BOROUGH OF STRATFORD
ENERGY ASSESSMENT

for

NEW JERSEY
BOARD OF PUBLIC UTILITIES

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1.0 INTRODUCTION & BACKGROUND

Three buildings within Stratford Borough are included in this energy audit; the Borough Hall, Justice Facility, and Fire Station.

The Stratford Borough Hall is a 2,500 SF facility located at 307 Union Avenue in Stratford, NJ. The building was constructed in 1973 and has not undergone any major renovations. The facility is generally occupied Monday through Friday from 9:00 AM until 5:00 PM by six fulltime employees. The building has one floor and a basement. The main floor consists of office space; the basement is utilized for storage and secondary office space.

The Stratford Justice Facility is 7,000 SF, and located at 315 Union Avenue in Stratford, NJ. The building was constructed in 1959 as a post office, but was renovated in 2000 to serve as the general office space for the municipal court and police. During the 2000 renovation, all mechanical systems were replaced, including electrical wiring, lighting, and HVAC; new windows and insulation were also installed. The building has two floors; the first floor houses the general court offices, municipal courtroom, and criminal processing area and holding cell. The second floor consists mainly of police department offices, and also has a large conference room.

The Stratford Fire Station is a 12,000 SF facility located at 311 East Laurel Road in Stratford, NJ. The building was constructed in 2006 and has not undergone any major renovations. The building consists of a large garage, which comprises the entire first floor of the building. The second floor consists of offices and recreational areas for the fire company staff. Typical building occupancy is low throughout the day, peak occupancy occurs for a fire call; or during a weekly meeting or other events held at the station.

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 Stratford Borough Hall, Justice Facility, and Fire Station. The Borough Hall is a 2,500 SF facility constructed in 1973 which is occupied Monday through Friday from 9:00 AM until 5:00 PM by six fulltime employees. The 7,000 SF Justice Facility was constructed in 1959, and renovated in 2000 to house the municipal court and police. The Fire Station, a 12,000 SF facility constructed in 2006, consists of a large garage, and offices and staff recreational areas. The following areas were evaluated for energy conservation measures:

- Insulation upgrades
- Night setback
- Restroom fixture upgrades
- Lighting replacement with occupancy sensors
- Door seals
- Exterior lighting upgrades
- Building temperature setback
- Window replacement
- Domestic hot water heater replacement

Various potential Energy Conservation Measures (ECMs) were identified for the above categories. Potential annual savings of $9,800 for the recommended ECMs may be realized with a payback of 3.5 years. It should be noted that Stratford will be switching to Hess as the electricity supplier for all three buildings; however, the ECM calculations were completed using the current rate structure under the existing utility service providers.

The ECMs identified in this report will allow for the buildings 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:

2.1 Borough Hall

BH ECM-1 Increase Roof Insulation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
3,400	0	140	390	600	3.2	N/A	5.7	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

BH ECM-2 Back Office Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
200	0	600	0	100	6.2	N/A	2.0	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

BH ECM-5 Replace Urinals & Flush Valves with Low Flow Types

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		kgals	Total				
$	kW	kWh	Water	$		$	Years	Years
600	0	0	6	100	1	N/A	6.0	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

BH ECM-9 Lighting Replacement & Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
11,000	0	5,950	0	1,100	0.5	800	10.0	9.3

* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting & Lighting Controls Applications. See section 5.0 for other incentive opportunities.

2.2 Justice Facility

JF ECM-1 Install Door Seals

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
200	0	440	60	200	6.9	N/A	1.0	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

JF ECM-2 Building Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
5,100	0	4,500	310	1,200	2.6	N/A	4.3	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

JF ECM-4 Exterior Lighting Timers

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
300	0	1,510	0	200	12.6	N/A	1.5	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

JF ECM-5 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
5,000	0	6,120	0	1,100	2.3	700	4.5	3.9

* Incentive shown is per the New Jersey Smart Start Program, Lighting Controls Application. See section 5.0 for other incentive opportunities.

2.3 Fire Station

FS ECM-2 Building Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
2,300	0	3,640	550	1,400	7.96	N/A	1.7	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

FS ECM-4 Metal Halide Lighting Replacement

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
8,400	4.3	21,720	0	3,500	5.31	1,900	2.4	1.9

* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting Application. See section 5.0 for other incentive opportunities.

