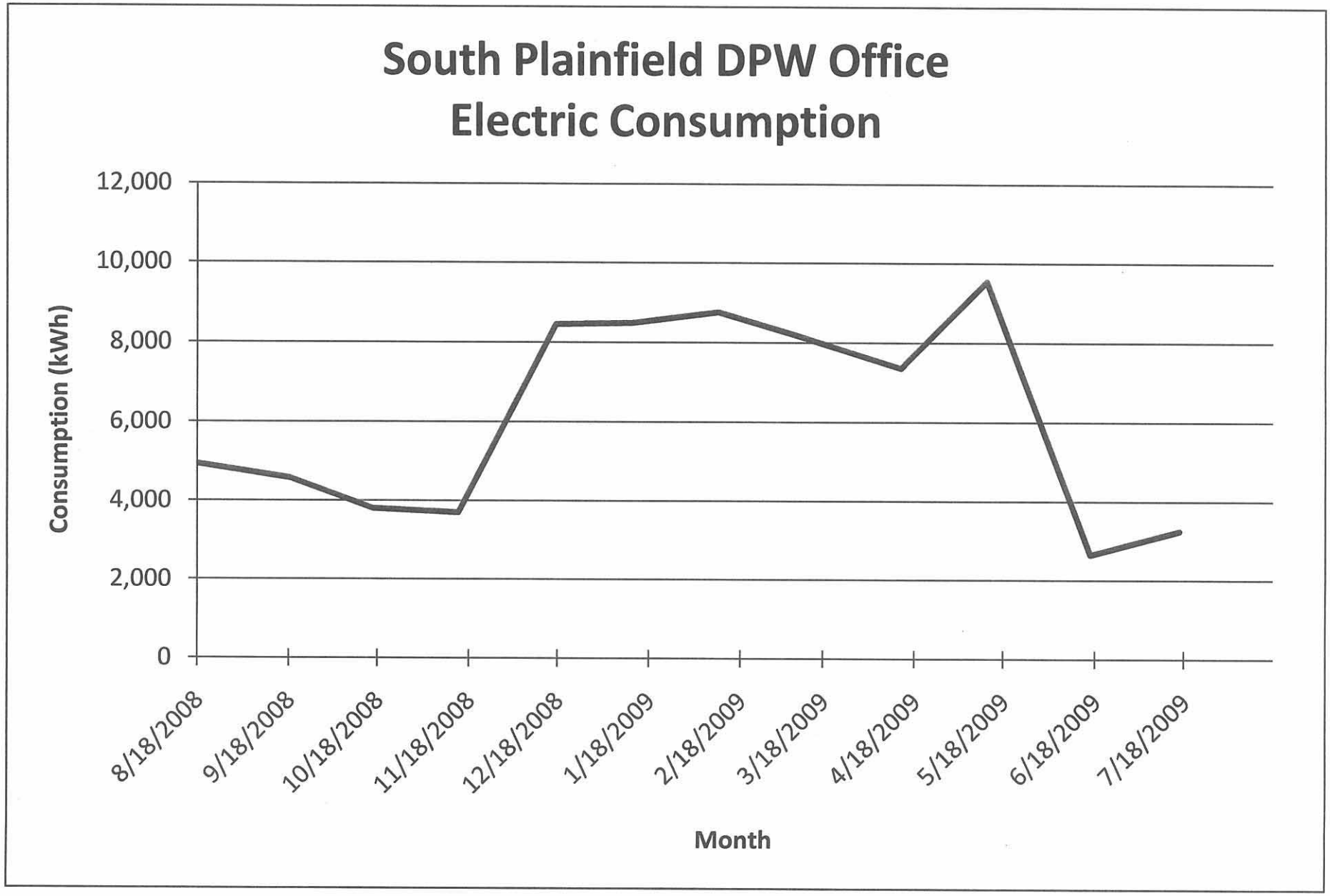
Utility Usage Analysis

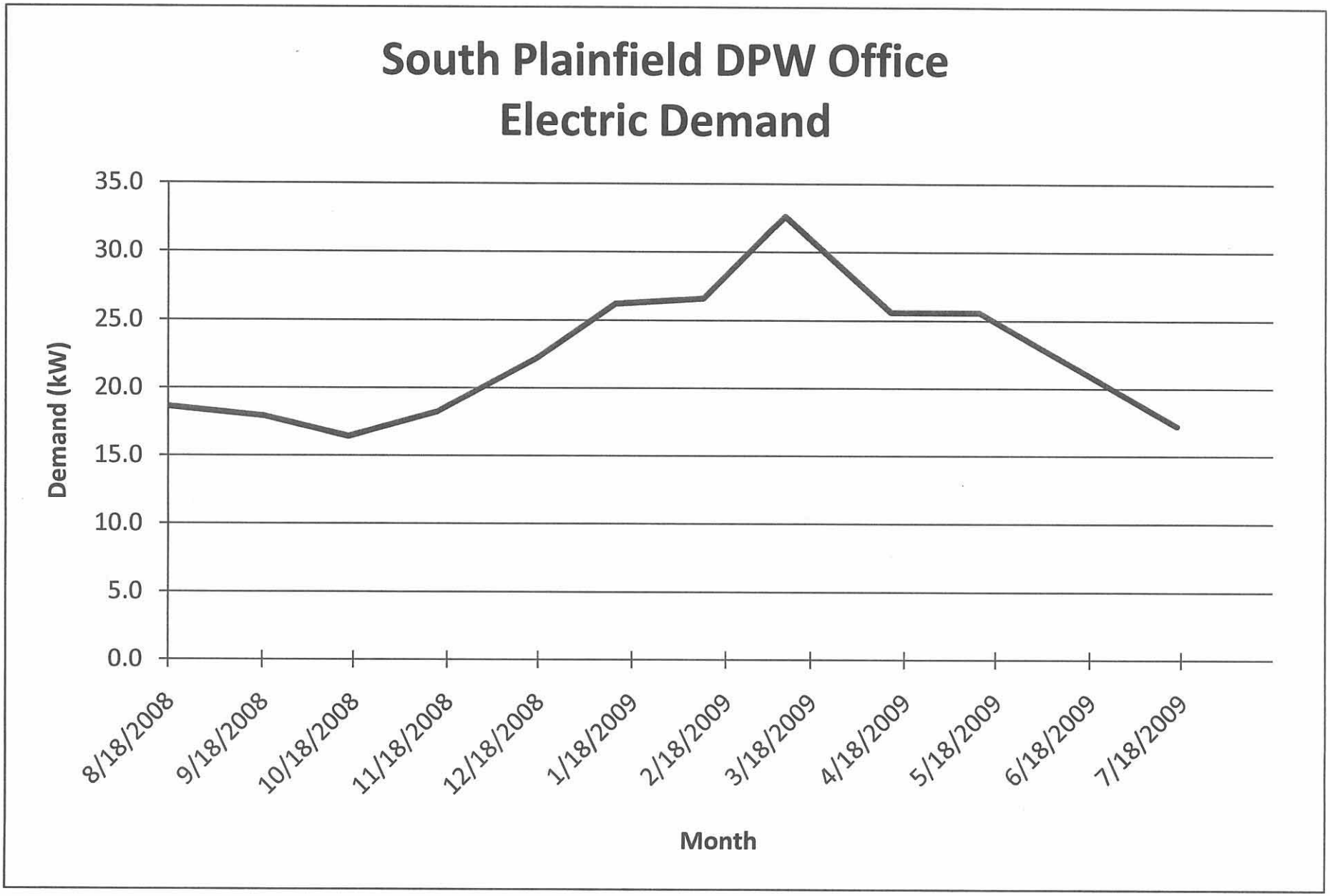
New Jersey BPU Energy Audit Program
CHA #20549
South Plainfield
DPW Office

Account Number: 52 899 291 18
PSE&G - Electric Service

Meter #: 256005346

			Charges			Unit Costs		
Date	Consumption (kWh)	Demand (kW)	Total ($)	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
3/19/2008	9,804	32.6	$1,259.34	$163.87	$1,095.47	0.1285	0.1117	5.03
4/18/2008	7,296	22.6	$921.08	$124.93	$796.15	0.1262	0.1091	5.53
5/19/2008	4,272	17.0	$563.59	$103.12	$460.47	0.1319	0.1078	6.07
6/18/2008	3,204	16.3	$461.15	$104.59	$356.56	0.1439	0.1113	6.42
7/18/2008	4,008	16.6	$849.43	$279.28	$570.15	0.2119	0.1423	16.82
8/18/2008	4,932	18.6	$1,013.21	$301.52	$711.69	0.2054	0.1443	16.21
9/18/2008	4,572	17.9	$983.14	$293.73	$689.41	0.2150	0.1508	16.41
10/16/2008	3,804	16.4	$825.29	$277.05	$548.24	0.2170	0.1441	16.89
11/14/2008	3,696	18.2	$594.94	$166.26	$428.68	0.1610	0.1160	9.14
12/17/2008	8,448	22.2	$1,136.72	$181.84	$954.88	0.1346	0.1130	8.19
1/12/2009	8,484	26.2	$1,145.17	$197.42	$947.75	0.1350	0.1117	7.54
2/10/2009	8,760	26.6	$1,208.93	$198.72	$1,010.21	0.1380	0.1153	7.47
3/9/2009	8,172	32.6	$1,211.37	$222.03	$989.34	0.1482	0.1211	6.81
4/13/2009	7,356	25.6	$1,076.57	$194.77	$881.80	0.1464	0.1199	7.61
5/12/2009	9,540	25.6	$1,317.12	$194.77	$1,122.35	0.1381	0.1176	7.61
6/16/2009	2,652	21.1	$489.63	$177.68	$311.95	0.1846	0.1176	8.42
7/16/2009	3,252	17.2	$754.55	$297.54	$457.01	0.2320	0.1405	17.30
Total	102,252	32.6	$15,811.23	$3,479.12	$12,332.11	0.1546	0.1206	9.32
Most Recent Yr	73,668	32.6	$11,756.64	$2,703.33	$9,053.31	0.1596	0.1229	10.08


South Plainfield DPW Office
Electric Consumption
Consumption (kWh)
12,000
10,000
8,000
6,000
4,000
2,000
0
8/18/2008
9/18/2008
10/18/2008
11/18/2008
12/18/2008
1/18/2009
2/18/2009
3/18/2009
4/18/2009
5/18/2009
6/18/2009
7/18/2009
Month


South Plainfield DPW Office
Electric Demand
Demand (kW)
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
8/18/2008
9/18/2008
10/18/2008
11/18/2008
12/18/2008
1/18/2009
2/18/2009
3/18/2009
4/18/2009
5/18/2009
6/18/2009
7/18/2009
Month

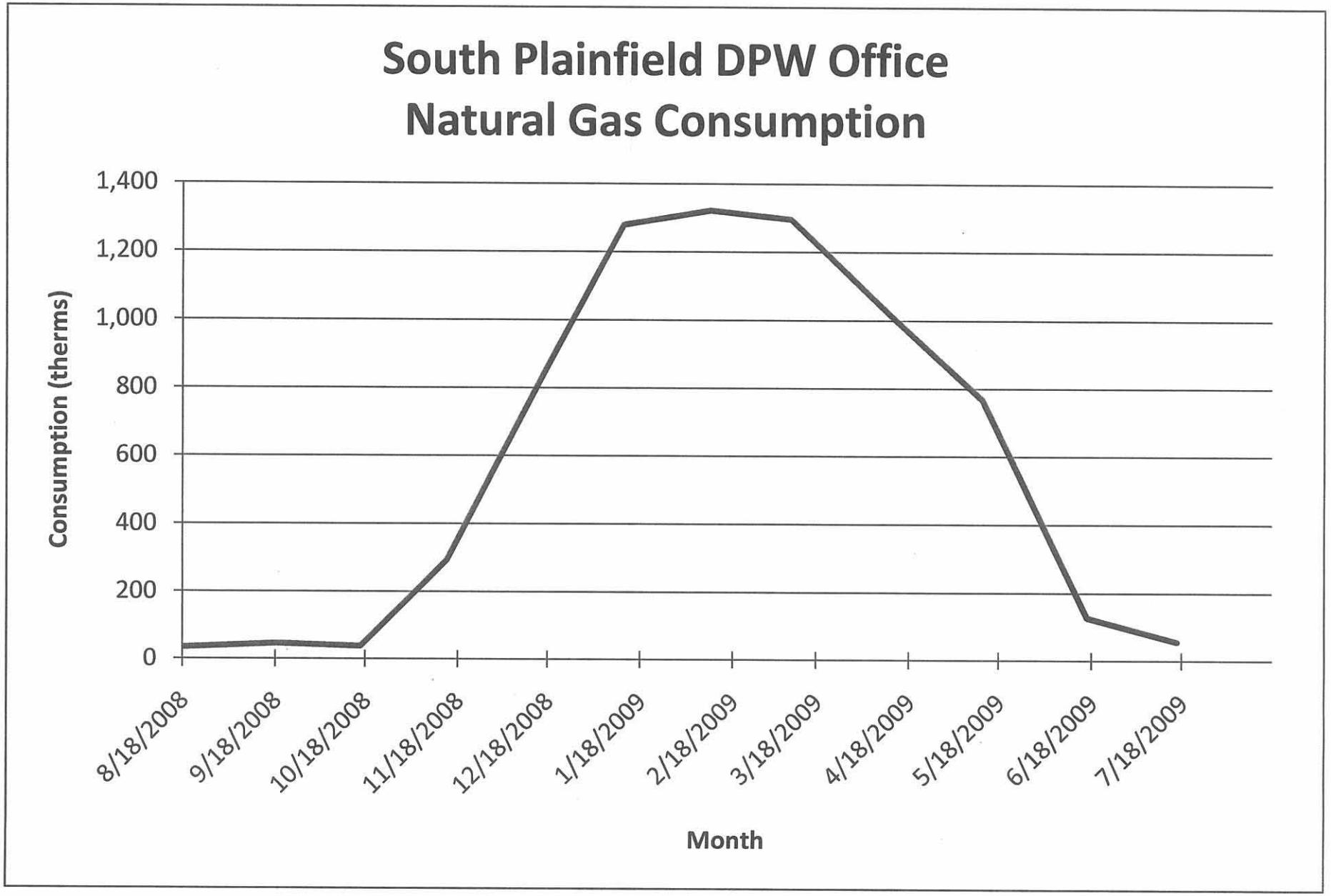
New Jersey BPU Energy Audit Program
CHA #20549
South Plainfield
DPW Office

