FAIR HAVEN
POLICE DEPARTMENT

ENERGY ASSESSMENT

for

NEW JERSEY
BOARD OF PUBLIC UTILITIES

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1.0 INTRODUCTION

This report summarizes the energy audit for the Police Department in the Borough of Fair Haven. The facility, located at 35 Fisk Road, was constructed in 1969 and has 14 full time employees. Attached to the back of the building is the Borough's Youth Center, which is utilized for summer camp, polling station, and emergency relief center. The building is 4,000 square feet and is utilized between 8:00 AM and 4:00 PM daily; however, the building may be sporadically occupied at other times.

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 Police Department in the Borough of Fair Haven, New Jersey. The facility, constructed in 1969, is 4,000 square feet, and is open between 8:00 AM and 4:00 PM daily with 14 full time employees. In addition, attached at the back of the building is the Youth Center utilized for summer camp, polling station, and emergency relief center. The following areas were evaluated for energy conservation measures:

- Temperature setback
- Lighting upgrades
- Demand control ventilation
- Door seal replacement
- Window replacement

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Potential annual savings of $2,300 for the recommended ECMs may be realized with a payback of 3.0 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-4 Lighting Replacement with Occupancy Sensors

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
$	kW	kWh	Therms	kGals	$	$	$		$	Years	Years
7,500	2.6	8,700	0	0	1,500	0	1,500	1.6	800	5.0	4.5

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

ECM-6 Temperature Setback

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
$	kW	kWh	Therms	kGals	$	$	$		$	Years	Years
100	0	920	380	0	800	0	800	168	NA	0.1	NA

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

In addition, the following measure is recommended if it qualifies for funding through the Direct Install Program (see section 5.2.4). Under this program, incentives can be potentially awarded for up to 60% of a project's budgetary cost up to a maximum incentive of $50,000, when the work is performed by a participating Direct Install contractor.

- ECM-7 Install Demand Control Ventilation

3.0 EXISTING CONDITIONS

3.1 Building – General

The facility consists of two separate structures; a two-story building used as the Police Department, and an attached single story, pitched roof building known as the Youth Center. The center consist of a large all purpose room, kitchen, public restrooms, and some storage areas. It is utilized as a polling place, meeting room for various Borough committees and commissions, and a secondary emergency evacuation facility.

The entire facility is heated with natural gas; and ventilated and cooled by electricity, both using forced air circulation. Lighting consists of mainly fluorescent and some incandescent fixtures. The two buildings have separate controls for HVAC and lighting, and a single electric and gas account.

3.2 Utility Usage

Utility service for includes electricity from Jersey Central Power and Light (JCP&L) and natural gas from South Jersey Energy (SJE). The Police Department utilizes a separate meter for electricity and natural gas consumption.

From December 2008 through December 2009, electric usage was approximately 91,060 kWh at a cost of $15,400. Analyzing electricity bills during this period showed that the Police Department was charged at a blended rate of $0.169/kWh. Electricity consumption is generally higher during the summer months when air conditioning is required and summer camps are in session. Electricity consumption data and a graph of the previous year are provided in Appendix A.

From November 2008 through November 2009, natural gas consumption for the Police Department was approximately 1,730 therms at a cost of $2,900. Analyzing natural gas bills during this period showed that the Police Department was charged a blended rate of $1.65/therm. Natural gas consumption was generally higher during the winter heating months. Natural gas consumption data and a graph of the previous year are provided in Appendix A.

Electricity and natural gas commodity supply and delivery is presently provided by JCP&L and SJE, respectively. 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 B. According to the U.S. Energy Information Administration, the average commercial unit costs of electricity and natural gas in New Jersey during July 2010 was $0.152 per kWh and $1.09 per therm. Based on the fact that the building is currently paying above the state average for electricity and natural gas, it is recommended that a third party supplier be pursued for both utilities.

3.3 HVAC Systems

The Fair Haven Police Department is heated by a natural gas fired furnace located in the basement of the building. Cooling is provided by two split system condensing units. The furnace is a high efficiency condensing furnace. The furnace/air conditioning system is controlled by a central programmable thermostat located in the hallway area of the first floor.

The Youth Center is heated and cooled by an external York air handling unit. Heat is provided by a natural gas fired furnace internal to the unit.

3.4 Lighting / Electrical Systems

The lighting system consists of a combination of 2 x 4, T-12 fixtures, 2 x 2, T-8 fixtures and some medium wattage incandescent bulbs. Most of the lighting is manually controlled by wall switches. Outdoor lights are controlled by timers. The older exit signs are 24 W each. Additionally, there is a natural gas fired emergency generator used for the Dispatcher office, and emergency lighting.

3.5 Control Systems

There are two older control panels with timers and termination strips that hang on the wall of the mechanical room. The left panel has cut wire bundles, and appears to be out of service. The panel on the right appears inoperable. Although the panels are still in place, it appears they were replaced by the Maple Chase programmable thermostat.

The York heat pump that serves the main Police Department has a Maple Chase programmable thermostat in the main hallway.

The temperature for the building is set at 68°F in the winter and 72°F in the summer.

3.6 Plumbing Systems

The restrooms and locker room use standard toilets and faucets. The hot water heater is an A.O. Smith electric, 22 gallon unit that serves the restrooms and locker room.

An equipment inventory is provided in Appendix P.

4.0 ENERGY CONSERVATION MEASURES

4.1 ECM-1 Lighting Replacements

During the site visit, 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 offices, conference room, and hallways are lit with a combination of four lamp T-12 fixtures with magnetic ballasts and 2 x 2, U-tube T-8 fixtures with electronic ballast. The T-12 fixtures are inefficient by current standards. The dispatch room is lit with inefficient lighting that includes (6) 60 W incandescent flood lamps.

This measure addressed replacing the T-12 fixtures with high output T-8 fluorescent lamps and replacing the 60W incandescent flood lamps with 13W compact fluorescent flood lamps.

Energy savings for this measure were calculated by applying the existing and proposed fixture wattages to the estimated time of operation to determine annual electricity consumption. The difference resulted in an annual savings of about 5,410 kWh per year. Supporting calculations, including all assumptions for lighting hours and the annual energy usage for each fixture is provided in Appendix C.

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 81,150 kWh, totaling $13,500.

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

ECM-1 Lighting Replacements

Budgetary Cost	Annual Utility Savings						Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total							
$	kW	kWh	Therms	kGals	$		$	$		$	Years	Years
5,400	2.6	5,410	0	0	900		0	900	1.5	500	6.0	5.4

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

This measure is not recommended in lieu of ECM-4.

4.2 ECM-2 Occupancy Sensors for Interior Lighting

Most lighting fixtures throughout the building are manually switched on and off. The operation of the Police Department provides good opportunities for utilization of occupancy sensors.

As stated previously, a comprehensive lighting fixture survey was conducted during the site visit to identify approximate operating times and existing wattage consumption of each fixture. By reviewing the building occupancy schedule and typical traffic patterns for each space, the necessary operating time for the lighting in each space was established. The energy savings for installing occupancy sensors were calculated by applying the known fixture wattages in each space to the times of operation for each fixture. Taking the difference between the two values, the electric savings was found to be about 3,260 kWh. Supporting calculations, including cost estimates and all assumptions for existing and proposed lighting hours per each space, can be found in Appendix D.

Lighting controls have an expected life of 15 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 49,500 kWh and $9,000.

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

ECM-2 Occupancy Sensors for Interior Lighting

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
$	kW	kWh	Therms	kGals	$	$	$		$	Years	Years
2,300	0	3,300	0	0	600	0	600	2.6	300	3.8	3.3

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

This measure is not recommended in lieu of ECM-4.

4.3 ECM-3 Exit Sign Replacement

A building walkthrough noted three old style exit signs, which utilize two, 8 watt bulbs and have an overall consumption of 24 watts each, which are considered outdated and inefficient. Replacing the fixtures with new, energy efficient LED signs will reduce the electrical usage to approximately 1.7 watts/fixture.

The combined wattage of the existing exit signs were applied to the annual hours. The computation determined the annual electrical consumption for these signs to be about 630 kWh. Reapplying the calculation to the combined wattage for the proposed exit signs yielded an annual consumption of 45 kWh, resulting in a savings of approximately 585 kWh.

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 8,850 kWh and $1,500.

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

ECM-3 Exit Sign Replacement

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
$	kW	kWh	Therms	kGals	$	$	$		$	Years	Years
400	0.1	590	0	0	100	0	100	3.1	30	4.0	3.6

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

This measure is not recommended in lieu of ECM-4.

4.4 ECM-4 Cumulative Lighting Upgrades

This measure is a combination of ECMs 1, 2, and 3 to allow maximum energy and demand reduction. The values shown encompass all energy saving measures associated with the building lighting system.

ECM-4 Lighting Replacement with Occupancy Sensors

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
$	kW	kWh	Therms	kGals	$	$	$		$	Years	Years
7,500	2.6	8,700	0	0	1,500	0	1,500	1.6	800	5.0	4.5

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

This measure is recommended.

4.5 ECM-5 Replace Windows

All windows on the north, east, and west side of the building are original to construction. The windows are single pane with metal frames and do not offer much resistance to heat transfer.

To calculate the savings of replacing the windows, the existing window conditions were evaluated. The nine existing 3' x 3'-8" windows were estimated to have a thermal resistance of about U-1.05 and allow in 0.33 CFM per linear foot. The proposed energy efficient windows would have a U-Factor of 0.53 and an infiltration rate of 0.20 CFM per linear foot. The difference between the existing and proposed conditions yielded a savings of 110 therms and 30 kWh for a savings of approximately $200 per year.

Windows have an expected life of 25 years, according to the manufacturer, and total energy savings over the life of the project are estimated at 2,500 therms, 750 kWh, and $5,000.

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

ECM-5 Replace Windows

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
$	kW	kWh	Therms	kGals	$	$	$		$	Years	Years
3,600	0	30	100	0	200	0	200	0.28	NA	18.0	NA

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

This measure is not recommended.

4.6 ECM-6 Temperature Setback

The temperature is controlled from a programmable thermostat located in the hallway. This ECM assessed setting back the temperatures of the second floor office area, dispatch area, and first floor offices. The unoccupied cooling setpoint would be increased from 74°F to 80°F, and the unoccupied heating setpoint reduced from 68°F to 60°F.

To calculate the savings, a block load model was utilized. The temperature setpoints representing the existing conditions were changed to represent proposed conditions and energy savings was realized. By implementing temperature setback, the building could achieve a savings of about 380 therms and 920 kWh per year.

Programmable thermostats have an approximate life expectancy of 15 years according to ASHRAE. The savings over the life of the project would be about 5,700 therms, 13,800 kWh, and $12,000.

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

ECM-6 Temperature Setback

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
$	kW	kWh	Therms	kGals	$	$	$		$	Years	Years
100	0	920	380	0	800	0	800	168	NA	0.1	NA

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

This measure is recommended.

4.7 ECM-7 Install Demand Control Ventilation

One high efficiency furnace is used to meet the HVAC requirements for the building. The furnace draws fresh air in through an outside air (OA) intake and blends it with return air prior to being treated and discharged into the building. Since there are no controls on the fresh air intakes, the same amount of OA is treated regardless of the ventilation demand determined by occupancy. Therefore, the unit is constantly ventilating the area for maximum occupancy. Utilizing demand control ventilation (DCV) would regulate the amount of OA induced to each space based on the CO_2 levels detected within the return air duct. A DCV system is based on the principle that the number of people within the space is proportional to the concentration of CO_2. This ECM evaluated providing only the required fresh air to the building, which will decrease the amount of OA necessary to be treated and reduce the annual heating and cooling loads.

According to the 2006 International Mechanical Code, the building requires 15 CFM/person of OA. Therefore, based on the schedule for the building with 13 occupants, it was determined that the average required amount of OA within the space over a 24 hour period would be approximately 200 CFM. This assumes that personnel are on patrol off and on and that one officer would occupy the building after 4:00 PM. Calculating the energy required to condition the existing and proposed OA rate of 45 CFM for the space yielded a combined annual savings of 60 therms and 190 kWh.

Implementation of this measure requires installation of OA controls on the furnace serving the building, including installing CO_2 sensors within the return air duct and upgrades to the OA damper actuator. Additionally, a programmable logic controller will be necessary to control the OA damper position based on the CO_2 readings.

Electrical control devices have an approximate life expectancy of 15 years according to ASHRAE. The savings over the life of the project would be about 900 therms, 3,000 kWh, and $1,500.

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

ECM-7 Install Demand Control Ventilation

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
$	kW	kWh	Therms	kGals	$	$	$		$	Years	Years
4,100	0	190	60	0	100	0	100	(0.5)	NA	>25	NA

* There is no incentive available through the New Jersey Smart Start Program for this ECM. This measure is potentially eligible for Direct Install funding. See section 5.0 for other incentive opportunities.

This measure is potentially eligible for Direct Install funding. See section 5.0 for other incentive opportunities.

4.8 ECM-8 Replace Door Seals

The doors are original construction, and the door seals are worn, resulting in air infiltration.

This ECM calculated the savings of replacing door seals by evaluating the infiltration rate due to the worn door seals and the reduced infiltration from new door seals. The existing single and double doors were determined to have an infiltration rate 0.33 CFM per linear foot. The new proposed door seals would result in an infiltration rate of 0.20 CFM per linear foot. The difference between the existing and proposed conditions is the savings.

This measure was evaluated and the savings were less than $100; therefore, it is not recommended as part of the study. However, it is a low cost measure with an attractive payback, and implementation may be desired for occupant comfort. See Appendix J for calculations.

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 200 therms, 400 kWh, and $400.

5.0 PROJECT INCENTIVES

5.1 Incentives Overview

5.1.1 New Jersey Pay For Performance Program

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. However, the 200 kW/month average minimum has been waived for buildings owned by local governments or municipalities and non-profit organizations. Facilities that meet this criterion must also achieve a minimum performance target of 15% energy reduction by using the EPA Portfolio Manager benchmarking tool before and after implementation of the measure(s). If the participant is a municipal electric company customer, and a customer of a regulated gas New Jersey Utility, only gas measures will be eligible under the Program. American Recovery and Reinvestment Act (ARRA) funding, when available, may allow oil, propane and municipal electric customers to be eligible for the P4P Program. Available incentives are as follows:

Incentive #1: Energy Reduction Plan – This incentive is designed to offset the cost of services associated with the development of the Energy Reduction Plan (ERP). The standard incentive pays $0.10 per square foot, up to a maximum of $50,000, not to exceed 50% of facility annual energy cost, paid after approval of application. For building audits funded by the New Jersey Board of Public Utilities, which receive an initial 75% incentive toward performance of the energy audit, facilities are only eligible for an additional $0.05 per square foot, up to a maximum of $25,000, rather than the standard incentive noted above.

Incentive #2: Installation of Recommended Measures – This incentive is based on projected energy saving and designed to pay approximately 60% of the total performance-based incentive. Base incentives deliver $0.11/kWh and $1.10/therm not to exceed 30% of total project cost.

Incentive #3: Post-Construction Benchmarking Report – This incentive is paid after acceptance of a report proving energy savings over one year utilizing the Environmental Protection Agency (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.