FS ECM-5 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
1,300	0	1,780	0	300	2.49	100	4.3	4.0

* Incentive shown is per the New Jersey Smart Start Program, Lighting Controls Application. See section 5.0 for other incentive opportunities.

3.0 EXISTING CONDITIONS

3.1 Borough Hall

3.1.1 Building General

The 2,500 SF Stratford Borough Hall was constructed in 1973 and has not undergone major renovations. The building has a main floor and basement; the main floor is used primarily for office space, the basement is also used for record storage. The facility has six full time employees, with occupancy typically from 9:00 AM to 5:00 PM Monday through Friday.

The building is constructed of block walls with a brick veneer, with some insulation in the walls. The first floor is a concrete pour on steel decking. The building has a flat metal deck roof with insulation located above the drop ceiling which is original to construction; the roof has never been replaced but is recoated annually. Windows and doors are also original construction, all windows consist of single pane glass with metal frames.

3.1.2 Utility Usage

The Borough Hall pays for electricity, natural gas, and water. Electricity is provided by Atlantic City Electric Company, gas by South Jersey Gas Company, and water by New Jersey American Water Company. Each utility has a single meter for the building; for gas and electric, both commodity and delivery is purchased from Atlantic City Electric Company and South Jersey Gas Company, respectively. The following utility data is based on the most recent 12 months of utility data.

The building used 35,530 kWh of electricity over the past 12 months with a maximum demand of 16.2 kW. The total annual cost was $6,400, for a blended rate of $0.18 per kWh. The average electricity cost was $0.17 per kWh with an average demand charge of $3.61 per kW. Electricity usage and demand profiles varied as expected throughout the year, both were at a minimum during the winter months and peaked during the summer months, when air conditioners were running.

Stratford recently received a bid from Hess to supply electricity at a contract rate of $0.09 per kWh. Stratford plans to switch to Hess as its electricity supplier for all three buildings. However, the calculations for the ECMs were completed using the current rate structure under the existing utility service providers.

Annual natural gas usage was 1,440 therms, at a cost of $2,100. The average rate paid over the past 12 months was $1.45 per therm. Natural gas is used for heating and hot water; however, hot water demand is very low, the only use is for restroom sinks. The usage profile peaked at 340 therms during the coldest months, and dropped as low as 3 therms during the summer, when the only demand for gas was hot water.

Water usage was 21,000 gallons over the year, which cost $230; the average cost for the water was $10.93 per kgal. The water usage profile was fairly constant at 1 or 2 kgals per month; although usage peaked at 4 kgals during January 2010.

Electricity and natural gas commodity supply and delivery is presently purchased from Atlantic City Electric and South Jersey Gas Company, 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, as the Borough plans to do for electricity. The electricity or natural gas commodity supply entity will require submission of one to three years of past energy bills. Contract

terms can vary among suppliers. A list of approved electrical and natural gas energy commodity suppliers can be found in Appendix A.

3.1.3 HVAC Systems

The Stratford Borough Hall is heated by natural gas furnaces and cooled by electric air conditioners. Four natural gas furnaces, which were installed in 2008, with cooling coils served by outdoor AC condensing units, are located in the utility room. The furnaces are manufactured by Gibson, they are 100,000 Btuh input and with an 80% burner efficiency. The condensing units are located outside, on grade near the basement stairwell. The condensers are manufactured by Coleman, and are all 2 ton or 2.5 ton units.

A 2 ton split system air conditioner serves the first floor rear office. In addition, two small ducted air conditioners serve the tax collectors office and the side office adjacent to it. The units are manufactured by Everstar, model MPK-10CR-1, each has a capacity of 10,000 Btuh and a 9.5 energy efficiency ratio (EER).

3.1.4 Lighting/Electrical Systems

The lighting consists of the original fluorescent lighting fixtures controlled by switches. Most of the lights in the building are 4 ft T-12 fixtures with two or four bulbs and magnetic ballasts. A complete lighting inventory can be found in Appendix C.

3.1.5 Control Systems

The building does not have a centralized control system. The HVAC units located in the utility room are controlled by programmable thermostats; each unit has one thermostat for the area served, which controls the gas fired furnace and the outdoor AC condensing unit. The units operate in occupied mode from 7:30 AM until 5:00 PM Monday through Friday, with an occupied cooling setpoint of 72°F and an unoccupied cooling setpoint of 80°F. Heating setpoints are not known since the units were not in heating mode.