Account Number: 52 899 291 18
PSE&G - Natural Gas Service

Meter #: 1865668

Date	Therms	Cost	($/Therm)
3/19/2008	1,445	$2,110.58	1.461
4/18/2008	860	$1,443.40	1.679
5/19/2008	387	$620.89	1.604
6/18/2008	233	$453.11	1.941
7/18/2008	34	$147.60	4.291
8/18/2008	34	$152.25	4.413
9/18/2008	46	$152.28	3.301
10/16/2008	38	$138.20	3.669
11/14/2008	295	$423.01	1.435
12/17/2008	853	$1,212.97	1.422
1/12/2009	1,279	$1,746.99	1.366
2/10/2009	1,322	$1,724.84	1.305
3/9/2009	1,297	$1,517.67	1.171
4/13/2009	1,001	$1,152.89	1.151
5/12/2009	768	$656.71	0.856
6/16/2009	127	$180.31	1.419
7/16/2009	56	$132.56	2.355

Total	10,076	$13,966.26	1.386
Most Recent Yr	7,116	$9,190.68	1.291


South Plainfield DPW Office
Natural Gas Consumption
Consumption (therms)
1,400
1,200
1,000
800
600
400
200
0
8/18/2008
9/18/2008
10/18/2008
11/18/2008
12/18/2008
1/18/2009
2/18/2009
3/18/2009
4/18/2009
5/18/2009
6/18/2009
7/18/2009
Month

ELECTRIC MARKETERS LIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Jan 14, 2009

GAS MARKETERS LIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

RPL Holdings, Inc
601 Carlson Pkwy
Minnetonka, MN 55305

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

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

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

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

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

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

APPENDIX B

ECM-1 Increase Roof Insulation – Garage

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-1 **Increase Roof Insulation - Garage**
Heated Garage Area Only

Existing Roof Area	7,300	sf
Existing U-value	0.139	Btu/hr/(sf*F)
Proposed U-value	0.052	Btu/hr/(sf*F)
Heating System Efficiency	80%	
Cooling System Efficiency	0.00	kW/ton

3" Expanded Polystyrene Board Insulation (R-12)

Existing Cooling		
Existing Cooling Load Temp Diff.	73	F
Existing Max. Roof Cooling Load	6,015	Btu/hr
Proposed Cooling		
Proposed Cooling Load	2252.09088	Btu/hr
Occupied Cooling Setpoint	74	F
Unoccupied Cooling Setpoint	80	F

Existing Heating		
Existing Heating Load Temp Diff.	48	F
Existing Max. Roof Heating Load	48,667	Btu/hr
Proposed Heating		
Proposed Heating Load	18220.8	Btu/hr
Occupied Heating Setpoint	62	F
Unoccupied Heating Setpoint	60	F

Existing Heating Total	102,241,099	Btu/yr
Proposed Heating Total	38,279,067	Btu/yr
Savings	63,962,031	Btu/yr
Input	800	**therms**
Existing Cooling Total	-	kWh/yr
Proposed Cooling Total	-	kWh/yr
		kWh/yr

				Occupied				Unoccupied							
Avg Outdoor Air Temp. Bins °F	**Existing Equipment Bin Hours**	**Occupied Equipment Bin Hours**	**Unoccupied Equipment Bin Hours**	**Existing Heat Gain**	**Proposed Heat Gain**	**Existing Heat Loss**	**Proposed Heat Loss**	**Existing Heat Gain**	**Proposed Heat Gain**	**Existing Heat Loss**	**Proposed Heat Loss**	**Existing Cooling Load**	**Existing Heating Load**	**Proposed Cooling Load**	**Proposed Heating Load**
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
102.5	0	0	0	28896	10819	0	0	22813	8541	0	0	0	0	0	0
97.5	3	1	2	23826	8921	0	0	17743	6643	0	0	0	0	0	0
92.5	34	9	25	18757	7023	0	0	12674	4745	0	0	0	0	0	0
87.5	131	35	96	13688	5125	0	0	7604	2847	0	0	0	0	0	0
82.5	500	134	366	8618	3227	0	0	2535	949	0	0	0	0	0	0
77.5	620	166	454	3549	1329	0	0	0	0	0	0	0	0	0	0
72.5	664	178	486	0	0	0	0	0	0	0	0	0	0	0	0
67.5	854	229	625	0	0	0	0	0	0	0	0	0	0	0	0
62.5	927	248	679	0	0	0	0	0	0	0	0	0	0	0	0
57.5	600	161	439	0	0	4563	1708	0	0	2535	949	0	1846726	0	691414
52.5	610	163	447	0	0	9632	3606	0	0	7604	2847	0	4969866	0	1860718
47.5	611	164	447	0	0	14701	5504	0	0	12674	4745	0	8075444	0	3023446
42.5	656	176	480	0	0	19771	7402	0	0	17743	6643	0	11995754	0	4491210
37.5	1,023	274	749	0	0	24840	9300	0	0	22813	8541	0	23892835	0	8945477
32.5	734	197	537	0	0	29910	11198	0	0	27882	10439	0	20864023	0	7811490
27.5	334	89	245	0	0	34979	13096	0	0	32951	12337	0	11187178	0	4188479
22.5	252	68	185	0	0	40049	14994	0	0	38021	14235	0	9718125	0	3638466
17.5	125	33	92	0	0	45118	16892	0	0	43090	16133	0	5454179	0	2042045
12.5	47	13	34	0	0	50188	18790	0	0	48160	18031	0	2289035	0	857015
7.5	22	6	16	0	0	55257	20688	0	0	53229	19929	0	1182991	0	442912
2.5	13	3	10	0	0	60326	22586	0	0	58299	21827	0	764943	0	286395
-2.5	0	0	0	0	0	65396	24484	0	0	63368	23725	0	0	0	0
-7.5	0	0	0	0	0	70465	26382	0	0	68438	25623	0	0	0	0
TOTALS	**8,760**	**2,346**	**6,414**										**102,241,099**		**38,279,067**

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-1 **Increase Roof Insulation - Garage**

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
3" Expanded Polystyrene Board Insulation	7,300	SQFT	$ 0.93	$ 0.44		$ 6,653	$ 3,887	$ -	$ 10,540	With flame spread resistant backing
Working conditions / Project difficulty	1	LS		$ 2,000		$ -	$ 2,420	$ -	$ 2,420	High Ceilings
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

12,960	Subtotal
1,944	15% Contingency
1,490	10% Contractor O&P
-	0% Engineering
16,394	**Total**

APPENDIX C

ECM-2 Increase Wall Insulation – Garage

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-2 **Increase Wall Insulation - Garage**
Heated Garage Area Only

Total Existing Wall Area	4,214	sf
Existing U-value	0.370	Btu/hr/(sf*F)
Proposed U-value	0.097	Btu/hr/(sf*F)
Heating Efficiency	80%	
Cooling Efficiency	0%	kW/ton

2" Expanded Polystyrene Board Insulation (R-7.6)

Existing Cooling		
Max. North Wall Cooling Load	8,286	Btu/hr
Max. East Wall Cooling Load	19,847	Btu/hr
Max. South Wall Cooling Load	8,000	Btu/hr
Max. West Wall Cooling Load	7,558	Btu/hr

Proposed Cooling		
Max. North Wall Cooling Load	2,171	Btu/hr
Max. East Wall Cooling Load	5,198	Btu/hr
Max. South Wall Cooling Load	2,095	Btu/hr
Max. West Wall Cooling Load	1,980	Btu/hr

Occupied Cooling Setpoint	78	F
Unoccupied Cooling Setpoint	80	F
Existing Cooling Total	-	kWh/yr
Proposed Cooling Total	-	kWh/yr
Savings		kWh/yr

Existing Heating

Existing Heating Load Temp Diff	48	F
Existing Max. Wall Heating Load	74,916	Btu/hr

Proposed Heating

Proposed Max. Heating Load	19,620	Btu/hr
Occupied Heating Setpoint	62	F
Unoccupied Heating Setpoint	62	F
Existing Heating Total	168,874,489	Btu/yr
Proposed Heating Total	44,228,229	Btu/yr
Savings	124,646,261	Btu/yr
Input	1,558	**therms**

				Occupied				Unoccupied							
Avg Outdoor Air Temp. Bins °F	**Existing Equipment Bin Hours**	**Occupied Equipment Bin Hours**	**Unoccupied Equipment Bin Hours**	**Existing Heat Gain**	**Proposed Heat Gain**	**Existing Heat Loss**	**Proposed Heat Loss**	**Existing Heat Gain**	**Proposed Heat Gain**	**Existing Heat Loss**	**Proposed Heat Loss**	**Existing Cooling Load**	**Existing Heating Load**	**Proposed Cooling Load**	**Proposed Heating Load**
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
97.5	3	1	2	43,640	11,429	-	-	43,640	11,429	-	-		-		-
92.5	34	9	25	34,355	8,998	-	-	31,171	8,164	-	-		-		-
87.5	131	35	96	25,070	6,566	-	-	18,703	4,898	-	-		-		-
82.5	500	134	366	15,785	4,134	-	-	6,234	1,633	-	-		-		-
77.5	620	166	454	6,500	1,702	-	-	-	-	-	-		-		-
72.5	664	178	486	-	-	-	-	-	-	-	-		-		-
67.5	854	229	625	-	-	-	-	-	-	-	-		-		-
62.5	927	248	679	-	-	-	-	-	-	-	-		-		-
57.5	600	161	439	-	-	7,023	1,839	-	-	7,023	1,839		4,214,000		1,103,647
52.5	610	163	447	-	-	14,827	3,883	-	-	14,827	3,883		9,044,493		2,368,753
47.5	611	164	447	-	-	22,631	5,927	-	-	22,631	5,927		13,827,383		3,621,392
42.5	656	176	480	-	-	30,434	7,971	-	-	30,434	7,971		19,964,996		5,228,832
37.5	1,023	274	749	-	-	38,238	10,015	-	-	38,238	10,015		39,117,626		10,244,906
32.5	734	197	537	-	-	46,042	12,058	-	-	46,042	12,058		33,794,719		8,850,837
27.5	334	89	245	-	-	53,846	14,102	-	-	53,846	14,102		17,984,416		4,710,118
22.5	252	68	185	-	-	61,649	16,146	-	-	61,649	16,146		15,535,613		4,068,777
17.5	125	33	92	-	-	69,453	18,190	-	-	69,453	18,190		8,681,620		2,273,716
12.5	47	13	34	-	-	77,257	20,234	-	-	77,257	20,234		3,631,063		950,975
7.5	22	6	16	-	-	85,060	22,277	-	-	85,060	22,277		1,871,328		490,101
2.5	13	3	10	-	-	92,864	24,321	-	-	92,864	24,321		1,207,233		316,174
-2.5	0	0	0	-	-	100,668	26,365	-	-	100,668	26,365		-		-
-7.5	0	0	0	-	-	108,471	28,409	-	-	108,471	28,409		-		-
TOTALS	**8,760**	**2,346**	**6,414**										**168,874,489**		**44,228,229**

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-2 **Increase Wall Insulation - Garage**

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.		
						$ -	$ -	$ -	$ -	
2" Expanded Polystyrene board insulation	4,214	SQFT	$ 0.75	$ 0.55		$ 3,097	$ 2,804	$ -	$ 5,902	With flame spread resistant backing
Working conditions / Project difficulty	1	LS		$ 5,000		$ -	$ 6,050	$ -	$ 6,050	Cost adjustment for wall obstacles
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

11,952	Subtotal
2,390	20% Contingency
1,434	10% Contractor O&P
-	Engineering
15,776	**Total**

APPENDIX D

ECM-3 Night Setback – Office

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-3 **Night Setback** **Office Area**