5.1.2 New Jersey Smart Start Program

For this program, specific incentives for energy conservation measures are calculated on an individual basis utilizing the 2010 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 reduction, and savings will be applied towards the Pay for Performance incentive. A project is not applicable for both New Jersey incentive programs.

5.1.3 Energy Efficient and Conservation Block Grant

Following is a brief summary of the Energy Efficient and Conservation Block Grant (EECBG) program. The Energy Efficiency and Conservation Block Grant Complete Program Application Package should be consulted for rules and regulations.

Additional funding is available to local government entities through the EECBG, a part of New Jersey's Clean Energy program (NJCEP). The grant is for local government entities only, and can offset the cost of energy reduction implementation to a maximum of $20,000 per building.

This program is provided in conjunction with NJCEP funding and any utility incentive programs; the total amount of the three incentives combined cannot exceed 100% of project cost. Funds shall first be provided by NJCEP, followed by the EECBG and any utility incentives available to the customer. The total amount of the incentive shall be determined TRC Solutions, a third party technical consulting firm for the NJCEP.

In order to receive EECBG incentives, local governments must not have received a Direct Block Grant from the US Department of Energy. A list of the 512 qualifying municipalities and counties is provided on the NJCEP website. Qualifying municipalities must participate in at least one eligible Commercial & Industrial component of the NJCEP, utility incentive programs, or install building shell measures recommended by the Local Government Energy Audit Program. Eligible conservation programs through NJCEP include:

- Direct Install
- Pay for Performance
- NJ SmartStart Buildings for measures recommended by a Local Government Energy Audit (LGEA) or an equivalent audit completed within the last 12 months
- Applicants may propose to independently install building shell measures recommended by a LGEA or an equivalent audit. The audit must have been completed within the past 12 months.
- Any eligible utility energy efficiency incentive program

Most facilities owned or leased by an eligible local government within the State of New Jersey are eligible for this grant. Ineligible facilities include casinos or other gambling establishments, aquariums, zoos, golf courses, swimming pools, and any building owned or leased by the United States Federal Government. New construction is also ineligible.

5.1.4 ARRA Initiative "Energy Efficiency Programs through the Clean Energy Program"

The American Recovery and Reinvestment Act (ARRA) Initiative is available to New Jersey oil, propane, cooperative and municipal electric customers who do not pay the Societal Benefits Charge. This charge can be seen on any electric bill as the line item "SBC Charge." Applicants can participate in this program in conjunction with other New Jersey Clean Energy Program initiatives including Pay for Performance, Local Government Energy Audits, and Direct Install programs.

Funding for this program is dispersed on a first come, first serve basis until all funds are exhausted. The program does not limit the municipality to a minimum or maximum incentive, and the availability of funding cannot be determined prior to application. If the municipality meets all qualifications, the application must be submitted to TRC Energy Solutions for review. TRC will then determine the amount of the incentive based on projected energy savings of the project. It is important to note that all applications for this incentive must be submitted before implementation of energy conservation measures.

Additional information is available on New Jersey's Clean Energy Program website.

5.1.5 Direct Install Program

The Direct Install Program targets small and medium sized facilities where the peak electrical demand does not exceed 200 kW in any of the previous 12 months. Buildings must be located in New Jersey and served by one of the state's public, regulated electric or natural gas utility companies. On a case-by-case basis, the program manager may accept a project for a customer that is within 10% of the 200 kW peak demand threshold.

The 200 kW peak demand threshold has been waived for local government entities that receive and utilize their Energy Efficiency and Conservation Block Grant as discussed in section 5.1.3 in conjunction with Direct Install.

Direct Install is funded through New Jersey's Clean Energy Program and is designed to provide capital for building energy upgrade projects to fast track implementation. The program will pay up to 60% of the costs for lighting, HVAC, motors, natural gas, refrigeration, and other equipment upgrades with higher efficiency alternatives. If a building is eligible for this funding, the Direct Install Program can significantly reduce the implementation cost of energy conservation projects.

The program pays a maximum amount of $50,000 per building, and up to $250,000 per customer per year. Installations must be completed by a Direct Install participating contractor, a list of which can be found on the New Jersey Clean Energy Website at http://www.njcleanenergy.com. Contractors will coordinate with the applicant to arrange installation of recommended measures identified in a previous energy assessment, such as this document.

5.2 Building Incentives

5.2.1 New Jersey Pay For Performance Program

Under incentive #1 of the New Jersey Pay for Performance Program, the 4,000 square foot building is eligible for about $200 toward development of an Energy Reduction Plan. When calculating the total amount under Incentives #2 and #3, all energy conservation measures are applicable as the amount received is based on building wide energy improvements. Since the overall energy reduction for the building is estimated to exceed the 15% minimum, the building is eligible to receive monies based as discussed above in section 5.1.1. In total, incentives through the NJ P4P program are expected to total about $3,100, reducing the total project payback from 6.0 years to 4.8 years. See Appendix K for calculations.

5.2.2 New Jersey Smart Start Program

The Fair Haven Police Department building is eligible for several incentives available under New Jersey Smart Start Programs. The total amount of all qualified incentives is about $800 and includes installing upgrades to the lighting system.

5.2.3 Energy Efficient and Conservation Block Grant

The Fair Haven Police Department building is owned by local government which makes it eligible for this incentive. The incentive amount is determined by TRC Solutions and is not calculable at this time. Further information about this incentive, including the application, can be found at: http://www.njcleanenergy.com/commercial-industrial/programs/energy-efficiency-and-conservation-block-grants

5.2.4 Direct Install Program

The Fair Haven Police Department building will be eligible to receive funding from the Direct Install Program. This money will be in conjunction with the Energy Efficiency and Conservation Block Grant. The total implementation cost for all ECMs is about $16,200. This program would potentially pay 60%, or about $9,700 of these initial costs. This funding has the potential to significantly affect the payback periods of Energy Conservation Measures. For Borough Hall, the Direct Install Program brings the simple payback from about 6.0 years, to approximately 2.4 years.

In order to apply for this program the borough must contact the Direct Install contractor for Monmouth County, Hutchinson Mechanical Services. Contact information is available on the New Jersey Clean Energy Website.

Incentives cannot be obtained under multiple NJCEP 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 50s°F range throughout the year. This stable temperature provides a source for heat in the winter and a means to reject excess heat in the summer. With GHP systems, water is circulated between the building and the piping buried in the ground. The ground heat exchanger in a GHP system is made up of a closed or open loop pipe system. Most common is the closed loop in which high density polyethylene pipe is buried horizontally at 4-6 feet deep or vertically at 100 to 400 feet deep. These pipes are filled with an environmentally friendly antifreeze/water solution that acts as a heat exchanger. In the summer, the water picks up heat from the building and moves it to the ground. In the winter the system reverses and fluid picks up heat from the ground and moves it to the building. Heat pumps make collection and transfer of this heat to and from the building possible.

The building uses a gas-fired furnace and split air conditioning systems to meet its HVAC needs. None of which are not compatible with a geothermal energy source. Therefore, to take advantage of a GHP system, the existing mechanical equipment would have to be removed or overhauled; and either a low temperature closed loop water source heat pump system or a water to water heat pump system would have to be installed to realize the benefit of the consistent temperature of the ground.

This measure is not recommended due to the extent of HVAC system renovation needed for implementation. Additionally, the savings do not justify such an extensive renovation and the project would not payback within the useful life of the equipment.

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The Police Department was evaluated for the potential to install rooftop photovoltaic (PV) solar panels for power generation. Present technology incorporates the use of solar cell arrays that produce direct current (DC) electricity. This DC current is converted to alternating current (AC) with the use of an electrical device known as an inverter. The building's roof has sufficient room to install a solar cell array above the second floor offices and recreation annex but it would need to be angled south for maximum efficiency. A structural analysis would be required to determine if the roof framing could support a cell array.

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

The State of New Jersey incentives for non-residential PV applications is \$0.75/watt up to 30 kW of installed PV array. Projects up to 50 kW are eligible to apply. Federal tax credits are also available for renewable energy projects up to 30% of installation cost. Municipalities do not pay federal taxes and would not be able to utilize the federal tax credit incentive.

Installation of (PV) arrays in the state of 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 periods of 15 years from the date of installation. The cost of the ACP penalty for 2009 was $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 2010 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.

There was no kW usage data available for determining the size of the PV solar array, so a 10 kW was used for the calculations. Incentives for a 10 kW PV solar array were used in the payback calculation.

The system costs for PV installations were derived from the most recent Solar Center, of New Jersey, estimates of total cost of system installation. It should be noted that the cost of installation is approximately $6.33 per watt or $6,330 per kW of installed system. This has decreased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

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

Photovoltaic (PV) Rooftop Solar Power Generation – 10 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
63,300	0	11,830	0	2,000	2,000	7,500	5,800	31.7	7.2

*Incentive based on New Jersey Renewable Energy Program for non-residential applications of $0.75 per Watt of installed capacity
** Estimated Solar Renewable Energy Certificate Program (SREC) for 15 years at $487/1000 kWh

The Fair Haven Police Department has a very attractive roof for photovoltaics on the south side of the pitched roof and over the recreation building.

While the payback period is within the parameters for recommended measures, further investigation of possible installation locations, required system maintenance, and local installation costs are suggested prior to consideration for implementation.

6.2.2 Solar Thermal Hot Water Plant

Active solar thermal systems use solar collectors to gather the sun's energy to heat water, other fluids, 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, a heat storage vessel, piping, circulators, and controls. Systems are typically integrated to work alongside a conventional heating system that provides heat when solar resources are not sufficient. The solar collectors are usually placed on the roof of the building, oriented south, and tilted around the site's latitude, to maximize the amount of radiation collected on a yearly basis.

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

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

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

Solar Thermal Domestic Hot Water Plant

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive	Payback (without incentive)	Payback (with incentive)
	Electricity		Natural Gas	Total				
$	kW	kWh	Therms	$	$	$	Years	Years
27,100	0		50	80	80	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 are 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 Fair Haven Borough area, the map shown in the appendices indicates a mean annual wind speed of about 11.9 miles per hour. For the building, there are site restrictions, such as parking lots, trees and surrounding structures that would greatly affect a tower location.

A wind speed map is included in Appendix N.

If a site could be identified near the building with limited obstructions, a meteorological tower could be installed to gain a more accurate representation of wind speed for the area.

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, 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 building does not have an excessively large electricity demand, and it does not have a heating load to use the thermal byproduct in the summer. 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 due to the extent of HVAC system renovation needed for implementation. Additionally, the building's heating requirements do not justify such an extensive renovation and the project would not payback within the useful life of the equipment.

6.6 Demand Response Curtailment

Utility Curtailment is an agreement with the 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 incentives are offered 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 emergencies. Part of the program also will require that participants reduce their required load or run emergency generators with notice to test the system.

JCP&L does not currently have a Demand Response Curtailment, or load shedding program for its customers so this is not an option for the Police Dept. building.

7.0 EPA PORTFOLIO MANAGER

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

The Police Department building is considered a below average energy consumer per the Portfolio Manager with a Site Energy Usage Index (EUI) of 122 kBTU/ft^2/year. The EUI can be improved by addressing wasted energy from infiltration, poor control of the HVAC equipment and inefficient lighting systems. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 100 kBTU/ft^2/year; the national average for this building type is 157 kBTU/ft^2/year. The EPA Portfolio Manager did not generate an energy rating score for this building because the building type (Police Department) is not eligible for an energy star rating.

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

The user name and password for the building's EPA Portfolio Manager Account will be provided to the supervisor of the Borough of Fair Haven.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA at the Police Department in Fair Haven, New Jersey identified potential ECMs for temperature setback and lighting upgrades. Potential annual savings of $2,300 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

ECM-4 Lighting Replacement with Occupancy Sensors

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
$	kW	kWh	Therms	kGals	$	$	$		$	Years	Years
7,500	2.6	8,700	0	0	1,500	0	1,500	1.6	800	5.0	4.5

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

ECM-6 Temperature Setback

Budgetary Cost	Annual Utility Savings					Estimated Maintenance Savings	Total Savings	ROI	Potential Incentive*	Payback (without Incentive)	Payback (with Incentive)
	Electricity		Natural Gas	Water	Total						
$	kW	kWh	Therms	kGals	$	$	$		$	Years	Years
100	0	920	380	0	800	0	800	168	NA	0.1	NA

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

In addition, the following measure is recommended if it qualifies for funding through the Direct Install Program (see section 5.2.4). Under this program, incentives can be potentially awarded for up to 60% of a project's budgetary cost up to a maximum incentive of $50,000, when the work is performed by a participating Direct Install contractor.

- ECM-7 Install Demand Control Ventilation

APPENDIX A

Utility Usage Analysis

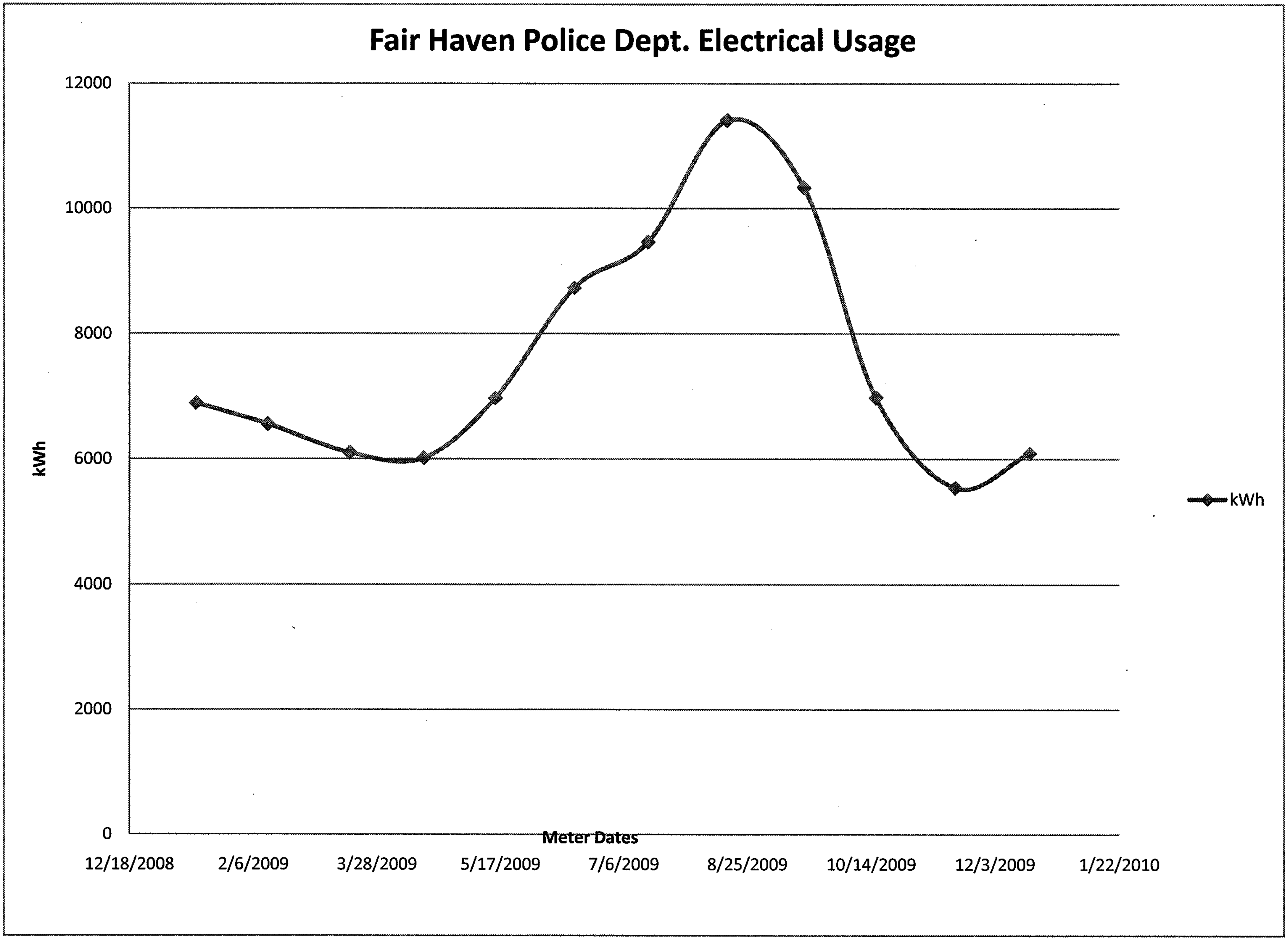
Fair Haven, NJ
CHA #21968
Building: Fair Haven - Police Department
Account # 10 00 13 3942 65
Meter: G17995173