The split system cooling unit which serves the back office has a manual thermostat set to 74°F during the site visit. This thermostat does not enable automatic setback, and maintains the same setpoint during unoccupied hours.

3.1.6 Plumbing System

The building has three restrooms on the main floor; the men's and women's restrooms are located adjacent to the main lobby, a private restroom is located off the mayor's office. The men's room has one each sink, urinal, and toilet; the women's room and mayor's restroom have one sink and toilet each. All plumbing fixtures are original to the building; the toilets appear to use 3.5 gallons per flush, sink faucets do not use aerators and are not low flow, and the urinals do not appear to be low flow.

Domestic hot water is produced by a Mor-Flo natural gas fired hot water heater; model G61-30T33-3NV. The heater is located in the utility room, and serves the entire building. It has a 30 gallon tank and a 33,000 Btuh input, with a 160°F maximum water outlet temperature. Domestic hot water in the building is only used for restroom sinks; therefore, the demand is very low.

3.2 JUSTICE FACILITY

3.2.1 Building General

The Justice Facility is 7,000 SF, constructed in 1959, but significantly modified in 2000. As part of the 2000 renovation project, the second floor was added, all mechanical and electrical equipment was replaced, and new windows were installed. The building serves as general office space for the police and municipal courts; it also has a courtroom and holding cell located on the first floor.

Typical building occupancy consists of three full time court employees and four officers on duty during normal business hours. The building operates 24/7 since there is generally at least one police officer occupying the building at any time. Town council meetings are held in the courtroom twice per month; these meetings typically last for several hours and are attended by 20 to 30 people. Court is held three times per month, with two daytime and one evening session; courtroom occupancy generally consists of 10-20 people.

The building has two floors, and no basement. First floor exterior walls are concrete block with a brick veneer, the walls are insulated. The building has a mansard type roof which encompasses the second floor; the ceiling above the second floor is well insulated with fiberglass batt insulation.

3.2.2 Utility Usage

The Justice Facility pays for electricity, natural gas, and water. Electricity is provided by Atlantic City Electric Company, gas by South Jersey Gas Company, and water by New Jersey American Water Company. Each utility has a single meter for the building; gas and electric commodity and delivery are purchased from the previously noted companies. The following utility data is based on the most recent 12 months of utility data.

The Justice Facility used 74,100 kWh during the past 12 months, with a 31.5 kW peak demand. Annual cost was $13,300, which resulted in an average blended rate of $0.18 per kWh. The average supply rate was $0.15, and average demand charge $8.50 per kW. As expected, the electricity usage was at a minimum during the winter months, and peaked during the summer months, with air conditioning usage.

Annual natural gas usage was 1,700 therms, which cost $2,400 over the 12 month period. The average natural gas rate was $1.43 per therm. Monthly gas usage was at a high during the heating season, when the facility consumed nearly 500 therms. Summer natural gas usage was as low as 6 therms in a month, when the only use was domestic hot water.

The Justice Facility consumed 55,000 gallons of water over the past year, at a cost of $400, at a rate of $7.75 per kgal. Monthly usage was typically between 2 and 8 kgals; however, usage reached a maximum of 15 kgals in September 2009. It is unknown why water usage was so large during September 2009. The only use for water in the building is sinks and toilets; monthly usage was sporadic and did not vary based on temperature.

3.2.3 HVAC Systems

Heat is provided by four natural gas furnaces which utilize outdoor electric AC condensing units for cooling.

Two furnaces are located in the crawlspace above the second floor office on the northwest end of the building; each unit serves one side of the building, air flows from northwest to southeast. The furnaces are manufactured by Bryant, model 350MAV060100; they have a 100,000 Btuh heating input with 93% combustion efficiency. The outdoor condensing units which serve the furnaces are located on the ground

along the northeast wall of the building. Each has a 5 ton cooling capacity with a 14 Seasonal Energy Efficiency Rating (SEER).

The two furnaces which serve the first floor are located in the mechanical closet on the north corner of the building. The units operate in the same manner as the second floor units, each serving a side of the building, moving air from the back of the building to the front. These units are Bryant, model 350MAV048100; each has the same heating capacity and efficiency as the second floor units. The condensing units serving these furnaces are also located on the ground along the northeast wall of the mechanical closet; each has a 3.5 ton cooling capacity with a 14 SEER.