Building Footprint	1,030	SF	Ex Occupied Clng Temp.	74	°F	Ex Occupied Htg Temp.	65	°F	**Heating Energy Savings** 3,116 kWh
Heating Efficiency	100%		Ex Unoccupied Clng Temp.	74	°F	Ex Unoccupied Htg Temp.	65	°F	kWh
		kW/ton	Prop Occupied Clng Temp.	75	°F	Prop Occupied Htg Temp.	65	°F	
Building Balance Temp.	60	°F	Prop Unoccupied Clng Temp.	74	°F	Prop Unoccupied Htg Temp.	58	°F	
Internal Gains	14,503	btu/h	Occupied Cooling UA	-683	btu/hr/°F	Occupied Heating UA	310	btu/hr/°F	
Unoc Internal Gain factor	0.03		Unoccupied Cooling UA	-509	btu/hr/°F	Unoccupied Heating UA	310	btu/hr/°F	
Ave Occ Internal Gain Factor	0.5		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb				
					Btu/lb				

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

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy kWh	Proposed Heating Energy kWh
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-18,904	-21,061	-7,251	-14,507	-21,061	-435	-18,904	-21,061	-7,251	-14,507	-21,061	-435	0	0	0	0
97.5	42.5	3	1	2	-15,587	-14,626	-7,251	-11,962	-14,626	-435	-15,587	-14,626	-7,251	-11,962	-14,626	-435	10	10	0	0
92.5	39.5	34	9	25	-12,271	-11,701	-7,251	-9,417	-11,701	-435	-12,271	-11,701	-7,251	-9,417	-11,701	-435	94	94	0	0
87.5	36.6	131	35	96	-8,955	-8,873	-7,251	-6,872	-8,873	-435	-8,955	-8,873	-7,251	-6,872	-8,873	-435	280	280	0	0
82.5	34	500	134	366	-5,638	-6,338	-7,251	-4,327	-6,338	-435	-5,638	-6,338	-7,251	-4,327	-6,338	-435	763	763	0	0
77.5	31.6	620	166	454	-2,322	-3,998	-7,251	-1,782	-3,998	-435	-2,322	-3,998	-7,251	-1,782	-3,998	-435	584	584	0	0
72.5	29.2	664	178	486	0	0	-7,251	0	0	-435	0	0	-7,251	0	0	-435	173	173	0	0
67.5	27	854	229	625	0	0	-7,251	0	0	-435	0	0	-7,251	0	0	-435	222	222	0	0
62.5	24.5	927	248	679	774	585	-7,251	774	585	-435	774	585	-7,251	0	0	-435	168	202	0	0
57.5	21.4	600	161	439	2,322	1,755	-7,251	2,322	1,755	-435	2,322	1,755	-7,251	155	117	-435	69	67	0	0
52.5	18.7	610	163	447	3,870	2,925	-7,251	3,870	2,925	-435	3,870	2,925	-7,251	1,703	1,287	-435	9	9	0	0
47.5	16.2	611	164	447	5,417	4,095	-7,251	5,417	4,095	-435	5,417	4,095	-7,251	3,250	2,457	-435	0	0	1,298	799
42.5	14.4	656	176	480	6,965	5,265	-7,251	6,965	5,265	-435	6,965	5,265	-7,251	4,798	3,627	-435	0	0	1,916	1,381
37.5	12.6	1,023	274	749	8,513	6,435	-7,251	8,513	6,435	-435	8,513	6,435	-7,251	6,346	4,797	-435	0	0	3,803	2,968
32.5	10.7	734	197	537	10,061	7,605	-7,251	10,061	7,605	-435	10,061	7,605	-7,251	7,894	5,967	-435	0	0	3,313	2,714
27.5	8.6	334	89	245	11,609	8,776	-7,251	11,609	8,776	-435	11,609	8,776	-7,251	9,442	7,137	-435	0	0	1,774	1,501
22.5	6.8	252	68	185	13,156	9,946	-7,251	13,156	9,946	-435	13,156	9,946	-7,251	10,989	8,308	-435	0	0	1,539	1,333
17.5	5.5	125	33	92	14,704	11,116	-7,251	14,704	11,116	-435	14,704	11,116	-7,251	12,537	9,478	-435	0	0	863	761
12.5	4.1	47	13	34	16,252	12,286	-7,251	16,252	12,286	-435	16,252	12,286	-7,251	14,085	10,648	-435	0	0	362	323
7.5	2.6	22	6	16	17,800	13,456	-7,251	17,800	13,456	-435	17,800	13,456	-7,251	15,633	11,818	-435	0	0	187	169
2.5	1	13	3	10	19,348	14,626	-7,251	19,348	14,626	-435	19,348	14,626	-7,251	17,181	12,988	-435	0	0	121	110
-2.5	0	0	0	0	20,895	15,796	-7,251	20,895	15,796	-435	20,895	15,796	-7,251	18,728	14,158	-435	0	0	0	0
-7.5	-1.5	0	0	0	22,443	16,966	-7,251	22,443	16,966	-435	22,443	16,966	-7,251	20,276	15,328	-435	0	0	0	0
TOTALS		8,760	2,346	6,414															15,175	12,060

Existing Building Ventilation & Infiltration (occ)	217	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	217	cfm

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-3 **Night Setback** **Garage Area**

Building Footprint	3,650	SF	Ex Occupied Clng Temp.	74	°F	Ex Occupied Htg Temp.	62	°F	Heating Energy Savings 1,366 therms
Heating Efficiency	80%		Ex Unoccupied Clng Temp.	74	°F	Ex Unoccupied Htg Temp.	62	°F	kWh
[redacted]	[redacted]	kW/ton	Prop Occupied Clng Temp.	74	°F	Prop Occupied Htg Temp.	62	°F	
Building Balance Temp.	55	°F	Prop Unoccupied Clng Temp.	74	°F	Prop Unoccupied Htg Temp.	56	°F	
Internal Gains	21,294	btu/h	Occupied Cooling UA	7,268	btu/hr/°F	Occupied Heating UA	3,098	btu/hr/°F	
Unoc Internal Gain factor	0.03		Unoccupied Cooling UA	7,268	btu/hr/°F	Unoccupied Heating UA	3,098	btu/hr/°F	
Ave Occ Internal Gain Factor	0.7		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb				
			[redacted]	[redacted]	Btu/lb				

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

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-207,143	-315,416	-14,906	-207,143	-180,238	-639	-207,143	-315,416	-14,906	-207,143	-180,238	-639	0	0	0	0
97.5	42.5	3	1	2	-170,802	-219,039	-14,906	-170,802	-125,165	-639	-170,802	-219,039	-14,906	-170,802	-125,165	-639	112	112	0	0
92.5	39.5	34	9	25	-134,461	-175,231	-14,906	-134,461	-100,132	-639	-134,461	-175,231	-14,906	-134,461	-100,132	-639	1,013	1,013	0	0
87.5	36.6	131	35	96	-98,121	-132,884	-14,906	-98,121	-75,934	-639	-98,121	-132,884	-14,906	-98,121	-75,934	-639	2,918	2,918	0	0
82.5	34	500	134	366	-61,780	-94,917	-14,906	-61,780	-54,238	-639	-61,780	-94,917	-14,906	-61,780	-54,238	-639	7,554	7,554	0	0
77.5	31.6	620	166	454	-25,439	-59,871	-14,906	-25,439	-34,212	-639	-25,439	-59,871	-14,906	-25,439	-34,212	-639	5,081	5,081	0	0
72.5	29.2	664	178	486	0	0	-14,906	0	0	-639	0	0	-14,906	0	0	-639	341	341	0	0
67.5	27	854	229	625	0	0	-14,906	0	0	-639	0	0	-14,906	0	0	-639	438	438	0	0
62.5	24.5	927	248	679	0	0	-14,906	0	0	-639	0	0	-14,906	0	0	-639	475	475	0	0
57.5	21.4	600	161	439	13,939	15,771	-14,906	13,939	9,012	-639	13,939	15,771	-14,906	0	0	-639	0	0	152	26
52.5	18.7	610	163	447	29,426	33,294	-14,906	29,426	19,025	-639	29,426	33,294	-14,906	10,841	7,009	-639	0	0	365	194
47.5	16.2	611	164	447	44,914	50,817	-14,906	44,914	29,038	-639	44,914	50,817	-14,906	26,329	17,022	-639	0	0	575	404
42.5	14.4	656	176	480	60,401	68,340	-14,906	60,401	39,052	-639	60,401	68,340	-14,906	41,816	27,036	-639	0	0	843	660
37.5	12.6	1,023	274	749	75,889	85,863	-14,906	75,889	49,065	-639	75,889	85,863	-14,906	57,304	37,049	-639	0	0	1,667	1,380
32.5	10.7	734	197	537	91,377	103,386	-14,906	91,377	59,078	-639	91,377	103,386	-14,906	72,792	47,062	-639	0	0	1,448	1,243
27.5	8.6	334	89	245	106,864	120,910	-14,906	106,864	69,091	-639	106,864	120,910	-14,906	88,279	57,075	-639	0	0	774	680
22.5	6.8	252	68	185	122,352	138,433	-14,906	122,352	79,104	-639	122,352	138,433	-14,906	103,767	67,089	-639	0	0	671	600
17.5	5.5	125	33	92	137,839	155,956	-14,906	137,839	89,118	-639	137,839	155,956	-14,906	119,254	77,102	-639	0	0	376	341
12.5	4.1	47	13	34	153,327	173,479	-14,906	153,327	99,131	-639	153,327	173,479	-14,906	134,742	87,115	-639	0	0	157	144
7.5	2.6	22	6	16	168,814	191,002	-14,906	168,814	109,144	-639	168,814	191,002	-14,906	150,229	97,128	-639	0	0	81	75
2.5	1	13	3	10	184,302	208,525	-14,906	184,302	119,157	-639	184,302	208,525	-14,906	165,717	107,141	-639	0	0	52	49
-2.5	0	0	0	0	199,789	226,048	-14,906	199,789	129,171	-639	199,789	226,048	-14,906	181,204	117,155	-639	0	0	0	0
-7.5	-1.5	0	0	0	215,277	243,572	-14,906	215,277	139,184	-639	215,277	243,572	-14,906	196,692	127,168	-639	0	0	0	0
TOTALS		8,760	2,346	6,414													[redacted]	[redacted]	7,162	5,796

Existing Building Ventilation & Infiltration (occ)	**1,854**	**cfm**
Overheat Ventilation Factor	**1.75**	
Additional ventilation to offset overheat	**1,391**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**1,854**	**cfm**

Borough of South Plainfield
CHA #20549
Building: Department of Public Works
Office Area Only

Building Footprint	2,060	SF	Ex Occupied Clng Temp.	74	*F	Ex Occupied Htg Temp.	65 *F
Heating Efficiency	100%		Ex Unoccupied Clng Temp.	74	*F	Ex Unoccupied Htg Temp.	65 *F
Cooling Efficiency	1.30	kW/ton	Occupied Cooling UA	(663)	btu/hr/°F	Occupied Heating UA	310 btu/hr/°F
Internal Gains	14,503	btu/h	Unoccupied Cooling UA	(509)	btu/hr/°F	Unoccupied Heating UA	310 btu/hr/°F
Unoc Internal Gain factor	0.03		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb		
Ave Occ Internal Gain Factor	0.5		Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb		
Economizer available (Y/N)	No						

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

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy kWh
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-18,904	-21,061	-7,251	-14,507	-21,061	-435	0	0	0	0
97.5	42.5	3	1	2	-15,587	-14,626	-7,251	-11,962	-14,626	-435	0	10	10	0
92.5	39.5	34	9	25	-12,271	-11,701	-7,251	-9,417	-11,701	-435	0	94	94	0
87.5	36.6	131	35	96	-8,955	-8,873	-7,251	-6,872	-8,873	-435	0	280	280	0
82.5	34.0	500	134	366	-5,638	-6,338	-7,251	-4,327	-6,338	-435	0	763	763	0
77.5	31.6	620	166	454	-2,322	-3,998	-7,251	-1,782	-3,998	-435	0	584	584	0
72.5	29.2	664	178	486	0	0	-7,251	0	0	-435	0	173	173	0
67.5	27.0	854	229	625	0	0	-7,251	0	0	-435	0	222	222	0
62.5	24.5	927	248	679	774	585	-7,251	774	585	-435	0	168	168	0
57.5	21.4	600	161	439	2,322	1,755	-7,251	2,322	1,755	-435	0	59	59	0
52.5	18.7	610	163	447	3,870	2,925	-7,251	3,870	2,925	-435	0	9	9	0
47.5	16.2	611	164	447	5,417	4,095	-7,251	5,417	4,095	-435	0	0	0	1,298
42.5	14.4	656	176	480	6,965	5,265	-7,251	6,965	5,265	-435	0	0	0	1,916
37.5	12.6	1,023	274	749	8,513	6,435	-7,251	8,513	6,435	-435	0	0	0	3,803
32.5	10.7	734	197	537	10,061	7,605	-7,251	10,061	7,605	-435	0	0	0	3,313
27.5	8.6	334	89	245	11,609	8,776	-7,251	11,609	8,776	-435	0	0	0	1,774
22.5	6.8	252	68	185	13,156	9,946	-7,251	13,156	9,946	-435	0	0	0	1,539
17.5	5.5	125	33	92	14,704	11,116	-7,251	14,704	11,116	-435	0	0	0	863
12.5	4.1	47	13	34	16,252	12,286	-7,251	16,252	12,286	-435	0	0	0	362
7.5	2.6	22	6	16	17,800	13,456	-7,251	17,800	13,456	-435	0	0	0	187
2.5	1.0	13	3	10	19,348	14,626	-7,251	19,348	14,626	-435	0	0	0	121
-2.5	0.0	0	0	0	20,895	15,796	-7,251	20,895	15,796	-435	0	0	0	0
-7.5	-1.5	0	0	0	22,443	16,966	-7,251	22,443	16,966	-435	0	0	0	0
TOTALS		8,760	2,346	6,414								2,362	2,362	15,175