Meter Date	Billing kWH	Charge
1/14/2008	6474	$998.42
2/13/2008	6471	$993.95
3/18/2008	7262	$1,083.16
4/14/2008	6823	$989.53
5/14/2008	7691	$1,099.00
6/13/2008	8051	$1,385.14
7/15/2008	9946	$1,784.87
8/14/2008	11360	$2,014.77
9/15/2008	10331	$1,825.74
10/15/2008	7112	$1,116.72
11/13/2008	7351	$1,135.59
12/15/2008	6493	$1,027.70
1/14/2009	6891	$1,118.14
2/12/2009	6553	$1,085.65
3/17/2009	6099	$997.93
4/16/2009	6014	$972.03
5/15/2009	6968	$1,112.61
6/16/2009	8727	$1,529.85
7/16/2009	9460	$1,684.54
8/17/2009	11406	$2,007.59
9/17/2009	10331	1825.74
10/16/2009	6976	$1,140.37
11/17/2009	5540	$907.95
12/17/2009	6091	$1,002.33

Total	186421	$30,839.32

Previous 12 Months	91056	$15,384.73

Cost per kWh	$0.17


Fair Haven Police Dept. Electrical Usage
12000
10000
8000
6000
4000
2000
0
kWh
12/18/2008
2/6/2009
3/28/2009
5/17/2009
7/6/2009
8/25/2009
10/14/2009
12/3/2009
1/22/2010
Meter Dates
kWh

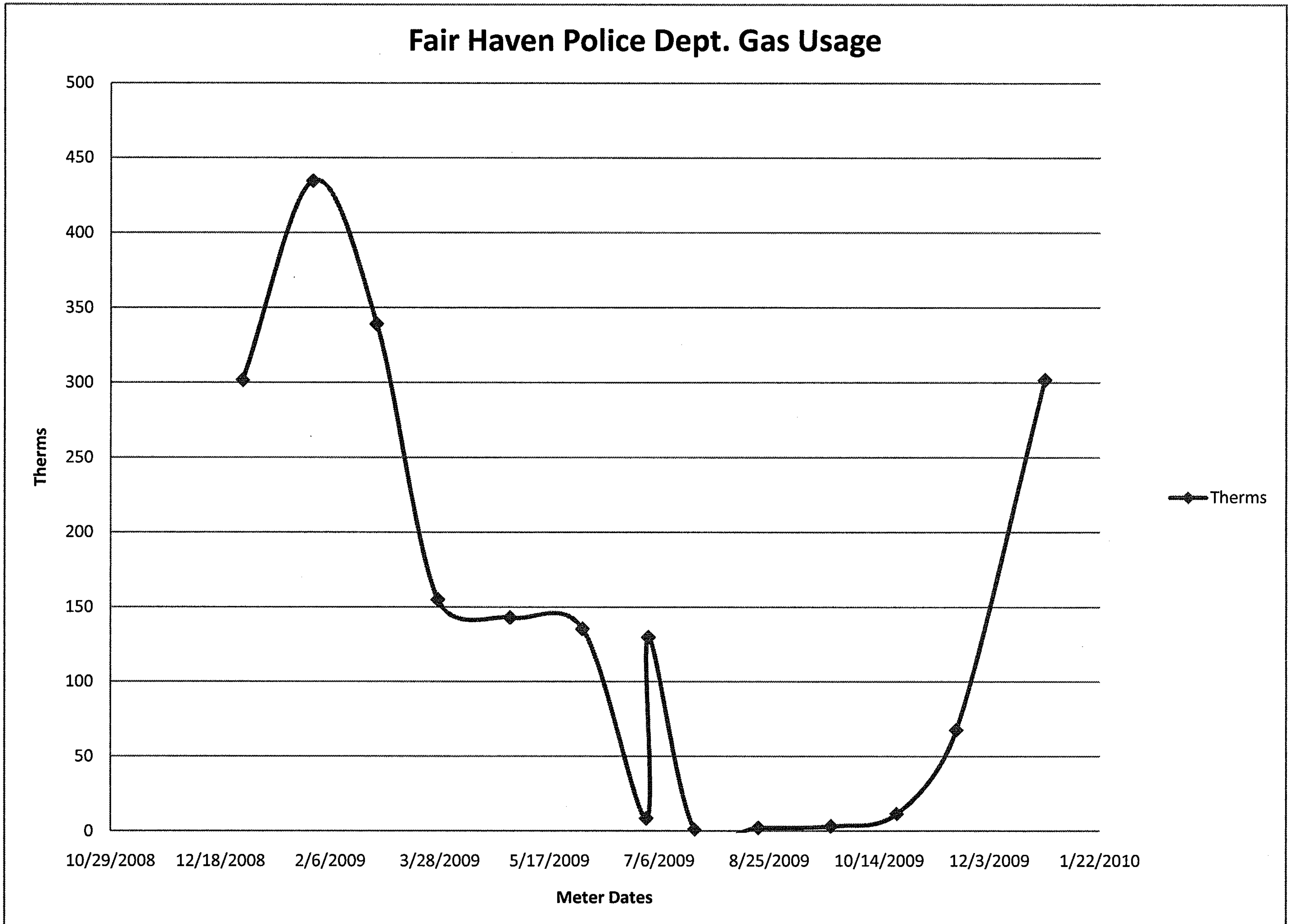
Fair Haven, NJ
CHA #21968
Fair Haven Police Department

Account Number 22-0007-0632-40
Meter number 643047

Meter Date	100's of Cubic Feet	Conversion	Billing Therms	Charge
1/29/2008	416	1.052	437.76	$ 650.57
2/28/2008	290	1.051	304.88	$ 454.52
3/31/2008	289	1.051	303.68	$ 452.80
4/29/2008	93	1.051	97.72	$ 155.95
5/27/2008	7	1.05	7.35	$ 25.69
6/27/2008	4	1.049	4.2	$ 21.15
7/28/2008	41	1.053	43.17	$ 77.31
8/26/2008	21	1.055	22.16	$ 47.04
9/26/2008	6	1.053	6.32	$ 39.30
10/27/2008	57	1.051	59.93	$ 115.52
11/24/2008	101	1.052	106.28	$ 192.22
12/28/2008	287	1.051	301.64	$ 451.46
1/29/2009	413	1.052	434.52	$ 621.90
2/27/2009	321	1.057	339.14	$ 490.87
3/27/2009	147	1.054	154.98	$ 229.93
4/29/2009	136	1.051	142.92	$ 249.86
6/1/2009	129	1.05	135.42	$ 263.06
6/30/2009	8	1.047	8.37	$ 38.18
7/1/2009	124	1.047	129.77	$ 279.16
7/22/2009	1	1.048	1.05	$ 19.14
8/20/2009	2	1.046	2.09	$ 28.31
9/22/2009	3	1.046	3.14	$ 29.77
10/22/2009	11	1.045	11.5	$ 39.52
11/18/2009	65	1.042	67.73	$ 110.21
12/28/2009	287	1.051	301.64	$ 451.46

Total Usage	3259		3427.36	$ 5,534.90
Previous Year	1647		1,732	$2,851

Cost/Therm	$1.65


Fair Haven Police Dept. Gas Usage
Therms
500
450
400
350
300
250
200
150
100
50
0
10/29/2008
12/18/2008
2/6/2009
3/28/2009
5/17/2009
7/6/2009
8/25/2009
10/14/2009
12/3/2009
1/22/2010
Meter Dates
Therms

APPENDIX B

Approved Electrical and Natural Gas Energy Commodity Suppliers

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

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 C

ECM-1 Lighting Replacements

Fair Haven
CHA #21968
Building: Police Station

ECM-1 Replacement of incandescent and T-12 lights

Building Schedule:
Existing conditions (master switch): 40 hrs/week
Supply Electric Rate $ 0.169 /kWh
Demand Rate $ - /kW

Instructions and notes:
Input existing fixtures and retrofit fixtures. Use light table

Area Description	EXISTING CONDITIONS										RETROFIT CONDITIONS								COST ANALYSIS				
	Number of Fixtures	Fixture Code	Watts per Fixture	Number of Non-Operational Fixtures	Watts per Non-Operational Fixtures	kW/Space	Exist Control	Daily Hours	Annual Hours	Annual kWh	Number of Fixtures	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Daily Hours	Annual Hours	Annual kWh	kW Saved	Annual kWh Saved	Annual $ Saved	Retrofit Cost	Simple Payback
Office #1	3	F44SS	188	0	191.76	0.564	switch		2,080	1,173	3	F44ILL	112	0.336	switch	0	2,080	699	0	474	$ 80	$ 504	6.3
Office #2	3	F44SS	188	0	191.76	0.564	switch		2,080	1,173	3	F44ILL	112	0.336	switch	0	2,080	699	0	474	$ 80	$ 504	6.3
Break Room	1	F44SS	188	0	191.76	0.188	switch		2,080	391	1	F44ILL	112	0.112	switch	0	2,080	233	0	158	$ 27	$ 168	6.3
Dispatch Room	6	I60/1	60	0	61.2	0.36	switch		2,080	749	6	CFT13/1	17	0.102	switch	0	2,080	212	0	537	$ 91	$ 239	2.6
	1	F44SS	188	0	191.76	0.188	switch		2,080	391	1	F44ILL	112	0.112	switch	0	2,080	233	0	158	$ 27	$ 168	6.3
File Room	3	F44SS	188	0	191.76	0.564	switch		2,080	1,173	3	F44ILL	112	0.336	switch	0	2,080	699	0	474	$ 80	$ 504	6.3
Lt. Office	2	F44SS	188	0	191.76	0.376	switch		2,080	782	2	F44ILL	112	0.224	switch	0	2,080	466	0	316	$ 53	$ 336	6.3
Sargents Office	2	F44SS	188	0	191.76	0.376	switch		2,080	782	2	F44ILL	112	0.224	switch	0	2,080	466	0	316	$ 53	$ 336	6.3
Front Office	6	F44SS	188	0	191.76	1.128	switch		2,080	2,346	6	F44ILL	112	0.672	switch	0	2,080	1,398	0	948	$ 160	$ 1,008	6.3
Storage	2	F44SS	188	0	191.76	0.376	switch		2,080	782	2	F44ILL	112	0.224	switch	0	2,080	466	0	316	$ 53	$ 336	6.3
Mech. Room	1	F42ES	80	0	81.6	0.08	switch		2,080	166	1	F42ILL	59	0.059	switch	0	2,080	123	0	44	$ 7	$ 125	17.0
Bathroom	1	F44SS	188	0	191.76	0.188	switch		2,080	391	1	F44ILL	112	0.112	switch	0	2,080	233	0	158	$ 27	$ 168	6.3
Detention Cell	1	I60/1	60	0	61.2	0.06	switch		2,080	125	1	CFT13/1	17	0.017	switch	0	2,080	35	0	89	$ 15	$ 40	2.6
Conference Rm.	6	F44SS	188	0	191.76	1.128	switch		2,080	2,346	6	F44ILL	112	0.672	switch	0	2,080	1,398	0	948	$ 160	$ 1,008	6.3
					0	0			2,080	-			0	0	switch	0	2,080	-	-	-	$ -	$ -	
TOTALS -	**38**			**0**		**6.1**				**12,771**	**38**			**3.5**				**7,359**	**2.6**	**5,412**	**$ 915**	**$ 5,445**	**6.0**

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
1 & 2 Lamp T-12 Retrofit < 250 Watt	1	EA	15	$ 15.00	$ -	$ -
3 & 4 Lamp T-12 Retrofit < 250 Watt	30	EA	15	$ 450.00		$ -
				$ 465	$ 5,445	$ 4,980

Total ECM Cost w/ Incentives		$ 4,980

APPENDIX D

ECM-2 Occupancy Sensors for Interior Lighting

Fair Haven
CHA #21968
Building: Police Station

ECM-2 - Use of motion sensors for interior lighting

Building Schedule:
Existing conditions (master switch): 40 hrs/week
Retrofit conditions (motion sensors): 20 hrs/week

Cost of Electricity: 0.169 $/kWh

Instructions and notes:
Input all applicable fixture codes from Light Table. In retrofit conditions indicate "Yes" if motion sensor is applicable
Use weekly hours if all fixtures on this sheet can be retrofitted with motion sensors, else use daily hours
*Motion sensor = Evaluate operating hours (location, traffic, etc.)
Tip: Motion sensors stays On for approx. 10 minutes when activated. It may save operating hours by 25%,30% or more.
Make sure that security or safety does not prevent installation of motion sensors
Make judgment when using Cost Tables

	EXISTING CONDITIONS									RETROFIT CONDITION				COST ANALYSIS			
Area Description	**Number of Fixtures**	**Fixture Code**	**Watts per Fixture**	**Number of Non-Operational Fixtures**	**Watts per Non-Operational Fixtures**	**kW/Space**	**Daily Hours**	**Annual Hours**	**Annual kWh**	**Motion sensor Yes or No**	**Number of Sensors Required**	**Annual Hours**	**Annual kWh**	**Annual kWh Saved**	**Annual $ Saved**	**Retrofit Cost**	**Simple Payback**
Office #1	3	F44ILL	112	0	114.24	0.3		2,080	699	Yes	1	1,040	349	349	$ 59	$ 259	4.4
Office #2	3	F44ILL	112	0	114.24	0.336		2,080	699	Yes	1	1,040	349	349	$ 59	$ 259	4.4
Break Room	1	F44ILL	112	0	114.24	0.112		2,080	233	Yes	1	1,040	116	116	$ 20	$ 259	13.1
File Room	3	F44ILL	112	0	114.24	0.336		2,080	699	Yes	1	1,040	349	349	$ 59	$ 259	4.4
Lt. Office	2	F44ILL	112	0	114.24	0.224		2,080	466	Yes	1	1,040	233	233	$ 39	$ 259	6.6
Sargents Office	2	F44ILL	112	0	114.24	0.224		2,080	466	Yes	1	1,040	233	233	$ 39	$ 259	6.6
Front Office	6	F44ILL	112	0	114.24	0.672		2,080	1,398	Yes	1	1,040	699	699	$ 118	$ 259	2.2
Storage	2	F44ILL	112	0	114.24	0.224		2,080	466	Yes	1	1,040	233	233	$ 39	$ 259	6.6
Conference Rm.	6	F44ILL	112	0	114.24	0.672		2,080	1,398	Yes	1	1,040	699	699	$ 118	$ 259	2.2
TOTALS -	**28**			**0**		**3.1**			**6,523**		**9.0**	**9,360.00**	**3,261.4**	**3,261**	**$ 551**	**$ 2,327**	4.2