Existing Building Ventilation & Infiltration (occ)	**217**	**cfm**
Overheat Ventilation Factor	**1.00**	
Additional ventilation to offset overheat	**0**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**217**	**cfm**
Economizer Ventilation (from AHU's)	**0**	**cfm**

Energy Use Indices (calculated)

	Base Case
Heating	15,175
Target ->	15,183
	100.0%

	Base Case
Cooling	2,362
Target ->	300
	787.4%

Heating Target

Equipment	kW	Heating hrs	% Runtime	Annual kWh	Comments
Elec Baseboard	12.0	5,954	15%	10,717	250 W/LF x 48'
Unit Heater	5.0	5,954	15%	4,466	
Total	17			15,183	

HEAT GAIN/LOSS WORKSHEET

Project Name:	New Jersey BPU - Energy Audits	**Project No.:**	CHA#20549		
Location	Borough of South Plainfield	**Site Elevation:**	60 Feet	**Specific Volume**	13.50 CF/#
Building Name	DPW Office and Maintenance Facility	**Date:**	10/09/09		
Engineer:	Andrew Grant				

Building/Facility Designation DPW Office Area

Outdoor Winter Design DB Temperature	14 *F	**Indoor Winter Design DB Temperature**	65 *F
Outdoor Summer Design DB Temperature	91 *F	**Indoor Summer Design DB Temperature**	74 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 ##	**Indoor Air (70*F) Humidity Ratio**	0.0078 ##

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)		R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
	Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
	4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
x	Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	14.2	5
	4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
	4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
	Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
	Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
	Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
	4" Block, 1" insulation, 8" Block	19.9	16
	Other		

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

Windows (Select One)		U Value
	Aluminum Frame, 1/8" SP Glazing	1.05
	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
x	Vinyl Frame, 1/4" DP Glazing	0.60

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

BUILDING CHARACTERISTICS

Roof Area	2,060 SF		
Occupied Area	2,060 SF	**Return Plenum?**	No

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	25 Ft	12.0 Ft	10.0 Ft	0 SF	21 SF	279 SF
East Exposure	0 Ft	0.0 Ft	10.0 Ft	0 SF	0 SF	0 SF
South Exposure	44 Ft	12.0 Ft	10.0 Ft	36 SF	0 SF	492 SF
West Exposure	39 Ft	12.0 Ft	10.0 Ft	16 SF	0 SF	452 SF

Forced Ventilation 0 cfm

HEAT GAIN/LOSS WORKSHEET

Project Name:	New Jersey BPU - Energy Audits	**Project No.:**	CHA#20549		
Location	Borough of South Plainfield	**Site Elevation:**	60 Feet	**Specific Volume**	13.50 CF/#
Building Name	DPW Office and Maintenance Facility	**Date:**	10/09/09		
Engineer:	Andrew Grant				

Building/Facility Designation DPW Office Area

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF		Shade Coef	Cooling Load Factor		Solar Heat Gain	
North Exposure	0	38	btu/h/sf	0.8	0.75	Glass Type C	0	Btu/hr
East Exposure	0	216	btu/h/sf	0.8	0.31	Glass Type C	0	Btu/hr
South Exposure	36	109	btu/h/sf	0.8	0.58	Glass Type C	1,821	Btu/hr
West Exposure	16	216	btu/h/sf	0.8	0.29	Glass Type C	802	Btu/hr
								2,623 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain	
North Exposure	229	0.07	20 *F	1.0	323	Btu/hr
East Exposure	0	0.07	39 *F	1.0	0	Btu/hr
South Exposure	404	0.07	27 *F	1.0	768	Btu/hr
West Exposure	374	0.07	22 *F	1.0	579	Btu/hr
Roof	2,060	0.04	73 *F	1.0	6,015	Btu/hr
Fenestration	52	0.60	17 *F		530	Btu/hr
Doors	21	0.14	27 *F		79	Btu/hr
Ceiling	2,060	0.14	0 *F		0	Btu/hr
Partition	720	0.37	0 *F		0	Btu/hr
Floor	2,060	0.04	0 *F		0	Btu/hr
						8,295 Btu/h

INTERNAL HEAT GAINS

									Room Heat Gain	
Lights	1.00	w/sf x	2,060	Occ Area =	2.1	kW x 3.4x	1.0	RAF =	7,031	Btu/h
Plug Load	0.50	w/sf x	2,060	Occ Area =	1.0	kW x 3.4x	1.0	RAF =	3,515	Btu/h
People	4	people x	255	btu/person x	60%	time in space =			612	Btu/h
Computer Work Stations			4	Units x	120	W/Unit x	3414 =		1,638	Btu/h
Equipment	0.5	kW x 3.413 =							1,707	Btu/h
Misc.									0	Btu/h
										14,503 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor		Perimeter Ratio		Coef	Temp. Diff.	Room Heat Gain	
Walls	1,007 SF	0.16	CFM/SF			1.08	17 *F	3,202	Btu/h
Doors	21 SF	0.25	CFM/LF	0.95	LF/SF	1.08	17 *F	99	Btu/h
Windows	52 SF	0.25	CFM/LF	1.23	LF/SF	1.08	17 *F	318	Btu/h
Ventilation	0 cfm					1.08	17 *F	0	Btu/h
									3,619 Btu/h

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE 4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain	
North Exposure	50	0.07	20	1.0	70	Btu/hr
East Exposure	0	0.07	39	1.0	0	Btu/hr
South Exposure	88	0.07	27	1.0	167	Btu/hr
West Exposure	78	0.07	22	1.0	121	Btu/hr
Roof	2,060	0.04	73	0.0	0	Btu/hr
						359 Btu/h

INTERNAL HEAT GAINS

Lights	1.00	w/sf x	2,060	Occ Area =	2.1	kW x3413x	0.00	RAF =	0	Btu/h
Misc.									0	Btu/h
										0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT	
Solar	2,623
Conduction to Room	8,295
Conduction to Plenum	359
Ventilaton and Infiltration	3,619
Sub Total	14,895

SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Internal Gains to Room	14,503
Internal Gains to Plenum	0
Sub Total	14,503

HEAT GAIN/LOSS WORKSHEET

Project Name:	New Jersey BPU - Energy Audits	**Project No.:**	CHA#20549		
Location	Borough of South Plainfield	**Site Elevation:**	60 Feet	**Specific Volume**	13.50 CF/#
Building Name	DPW Office and Maintenance Facility	**Date:**	10/09/09		
Engineer:	Andrew Grant				

Building/Facility Designation DPW Office Area

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	2,276 SF	0.16 CFM/SF	4,800	0.0043 #/#	7,591 Btu/h
Doors	21 SF	0.25 CFM/LF	4,800	0.0043 #/#	104 Btu/h
Windows	52 SF	0.25 CFM/LF	4,800	0.0043 #/#	334 Btu/h
Ventilation	0 cfm		4,800	0.0043 #/#	0 Btu/h
People	4 people	0.60 time in space		250 Btu/hr/person	600 Btu/h
					8,629 Btu/h

Cooling Load Summary

	Sensible	Latent	Total		
Temperature Dependent Gains	14,895	8,629	23,524		
Temperature Indep. Gains	14,503		14,503	SHR=	0.77
Total	29,398	8,629	38,027		

Building Cooling Load 3.2 Tons at 650 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is 2,236 CFM / 1.09 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	279	0.07	51	1,002 Btu/h
East Exposure	0	0.07	51	0 Btu/h
South Exposure	492	0.07	51	1,767 Btu/h
West Exposure	452	0.07	51	1,623 Btu/h
Fenestration	52	0.60	51	1,591 Btu/h
Roof	2,060	0.04	51	4,202 Btu/h
Doors	21	0.14	51	150 Btu/h
Ceiling	2,060	0.14	0	0 Btu/h
Partition	720	0.37	5	1,332 Btu/h
Floor	2,060	0.04	50	4,120 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	1,223 SF	0.16 CFM/SF	1.08	51	196 cfm	10,801 Btu/h
Doors	21 SF	0.25 CFM/LF	1.08	51	5 cfm	276 Btu/h
Windows	52 SF	0.25 CFM/LF	1.08	51	16 cfm	883 Btu/h
Ventilation Load	0 cfm		1.08	51	0 cfm	0 Btu/h
Total Ventilation & Infiltration Load					217 cfm	11,960 Btu/h

Building Heating Load 27,747 btu/h

13.5 btu/sf

Borough of South Plainfield
CHA #20549
Building: Department of Public Works
Office Area

Doors

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

LF/SF
0.95

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	25.0	12.0	1	300.0	74.0		All wall quantities must remain equal to 1
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	25.0			300.0	74.0	12.0	Average height wall automatically linked
East				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	0.0			0.0	0.0	0.0	Average height wall automatically linked
South	44.0	12.0	1	528.0	112.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	44.0			528.0	112.0	12.0	Average height wall automatically linked
West	18.0	12.0	1	216.0	60.0		
	21.0	12.0	1	252.0	66.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	39.0			468.0	126.0	12.0	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
East				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
South	3.0	4.0	3	36.0	42.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	36.0	42.0	
West	3.0	4.0	1	12.0	14.0	
	2.0	2.0	1	4.0	8.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	16.0	22.0	
			Total	**52.0**	**64.0**	LF/SF 1.23

Borough of South Plainfield
CHA #20549
Building: Department of Public Works
Heated Maintenance and Garage Area Only

Building Footprint	7,300	SF	Ex Occupied Clng Temp.	74	°F	Ex Occupied Htg Temp.	62 °F (Average Temp between areas)
Heating Efficiency	80%		Ex Unoccupied Clng Temp.	74	°F	Ex Unoccupied Htg Temp.	62 °F
Cooling Efficiency	1.38	kW/ton	Occupied Cooling UA	(7,268)	btu/hr/°F	Occupied Heating UA	3,098 btu/hr/°F
Internal Gains	21,294	btu/h	Unoccupied Cooling UA	(7,268)	btu/hr/°F	Unoccupied Heating UA	3,098 btu/hr/°F
Unoc Internal Gain factor	0.03		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb		
Ave Occ Internal Gain Factor	0.7		Cooling Unocc Enthalpy Setpoint	27.5	Btu/lb		
Economizer available (Y/N)	No						

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

					EXISTING LOADS							
					Occupied			Unoccupied				
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh
A		B	C	D	E	F	G	H	I	J	K	L
102.5	49.1	0	0	0	-207,143	-315,416	-14,906	-207,143	-180,238	-639	0	0
97.5	42.5	3	1	2	-170,802	-219,039	-14,906	-170,802	-125,165	-639	0	112
92.5	39.5	34	9	25	-134,461	-175,231	-14,906	-134,461	-100,132	-639	0	1,013
87.5	36.6	131	35	96	-98,121	-132,884	-14,906	-98,121	-75,934	-639	0	2,919
82.5	34.0	500	134	366	-61,780	-94,917	-14,906	-61,780	-54,238	-639	0	7,554
77.5	31.6	620	166	454	-25,439	-59,871	-14,906	-25,439	-34,212	-639	0	5,061
72.5	29.2	664	178	486	0	0	-14,906	0	0	-639	0	341
67.5	27.0	854	229	625	0	0	-14,906	0	0	-639	0	438
62.5	24.5	927	248	679	0	0	-14,906	0	0	-639	0	475
57.5	21.4	600	161	439	13,939	15,771	-14,906	13,939	9,012	-639	0	0
52.5	18.7	610	163	447	29,426	33,294	-14,906	29,426	19,025	-639	0	0
47.5	16.2	611	164	447	44,914	50,817	-14,906	44,914	29,038	-639	0	0
42.5	14.4	656	176	480	60,401	68,340	-14,906	60,401	39,052	-639	0	0
37.5	12.6	1,023	274	749	75,889	85,863	-14,906	75,889	49,065	-639	0	0
32.5	10.7	734	197	537	91,377	103,386	-14,906	91,377	59,078	-639	0	0
27.5	8.6	334	89	245	106,864	120,910	-14,906	106,864	69,091	-639	0	0
22.5	6.8	252	68	185	122,352	138,433	-14,906	122,352	79,104	-639	0	0
17.5	5.5	125	33	92	137,839	155,956	-14,906	137,839	89,118	-639	0	0
12.5	4.1	47	13	34	153,327	173,479	-14,906	153,327	99,131	-639	0	0
7.5	2.6	22	6	16	168,814	191,002	-14,906	168,814	109,144	-639	0	0
2.5	1.0	13	3	10	184,302	208,525	-14,906	184,302	119,157	-639	0	0
-2.5	0.0	0	0	0	199,789	226,048	-14,906	199,789	129,171	-639	0	0
-7.5	-1.5	0	0	0	215,277	243,572	-14,906	215,277	139,184	-639	0	0
TOTALS		8,760	2,346	6,414								17,914

Existing Building Ventilation & Infiltration (occ)	**1,854**	**cfm**
Overheat Ventilation Factor	**1.75**	
Additional ventilation to offset overheat	**1,391**	**cfm**
Existing Building Ventilation & Infiltration (unocc)	**1,854**	**cfm**
Economizer Ventilation (from AHU's)	**0**	**cfm**

Accounts for frequent opening of garage doors.

Energy Use Indices (calculated)

	Base Case
Heating	7,162
Target ->	7,120
	100.6%

	Base Case
Cooling	17,914
Target ->	300
	5971.3%

HEAT GAIN/LOSS WORKSHEET

Project Name:	New Jersey BPU - Energy Audits	**Project No.:**	CHA#20549		
Location	Borough of South Plainfield	**Site Elevation:**	60 Feet	**Specific Volume**	13.50 CF/#
Building Name	DPW Office and Maintenance Facility	**Date:**	10/09/09		
Engineer:	Andrew Grant/CAA				

Building/Facility Designation DPW Garage Area

Outdoor Winter Design DB Temperature	14 *F	**Indoor Winter Design DB Temperature**	62 *F (Average Temp)
Outdoor Summer Design DB Temperature	91 *F	**Indoor Summer Design DB Temperature**	74 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 ##	**Indoor Air (70*F) Humidity Ratio**	0.0078 ##

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

		R Value	Wall Type
	Steel Siding, 4" Insulation, Steel Siding	15.2	1
	Plaster or Gypsum, frame construction, 5" Insulation, 1" stucco	18.2	1
	4" WH CMU, 1" Insulation, Finished Exterior	5.2	2
	Plaster or Gypsum, frame construction, 3" Insulation, 8" LW CMU	7.8	5
	4" Face Brick, 2" Concrete, 1" Insulation, Exterior Finish	5.1	12
	4" Face Brick, 4" Concrete, 1" Insulation, Exterior Finish	4.0	11
	Interior Finish, 2" Insulation, 8" CMU, 4" Face Brick	10.9	16
	Finished Surface, 8" LW CMU (filled), Air Space, 4" Face Brick	11.1	16
	Stucco or Gypsum, 2.5" Insul, Face Brick	14.3	10
	4" Block, 1" insulation, 8" Block	19.9	16
x	8" CMU Block	2.7	

Roofs (Select One)

		R Value	Roof Type
	Tectum Deck, 3.3" Insul., BU Roof	13.0	1
	Steel Deck, 5" Insul., BU Roof	18.2	1
	Attic Roof with 6" Insul.	25.0	4
	4" HW Concrete Deck, BU Roof	2.7	2
	Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
	Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
	Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
	Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
	Wood Deck, 6" insulation, Felt & Membrane	18.0	
x	Steel Deck, 1-1/2" foam board Insul., membrane	7.20	

Windows (Select One)

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

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

BUILDING CHARACTERISTICS

Roof Area	7,300 SF		
Occupied Area	7,300 SF	**Return Plenum?**	no

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	57 Ft	20.0 Ft	20.0 Ft	0 SF	21 SF	1,119 SF
East Exposure	116 Ft	20.0 Ft	20.0 Ft	0 SF	946 SF	1,374 SF
South Exposure	40 Ft	20.0 Ft	20.0 Ft	0 SF	0 SF	800 SF
West Exposure	76 Ft	20.0 Ft	20.0 Ft	0 SF	599 SF	921 SF

Forced Ventilation 0 cfm

HEAT GAIN/LOSS WORKSHEET

Project Name:	New Jersey BPU - Energy Audits	**Project No.:**	CHA#20549		
Location	Borough of South Plainfield	**Site Elevation:**	60 Feet	**Specific Volume**	13.50 CF/#
Building Name	DPW Office and Maintenance Facility	**Date:**	10/09/09		
Engineer:	Andrew Grant/CAA				

Building/Facility Designation DPW Garage Area

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

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

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain	
North Exposure	1,119	0.37	20 *F	1.0	8,289 Btu/hr	
East Exposure	1,374	0.37	39 *F	1.0	19,847 Btu/hr	
South Exposure	800	0.37	27 *F	1.0	8,000 Btu/hr	
West Exposure	921	0.37	22 *F	1.0	7,504 Btu/hr	
Roof	7,300	0.14	73 *F	1.0	74,014 Btu/hr	
Fenestration	0	0.00	17 *F		0 Btu/hr	
Doors	1,566	0.14	27 *F		5,905 Btu/hr	
Ceiling	7,300	0.14	0 *F		0 Btu/hr	
Partition		0.05	0 *F		0 Btu/hr	
Floor	7,300	0.04	0 *F		0 Btu/hr	
						123,559 Btu/h

INTERNAL HEAT GAINS

								Room Heat Gain	
Lights	0.50 w/sf x	7,300 Occ Area =	3.7 kW x 3.4x	1.0 RAF =	12,457 Btu/hr	
Plug Load	0.05 w/sf x	7,300 Occ Area =	0.4 kW x 3.4x	1.0 RAF =	1,246 Btu/hr	
People	5 people x	255 btu/person x	60% time in space =		765 Btu/h	
Computer Work Stations		0 Units x	120 W/Unit x	3414 =	0 Btu/h	
Equipment	2.0 kW x 3.413 =				6,826 Btu/h	
Misc.					0 Btu/h	
						21,294 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain	
Walls	4,214 SF	0.35 CFM/SF		1.08	17 *F	29,307 Btu/h	
Doors	1,566 SF	0.70 CFM/LF	0.35 LF/SF	1.08	17 *F	7,539 Btu/h	
Windows	0 SF	0.00 CFM/LF	0.00 LF/SF	1.08	17 *F	0 Btu/h	
Ventilation	0 cfm			1.08	17 *F	0 Btu/h	
							36,846 Btu/h

COOLING HEAT GAINS TO THE RA PLENUM - SENSIBLE 4,950

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain	
North Exposure	0	0.37	20	1.0	0 Btu/hr	
East Exposure	0	0.37	39	1.0	0 Btu/hr	
South Exposure	0	0.37	27	1.0	0 Btu/hr	
West Exposure	0	0.37	22	1.0	0 Btu/hr	
Roof	7,300	0.14	73	0.0	0 Btu/hr	
						0 Btu/h

INTERNAL HEAT GAINS

Lights	0.50 w/sf x	7,300 Occ Area =	3.7 kW x3413x	0.00 RAF =	0 Btu/h	
Misc.					0 Btu/h	
						0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT		SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Solar	0	Internal Gains to Room	21,294
Conduction to Room	123,559	Internal Gains to Plenum	0
Conduction to Plenum	0		
Ventilaton and Infiltration	36,846		
Sub Total	160,405	Sub Total	21,294

HEAT GAIN/LOSS WORKSHEET

Project Name:	New Jersey BPU - Energy Audits	**Project No.:**	CHA#20549		
Location	Borough of South Plainfield	**Site Elevation:**	60 Feet	**Specific Volume**	13.50 CF/#
Building Name	DPW Office and Maintenance Facility	**Date:**	10/09/09		
Engineer:	Andrew Grant/CAA				

Building/Facility Designation DPW Garage Area

LATENT COOLING LOADS

Infiltration

			Infiltration Factor		Air Density	Humidity Ratio Dif.		Room Heat Gain	
Walls	7,300	SF	0.35	CFM/SF	4,800	0.0043	#/#	53,261	Btu/h
Doors	1,566	SF	0.70	CFM/LF	4,800	0.0043	#/#	7,909	Btu/h
Windows	0	SF	0.00	CFM/LF	4,800	0.0043	#/#	0	Btu/h
Ventilation	0	cfm			4,800	0.0043	#/#	0	Btu/h
People	5	people	0.60	time in space		250	Btu/hr/person	750	Btu/h
									61,920 Btu/h

Cooling Load Summary

	Sensible	Latent	Total		
Temperature Dependent Gains	160,405	61,920	222,325		
Temperature Indep. Gains	21,294	0	21,294	SHR=	0.75
Total	181,699	61,920	243,619		

Building Cooling Load 20.3 Tons at 360 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is 13,991 CFM

1.92 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain	
North Exposure	1,119	0.37	48	19,893	Btu/h
East Exposure	1,374	0.37	48	24,427	Btu/h
South Exposure	800	0.37	48	14,222	Btu/h
West Exposure	921	0.37	48	16,373	Btu/h
Fenestration	0	0.00	48	0	Btu/h
Roof	7,300	0.14	48	48,667	Btu/h
Doors	1,566	0.14	48	10,498	Btu/h
Ceiling	7,300	0.14	0	0	Btu/h
Partition	0	0.05	0	0	Btu/h
Floor	7,300	0.04	50	14,600	Btu/h

Ventilation and Infiltration

			Infiltration Factor		Coef	Temp. Difference	Air Flow		Room Heat Gain	
Walls	4,214	SF	0.35	CFM/SF	1.08	48	1,475	cfm	76,619	Btu/h
Doors	1,566	SF	0.70	CFM/LF	1.08	48	379	cfm	19,709	Btu/h
Windows	0	SF	0.00	CFM/LF	1.08	48	0	cfm	0	Btu/h
Ventilation Load	0	cfm			1.08	48	0	cfm		0 Btu/h
Total Ventilation & Infiltration Load							1,854	cfm	96,329	Btu/h

Building Heating Load 245,009 btu/h

33.6 btu/sf

Borough of S. Plainfield
CHA #20549
Building: Department of Public Works
Heated Garage and Maintenance Area

Doors

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet
North	3.0	7.0	1	21.0	20.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	21.0	20.0
East	12.0	14.0	2	336.0	104.0
	12.0	12.0	2	288.0	96.0
	10.0	14.0	2	280.0	96.0
	3.0	7.0	2	42.0	40.0
				0.0	0.0
			Sub-total	946.0	336.0
South				0.0	0.0
				0.0	0.0
				0.0	0.0
				0.0	0.0
			Sub-total	0.0	0.0
West	3.0	7.0	1	21.0	20.0
	12.0	12.0	1	144.0	48.0
	12.0	14.0	1	168.0	52.0
	19.0	14.0	1	266.0	66.0
			Sub-total	599.0	186.0
			Total	**1566.0**	**542.0**

LF/SF
0.35

Walls

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet		
North	57.0	20.0	1	1140.0	154.0		All wall quantities must remain equal to 1
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	57.0			1140.0	154.0	20.0	Average height wall automatically linked
East	116.0	20.0	1	2320.0	272.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	116.0			2320.0	272.0	20.0	Average height wall automatically linked
South	40.0	20.0	1	800.0	120.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	40.0			800.0	120.0	20.0	Average height wall automatically linked
West	76.0	20.0	1	1520.0	192.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0		
				0.0	0.0	Ave. height	
	76.0			1520.0	192.0	20.0	Average height auto linked to block load sheet

Windows

	Width (ft)	Height (ft)	Quantity	Area (SF)	Lineal Feet	
North				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
East				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
South				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
West				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
				0.0	0.0	
			Sub-total	0.0	0.0	
			Total	**0.0**	**0.0**	LF/SF 0.00

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-3 **Night Setback**

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Programmable thermostat	3	EA	$ 100	$ 150	$ -	$ 294	$ 545	$ -	$ 839	
Miscellaneous Electrical	1	LS		$ 200		$ -	$ 242	$ -	$ 242	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 1,081	Subtotal
$ 54.03	5% Contingency
$ 56.73	Contractor 5% O&P
$ -	0% Engineering
$ 1,191	**Total**

APPENDIX E

ECM-4 Replace Window AC Units – Office

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-4 **Replace Window AC Unit - Office**
Istall ductless mini-split units with a common, remote outdoor condensing unit.

ASSUMPTIONS			Comments
Electric Cost	$0.160	/ kWh	
Average run hours per Week	60	Hours	Unit is manually turned on (even if after hours) and sometimes left on over night
Space Temperature Setpoint	74	deg F	setpoint
Avg. BTU / Hr Rating of existing AC unit	10,000	Btu / Hr	(typical size for cooling office spaces in this type of building)
Average EER	8.5	Btu / W hr	One unit 9.4 EER. Two units 8.0 EER

Item	Value	Units	Comments
Total Number of Units	3		
Existing Annual Electric Usage	1,008	kWh	
Proposed EER	14.4		New ductless mini-splits (per manufacturer)
Proposed Annual Electric Usage	595	kWh	Unit will cycle on w/ temp of room. Possible operating time shown below

ANNUAL SAVINGS		
Annual Savings	413	kWh
Annual Cost Savings	$66	

OAT - DB Bin Temp F	Annual Hours	Cooling Hrs at Temp Above balance point	Assumed % of time of operation	Assumed hrs of Operation
102.5	0	0	100%	0
97.5	3	1	91%	1
92.5	34	12	82%	10
87.5	131	47	74%	34
82.5	500	179	65%	116
77.5	620	221	56%	124
72.5	664	0	0%	0
67.5	854	0	0%	0
62.5	927	0	0%	0
57.5	600	0	0%	0
52.5	610	0	0%	0
47.5	611	0	0%	0
42.5	656	0	0%	0
37.5	1,023	0	0%	0
32.5	734	0	0%	0
27.5	334	0	0%	0
22.5	252	0	0%	0
17.5	125	0	0%	0
12.5	47	0	0%	0
7.5	22	0	0%	0
2.5	13	0	0%	0
-2.5	0	0	0%	0
-7.5	0	0	0%	0

Total	8,760	460	62%	286

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-4 **Replace Window AC Unit - Office**

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Window AC Unit Removal	3	LS		$ 50		$ -	$ 182	$ -	$ 182	
Wall patching	3	LS		$ 200		$ -	$ 726	$ -	$ 726	
Condenser & Install	1	LS		$ 5,180		$ -	$ 6,268	$ -	$ 6,268	
Indoor Wall Unit & Install	3	LS		$ 1,310		$ -	$ 4,755	$ -	$ 4,755	Includes mounting bracket
Unit Controllers & Install	3	LS		$ 285		$ -	$ 1,035	$ -	$ 1,035	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

Pricing based on the use of Mitsubishi Mr. Slim products.