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
Remote Motion Sensors	9	EA	35	$ 315	$ 2,327	$ 2,012
				$ 315	$ 2,327	$ 2,012

Total ECM Cost w/ Incentives	**$2,012**

APPENDIX E

ECM-3 Exit Sign Replacement

Fair Haven
CHA #21968
Building: Police Station

ECM-3 Replace EXIT signs with LED type

Analysis

Referenced Data

Demand Rate	$ -	/kW
Supply Electrical Rate	$ 0.169	/kWh

Inputs

	Material	Labor
Demolition	$ -	$ 5
New Sign Install	$ 85	$ 10

Contingency	10%	of Sub-Total
Contractor O&P	12%	of Sub-Total
Engineering	0%	of Sub-Total
Replacement Power	1.7	watts/sign

Sign Type	Wattage Per Side	Sides	Quantity
A	24	1	3
B	0	1	0
C	0	1	0

Results

Utility Savings	Electrical		586 kWh
	Demand		0.1 kW
	Steam		- klbs
	Savings	**$99**	
	Implementation Cost	**$365**	
	Simple Payback (Yrs)	**3.7**	

Calculations

Current Power Consumption = [(24 W/side x 1 side x 3 signs) + (0 W/side x 1 side x 0 signs) + (0 W/side x 1 side x 0 sign)] x 8,760 hrs/yr

= 0.072 kW x 8,760 hrs/yr

= 631 kWh

Proposed Power Consumption = (1.7 W/sign x 3 signs) x 8,760 hrs/yr

= 0. kW x 8,760 hrs/yr

= 45 kWh

Fair Haven
CHA #21968
Building: Police Station

ECM-3 Replace EXIT signs with LED type

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.		
						$ -	$ -	$ -	$ -	
Demolition	3	Ea	$ -	$ 5		$ -	$ 18	$ -	$ 18	
New Sign Install	3	Ea	$ 85	$ 10		$ 250	$ 36	$ -	$ 286	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 304	Subtotal
$ 30	10% Contingency
$ 30	10% Contractor O&P
	0% Engineering
$ 365	**Total**

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIV	Cost W/ INCENTIV
LED Exit Signs	3	EA	10	30	$ 365	$ 335
				30	$ 365	$ 335

Total ECM Cost w/ Incentives	$ 335
Payback with incentive	3.38

APPENDIX F

ECM-4 Occupancy Sensors with Lighting Replacements

Fair Haven
CHA #21968
Building: Police Station

ECM-4 Occupancy Sensors with Lighting Replacements

Building Schedule:
Existing conditions (master switch): 40 hrs/week
Supply Electric Rate $ 0.169 /kWh
Demand Rate $ - /kW

Instructions and notes:
Input existing fixtures and retrofit fixtures. Use light table

	EXISTING CONDITIONS										RETROFIT CONDITIONS								COST ANALYSIS				
Area Description	Number of Fixtures	Fixture Code	Watts per Fixture	Number of Non-Operational Fixtures	Watts per Non-Operational Fixtures	kW/Space	Exist Control	Daily Hours	Annual Hours	Annual kWh	Number of Fixtures	Fixture Code	Watts per Fixture	kW/Space	Retrofit Control	Daily Hours	Annual Hours	Annual kWh	kW Saved	Annual kWh Saved	Annual $ Saved	Retrofit Cost	Simple Payback
Office #1	3	F44SS	188	0	191.76	0.564	switch		2,080	1,173	3	F44ILL	112	0.336	switch	0	1,040	349	0	824	$ 139	$ 763	5.5
Office #2	3	F44SS	188	0	191.76	0.564	switch		2,080	1,173	3	F44ILL	112	0.336	switch	0	1,040	349	0	824	$ 139	$ 763	5.5
Break Room	1	F44SS	188	0	191.76	0.188	switch		2,080	391	1	F44ILL	112	0.112	switch	0	1,040	116	0	275	$ 46	$ 437	9.4
Dispatch Room	6	I60/1	60	0	61.2	0.36	switch		2,080	749	6	CFT13/1	17	0.102	switch	0	2,080	212	0	537	$ 91	$ 239	2.6
	1	F44SS	188	0	191.76	0.188	switch		2,080	391	1	F44ILL	112	0.112	switch	0		-	0	391	$ 66	$ 168	2.5
File Room	3	F44SS	188	0	191.76	0.564	switch		2,080	1,173	3	F44ILL	112	0.336	switch	0	1,040	349	0	824	$ 139	$ 763	5.5
Lt. Office	2	F44SS	188	0	191.76	0.376	switch		2,080	782	2	F44ILL	112	0.224	switch	0	1,040	233	0	549	$ 93	$ 595	6.4
Sargents Office	2	F44SS	188	0	191.76	0.376	switch		2,080	782	2	F44ILL	112	0.224	switch	0	1,040	233	0	549	$ 93	$ 595	6.4
Front Office	6	F44SS	188	0	191.76	1.128	switch		2,080	2,346	6	F44ILL	112	0.672	switch	0	1,040	699	0	1,647	$ 278	$ 1,267	4.6
Storage	2	F44SS	188	0	191.76	0.376	switch		2,080	782	2	F44ILL	112	0.224	switch	0	2,080	466	0	316	$ 53	$ 336	6.3
Mech. Room	1	F42ES	80	0	81.6	0.08	switch		2,080	166	1	F42ILL	59	0.059	switch	0	2,080	123	0	44	$ 7	$ 125	17.0
Bathroom	1	F44SS	188	0	191.76	0.188	switch		2,080	391	1	F44ILL	112	0.112	switch	0	2,080	233	0	158	$ 27	$ 168	6.3
Detention Cell	1	I60/1	60	0	61.2	0.06	switch		2,080	125	1	CFT13/1	17	0.017	switch	0	2,080	35	0	89	$ 15	$ 40	2.6
Conference Rm.	6	F44SS	188	0	191.76	1.128	switch		2,080	2,346	6	F44ILL	112	0.672	switch	0	1,040	699	0	1,647	$ 278	$ 1,267	4.6
					0	0			2,080	-			0	0	switch	0	2,080	-	-	-	$ -	$ -	
TOTALS -	38			0		6.1				12,771	38			3.5				4,098	2.6	8,674	$ 1,466	$ 7,527	5.1

New Jersey Smart Start Incentive	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
1 & 2 Lamp T-12 Retrofit < 250 Watt	1	EA	15	$ 15.00	$ -	$ -
3 & 4 Lamp T-12 Retrofit < 250 Watt	30	EA	15	$ 450.00		$ -
Occ. Sensors	9	EA	35	315		
				$ 780	$ 7,527	$ 6,747

Total ECM Cost w/ Incentives		$ 6,747

APPENDIX G

ECM-5 Replace Windows

Fair Haven
CHA #21968
Building: Police Station

*Change U-value and air infiltration rates based on new windows or storm windows
See block load spreadsheet for U-values

ECM-5 Window Replacement/Upgrade

Description

Windows can lead to increased energy consumption due to infiltration/exfiltration and heat gain/loss. Replacing older windows with more panes and low-emissivity coatings and insulated frames can decrease energy usage.

Given

Occupied Cooling Hours per Week	40	Hours		
Occupied Heating Hours per Week	40	Hours		
Heating Energy Cost	$1.65	$/therm		
Cooling Cost	$0.169	$/kWh		
Occupied Cooling Setpoint Temperature	74.0	Degrees F		(Assumption)
Occupied Cooling Avg Space Air Enthalpy	25.5	btu/# air		(Assumption)
Occupied Heatng Setpoint Temperature	68.0	Degrees F	Occupied	(Assumption)
Unoccupied Heating Setpoint Temperature	68.0	Degrees F	Unoccupied	(Assumption)
Window Area	99	sq.ft.		(From window survey)
Window Perimeter	120	ft		(From window survey)
Proposed U factor	0.53	Btu/(h*sqft*degf)		(From window vendor)
Proposed Air Infiltration	0.20	cfm/ft		(From window vendor)
Cooling Conversion	12,000	Btu/ton		
Heating Btu Conversion	1,000,000	Btu/MMBtu		

Assumptions

Existing U factor	1.05	Btu/(h*sqft*degf)	(From ASHRAE Fundamentals)
Existing Air Infiltration	0.33	cfm/ft	(From ASHRAE Fundamentals)
Heating System Efficiency	92%		
Cooling System Efficiency	1.20	kW/ton	

Formula

Cooling Energy Conduction = (Existing U x Area x (OA Temp - RA Temp) x Op Hours)

Heating Energy Conduction = (Existing U x Area x (RA Temp - OA Temp) x Op Hours)
Cooling Energy Infiltration = (4.5 x Leakage x Perimeter x (OA Enthalpy - RA Enthalpy) x Op Hours)
Heating Energy Infiltration = 1.08 x Leakage x Perimeter x (RA temp - OA temp) x Op Hours)
Load = (Conduction) + (Infiltration)
Cooling Energy = (Cooling Load) / (12,000 Btu/Ton) x (kw/Ton)
Heating Energy = (Heating Load) / (1,000,000 Btu/MMBtu) / (Boiler Efficiency)
Energy Cost = (Energy) x (Cost/Unit)

Existing	Operation	OA Enthalphy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
	Cooling	38.3	92.5	37	8.8	0.0	0.0	17,018	0	0	20,144	0	0
	Cooling	36.6	87.5	131	31.2	0.0	0.0	43,969	0	0	61,850	0	0
	Cooling	33.5	82.5	500	119.0	0.0	0.0	105,666	0	0	170,139	0	0
	Cooling	31.6	77.5	620	147.6	0.0	0.0	53,952	0	0	160,866	0	0
	Heating	30.3	72.5	664	0.0	0.0	0.0	0	0	0	0	0	0
	Heating	27.9	67.5	854	0.0	203.3	650.7	0	10,616	33,972	0	4,359	13,949
	Heating	24.6	62.5	927	0.0	220.7	706.3	0	126,761	405,637	0	52,047	166,551
	Heating	21.6	57.5	600	0.0	142.9	457.1	0	156,634	501,228	0	64,312	205,800
	Heating	18.7	52.5	610	0.0	145.2	464.8	0	235,075	752,240	0	96,520	308,863
	Heating	16.2	47.5	611	0.0	145.5	465.5	0	311,415	996,529	0	127,864	409,166
	Heating	14.3	42.5	656	0.0	156.2	499.8	0	415,900	1,330,880	0	170,765	546,447
	Heating	12.4	37.5	1,023	0.0	243.6	779.4	0	775,747	2,482,391	0	318,515	1,019,247
	Heating	10.4	32.5	734	0.0	174.8	559.2	0	647,842	2,073,095	0	265,998	851,194
	Heating	8.7	27.5	334	0.0	79.5	254.5	0	336,315	1,076,208	0	138,088	441,881
	Heating	7	22.5	252	0.0	60.0	192.0	0	285,073	912,235	0	117,049	374,555
	Heating	5.4	17.5	125	0.0	29.8	95.2	0	156,945	502,223	0	64,440	206,208
	Heating	3.9	12.5	47	0.0	11.2	35.8	0	64,854	207,532	0	26,628	85,211
	Heating	2.5	7.5	22	0.0	5.2	16.8	0	33,092	105,894	0	13,587	43,479
	Heating	1.2	2.5	13	0.0	3.1	9.9	0	21,170	67,745	0	8,692	27,816
	Heating	-0.2	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
	Heating	-1.4	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
	Subtotal =			8,760	307	1,621	5,187	220,605	3,577,440	11,447,809 btu	412,999	1,468,864	4,700,365 btu

	Conduction	Infiltration	
Cooling Load =	(220605) + (	412999) =	633,604 btu
	Cooling Load		
Cooling Energy =	(633604)/(	12000) * (1.20) =	63 kWh
	Cooling Energy	Cooling Cost	
Cooling Energy Cost =	(63.36) x (	$0.169) =	$ 10.71
	Conduction	Infiltration	
Heating Load =	(15025249) + (	6169229) =	21,194,478 btu
	Heating Load	Heat Content	
Heating Energy =	(21194478)/(	92%)/(100000) =	230 therms
	Heating Energy	Heating Cost	
Heating Energy Cost =	(230.37) x (	$1.650) =	$ 380

Operation	OA Enthalphy	OA Temp	Total Hours	Cooling Occupied Hours	Heating Occupied Hours	Heating Unoccupied Hours	Cooling Occupied Conduction	Heating Occupied Conduction	Heating Unoccupied Conduction	Cooling Occupied Infiltration	Heating Occupied Infiltration	Heating Unoccupied Infiltration
Cooling	38.3	92.5	37	8.8	0.0	0.0	8,590	0	0	12,209	0	0
Cooling	36.6	87.5	131	31.2	0.0	0.0	22,194	0	0	37,485	0	0
Cooling	33.5	82.5	500	119.0	0.0	0.0	53,336	0	0	103,114	0	0
Cooling	31.6	77.5	620	147.6	0.0	0.0	27,233	0	0	97,495	0	0
Heating	30.3	72.5	664	0.0	0.0	0.0	0	0	0	0	0	0
Heating	27.9	67.5	854	0.0	203.3	650.7	0	5,359	17,148	0	2,642	8,454
Heating	24.6	62.5	927	0.0	220.7	706.3	0	63,984	204,750	0	31,544	100,940
Heating	21.6	57.5	600	0.0	142.9	457.1	0	79,063	253,001	0	38,977	124,727
Heating	18.7	52.5	610	0.0	145.2	464.8	0	118,657	379,702	0	58,497	187,190
Heating	16.2	47.5	611	0.0	145.5	465.5	0	157,191	503,010	0	77,493	247,979
Heating	14.3	42.5	656	0.0	156.2	499.8	0	209,930	671,777	0	103,494	331,180
Heating	12.4	37.5	1,023	0.0	243.6	779.4	0	391,568	1,253,017	0	193,039	617,726
Heating	10.4	32.5	734	0.0	174.8	559.2	0	327,006	1,046,419	0	161,211	515,875
Heating	8.7	27.5	334	0.0	79.5	254.5	0	169,759	543,229	0	83,690	267,807
Heating	7	22.5	252	0.0	60.0	192.0	0	143,894	460,461	0	70,939	227,003
Heating	5.4	17.5	125	0.0	29.8	95.2	0	79,220	253,503	0	39,055	124,975
Heating	3.9	12.5	47	0.0	11.2	35.8	0	32,736	104,754	0	16,138	51,643
Heating	2.5	7.5	22	0.0	5.2	16.8	0	16,704	53,451	0	8,235	26,351
Heating	1.2	2.5	13	0.0	3.1	9.9	0	10,686	34,195	0	5,268	16,858
Heating	-0.2	-2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	-1.4	-7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Subtotal =			8,760	307	1,621	5,187	111,353	1,805,756	5,778,418 btu	250,302	890,221	2,848,706 btu