$ 12,965	Subtotal
$ 648	5% Contingency
$ 1,297	10% Contractor O&P
$ -	0% Engineering
$ 14,910	**Total**

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIV	Cost W/ INCENTIVE
					$ -	$ -
Unitary Split System < 5.4 tons	3	Tons	$92	$276	$ 12,058	$ 11,782
					$ -	$ -
				$276	$12,058	$11,782

Total ECM Cost w/ Incentives	**$14,634**

APPENDIX F

ECM-5 Install Door Seals

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-5 **Install door seals**

Existing: Lack of door seals result in excessive heat loss and infiltration
Proposed: Install door seals and/or weather-stripping to reduce air infiltration

Heating System Efficiency	80%		Ex Occupied Clng Temp.	74	*F	Ex Occupied Htg Temp.	62 *F
Cooling System Efficiency	kW/ton		Ex Unoccupied Clng Temp.	74	*F	Ex Unoccupied Htg Temp.	62 *F
			Prop Occupied Clng Temp.	74	*F	Prop Occupied Htg Temp.	62 *F
Linear Feet of Door Edge	356		Prop Unoccupied Clng Temp.	74	*F	Prop Unoccupied Htg Temp.	62 *F
Existing Infiltration Factor	0.70	cfm/LF	Cooling Occ Enthalpy Setpoint	27.5	Btu/lb	Electricity	$ 0.16 $/kWh
Proposed Infiltration Factor	0.3	cfm/LF	Cooling Unocc Enthalpy Setpoint		Btu/lb	Natural Gas	$ 1.29 $/therm

					EXISTING LOADS		PROPOSED LOADS		COOLING ENERGY		HEATING ENERGY	
					Occupied	Unoccupied	Occupied	Unoccupied				
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Door Infiltration Load BTUH	Door Infiltration Load BTUH	Door Infiltration Load BTUH	Door Infiltration Load BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L
102.5	49.1	0	0	0	-24,222	-24,222	-10,381	-10,381	0	0	0	0
97.5	42.5	3	2	1	-16,821	-16,821	-7,209	-7,209	0	0	0	0
92.5	39.5	34	17	17	-13,457	-13,457	-5,767	-5,767	0	0	0	0
87.5	36.6	131	66	65	-10,205	-10,205	-4,373	-4,373	0	0	0	0
82.5	34.0	500	252	248	-7,289	-7,289	-3,124	-3,124	0	0	0	0
77.5	31.6	620	313	307	-4,598	-4,598	-1,970	-1,970	0	0	0	0
72.5	29.2	664	335	329	0	0	0	0	0	0	0	0
67.5	27.0	854	431	423	0	0	0	0	0	0	0	0
62.5	24.5	927	468	459	0	0	0	0	0	0	0	0
57.5	21.4	600	303	297	1,211	1,211	519	519	0	0	9	4
52.5	18.7	610	308	302	2,557	2,557	1,096	1,096	0	0	19	8
47.5	16.2	611	308	303	3,902	3,902	1,672	1,672	0	0	30	13
42.5	14.4	656	331	325	5,248	5,248	2,249	2,249	0	0	43	18
37.5	12.6	1,023	516	507	6,594	6,594	2,826	2,826	0	0	84	36
32.5	10.7	734	370	364	7,940	7,940	3,403	3,403	0	0	73	31
27.5	8.6	334	169	165	9,285	9,285	3,979	3,979	0	0	39	17
22.5	6.8	252	127	125	10,631	10,631	4,556	4,556	0	0	33	14
17.5	5.5	125	63	62	11,977	11,977	5,133	5,133	0	0	19	8
12.5	4.1	47	24	23	13,322	13,322	5,710	5,710	0	0	8	3
7.5	2.6	22	11	11	14,668	14,668	6,286	6,286	0	0	4	2
2.5	1.0	13	7	6	16,014	16,014	6,863	6,863	0	0	3	1
-2.5	0.0	0	0	0	17,359	17,359	7,440	7,440	0	0	0	0
-7.5	-1.5	0	0	0	18,705	18,705	8,016	8,016	0	0	0	0
TOTALS		**8,760**	**4,420**	**4,340**					**0**	**0**	**364**	**156**

Existing Door Infiltration	**249**	**cfm**
Existing Unoccupied Door Infiltration	**249**	**cfm**
Proposed Door Infiltration	**107**	**cfm**
Proposed Unoccupied Door Infiltration	**107**	**cfm**

Savings	**208**	**therms**	**$**	**269**
	0	**kWh**	**$**	**-**
			$	**269**

All doors identified are in the heated garage area. 3 man doors and 6 overhead doors on East wall.

Door	Width (ft)	Height (ft)	Linear Feet (LF)	gap (in)	gap location	LF of gap	% door w/ gap	Average gap for door (in)
1	12	14	52	0.5	bottom	12	23%	0.115
2	12	14	52	0.5	bottom	12	23%	0.115
3	12	12	48	0.5	bottom	12	25%	0.125
4	12	12	48	0.5	bottom	12	25%	0.125
5	10	14	48	0.5	bottom	10	21%	0.104
6	10	14	48	0.5	bottom	10	21%	0.104
7	3	7	20	0.125	all sides	20	100%	0.125
8	3	7	20	0.125	all sides	20	100%	0.125
9	3	7	20	0.125	all sides	20	100%	0.125
Total	**77**	**101**	**356**	**0.375**		**128**	**36%**	**0.118**

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-5 **Install door seals**

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
									$ -	
Door Seals (3'x7')	3	EA	$ 35	$ 50	$ -	$ 103	$ 182	$ -	$ 284	
Garage Door Bottom Seals	68	LF	$ 1.25	$ 2.50	$ -	$ 83	$ 206	$ -	$ 289	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 573	Subtotal
$ 86	15% Contingency
$ 66	10% Contractor O&P
$ -	0% Engineering
$ 725	**Total**

APPENDIX G

ECM-6 Replace Domestic Hot Water Heater

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-6 **Replace Domestic Hot Water Heater**

Summary

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

Item	Value	Units	Formula/Comments
Occupied days per week	5	days/wk	
Water supply Temperature	50	°F	Termperature of water coming into building
Hot Water Temperature	120	°F	
Hot Water Usage per day	27	gal/day	Calculated from usage below
Annual Hot Water Energy Demand	4,122	MBTU/yr	Energy required to heat annual quantity of hot water to setpoint
Existing Tank Size	40	Gallons	Per manufacturer nameplate
Hot Water Temperature	120	°F	Per building personnel
Average Room Temperature	68	°F	
Standby Losses (% by Volume)	1.5%	Adjusted for insulation	(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.3	MBH	
Annual Standby Hot Water Load	2,278	MBTU/yr	
Total Annual Hot Water Demand (w/ standby losses)	6,399	Mbtu/yr	Building demand plus standby losses
Existing Water Heater Efficiency	98%		Per Manufacturer
Total Annual Energy Required	6,530	Mbtu/yr	
Total Annual Electric Required	**1,913**	**kWh/yr**	**Electrical Savings**
Average Annual Electric Demand	0.22	kW	
Peak Electric Demand	**4.50**	**kW**	**Per Manufacturer's Nameplate (Demand Savings)**
New Tank Size	0	Gallons	tankless
Hot Water Temperature	120	°F	
Average Room Temperature	68	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.0	MBH	
Annual Standby Hot Water Load	0	MBTU/yr	
Prop Annual Hot Water Demand (w/ standby losses)	4,122	MBTU/yr	
Proposed Avg. Hot water heater efficiency	92%		Based on Navien CR180 instantaneous, condensing DHW Heater
Proposed Total Annual Energy Required	4,495	MBTU/yr	
Proposed Fuel Use	45	Therms/yr	Standby Losses and inefficient DHW heater eliminated
Elec Utility Demand Unit Cost	$10.08	$/kW	
Elec Utility Supply Unit Cost	$0.12	$/kWh	
NG Utility Unit Cost	$1.29	$/Therm	
Existing Operating Cost of DHW	$779	$/yr	
Proposed Operating Cost of DHW	$58	$/yr	
Annual Utility Cost Savings	**$721**	**$/yr**	

Daily Hot Water Demand

FIXTURE	*BASE WATER USE GPM	DURATION OF USE (MIN)	#USES PER DAY MALE	#USES PER DAY FEMALE	FULL TIME OCCUPANTS** MALE	FULL TIME OCCUPANTS** FEMALE	TOTAL GAL/DAY	% HOT WATER	TOTAL HW GAL/DAY
LAVATORY (Low-Flow Lavs use 0.5 GI	2.5	0.25	3	3	14	1	28	50%	14
SHOWER	2.5	5	1	1	0	0	0	75%	0
KITCHEN SINK / UTILITY SINK	2.5	0.5	1	1	14	0	18	75%	13
MOP SINK	2.5	2	1	1	0	0	0	75%	0
Dishwasher (ga	10	1	1	0	0	0	0	100%	0
						TOTAL	46		27

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

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-6 **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	
						$ -	$ -	$ -	$ -	
Tankless condensing DHW Heater	1	EA	$ 1,175	$ 280		$ 1,152	$ 339	$ -	$ 1,490	Navien CR180
Miscellaneous Electrical	1	LS	$ 300			$ 294	$ -	$ -	$ 294	
Venting Kit	1	EA	$ 400	$ 500		$ 392	$ 605	$ -	$ 997	
Water Piping and Valves	1	LS	$ 100	$ 200		$ 98	$ 242	$ -	$ 340	
Gas Piping and Valves	1	LS	$ 300	$ 500		$ 294	$ 605	$ -	$ 899	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 4,081	Subtotal	
$ 612	15%	Contingency
$ 469	10%	Contractor O&P
$ -	0%	Engineering
$ 5,162	**Total**	

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

Total ECM Cost w/ Incentives	**$5,112**

APPENDIX H

ECM-7 Lighting Replacements

Energy Audit of South Plainfield Facilities

CHA Project No. 20549 - Department of Public Works

ECM-7 Lighting Replacements

Cost of Electricity: **$0.123 $/kWh supply**
$0.160 $/kWh blended
$10.08 $/kW

		EXISTING CONDITIONS									
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"L 2T w
18	Secretaries Office	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2600	874	3	T
55	Secretaries Office	2	2T 17 R F 4 (ELE)	F24ILL-R	55	0.1	SW	2600	286	2	2T
55	Secretaries Office	2	2T 17 R F 4 (ELE)	F24ILL-R	55	0.1	SW	2600	286	2	2T
5	Superintendant's Office	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	156	1	2T
6	Superintendant's Office	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	749	2	T
6	Superintendant's Office	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	749	2	T
6	Superintendant's Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	2600	374	1	T
55	Foreman's Office	6	2T 17 R F 4 (ELE)	F24ILL-R	55	0.3	SW	2600	858	6	2T
194	Foreman's Office	1	W 34 C F 2 (MAG)	F42EE	72	0.1	SW	2600	187	1	W
30	Foreman's Office	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	2600	590	1	T
71	Foreman's Bathroom and Closet	2	I 60	I60/1	60	0.1	SW	2600	312	2	CF
6	Employee Entrance	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	8760	1,261	1	T
30	Employee Entrance	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	8760	1,989	1	T
30	Supply Room	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
115	Main Entrance	2	W 20 C F 4	F22SS	56	0.1	SW	8760	981	2	W
30	Garage 1	9	1 B 96 C F 2 (MAG)	F82EHS	227	2.0	SW	1000	2,043	9	T
51	Garage 1	1	W 34 F 4 (MAG) 1'x8'	F44EE	144	0.1	SW	1000	144	1	W
30	Garage 2	4	1 B 96 C F 2 (MAG)	F82EHS	227	0.9	SW	1000	908	4	T
30	Garage 2	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Garage 3	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Garage 3	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Garage 3	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	1000	227	1	T
30	Garage 4	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Garage 5	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Break Room	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	2000	908	2	T
30	Sign Room	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Loft Storage Area	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	1000	227	1	T
	Total	**59**				**9.7**			**17,287**	**59**	

APPENDIX I

ECM-8 Install Occupancy Sensors

Energy Audit of South Plainfield Facilities

CHA Project No. 20549 - Department of Public Works

ECM-8 Install Occupancy Sensors

Cost of Electricity: **$0.123 $/kWh supply**
$0.160 $/kWh blended
$10.08 $/kW

		EXISTING CONDITIONS									
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated annual hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"L 2T w
18	Secretaries Office	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2600	873.6	3	T 3
55	Secretaries Office	2	2T 17 R F 4 (ELE)	F24ILL-R	55	0.1	SW	2600	286.0	2	2T
55	Secretaries Office	2	2T 17 R F 4 (ELE)	F24ILL-R	55	0.1	SW	2600	286.0	2	2T
5	Superintendant's Office	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	156.0	1	2T
6	Superintendant's Office	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	748.8	2	T 3
6	Superintendant's Office	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	748.8	2	T 3
6	Superintendant's Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	2600	374.4	1	T 3
55	Foreman's Office	6	2T 17 R F 4 (ELE)	F24ILL-R	55	0.3	SW	2600	858.0	6	2T
194	Foreman's Office	1	W 34 C F 2 (MAG)	F42EE	72	0.1	SW	2600	187.2	1	W
30	Foreman's Office	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	2600	590.2	1	1 B
71	Foreman's Bathroom and Closet	2	I 60	I60/1	60	0.1	SW	2600	312.0	2	I 6
6	Employee Entrance	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	8760	1,261.4	1	T 3
30	Employee Entrance	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	8760	1,988.5	1	1 B
30	Supply Room	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454.0	2	1 B
115	Main Entrance	2	W 20 C F 4	F22SS	56	0.1	SW	8760	981.1	2	W
30	Garage 1	9	1 B 96 C F 2 (MAG)	F82EHS	227	2.0	SW	1000	2,043.0	9	1 B
51	Garage 1	1	W 34 F 4 (MAG) 1'x8'	F44EE	144	0.1	SW	1000	144.0	1	W
30	Garage 2	4	1 B 96 C F 2 (MAG)	F82EHS	227	0.9	SW	1000	908.0	4	1 B
30	Garage 2	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454.0	2	1 B
30	Garage 3	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454.0	2	1 B
30	Garage 3	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454.0	2	1 B
30	Garage 3	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	1000	227.0	1	1 B
30	Garage 4	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454.0	2	1 B
30	Garage 5	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454.0	2	1 B
30	Break Room	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	2000	908.0	2	1 B
30	Sign Room	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454.0	2	1 B
30	Loft Storage Area	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	1000	227.0	1	1 B
	Total	**59**				**9.7**			**17,287**	**59**	

APPENDIX J

ECM-9 Combined Lighting Replacements With Occupancy Sensors

Energy Audit of South Plainfield Facilities

CHA Project No. 20549 - Department of Public Works

ECM-9 Lighting Replacements with Occupancy Sensors

Cost of Electricity: **$0.123 $/kWh supply**
$0.160 $/kWh blended
$10.08 $/kW

		EXISTING CONDITIONS									
	Area Description	**No. of Fixtures**	**Standard Fixture Code**	**NYSERDA Fixture Code**	**Watts per Fixture**	**kW/Space**	**Exist Control**	**Annual Hours**	**Annual kWh**	**Number of Fixtures**	
Field Code	Unique description of the location - Room number/Room name: Floor number (if applicable)	No. of fixtures before the retrofit	"Lighting Fixture Code" Example 2T 40 R F(U) = 2'x2' Troff 40 w Recess. Floor 2 lamps U shape	Code from Table of Standard Fixture Wattages	Value from Table of Standard Fixture Wattages	(Watts/Fixt) * (Fixt No.)	Pre-inst. control device	Estimated daily hours for the usage group	(kW/space) * (Annual Hours)	No. of fixtures after the retrofit	"L 2T w
18	Secretaries Office	3	T 32 R F 4 (ELE)	F44ILL	112	0.3	SW	2600	874	3	T
55	Secretaries Office	2	2T 17 R F 4 (ELE)	F24ILL-R	55	0.1	SW	2600	286	2	2T
55	Secretaries Office	2	2T 17 R F 4 (ELE)	F24ILL-R	55	0.1	SW	2600	286	2	2T
5	Superintendant's Office	1	2T 32 R F 2 (u) (ELE)	FU2LL	60	0.1	SW	2600	156	1	2T
6	Superintendant's Office	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	749	2	T
6	Superintendant's Office	2	T 34 R F 4 (MAG)	F44EE	144	0.3	SW	2600	749	2	T
6	Superintendant's Office	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	2600	374	1	T
55	Foreman's Office	6	2T 17 R F 4 (ELE)	F24ILL-R	55	0.3	SW	2600	858	6	2T
194	Foreman's Office	1	W 34 C F 2 (MAG)	F42EE	72	0.1	SW	2600	187	1	W
30	Foreman's Office	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	2600	590	1	T
71	Foreman's Bathroom and Closet	2	I 60	I60/1	60	0.1	SW	2600	312	2	CF
6	Employee Entrance	1	T 34 R F 4 (MAG)	F44EE	144	0.1	SW	8760	1,261	1	T
30	Employee Entrance	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	8760	1,989	1	T
30	Supply Room	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
115	Main Entrance	2	W 20 C F 4	F22SS	56	0.1	SW	8760	981	2	W
30	Garage 1	9	1 B 96 C F 2 (MAG)	F82EHS	227	2.0	SW	1000	2,043	9	T
51	Garage 1	1	W 34 F 4 (MAG) 1'x8'	F44EE	144	0.1	SW	1000	144	1	W
30	Garage 2	4	1 B 96 C F 2 (MAG)	F82EHS	227	0.9	SW	1000	908	4	T
30	Garage 2	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Garage 3	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Garage 3	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Garage 3	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	1000	227	1	T
30	Garage 4	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Garage 5	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Break Room	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	2000	908	2	T
30	Sign Room	2	1 B 96 C F 2 (MAG)	F82EHS	227	0.5	SW	1000	454	2	T
30	Loft Storage Area	1	1 B 96 C F 2 (MAG)	F82EHS	227	0.2	SW	1000	227	1	T
	Total	**59**				**9.7**			**17,287**	**59**	

APPENDIX K

ECM-10 Install Gas-Fired Heating Equipment – Office

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-10 **Install Gas-Fired Heating Equipment - Office**

Building Footprint	1,030	SF	Ex Occupied Clng Temp.	75	*F	Ex Occupied Htg Temp.	65 *F
Existing Heating Efficiency	100%		Ex Unoccupied Clng Temp.	75	*F	Ex Unoccupied Htg Temp.	58 *F
Proposed Heating Efficiency*	92%		Prop Occupied Clng Temp.	75	*F	Prop Occupied Htg Temp.	65 *F
Existing Cooling Efficiency	13	kW/ton	Prop Unoccupied Clng Temp.	75	*F	Prop Unoccupied Htg Temp.	58 *F
Building Balance Temp.	60	*F	Occupied Cooling UA	-66	btu/hr/*F	Occupied Heating UA	310 btu/hr/*F
Internal Gains	14,503	btu/h	Unoccupied Cooling UA	-50	btu/hr/*F	Unoccupied Heating UA	310 btu/hr/*F
Unoc Internal Gain factor	0.63		Cooling Occ Enthalpy Setpoint	27	Btu/lb	Proposed setback temperatures per ECM-3 used so savings is not counted twice.	
Ave Occ Internal Gain Factor	1.0				Btu/lb		

Utility Costs	
0.1596	$/kWh blended
1.291	$/Therm

Existing Heating Energy Use	12,060	kWh
Proposed Heating NG Use	447	therms
Proposed Heating Electric Use	971	kWh
Electric Use Savings	11,088	kWh
Annual Savings	$ 1,192	

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

					EXISTING LOADS						PROPOSED LOADS									
					Occupied			Unoccupied			Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy kWh	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L	M	N
102.5	49.1	0	0	0	-18,904	-21,061	-7,251	-14,507	-21,061	-435	-18,904	-21,061	-7,251	-14,507	-21,061	-435	0	0	0	0
97.5	42.5	3	1	2	-15,587	-14,626	-7,251	-11,962	-14,626	-435	-15,587	-14,626	-7,251	-11,962	-14,626	-435	10	10	0	0
92.5	39.5	34	9	25	-12,271	-11,701	-7,251	-9,417	-11,701	-435	-12,271	-11,701	-7,251	-9,417	-11,701	-435	94	94	0	0
87.5	36.6	131	35	96	-8,955	-8,873	-7,251	-6,872	-8,873	-435	-8,955	-8,873	-7,251	-6,872	-8,873	-435	280	280	0	0
82.5	34	500	134	366	-5,638	-6,338	-7,251	-4,327	-6,338	-435	-5,638	-6,338	-7,251	-4,327	-6,338	-435	703	703	0	0
77.5	31.6	620	166	454	-2,322	-3,998	-7,251	-1,782	-3,998	-435	-2,322	-3,998	-7,251	-1,782	-3,998	-435	584	584	0	0
72.5	29.2	664	178	486	0	0	-7,251	0	0	-435	0	0	-7,251	0	0	-435	173	173	0	0
67.5	27	854	229	625	0	0	-7,251	0	0	-435	0	0	-7,251	0	0	-435	222	222	0	0
62.5	24.5	927	248	679	774	585	-7,251	0	0	-435	774	585	-7,251	0	0	-435	202	202	0	0
57.5	21.4	600	161	439	2,322	1,755	-7,251	155	117	-435	2,322	1,755	-7,251	155	117	-435	87	87	0	0
52.5	18.7	610	163	447	3,870	2,925	-7,251	1,703	1,287	-435	3,870	2,925	-7,251	1,703	1,287	-435	9	9	0	0
47.5	16.2	611	164	447	5,417	4,095	-7,251	3,250	2,457	-435	5,417	4,095	-7,251	3,250	2,457	-435	0	0	799	30
42.5	14.4	656	176	480	6,965	5,265	-7,251	4,798	3,627	-435	6,965	5,265	-7,251	4,798	3,627	-435	0	0	1,381	51
37.5	12.6	1,023	274	749	8,513	6,435	-7,251	6,346	4,797	-435	8,513	6,435	-7,251	6,346	4,797	-435	0	0	2,968	110
32.5	10.7	734	197	537	10,061	7,605	-7,251	7,894	5,967	-435	10,061	7,605	-7,251	7,894	5,967	-435	0	0	2,714	101
27.5	8.6	334	89	245	11,609	8,776	-7,251	9,442	7,137	-435	11,609	8,776	-7,251	9,442	7,137	-435	0	0	1,501	56
22.5	6.8	252	68	185	13,156	9,946	-7,251	10,989	8,308	-435	13,156	9,946	-7,251	10,989	8,308	-435	0	0	1,333	49
17.5	5.5	125	33	92	14,704	11,116	-7,251	12,537	9,478	-435	14,704	11,116	-7,251	12,537	9,478	-435	0	0	761	28
12.5	4.1	47	13	34	16,252	12,286	-7,251	14,085	10,648	-435	16,252	12,286	-7,251	14,085	10,648	-435	0	0	323	12
7.5	2.6	22	6	16	17,800	13,456	-7,251	15,633	11,818	-435	17,800	13,456	-7,251	15,633	11,818	-435	0	0	169	6
2.5	1	13	3	10	19,348	14,626	-7,251	17,181	12,988	-435	19,348	14,626	-7,251	17,181	12,988	-435	0	0	110	4
-2.5	0	0	0	0	20,895	15,796	-7,251	18,728	14,158	-435	20,895	15,796	-7,251	18,728	14,158	-435	0	0	0	0
-7.5	-1.5	0	0	0	22,443	16,966	-7,251	20,276	15,328	-435	22,443	16,966	-7,251	20,276	15,328	-435	0	0	0	0
TOTALS		8,760	2,346	6,414													2,968	2,968	12,060	447

Existing Building Ventilation & Infiltration (occ)	217	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	217	cfm

Proposed Electric Load*

Unit	Heating Hrs	Amps	Volts	Phase	Power Factor	% Runtime	Annual kWh
Furnace	5,027	8.4	115	1	0.8	25%	971

*Proposed equipment information per Trane TUX Condensing Furnace

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

ECM-10 Install Gas-Fired Heating Equipment - Office

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Remove Electric Heating Unit	7	EA		$ 32.50	$ -	$ -	$ 275	$ -	$ 275	
Patchwork and painting	1	LS	$ 500	$ 500		$ 490	$ 605	$ -	$ 1,095	
Horizontal Condensing Furnace	1	EA	$ 1,500	$ 500		$ 1,470	$ 605	$ -	$ 2,075	Includes Controls
Project Conditions	1	LS		$ 1,000						Install unit above ceiling
Venting Kit	1	EA	$ 400	$ 250						
Insulated Supply / Return Ductwork	500	LB	$ 0.84	$ 3.68		$ 412	$ 2,226	$ -	$ 2,638	
Diffusers and Grilles	6	EA	$ 61	$ 21.50		$ 359	$ 156	$ -	$ 515	
Miscellaneous Electrical	1	LS		$ 500		$ -	$ 605	$ -	$ 605	
Gas Piping and valves	1	LS	$ 500	$ 500		$ 490	$ 605	$ -	$ 1,095	
						$ -	$ -	$ -	$ -	

$ 8,298	Subtotal
$ 829.80	10% Contingency
$ 912.78	Contractor 10% O&P
$ -	0% Engineering
$ 10,041	**Total**

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIV
Gas-Fired Furnace ≥ 92% Efficient	1	EA	$400	$400	$ 2,075	$ 1,675
				$400	$2,075	$1,675