	Conduction Infiltration	
Cooling Load =	(111353) + (250302) =	361,655 btu
	Cooling Load	
Cooling Energy =	(361655)/(12000) * (1.20) =	36 kWh
	Cooling Energy Cooling Cost	
Cooling Energy Cost =	(36.17) x ($0.169) =	$ 6.11
	Conduction Infiltration	
Heating Load =	(7584173) + (3738927) =	11,323,100 btu
	Heating Load Heat Content	
Heating Energy =	(11323100)/(92%) / (100000) =	123 therms
	Heating Energy Heating Cost	
Heating Energy Cost =	(123.08) x ($1.650) =	$ 203

Summary

EXISTING COOLING ENERGY	63.36	kWh	$	10.71
EXISTING HEATING ENERGY	230.37	therms	$	380.12
EXISTING ENERGY COST			$	390.83

PROPOSED COOLING ENERGY	36.17	kWh	$	6.11
PROPOSED HEATING ENERGY	123.08	therms	$	203.08
PROPOSED ENERGY COST			$	209.19

COOLING ENERGY SAVINGS	27.19	kWh	$	4.60	42.9% of existing
HEATING ENERGY SAVINGS	107.30	therms	$	177.04	46.6% of existing
ENERGY COST SAVINGS			$	181.64	46.5% of existing

Comments

Fair Haven
CHA #21968
Building: Police Station

ECM-5 Window Replacement/Upgrade

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 removals.	9	ea.		$ 33		$ -	$ 359	$ -	$ 359	
Install new 3' x 3'-8" double pane windows.	9	ea.	$ 191	$ 33		$ 1,685	$ 354	$ -	$ 2,039	
Trimwork	9	ea.	$ 20	$ 33		$ 176	$ 359	$ -	$ 536	

$ 2,934	Subtotal
$ 293	10% Contingency
$ 323	10% Contractor O&P
$ -	0% Engineering
$ 3,550	**Total**

APPENDIX H

ECM-6 Temperature Setback

Fair Haven
CHA #21968
Building: Police Station

ECM-6 Temperature Setback

Building Footprint	3,570 SF	Ex Occupied Clng Temp.	74 °F	Ex Occupied Htg Temp.	68 °F	**Heating Energy Savings**	382 therms
Heating Efficiency	92%	Ex Unoccupied Clng Temp.	74 °F	Ex Unoccupied Htg Temp.	68 °F	**Cooling Energy Savings**	922 kWh
Cooling Efficiency	1.2 kW/ton	Prop Occupied Clng Temp.	74 °F	Prop Occupied Htg Temp.	68 °F		
Building Balance Temp.	60 °F	Prop Unoccupied Clng Temp.	80 °F	Prop Unoccupied Htg Temp.	60 °F		
Internal Gains	25,185 btu/h	Occupied Cooling UA	-1,174 btu/hr/°F	Occupied Heating UA	530 btu/hr/°F		
Unoc Internal Gain factor	0.03	Unoccupied Cooling UA	-932 btu/hr/°F	Unoccupied Heating UA	530 btu/hr/°F		
Ave Occ Internal Gain Factor	0.7	Cooling Occ Enthalpy Setpoint	27.8 Btu/lb				
		Cooling Unocc Enthalpy Setpoint	27.8 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	-33,451	-68,665	-17,630	-26,561	-68,665	-756	-33,451	-68,665	-17,630	-20,970	-68,665	-756	0	0	0	0
97.5	42.5	3	1	2	-27,582	-47,389	-17,630	-21,902	-47,389	-756	-27,582	-47,389	-17,630	-16,310	-47,389	-756	23	21	0	0
92.5	39.5	34	8	26	-21,714	-37,718	-17,630	-17,242	-37,718	-756	-21,714	-37,718	-17,630	-11,650	-37,718	-756	207	192	0	0
87.5	36.6	131	31	100	-15,845	-28,369	-17,630	-12,582	-28,369	-756	-15,845	-28,369	-17,630	-6,990	-28,369	-756	609	553	0	0
82.5	34	500	119	381	-9,977	-19,987	-17,630	-7,922	-19,987	-756	-9,977	-19,987	-17,630	-2,330	-19,987	-756	1,659	1,446	0	0
77.5	31.6	620	148	472	-4,108	-12,250	-17,630	-3,262	-12,250	-756	-4,108	-12,250	-17,630	0	0	-756	1,270	537	0	0
72.5	29.2	664	158	506	0	0	-17,630	0	0	-756	0	0	-17,630	0	0	-756	317	317	0	0
67.5	27	854	203	651	265	387	-17,630	265	387	-756	265	387	-17,630	0	0	-756	352	394	0	0
62.5	24.5	927	221	706	2,917	4,255	-17,630	2,917	4,255	-756	2,917	4,255	-17,630	0	0	-756	231	284	0	0
57.5	21.4	600	143	457	5,569	8,124	-17,630	5,569	8,124	-756	5,569	8,124	-17,630	1,326	1,934	-756	56	56	0	0
52.5	18.7	610	145	465	8,221	11,992	-17,630	8,221	11,992	-756	8,221	11,992	-17,630	3,978	5,803	-756	0	0	102	50
47.5	16.2	611	145	466	10,873	15,861	-17,630	10,873	15,861	-756	10,873	15,861	-17,630	6,630	9,671	-756	0	0	146	93
42.5	14.4	656	156	500	13,525	19,729	-17,630	13,525	19,729	-756	13,525	19,729	-17,630	9,282	13,540	-756	0	0	203	146
37.5	12.6	1,023	244	779	16,178	23,598	-17,630	16,178	23,598	-756	16,178	23,598	-17,630	11,934	17,408	-756	0	0	389	301
32.5	10.7	734	175	559	18,830	27,466	-17,630	18,830	27,466	-756	18,830	27,466	-17,630	14,586	21,277	-756	0	0	331	268
27.5	8.6	334	80	254	21,482	31,335	-17,630	21,482	31,335	-756	21,482	31,335	-17,630	17,238	25,145	-756	0	0	174	146
22.5	6.8	252	60	192	24,134	35,203	-17,630	24,134	35,203	-756	24,134	35,203	-17,630	19,890	29,013	-756	0	0	149	128
17.5	5.5	125	30	95	26,786	39,071	-17,630	26,786	39,071	-756	26,786	39,071	-17,630	22,542	32,882	-756	0	0	83	72
12.5	4.1	47	11	36	29,438	42,940	-17,630	29,438	42,940	-756	29,438	42,940	-17,630	25,195	36,750	-756	0	0	35	30
7.5	2.6	22	5	17	32,090	46,808	-17,630	32,090	46,808	-756	32,090	46,808	-17,630	27,847	40,619	-756	0	0	18	16
2.5	1	13	3	10	34,742	50,677	-17,630	34,742	50,677	-756	34,742	50,677	-17,630	30,499	44,487	-756	0	0	11	10
-2.5	0	0	0	0	37,394	54,545	-17,630	37,394	54,545	-756	37,394	54,545	-17,630	33,151	48,356	-756	0	0	0	0
-7.5	-1.5	0	0	0	40,046	58,414	-17,630	40,046	58,414	-756	40,046	58,414	-17,630	35,803	52,224	-756	0	0	0	0
TOTALS		8,760	2,086	6,674													4,723	3,802	1,642	1,260

Existing Building Ventilation & Infiltration (occ)	**716 cfm**
Overheat Ventilation Factor	**1.00**
Additional ventilation to offset overheat	**0 cfm**
Existing Building Ventilation & Infiltration (unocc)	**716 cfm**

Fair Haven
CHA #21968
Building: Police Station

ECM-6 Temperature 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		ea	$ 100	$ 150	$ -	$ -	$ -	$ -	$ -	Existing.
Reprogram DDC system	1	ea	$ -	$ 50	$ -	$ -	$ 61	$ -	$ 61	Per temperature program.
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 61	Subtotal
$ 3	5% Contingency
$ 6	Contractor 10% O&P
$ -	0% Engineering
$ 70	**Total**

Fair Haven
CHA #21968
Building: Police Station

ECM-8 Install Door Seals

Existing: Doors or Door Seals result in excessive heat loss and infiltration
Proposed: Install new doors and/or weatherstripping to eliminate door infiltration

Building Footprint	3,570	SF	Ex Occupied Clng Temp.	74	*F	Ex Occupied Htg Temp.	68	*F
Heating System Efficiency	92%		Ex Unoccupied Clng Temp.	74	*F	Ex Unoccupied Htg Temp.	68	*F
Cooling System Efficiency	1.20	kW/ton	Prop Occupied Clng Temp.	74	*F	Prop Occupied Htg Temp.	68	*F
Internal Gains	25,185	btu/h	Prop Unoccupied Clng Temp.	74	*F	Prop Unoccupied Htg Temp.	68	*F
Unoc Internal Gain factor	0.02		Occupied Cooling UA	-1,174	btu/hr/°F	Occupied Heating UA	530	btu/hr/°F
Ave Occ Internal Gain Factor	0.6		Unoccupied Cooling UA	-932	btu/hr/°F	Unoccupied Heating UA	530	btu/hr/°F
			Cooling Occ Enthalpy Setpoint	27.8	Btu/lb			
			Cooling Unocc Enthalpy Setpoint	27.8	Btu/lb			

					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 lbs	Proposed Heating Energy lbs
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	-33,451	-68,665	-15,111	-26,561	-49,495	-504	-33,451	-67,315	-15,111	-26,561	-48,145	-504	0	0	0	0
97.5	42.5	3	1	2	-27,582	-47,389	-15,111	-21,902	-34,159	-504	-27,582	-46,457	-15,111	-21,902	-33,227	-504	19	19	0	0
92.5	39.5	34	8	26	-21,714	-37,718	-15,111	-17,242	-27,188	-504	-21,714	-36,976	-15,111	-17,242	-26,446	-504	177	174	0	0
87.5	36.6	131	31	100	-15,845	-28,369	-15,111	-12,582	-20,449	-504	-15,845	-27,811	-15,111	-12,582	-19,891	-504	520	512	0	0
82.5	34.0	500	119	381	-9,977	-19,987	-15,111	-7,922	-14,407	-504	-9,977	-19,594	-15,111	-7,922	-14,014	-504	1,406	1,387	0	0
77.5	31.6	620	148	472	-4,108	-12,250	-15,111	-3,262	-8,830	-504	-4,108	-12,009	-15,111	-3,262	-8,589	-504	1,060	1,045	0	0
72.5	29.2	664	158	506	0	0	-15,111	0	0	-504	0	0	-15,111	0	0	-504	264	264	0	0
67.5	27.0	854	203	651	265	387	-15,111	265	279	-504	265	379	-15,111	265	271	-504	294	294	0	0
62.5	24.5	927	221	706	2,917	4,255	-15,111	2,917	3,067	-504	2,917	4,172	-15,111	2,917	2,984	-504	175	177	0	0
57.5	21.4	600	143	457	5,569	8,124	-15,111	5,569	5,856	-504	5,569	7,964	-15,111	5,569	5,696	-504	20	23	0	0
52.5	18.7	610	145	465	8,221	11,992	-15,111	8,221	8,644	-504	8,221	11,757	-15,111	8,221	8,409	-504	0	0	91	89
47.5	16.2	611	145	466	10,873	15,861	-15,111	10,873	11,433	-504	10,873	15,549	-15,111	10,873	11,121	-504	0	0	129	127
42.5	14.4	656	156	500	13,525	19,729	-15,111	13,525	14,221	-504	13,525	19,341	-15,111	13,525	13,833	-504	0	0	179	176
37.5	12.6	1,023	244	779	16,178	23,598	-15,111	16,178	17,010	-504	16,178	23,134	-15,111	16,178	16,546	-504	0	0	342	337
32.5	10.7	734	175	559	18,830	27,466	-15,111	18,830	19,798	-504	18,830	26,926	-15,111	18,830	19,258	-504	0	0	291	287
27.5	8.6	334	80	254	21,482	31,335	-15,111	21,482	22,587	-504	21,482	30,719	-15,111	21,482	21,971	-504	0	0	153	151
22.5	6.8	252	60	192	24,134	35,203	-15,111	24,134	25,375	-504	24,134	34,511	-15,111	24,134	24,683	-504	0	0	131	129
17.5	5.5	125	30	95	26,786	39,071	-15,111	26,786	28,163	-504	26,786	38,303	-15,111	26,786	27,395	-504	0	0	73	72
12.5	4.1	47	11	36	29,438	42,940	-15,111	29,438	30,952	-504	29,438	42,096	-15,111	29,438	30,108	-504	0	0	30	30
7.5	2.6	22	5	17	32,090	46,808	-15,111	32,090	33,740	-504	32,090	45,888	-15,111	32,090	32,820	-504	0	0	16	15
2.5	1.0	13	3	10	34,742	50,677	-15,111	34,742	36,529	-504	34,742	49,681	-15,111	34,742	35,533	-504	0	0	10	10
-2.5	0.0	0	0	0	37,394	54,545	-15,111	37,394	39,317	-504	37,394	53,473	-15,111	37,394	38,245	-504	0	0	0	0
-7.5	-1.5	0	0	0	40,046	58,414	-15,111	40,046	42,106	-504	40,046	57,266	-15,111	40,046	40,958	-504	0	0	0	0
TOTALS		8,760	2,086	6,674													3,936	3,895	1,444	1,422

Existing Building Ventilation & Infiltration	716	cfm
Existing Unocc. Building Ventilation & Infiltration	516	cfm
Door infiltration	18	cfm
Proposed reduction (80%)	14	cfm
Proposed Building Ventilation & Infiltration	702	cfm
Proposed Unocc. Building Ventilation & Infiltration	502	cfm

Savings	22 therms
	40 kWh

APPENDIX I

ECM-7 Install Demand Control Ventilation

Fair Haven
CHA #21968
Building: Police Station

<u>**ECM-7 Install Demand Control Ventilation**</u>

	Total CFM	O.A. CFM	O.A. %	
Org. scheduled CFM	1,000	200	20%	
Derated CFM	1,000	45	5%	
SA Enthalpy	26.4	BTU/lbma		
SA Set point, Winter	68.0	°F		
SA Set point, Summer	74.0	°F		
Heating "On" Point	55.0	°F		
Cooling System Eff.	1.20	kW/Ton		(Includes ancillary equipment)
Heating System Eff.	92%			(Includes distribution losses)

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

Method:
The outdoor air introduced into the spaces is currently constant based on design occupancy conditions.
This ECM proposes the installation of CO2 sensors in the space to allow for reduced outdoor air flows when conditions allow.
An average reduction of 50% is assumed possible with the implementation of DCV
The DCV system will automatically adjust the outdoor air damper position through the EMS to reduce outdoor air flows based on indoor CO2 levels.
This ECM has been interacted with the new boiler ECMs and accounts for the reduced operating hours of the unit via EMS scheduling.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
			Existing					Proposed Demand Ventilation					Savings	
Avg. DB Bin Temp °F	OA Enthalpy Btu/lb	Occupied Bin HOURS	OA CFM	Cooling Load MBH	Heating Load MBH	Cooling kWh	Heating therms	Derated O.A. CFM	Cooling Load MBH	Heating Load MBH	Cooling kWh	Heating therms	Cooling kWh	Heating therms
102.5	49.1	0	200	20	0	0	-	45	5	0	0	-	0	-
97.5	42.5	1	200	14	0	1	-	45	3	0	0	-	1	-
92.5	39.5	8	200	12	0	10	-	45	3	0	2	-	7	-
87.5	36.6	31	200	9	0	29	-	45	2	0	6	-	22	-
82.5	34	119	200	7	0	81	-	45	2	0	18	-	63	-
77.5	31.6	148	200	5	0	69	-	45	1	0	16	-	54	-
72.5	29.2	158	200	3	0	40	-	45	1	0	9	-	31	-
67.5	27	203	200	1	0	11	-	45	0	0	2	-	9	-
62.5	24.5	221	200	0	0	0	-	45	0	0	0	-	0	-
57.5	21.4	143	200	0	0	0	-	45	0	0	0	-	0	-
52.5	18.7	145	200	0	3	0	5	45	0	1	0	1	0	4
47.5	16.2	145	200	0	4	0	7	45	0	1	0	2	0	5
42.5	14.4	156	200	0	6	0	9	45	0	1	0	2	0	7
37.5	12.6	244	200	0	7	0	17	45	0	1	0	4	0	14
32.5	10.7	175	200	0	8	0	15	45	0	2	0	3	0	11
27.5	8.6	80	200	0	9	0	8	45	0	2	0	2	0	6
22.5	6.8	60	200	0	10	0	6	45	0	2	0	1	0	5
17.5	5.5	30	200	0	11	0	4	45	0	2	0	1	0	3
12.5	4.1	11	200	0	12	0	1	45	0	3	0	0	0	1
7.5	2.6	5	200	0	13	0	1	45	0	3	0	0	0	1
2.5	1	3	200	0	14	0	0	45	0	3	0	0	0	0
-2.5	0	0	200	0	15	0	-	45	0	3	0	-	0	-
-7.5	-1.5	0	200	0	16	0	-	45	0	4	0	-	0	-
Total		**2,086**		**70**		**241**	**74**		**16**		**54**	**17**	**186**	**57**

Energy Cost Savings		
Heating Savings	57	therms
Cooling Savings	186	kWh

Fair Haven
CHA #21968
Building: Police Station

ECM-7 Install Demand Control Ventilation

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
CO2 sensor	1	ea	$ 400	$ 100	$ -	$ 392	$ 121	$ -	$ 513	
Replace damper actuators	1	ea	$ 50	$ 50	$ -	$ 49	$ 61	$ -	$ 110	
Control system programming	1	ls	$ 500	$ 400	$ -	$ 490	$ 484	$ -	$ 974	
Electrical/wiring	1	ls	$ 1,000	$ 800	$ -	$ 980	$ 968	$ -	$ 1,948	
						$ -	$ -	$ -	$ -	

Subtotal		$ 3,545
5% OH, 5% Profit		$ 354
5% Contingency		$ 195
Total		**$ 4,090**

APPENDIX J

ECM-8 Install Door Seals

Fair Haven
CHA #21968
Building: Police Station

ECM-8 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')	1	ea	$ 35	$ 50	$ -	$ 34	$ 61	$ -	$ 95	
Door Seals (double door - 6' x 7')	1	ea	$ 65	$ 100	$ -	$ 64	$ 121	$ -	$ 185	
36" Door Threshold Seal		ea	$ 50.00	$ 45.00	$ -	$ -	$ -	$ -	$ -	
Side and Top Door Seal		ft	$ 3.00	$ 3.00		$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 280	Subtotal
$ 28	10% Contingency
$ 31	10% Contractor O&P
$ -	0% Engineering
$ 338	**Total**

APPENDIX K

New Jersey Pay For Performance Incentive Program

Fair Haven
CHA #21968
Police Station

New Jersey Pay For Performance Incentive Program

Note: The following calculation is based on the New Jersey Pay For Performance Incentive Program per April, 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.

Total Building Area (Square Feet)	4,000
Is this audit funded by the NJ BPU (Y/N)	Yes

Bureau of Public Utilites (BPU)

Incentive #1		
Audit not funded by NJ BPU	$0.10	$/sqft
Audit is funded by NJ BPU	$0.05	$/sqft

	Annual Utilities	
	kWh	Therms
Existing Cost (from utility)	$15,400	$2,850
Existing Usage (from utility)	91,100	1,700
Proposed Savings	10,435	569
Existing Total MMBtus	481	
Proposed Savings MMBtus	92.499	
% Energy Reduction	**19.2%**	
Proposed Annual Savings	**$2,702**	

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

Incentives $

	Elec	Gas	Total
Incentive #1	$0	$0	$200
Incentive #2	$1,148	$626	$1,774
Incentive #3	$730	$398	$1,129
Total All Incentives	**$1,878**	**$1,024**	**$3,102**

Total Project Cost	**$16,184**

		Allowable Incentive
% Incentives #1 of Utility Cost*	**1%**	**$ 200**
% Incentives #2 of Project Cost**	**11%**	**$ 1,774**
% Incentives #3 of Project Cost**	**7%**	**$ 1,129**
Total Eligible Incentives***	**$ 3,102**	
Project Cost w/ Incentives	**$ 13,082**	

Project Payback (years)	
w/o Incentives	**w/ Incentives**
6.0	**4.8**

* Maximum allowable incentive is 50% of annual utility cost if not funded by NJ BPU, and %25 if it is.
** Maximum allowable amount of Incentive #2 is 30% of total project cost.
Maximum allowable amount of Incentive #3 is 20% of total project cost.
*** Maximum allowable amount of Incentive #1 is $50,000 if not funded by NJ BPU, and $25,000 if it is.
Maximum allowable amount of Incentive #2 & #3 is $1 million per gas account and $1 million per electric account

APPENDIX L

Photovoltaic (PV) Rooftop Solar Power Generation

Fair Haven
Police Department Building

Cost of Electricity $0.169 $/kWh

Photovoltaic (PV) Rooftop Solar Power Generation-10 kW 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
$63,300	**0.0**	**11,830**	**0**	**$2,000**	**0**	**$2,000**	**$7,500**	**$5,800**	**31.7**	**7.2**

Note: Budgetary cost is based on $8,000/kW.

*Incentive based on New Jersey renewable energy program for non-residential applications(PV)= $0.75/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**

PVWatts *** AC Energy & Cost Savings

Cautions for Interpreting the Results

(Type comments here to appear on printout; maximum 1 row of 80 characters.)

Station Identification	
City:	Newark
State:	New_Jersey
Latitude:	40.70° N
Longitude:	74.17° W
Elevation:	9 m
PV System Specifications	
DC Rating:	10.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	7.7 kW
Array Type:	Fixed Tilt
Array Tilt:	40.7°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	16.9 ¢/kWh

Results			
Month	Solar Radiation ($kWh/m^2/day$)	AC Energy (kWh)	Energy Value ($)
1	3.36	828	139.93
2	4.05	894	151.09
3	4.58	1084	183.20
4	4.84	1060	179.14
5	5.30	1168	197.39
6	5.33	1101	186.07
7	5.27	1112	187.93
8	5.25	1101	186.07
9	5.06	1068	180.49
10	4.46	1005	169.84
11	3.15	718	121.34
12	2.87	692	116.95
Year	4.46	11830	1999.27

Output Hourly Performance Data * Output Results as Text

About the Hourly Performance Data

Saving Text from a Browser

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

Please send questions and comments regarding PVWATTS to Webmaster

RReDC Return to RReDC home page (http://rredc.nrel.gov)

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.

APPENDIX M

Solar Thermal Domestic Hot Water Plant

Home

What Can I Do?

Electric Choice

Home Energy

FAQs

LEARN
Fact Sheets
Lesson Plans

PLAY
Calculators

NETWORK
Organizations
Businesses
Events Calendar

BROWSE
Resources
Solar
Wind
Biomass
Geothermal
Water

Projects

TX Energy - Past and Present

Financial Help

About Us

About SECO

RARE

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

Interactive Energy Calculators

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

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

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)	22	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	11.38	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	20
Energy Use			
444.7		? Heat Delivered in Hot Water (BTU/hr)	
0		? Heat loss through insulation (BTU/hr)	

Gas vs. Electric Water Heating		
Gas		**Electric**
0.8	? Overall Efficiency	0.98
0.8	? Conversion Efficiency	0.98
555.9 BTU/hr	? Power Into Water Heater	453.8 BTU/hr
Cost		
$ 1.65 /Therm	? Utility Rates	$ 0.169 /kWh
$ 80.3497	? Yearly Water Heating Cost	$ 196.760
How Does Solar Compare?		
? Solar Water Heater Cost: $ 27100		? Percentage Solar: 70
481.821 years for gas	? Payback Time for Solar System	196.758 years for electric

NJBPU Energy Audits
CHA #21968
Building: Borough of Fair Haven - Police Dept.

Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

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

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

Solar Water Heaters

RENEWABLE ENERGY
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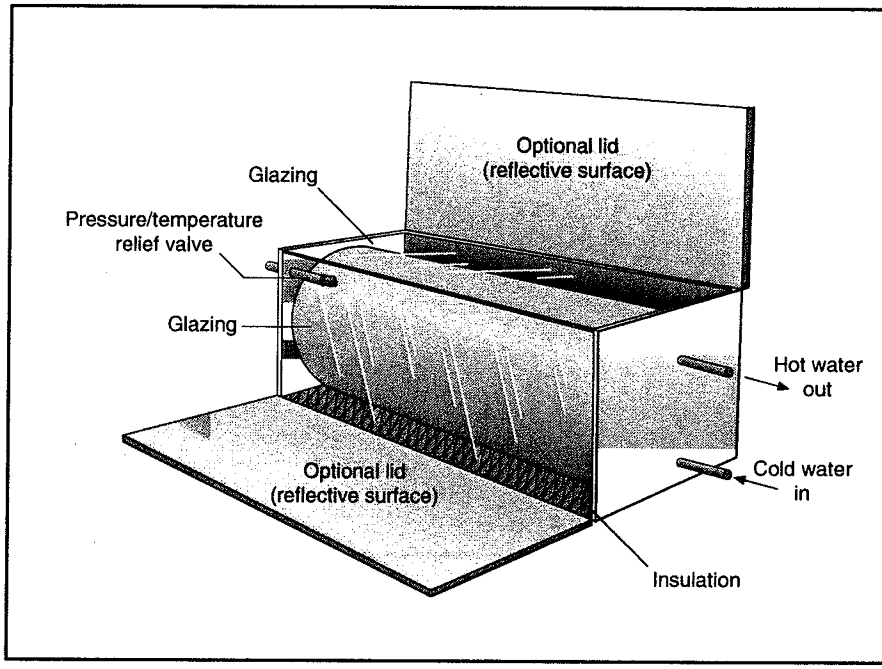
SECO FACT SHEET **NO. 10**

HIGHLIGHTS

- **Solar water heaters can provide half or more of the hot water needs in the average home**
- **Simple or complex, solar water heater systems save money**

SUMMARY

Solar water heaters can be as simple as a garden hose left in the sun or as complex as multiple glass-plated solar collectors filled with propylene glycol. Simple or complex, solar water heaters are an economical option for home and business owners wishing to reduce their water heating costs.



Breadbox or batch heater *Allows cold water to flow in from the bottom and hot water to flow out of the top.*

TYPES OF SYSTEMS

PASSIVE SOLAR SYSTEMS

Generally speaking, a passive solar system requires no moving parts and no external energy source except the sun itself.

Passive water heating systems are not much more complex than a regular garden hose that has been left in the sun. The basic passive water heater consists of one or more 40 gallon water tanks that have been painted black and placed in a well insulated box that has glass or plastic on one side to allow the sun's rays to heat the tanks. This Integral Collector Storage (ICS) system, also known as a "bread box" or batch heater, allows cold water to flow in from the bottom and hot water to flow out of the top. The system operates using only the water pressure from the city or your well. Water from the system is then routed to a standard water heater, where your thermostat determines if the water is already hot enough for use or if additional heat is necessary.

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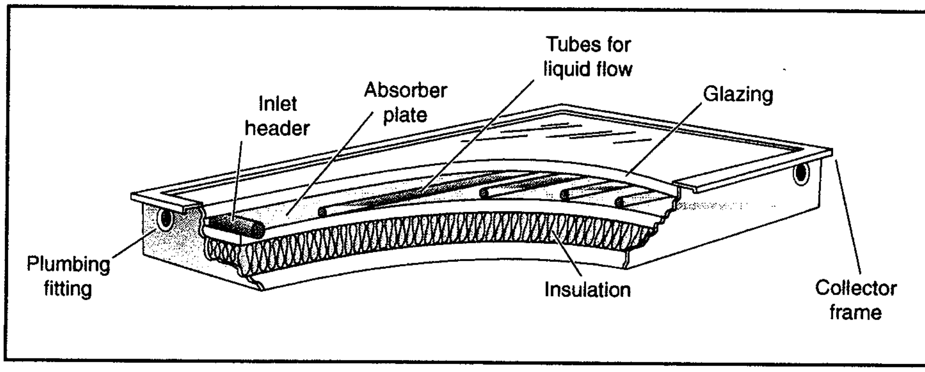


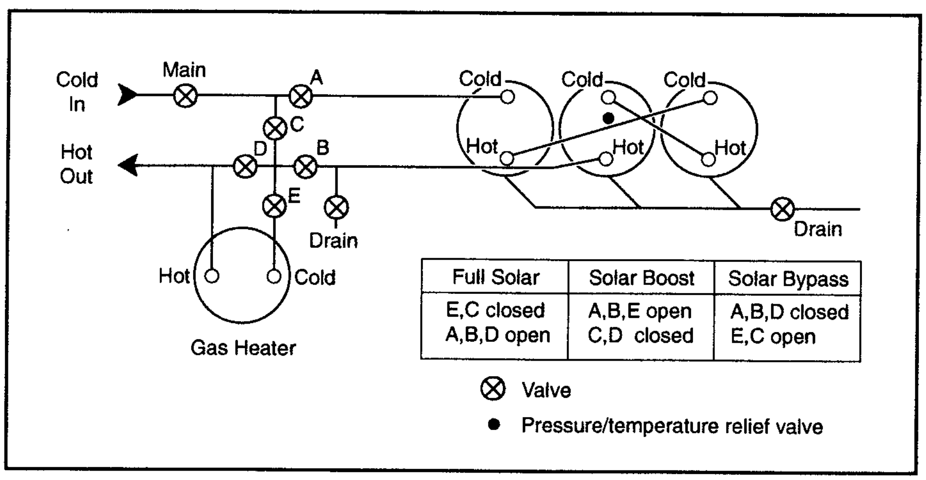
Liquid heating "flat plate" collector *It is a very simple machine.*

ACTIVE SOLAR SYSTEMS: DIRECT AND INDIRECT

Active water heaters are more efficient than their passive brethren, but they also require more equipment in the form of collectors, sensors, circulating pumps and controller mechanisms.