Total ECM Cost w/ Incentives	**$9,641**

APPENDIX L

New Jersey Pay For Performance Incentive Program

Borough of South Plainfield
CHA #20549
Building: Department of Public Works

New Jersey Pay For Performance Incentive Program

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

	Annual Utilities	
	kWh	Therms
Existing Usage (from utility)	73,670	7,120
Proposed Savings	24,260	3,440
Existing Total MMBtus	963	
Proposed Savings MMBtus	427	
% Reduction	44.3%	
Proposed Annual Savings	$9,100	

	≥ %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	$5,337	$7,568	$12,905
Incentive #3	$3,396	$4,816	$8,212
Totals	**$8,734**	**$12,384**	**$21,118**

Total Project Cost	$73,900
% Incentives of Project Cost*	28.6%
Project Cost w/ Incentives*	$52,782

Project Payback (years)	
w/o Incentives	w/ Incentives
8.1	5.8

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

APPENDIX M

Photovoltaic (PV) Rooftop Solar Power Generation

PVWatts * * * AC Energy & Cost Savings

Cautions for Interpreting the Results

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	20.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	15.4 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	16.0 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	3.36	1656	264.30
2	4.05	1788	285.36
3	4.58	2169	346.17
4	4.84	2119	338.19
5	5.30	2335	372.67
6	5.33	2202	351.44
7	5.27	2224	354.95
8	5.25	2201	351.28
9	5.06	2135	340.75
10	4.46	2011	320.96
11	3.15	1435	229.03
12	2.87	1384	220.89
Year	4.46	23660	3776.14

Output Hourly Performance Data

About the Hourly Performance Data

*

Output Results as Text

Saving Text from a Browser

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

Please send questions and comments regarding PVWATTS to Webmaster

Disclaimer and copyright notice

Cautions for Interpreting the Results

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

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

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

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

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

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

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

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

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

Township of South Plainfield
Department of Public Works Building

Cost of Electricity $0.160 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-20kW System

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	New Jersey Renewable * Energy Incentive	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$200,000	**0.0**	**23,660**	**0**	**$3,800**	**0**	**$3,800**	**$20,000**	**$11,500**	**52.6**	**11.8**

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

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

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

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

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

APPENDIX N

Solar Thermal Domestic Hot Water Plant

Interactive Energy Calculators

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

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

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

Solar Water Heating Calculator

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

Water Heater Characteristics			
Physical		**Thermal**	
? Diameter (feet)	1.5	? Water Inlet Temperature (Degrees F)	55
? Capacity (gallons)	40	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	17.79	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	27
Energy Use			
600.4		? Heat Delivered in Hot Water (BTU/hr)	
0		? Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		**Electric**
0.92	? Overall Efficiency	0.98
0.92	? Conversion Efficiency	0.98
652.6 BTU/hr	? Power Into Water Heater	612.7 BTU/hr
Cost		
$ 1.291 /Therm	? Utility Rates	$ 0.1596 /kWh
$ 73.8035	? Yearly Water Heating Cost	$ 250.880
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
524.558 years for gas	? Payback Time for Solar System	154.313 years for electric

NJBPU Energy Audits
CHA #20549
Building: South Plainfield Department of Public Works Building

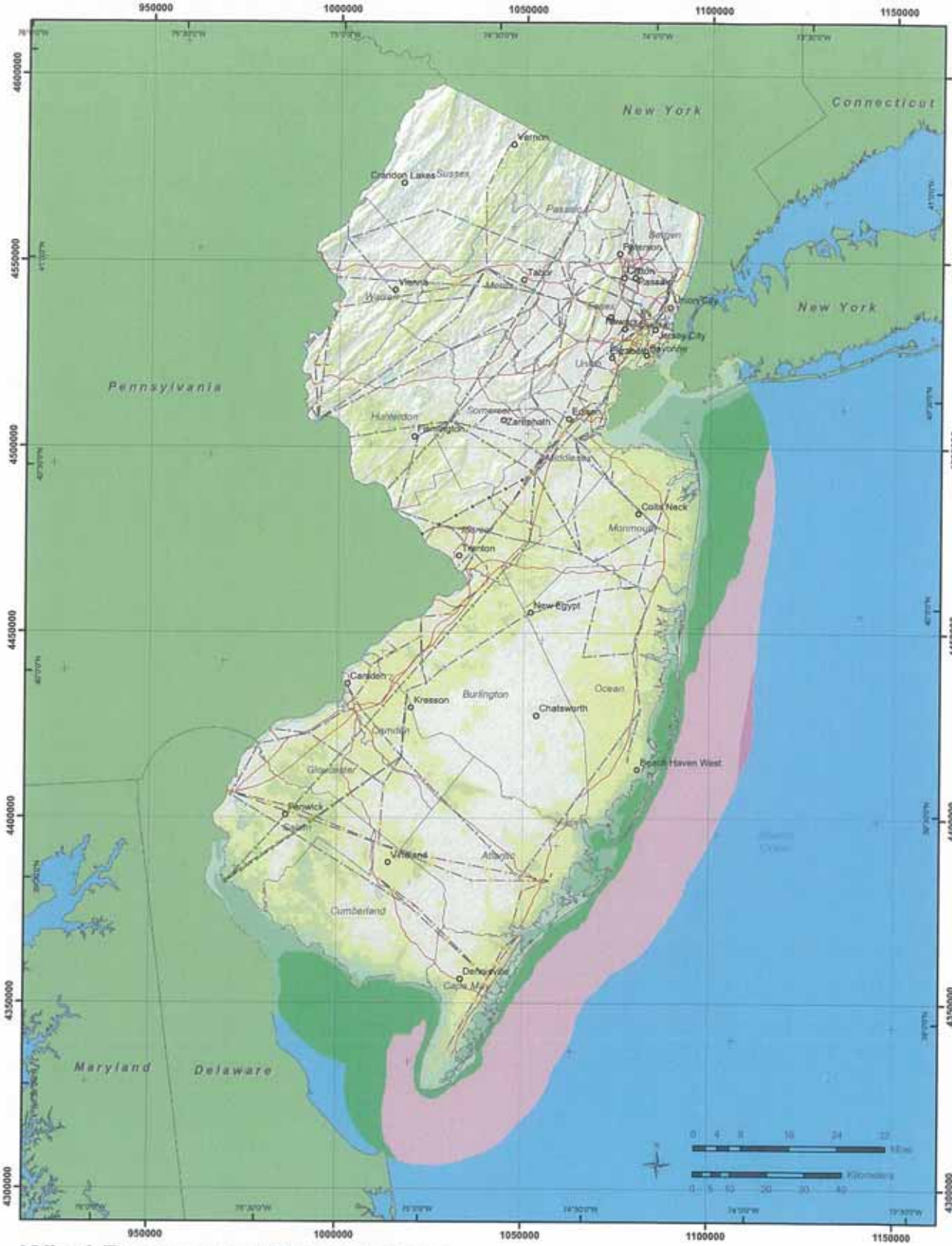
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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

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

APPENDIX O

Wind



Wind Resource of New Jersey

Mean Annual Wind Speed at 30 Meters

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

Generalized Transmission Line

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

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

AWS Truewind

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

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

Map of South Plainfield Public Works (908) 755-2187

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 P

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
DPW Offices/Garages

Building ID: 1926644
For 12-month Period Ending: June 30, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: February 09, 2010

Facility
DPW Offices/Garages
405 Spicer Avenue
South Plainfield, NJ 07080

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: 1960
Gross Floor Area (ft²): 11,480

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	253,643
Natural Gas (kBtu)[4]	710,653
Total Energy (kBtu)	964,296

Energy Intensity[5]

Site (kBtu/ft²/yr)	84
Source (kBtu/ft²/yr)	139

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	76

Electric Distribution Utility
Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI	77
National Average Source EUI	150
% Difference from National Average Source EUI	-8%
Building Type	Service (Vehicle Repair/Service, Postal Service)

Stamp of Certifying Professional

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

Certifying Professional
N/A

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

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

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

ENERGY STAR® Data Checklist for Commercial Buildings

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

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

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Building Name	DPW Offices/Garages	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Service (Vehicle Repair/Service, Postal Service)	Is this an accurate description of the space in question?		☐
Location	405 Spicer Avenue, South Plainfield, NJ 07080	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 Area (Office)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	2,060 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?		☐
Garage Area (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑

Gross Floor Area	9,420 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	45Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	11(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 - DPW Ofice/Garage (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	06/16/2009	2,652.00
04/14/2009	05/12/2009	9,540.00
03/10/2009	04/13/2009	7,356.00
02/11/2009	03/09/2009	8,172.00
01/13/2009	02/10/2009	8,760.00
12/18/2008	01/12/2009	8,484.00
11/14/2008	12/17/2008	8,448.00
10/17/2008	11/14/2008	3,696.00
09/19/2008	10/16/2008	3,804.00
08/19/2008	09/18/2008	4,572.00
07/19/2008	08/18/2008	4,932.00
Electric Meter - DPW Ofice/Garage Consumption (kWh (thousand Watt-hours))		**70,416.00**
Electric Meter - DPW Ofice/Garage Consumption (kBtu (thousand Btu))		**240,259.39**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**240,259.39**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Gas Meter - DPW Office/Garages (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
05/13/2009	06/16/2009	127.00
04/14/2009	05/12/2009	768.00
03/10/2009	04/13/2009	1,001.00
02/11/2009	03/09/2009	1,297.00
01/12/2009	02/10/2009	1,322.00
12/18/2008	01/12/2009	1,279.00
11/15/2008	12/17/2008	853.00
10/17/2008	11/14/2008	295.00
09/19/2008	10/16/2008	38.00
08/19/2008	09/18/2008	46.00
07/19/2008	08/18/2008	34.00

Gas Meter - DPW Office/Garages Consumption (therms)	**7,060.00**
Gas Meter - DPW Office/Garages Consumption (kBtu (thousand Btu))	**706,000.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**706,000.00**
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
DPW Offices/Garages
405 Spicer Avenue
South Plainfield, NJ 07080

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

DPW Offices/Garages	
Gross Floor Area Excluding Parking: (ft²)	11,480
Year Built	1960
For 12-month Evaluation Period Ending Date:	June 30, 2009

Facility Space Use Summary

Office Area	
Space Type	Office
Gross Floor Area(ft²)	2,060
Weekly operating hours	45
Workers on Main Shift	4
Number of PCs	4
Percent Cooled	50% or more
Percent Heated	50% or more

Garage Area	
Space Type	Other - Service (Vehicle Repair/Service, Postal Service)
Gross Floor Area(ft²)	9,420
Number of PCs°	0
Weekly operating hours°	45
Workers on Main Shift°	11

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 06/30/2009)	**Baseline** (Ending Date 03/31/2009)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	84	82	47	N/A	77
Source (kBtu/ft²)	139	134	77	N/A	150
Energy Cost					
$/year	$ 5,287.21	$ 1,401.37	$ 2,937.55	N/A	$ 4,846.61
$/ft²/year	$ 0.46	$ 0.12	$ 0.26	N/A	$ 0.42
Greenhouse Gas Emissions					
$MtCO_2e$/year	76	74	42	N/A	70
$kgCO_2e$/ft²/year	7	6	4	N/A	6

More than 50% of your building is defined as Service (Vehicle Repair/Service, Postal Service). This building is currently ineligible for a rating. Please note the National Average column represents the CBECS national average data for Service (Vehicle Repair/Service, Postal Service). This building uses X% less energy per square foot than the CBECS national average for Service (Vehicle Repair/Service, Postal Service).

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

APPENDIX Q

Equipment Inventory

South Plainfield BPU Energy Audit Program

Borough of South Plainfield, NJ

CHA#20549

Department of Public Works Office and Garage

Item	Qty.	Manuf	Model No.	Serial No.	Capacity	Condition	Gas	MBH	Refrig.	Comments
Window Air Conditioning Units										
1	1	LG	Unknown	Unknown	18,000 Btuh	E		18		Break Room (new unit)
2	1	Unknown	Unknown	Unknown	10,000 Btuh	G		10		Office
3	1	Unknown	Unknown	Unknown	10,000 Btuh	P		10		Office
4	1	Unknown	Unknown	Unknown	10,000 Btuh	P		10		Foreman's Office
Room Air Conitioning Unit with Electric Heat										
4	1	Friedrich	Unknown	Unknown	10.1 MBh cool	G				Sign Room
					8.1 MBh heat					
Gas-Fired Unit Heater										
5	2	Modine	Unknown	Unknown	250,000 Btuh	G	X	250		Vehicle Maintenance Area
Gas-Fired Infrared Radiant Heater										
6	6	Dayton	Unknown	Unknown	60,000 Btuh	E	X	60		Vehicle Storage Area
Electric Unit Heater										
7	1	Dayton	2E670B	Unknown	5.0 kW	G				Foreman's Office
Wall Propeller Fan										
8	1	Unknown	Unknown	Unknown	2.0 HP	G				Vehicle Maintenance Area, HP estimated
Domestic Hot Water Heater (Electric)										
9	1	Bradford White	Unknown	Unknown	4.5 kW	E				Mezzanine Storage Area
					40 Gallon					

E = Excellent
G = Good
P = Poor