Active systems come in two categories: direct (sometimes known as open loop) and indirect (closed loop). Direct systems heat water in the collectors. Indirect systems do not heat the household water, but instead they employ another fluid such as freon, distilled water or propylene glycol. After the fluid is heated in the collectors, it travels through a heat exchanger, where the heat it contains is transferred to the household water.

While direct systems are more efficient than indirect ones, they require more maintenance and are prone to scaling: a build up of mineral deposits that can close the smaller pipes. In addition, the direct systems must be allowed to drain to prevent damage from freezing or overheating. This drain down design limits installation options and requires additional components.



Full Solar	Solar Boost	Solar Bypass
E,C closed A,B,D open	A,B,E open C,D closed	A,B,D closed E,C open

Full solar, solar boost, and solar bypass systems *Direct systems are more efficient than indirect ones.*

COLLECTOR SYSTEM BASICS

The flat plate solar collector is a very simple machine. An insulated rectangular box, it contains a metal plate (usually copper) that has been painted black, with headers made of 3/4 inch or 1 inch pipe at each end that are connected to small tubes called risers made from 1/4 inch pipe. Supply water flows from the header into the risers where it is heated and then returns to the storage tank. The entire box is covered with tempered glass, which is hail resistant, and then installed at an angle equal to latitude plus 10 degrees.

STORAGE TANKS

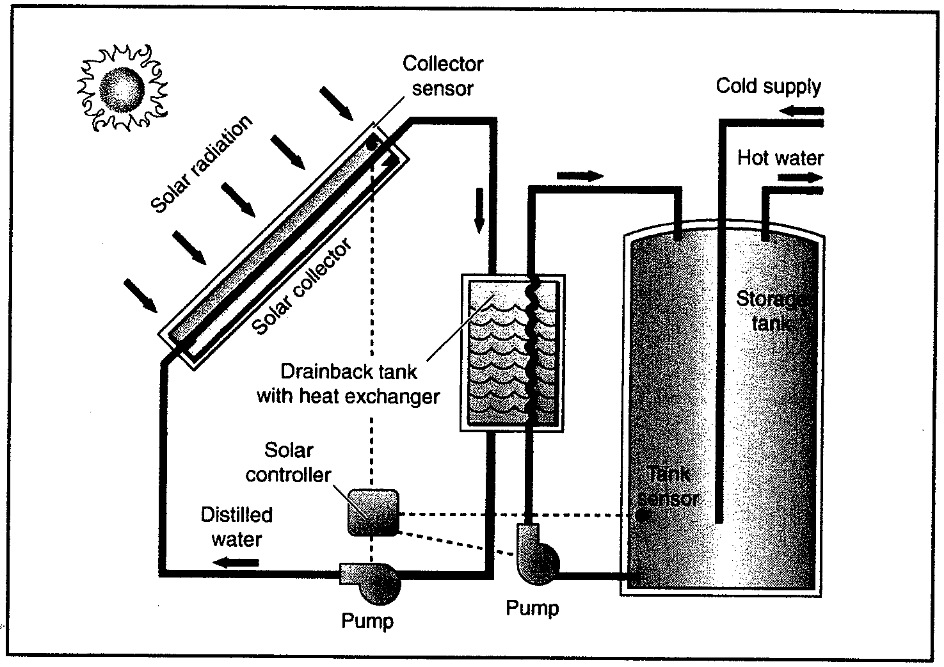
Whether the design used is direct or indirect, a large storage tank will be required. The most commonly used size is 80 gallons. Similar in shape to a water heater, solar water storage tanks must be highly insulated to preserve the heat gained by the collectors. From the storage tank, the water is usually routed to a standard water heater.

Tempering or mixing valves are recommended for residential water heating because solar systems typically heat water to 180 degrees, which can be a safety hazard especially with small children. The tempering valve can be set to 120 degrees and allows cold water to mix with the hot water before it reaches the faucet.

GETTING MORE FROM YOUR SYSTEM

Have you already installed low flow shower heads and aerators on all faucets? This is a cost effective method of not only conserving water but also reducing hot water demand as well.

The time of day when you use water can greatly affect how far you can stretch your solar heated water. For instance after normal morning water usage (when your schedule allows) wait until around noon to do laundry. This allows the solar system to heat up during the morning and to recover again in the afternoon.



Drain back system *The direct systems must be allowed to drain to prevent damage.*

DO IT YOURSELF?

Passive hot water systems, which range in price from $800 to $1,500, are among the easiest ways to incorporate solar design into the home. Because of their simplicity, many homeowners design, build and install passive hot water systems themselves for under $400. If a homeowner doesn't want to embark on a project without help, there are a myriad of instructional videos, blueprints and other materials available to the home handyman.

Of course, a competent contractor can reduce the hassle factor. If you decide to use a contractor, ask friends for recommendations and be sure to ask potential contractors about their experience with the type of system you want installed. Whether you build it yourself or purchase a passive system, all permits should be purchased and local plumbing codes followed. The installation of an active solar system, which can cost $2,000 to $3,500, is best left to a professional. The best equipment may not operate correctly or may even be ruined by a bad installation.

Financial Acknowledgement This publication was developed as part of the Renewable Energy Demonstration Program and was funded 100% with oil overcharge funds from the Exxon settlement as provided by the Texas State Energy Conservation Office and the U.S. Department of Energy. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

ORGANIZATIONS

American Solar Energy Society
2400 Central Ave., G-1
Boulder, CO 80301
(303) 443-3130
www.ases.org

Energy Center
University of Texas at El Paso
P. O. Box 645
El Paso, Texas 79968
(888) 879-2887
energycenter.utep.edu

Florida Solar Energy Center
1679 Clearlake Road
Cocoa, FL 32922
(407) 638-1000
www.fsec.ucf.edu

Passive Solar Industries Council
1511 K Street, Suite 600
Washington, DC 20005
(202) 628-7400
www.sbicouncil.org

Texas Solar Energy Society
P. O. Box 1447
Austin, TX 78767-1447
(512) 326-3391
e-mail: info@txses.org
www.txses.org

Texas Renewable Energy Industries Association
P. O. Box 16469
Austin, TX 78761
(512) 345-5446
www.treia.org

RESOURCES

TEXAS RENEWABLE ENERGY EDUCATION CAMPAIGN

FREE TEXAS RENEWABLE ENERGY INFORMATION

For more information on how you can put Texas' abundant renewable energy resources to use in your home or business, visit our website at **www.InfinitePower.org** or call us at 1-800-531-5441 ext 31796. Ask about our free lesson plans and videos available to teachers and home schoolers.

ON THE WORLD WIDE WEB:

Renewables, products, sustainable living. A good place to start search. **solstice.crest.org**

El Paso Solar Energy Association. Lots of good information. **www.epsea.org**

Florida Solar Energy Center. Information on solar pool heating and other information. **www.fsec.ucf.edu** You can order a manual called "Solar Water and Pool Heating Design and Installation Manual," for $25. Run by the Florida Solar Energy Center, the site contains a panoply of other documents on renewable energy. **www.fsec.ucf.edu/docsale.htm**

Fun facts on solar water heating, including this one: "Over 1.5 million Americans have invested in solar hot water systems for their homes and businesses, with over 94% of these customers considering the investment a wise decision." **www.seia.org/sf/sfsolth.htm**

City of Austin Green Builder Program's comprehensive guide covering energy, water, building materials, solid waste and other topics. A mammoth resource.
www.greenbuilder.com/sourcebook

Department of Energy offers a wealth of information on solar water heating, including tips on sizing your system, potential cost savings and other helpful info.
www.eren.doe.gov/erec/factsheets/solrwatr.html
www.eren.doe.gov/solarbuildings/hotwater.html

Software to estimate the economic benefits can be found at:
eren.doe.gov/solarbuildings/sbm.html

BOOKS:

The Passive Solar Energy Book. Edward Mazria, Rodale Press, 1979.

Solar Water Heating Systems, Active and Passive. US Department of Energy. (available by calling (800) 523-2929)

STATE ENERGY CONSERVATION OFFICE
111 EAST 17TH STREET, ROOM 1114
AUSTIN, TEXAS 78774
PH. 800.531.5441 ext 31796
www.InfinitePower.org

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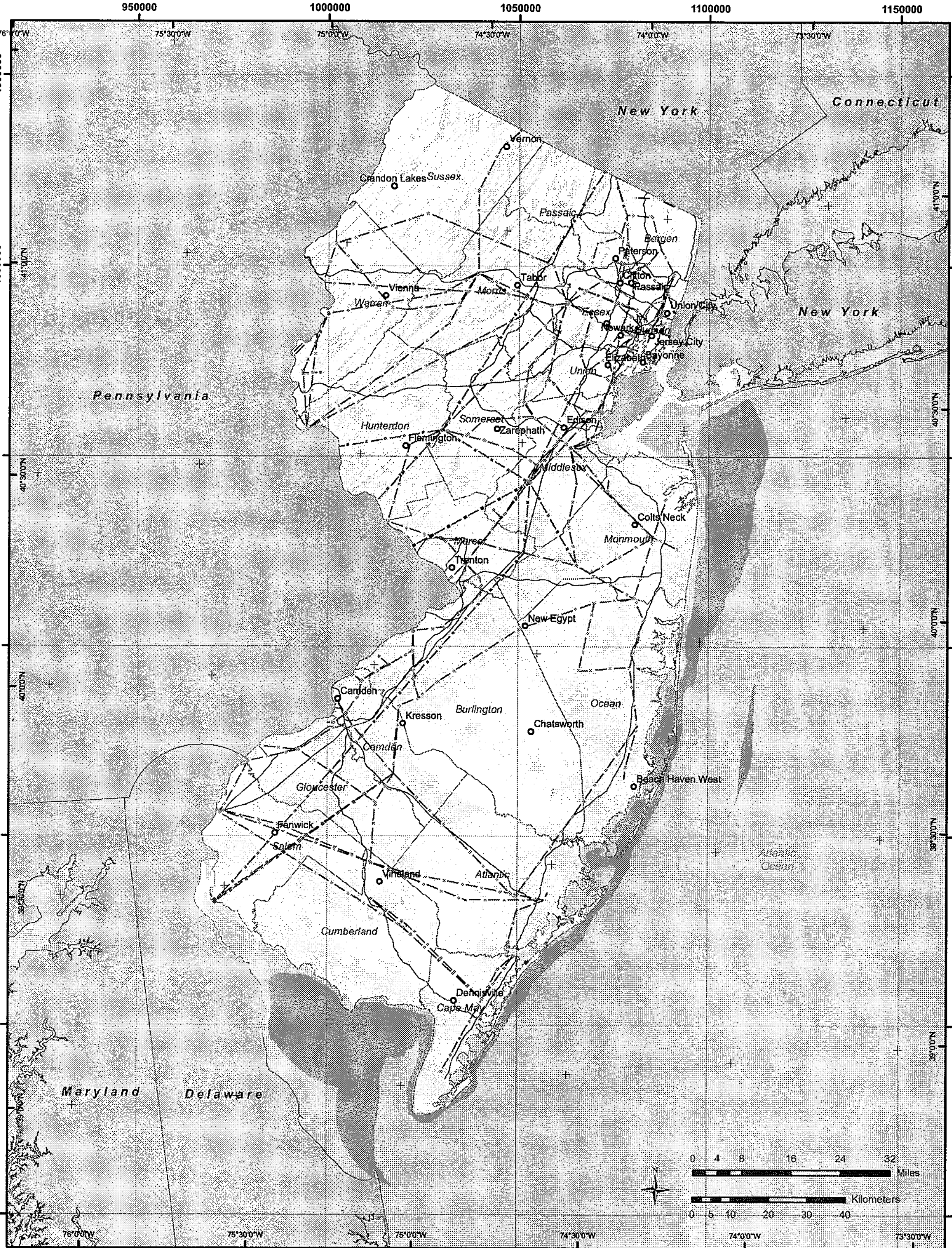
APPENDIX N

Wind



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

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

Generalized Transmission Line

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

Mean Speed at 30 m

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

AWS Truewind

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

AWS Truewind, LCC

APPENDIX O

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Police Station

ENERGY STAR

Building ID: 2413302
For 12-month Period Ending: November 30, 2009[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: October 15, 2010

Facility
Police Station
35 Fisk Road
Fair Have, NJ 07704

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1969
Gross Floor Area (ft²): 4,040

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	314,089
Natural Gas (kBtu)[4]	177,898
Total Energy (kBtu)	491,987

Energy Intensity[5]	
Site (kBtu/ft²/yr)	122
Source (kBtu/ft²/yr)	306

Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	57

Electric Distribution Utility
FirstEnergy - Jersey Central Power & Lt Co

National Average Comparison	
National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	95%
Building Type	Fire Station/Police Station

Stamp of Certifying Professional

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

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

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

Certifying Professional
N/A

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

ENERGY STAR® Data Checklist
for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) or a Registered Architect (RA) 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 or RA 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	Police Station	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Fire Station/Police Station	Is this an accurate description of the space in question?		☐
Location	35 Fisk Road, Fair Have, NJ 07704	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		☐

Police Station (Other)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	4,040 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	N/A(Optional)	Is this the number of personal computers in the space?		☐
Weekly operating hours	N/A(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	N/A(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: FirstEnergy - Jersey Central Power & Lt Co

Fuel Type: Electricity

Meter: Electricity (kWh (thousand Watt-hours))
Space(s): Entire Facility
Generation Method: Grid Purchase

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
10/17/2009	11/17/2009	5,540.00
09/19/2009	10/16/2009	6,976.00
08/18/2009	09/18/2009	10,331.00
07/17/2009	08/17/2009	11,406.00
06/17/2009	07/16/2009	9,460.00
05/16/2009	06/16/2009	8,727.00
04/17/2009	05/15/2009	6,968.00
03/18/2009	04/16/2009	6,014.00
02/13/2009	03/17/2009	6,099.00
01/15/2009	02/12/2009	6,553.00
12/16/2008	01/14/2009	6,891.00
Electricity Consumption (kWh (thousand Watt-hours))		**84,965.00**
Electricity Consumption (kBtu (thousand Btu))		**289,900.58**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**289,900.58**
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		☐

Fuel Type: Natural Gas

Meter: Natural Gas (therms)
Space(s): Entire Facility

Start Date	End Date	Energy Use (therms)
10/23/2009	11/18/2009	67.73
09/23/2009	10/22/2009	11.50
08/21/2009	09/22/2009	3.14
07/23/2009	08/20/2009	2.09
07/01/2009	07/22/2009	10.50
06/02/2009	06/30/2009	138.14
04/30/2009	06/01/2009	135.42
03/28/2009	04/29/2009	142.92
02/28/2009	03/27/2009	154.98
01/30/2009	02/27/2009	339.14
12/29/2008	01/29/2009	434.52

Natural Gas Consumption (therms)	**1,440.08**
Natural Gas Consumption (kBtu (thousand Btu))	**144,008.00**
Total Natural Gas Consumption (kBtu (thousand Btu))	**144,008.00**
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 PE or RA 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
Police Station
35 Fisk Road
Fair Have, NJ 07704

Facility Owner
N/A

Primary Contact for this Facility
N/A

General Information

Police Station	
Gross Floor Area Excluding Parking: (ft^2)	4,040
Year Built	1969
For 12-month Evaluation Period Ending Date:	November 30, 2009

Facility Space Use Summary

Police Station	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft2)	4,040
Number of PCs°	N/A
Weekly operating hours°	N/A
Workers on Main Shift°	N/A

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	Current (Ending Date 11/30/2009)	Baseline (Ending Date 12/31/2008)	Rating of 75	Target	National Average
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft2)	122	125	0	N/A	78
Source (kBtu/ft2)	306	321	0	N/A	157
Energy Cost					
$/year	$ 18,205.62	$ 18,161.30	N/A	N/A	$ 11,660.69
$/ft2/year	$ 4.51	$ 4.50	N/A	N/A	$ 2.89
Greenhouse Gas Emissions					
$MtCO_2e$/year	57	60	0	N/A	37
$kgCO_2e$/ft2/year	14	15	0	N/A	9

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

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

APPENDIX P

Block Load and Reconcile Thermal

Fair Haven
CHA #21968
Building: Police Station

Reconcile Thermal Model

Building Footprint	3,670 SF	Ex Occupied Clng Temp.	74 °F	Ex Occupied Htg Temp.	68 °F
Heating Efficiency	92%	Ex Unoccupied Clng Temp.	74 °F	Ex Unoccupied Htg Temp.	68 °F
Cooling Efficiency	1.20 kW/ton	Occupied Cooling UA	(1,174) btu/hr/°F	Occupied Heating UA	530 btu/hr/°F
Internal Gains	25,185 btu/h	Unoccupied Cooling UA	(932) btu/hr/°F	Unoccupied Heating UA	530 btu/hr/°F
Unoc Internal Gain factor	0.02	Cooling Occ Enthalpy Setpoint	27.8 Btu/lb		
Ave Occ Internal Gain Factor	0.6	Cooling Unocc Enthalpy Setpoint	27.8 Btu/lb		
Economizer available (Y/N)	No				

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

					EXISTING LOADS									
					Occupied			Unoccupied						
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Total Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Available Economizer Cooling kWh	Necessary Cooling Energy kWh	Existing Cooling Energy kWh	Existing Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L	M	M
102.5	49.1	0	0	0	-33,451	-68,665	-15,111	-26,561	-68,665	-504	0	0	0	0
97.5	42.5	3	1	2	-27,582	-47,389	-15,111	-21,902	-47,389	-504	0	22	22	0
92.5	39.5	34	8	26	-21,714	-37,718	-15,111	-17,242	-37,718	-504	0	204	204	0
87.5	36.6	131	31	100	-15,845	-28,369	-15,111	-12,582	-28,369	-504	0	599	599	0
82.5	34.0	500	119	381	-9,977	-19,987	-15,111	-7,922	-19,987	-504	0	1,619	1,619	0
77.5	31.6	620	148	472	-4,108	-12,250	-15,111	-3,262	-12,250	-504	0	1,221	1,221	0
72.5	29.2	664	158	506	0	0	-15,111	0	0	-504	0	264	264	0
67.5	27.0	854	203	651	265	387	-15,111	265	387	-504	0	294	294	0
62.5	24.5	927	221	706	2,917	4,255	-15,111	2,917	4,255	-504	0	175	175	0
57.5	21.4	600	143	457	5,569	8,124	-15,111	5,569	8,124	-504	0	20	20	0
52.5	18.7	610	145	465	8,221	11,992	-15,111	8,221	11,992	-504	0	0	0	108
47.5	16.2	611	145	466	10,873	15,861	-15,111	10,873	15,861	-504	0	0	0	151
42.5	14.4	656	156	500	13,525	19,729	-15,111	13,525	19,729	-504	0	0	0	209
37.5	12.6	1,023	244	779	16,178	23,598	-15,111	16,178	23,598	-504	0	0	0	398
32.5	10.7	734	175	559	18,830	27,466	-15,111	18,830	27,466	-504	0	0	0	338
27.5	8.6	334	80	254	21,482	31,335	-15,111	21,482	31,335	-504	0	0	0	177
22.5	6.8	252	60	192	24,134	35,203	-15,111	24,134	35,203	-504	0	0	0	152
17.5	5.5	125	30	95	26,786	39,071	-15,111	26,786	39,071	-504	0	0	0	84
12.5	4.1	47	11	36	29,438	42,940	-15,111	29,438	42,940	-504	0	0	0	35
7.5	2.6	22	5	17	32,090	46,808	-15,111	32,090	46,808	-504	0	0	0	18
2.5	1.0	13	3	10	34,742	50,677	-15,111	34,742	50,677	-504	0	0	0	12
-2.5	0.0	0	0	0	37,394	54,545	-15,111	37,394	54,545	-504	0	0	0	0
-7.5	-1.5	0	0	0	40,046	58,414	-15,111	40,046	58,414	-504	0	0	0	0
TOTALS		8,760	2,086	6,674								4,419	4,419	1,680

Existing Building Ventilation & Infiltration (occ)	716 cfm
Overheat Ventilation Factor	1.00
Additional ventilation to offset overheat	0 cfm
Existing Building Ventilation & Infiltration (unocc)	716 cfm
Economizer Ventilation (from AHU's)	0 cfm

Energy Use Indices (calculated)

	Base Case
Heating	1,680
Target ->	1,672
	100.5%

	Base Case
Cooling	4,419
Target ->	4,417
	100.1%

Electrical Requirements for Cooling Equipment

Unit	Area Served	Clng Hrs	Amps	Volts	Phase	Power Factor	% Runtime	Annual kWh
Condenser 1		1,952	36.0	208	1	0.8	20%	2456
Condenser 2		1,952	23.0	208	1	0.8	25%	1961
Total								4,417

HEAT GAIN/LOSS WORKSHEET

Project Name:	Fair Haven	Project No.:	CHA #21968		
Location	35 Fisk Street Fair Haven NJ, 07704	Site Elevation:	460 Feet	Specific Volume	14.00 CF/#
Building Name	Police Station	Date:			
Engineer:	Jacob Hansen / Patrick Shane				

Building/Facility Designation

Outdoor Winter Design DB Temperature	10 °F	Indoor Winter Design DB Temperature	68 °F
Outdoor Summer Design DB Temperature	93 °F	Indoor Summer Design DB Temperature	74 °F
Outdoor Summer Design WB Temperature	74 °F	Indoor Summer Design WB Temperature	60 °F
Outdoor Summer Humidity Ratio	0.0121 #/#	Indoor Air (70°F) Humidity Ratio	0.0079 #/#

ENVELOPE DESCRIPTIONS (Descriptions are from Interior to Exterior)

Walls (Select One - Type X)

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

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	U value calculator	16.9	

Windows (Select One)

		U Value
X	Aluminum Frame, 1/8" SP Glazing	1.05
	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
	Other	0.00

	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 1,785 SF

Occupied Area 3,570 SF

Return Plenum? n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	48 Ft	17.0 Ft	16.0 Ft	22 SF	42 SF	752 SF
East Exposure	50 Ft	17.0 Ft	16.0 Ft	33 SF	11 SF	797 SF
South Exposure	42 Ft	17.0 Ft	16.0 Ft	0 SF	0 SF	714 SF
West Exposure	50 Ft	17.0 Ft	16.0 Ft	44 SF	0 SF	797 SF

Occupied Forced Ventilation	200 cfm	0.3 AC/hr
Unoccupied Forced Ventilation	200 cfm	0.3 AC/hr

HEAT GAIN/LOSS WORKSHEET

Project Name:	Fair Haven	**Project No.:**	CHA #21968		
Location	35 Fisk Street Fair Haven NJ, 07704	**Site Elevation:**	460 Feet	**Specific Volume**	14.00 CF/#
Building Name	Police Station	**Date:**			
Engineer:	Jacob Hansen / Patrick Shane				

Building/Facility Designation

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	**AREA (SF)**	**SHGF**	**Shade Coef**	**Cooling Load Factor**		**Solar Heat Gain**	
North Exposure	22	38 btu/h/sf	0.8	0.75	Glass Type C	502 Btu/hr	
East Exposure	33	216 btu/h/sf	0.8	0.31	Glass Type C	1,769 Btu/hr	
South Exposure	0	109 btu/h/sf	0.8	0.58	Glass Type C	0 Btu/hr	
West Exposure	44	216 btu/h/sf	0.8	0.29	Glass Type C	2,225 Btu/hr	
							4,496 Btu/h

CONDUCTION

	NET AREA (SF)	**U-VALUE**	**Cooling Load Temp. Dif.**	**Return Air Factor**	**Room Heat Gain**	
North Exposure	704	0.09	20 °F	1.0	1,271 Btu/hr	
East Exposure	748	0.09	39 °F	1.0	2,633 Btu/hr	
South Exposure	672	0.09	27 °F	1.0	1,638 Btu/hr	
West Exposure	748	0.09	22 °F	1.0	1,484 Btu/hr	
Roof	1,785	0.06	73 °F	1.0	7,706 Btu/hr	
Fenestration	99	1.05	19 °F		1,942 Btu/hr	
Doors	53	0.14	27 °F		200 Btu/hr	
Ceiling	3,570	0.14	0 °F		0 Btu/hr	
Partition		0.05	0 °F		0 Btu/hr	
Floor	3,570	0.04	0 °F		0 Btu/hr	
						16,873 Btu/h

INTERNAL HEAT GAINS (all loads below are based on Occupied Periods)

						Room Heat Gain	
Lights	1.50 w/sf x	3,570 Occ Area =		5.4 kW x 3.4x	1.0 RAF =	18,277 Btu/h	
Plug Load	0.10 w/sf x	3,570 Occ Area =		0.4 kW x 3.4x	1.0 RAF =	1,218 Btu/h	
People	3 people x	255 btu/person x	30%	time in space =		230 Btu/h	
Computer Work Stations		5 Units x	120	W/Unit x	3414 =	2,048 Btu/h	
Equipment	1.0 kW x 3.413 =					3,413 Btu/h	
Misc.						0 Btu/h	
							25,185 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	**Perimeter Ratio**	**Coef**	**Temp. Diff.**	**Room Heat Gain**	
Walls	2,872 SF	0.15 CFM/SF		1.04	19 °F	9,032 Btu/h	
Doors	53 SF	0.33 CFM/LF	1.01 LF/SF	1.04	19 °F	369 Btu/h	
Windows	99 SF	0.33 CFM/LF	1.21 LF/SF	1.04	19 °F	832 Btu/h	
Ventilation	200 cfm			1.04	19 °F	4,194 Btu/h	
							14,427 Btu/h
Infiltration	488 cfm	0.8 AC/hr					

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	48	0.09	20	1.0	87 Btu/hr	
East Exposure	50	0.09	39	1.0	174 Btu/hr	
South Exposure	42	0.09	27	1.0	102 Btu/hr	
West Exposure	50	0.09	22	1.0	98 Btu/hr	
Roof	1,785	0.06	73	0.0	0 Btu/hr	
						462 Btu/h

INTERNAL HEAT GAINS

Lights	1.50 w/sf x	3,570 Occ Area =	5.4 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	4,496	**Internal Gains to Room**	25,185
Conduction to Room	16,873	**Internal Gains to Plenum**	0
Conduction to Plenum	462		
Ventilaton and Infiltration	14,427		
Sub Total	36,258	**Sub Total**	25,185

HEAT GAIN/LOSS WORKSHEET

Project Name:	Fair Haven	Project No.:	CHA #21968			
Location	35 Fisk Street Fair Haven NJ, 07704	Site Elevation:	460	Feet	Specific Volume	14.00 CF/#
Building Name	Police Station	Date:				
Engineer:	Jacob Hansen / Patrick Shane					

Building/Facility Designation

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain	
Walls	1,974 SF	0.15 CFM/SF	4,629	0.0042 #/#	5,815 Btu/h	
Doors	53 SF	0.33 CFM/LF	4,629	0.0042 #/#	346 Btu/h	
Windows	99 SF	0.33 CFM/LF	4,629	0.0042 #/#	780 Btu/h	
Ventilation	200 cfm		4,629	0.0042 #/#	3,928 Btu/h	
People	3 people	0.30 time in space		250 Btu/hr/person	225 Btu/h	
						11,093 Btu/h

Cooling Load Summary

	Sensible	Latent	Total		
Temperature Dependent Gains	36,258	11,093	47,351		
Temperature Indep. Gains	25,185		25,185	SHR=	0.85
Total	61,443	11,093	72,536		

Building Cooling Load 6.0 Tons at 591 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is 4,869 CFM

1.36 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	752	0.09	58	3,950 Btu/h
East Exposure	797	0.09	58	4,189 Btu/h
South Exposure	714	0.09	58	3,750 Btu/h
West Exposure	797	0.09	58	4,187 Btu/h
Fenestration	99	1.05	58	6,077 Btu/h
Roof	1,785	0.06	58	6,144 Btu/h
Doors	53	0.14	58	431 Btu/h
Ceiling	3,570	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	1,785	0.04	30	2,142 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	3,061 SF	0.15 CFM/SF	1.04	58	459 cfm	27,889 Btu/h
Doors	53 SF	0.33 CFM/LF	1.04	58	18 cfm	1,069 Btu/h
Windows	99 SF	0.33 CFM/LF	1.04	58	40 cfm	2,412 Btu/h
Ventilation Load	200 cfm		1.04	58	200 cfm	13,122 Btu/h
Total Ventilation & Infiltration Load					716 cfm	44,492 Btu/h

Building Heating Load	75,362	btu/h
	21.1	btu/sf

APPENDIX P

Equipment Inventory

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size	Location	Areas Served	Date Installed	Remaining Useful Life (years)	Other Info.
Heat Pump AHU #1	1	York	G1UA036S17C	(S)EHJS195223	HVAC /Electric	60,000 Btuh	Boiler Room	1st and 2nd Floor	-	16	Good Condition
Condenser #1	1	Trane	XB-13 - 4TTB3060A1000AA	9023LNM5F	Cooling / Electric	5.0 tons; 29 Amps	Outside	Heat Pump AHU	-	10	Fair Condition
Condenser #2	1	York			Cooling / Electric		Outside	Server Room	-	5	Fair Condition
Emergency Generator	1				Electric		Inside	Entire Building	-	10	Fair Condition
Air Handling Unit	1	York			HVAC /Electric		Outside	Annex		4	Poor Condition
Domestic HW Heater	1	A.O. Smith			DHW / Electric		Boiler Room	Entire Building	-	10	Fair Condition