There is an additional split system air conditioning unit serving the courtroom which is manufactured by Sanyo, it has a 3 ton capacity and 10.8 SEER. The indoor evaporator is a recessed ceiling insert which delivers 980 CFM.

3.2.4 Lighting/Electrical Systems

Lighting is primarily two or four lamp T-8 fixtures. Some of the second floor offices have halogen track lighting on the walls or ceiling and decorative incandescent bulbs in lights on ceiling fans. There are also various pin based compact fluorescent light bulbs (CFLs) in several areas of the building. All lights are controlled by master switches, with no occupancy based controls in place.

There are 12 exterior recessed fixtures located underneath the overhang of the mansard roof. Four of the lights have 60 W incandescent flood bulbs, while the rest use screw in type CFL bulbs. These lights are controlled by timers to operate approximately from sundown until sunrise. There are three addition exterior lights along the rear wall of the building near the police processing area entrance; these lights operate 24/7, facility staff was unaware of any switch by which controls the three lights.

3.2.5 Control Systems

The Justice Facility has no advanced control system, and uses manual thermostats for control of the HVAC system. The first floor has a single thermostat which controls both furnaces, it was set to 67°F during the site visit. This setpoint seems low for the cooling season, but due to the location of the thermostat, it must be set low to keep the front of the building cool. The back of the building, close to the origin of the supply ductwork stays cool, while the front of the building gets very warm during the summer. The opposite issue also occurs during the winter months when the building is in heating mode.

The two second floor furnaces and corresponding AC units are each controlled by a separate manual thermostat (controls heating & cooling). The thermostats are located near the back of the building, on the respective side which the unit serves. During the site visit, both thermostats were set to below 60°F, and the space was about 62°F. The same problem occurs on this floor with the front of the building being under heated/cooled.

3.2.6 Plumbing System

The Justice Facility has one restroom on the first floor, and two on the second. Each restroom contains a toilet and sink, one of the second floor restrooms also has a urinal and shower; however the shower is no longer used. There is also a combined toilet/sink located in the holding cell. All plumbing fixtures in the building were upgraded during the 2000 renovation; toilets use 1.6 gpf, and the urinals 1 gpf or less. The sinks are also fitted with aerators.

3.3 FIRE STATION

3.3.1 Building General

The Stratford Fire Station is a 12,000 SF facility which was constructed in 2006 and has not undergone major renovations. The first floor serves as a garage for the fire trucks. The second floor consists of offices, meeting rooms, kitchen, restrooms, and a recreational area for the department. The building is typically unoccupied, although volunteer staff have access to the building 24/7 to use the offices, weight room, and lounge. Times of increased occupancy are at the time of a fire call, which average about one per day; or during the weekly Tuesday night meeting. The company has 40 volunteer members.

The building is constructed of split face block on the first floor, and has a mansard type roof which encompasses the second floor. The roof (which includes second floor walls), is insulated with fiberglass batt insulation. The first floor (garage) walls and ceiling are not insulated, but this space is kept to a lower setpoint than the upstairs, and is not cooled.

3.3.2 Utility Usage

The Fire Station pays for electricity and natural gas usage. Electricity is provided by Atlantic City Electric Company, gas by South Jersey Gas Company; from which commodity and delivery are also purchased. Each utility has a single meter for the building. The facility does not pay for use of municipal water. The following information is based on the most recent 12 months of utility data.

The Fire Station used 103,560 kWh of electricity over the past 12 months, with a peak demand of 36.7 kW. The annual total electricity cost was $17,500, which resulted in an average blended rate of $0.17 per kWh. The average supply rate was $0.14 per kWh, and the average demand rate was $7.92 per kW. Electric usage and demand peaked during the summer months, as expected, but also showed a peak during December 2009. Since no other winter months showed a rise in electric usage or demand, it is assumed that the spike in electric usage was an isolated incident, and unrelated to temperature.

The facility also used 3,780 therms of natural gas in the most recent 12 month period, which cost $5,100, at an average rate of $1.35 per therm. Natural gas usage peaked at slightly fewer than 1,000 therms during the highest winter month, and dropped as low as 15 therms during a summer month. The only usage for natural gas in the building is heating in winter, and domestic hot water.

3.3.3 HVAC Systems

The garage is heated by four natural gas unit heaters, and has no cooling. The heaters are identical, each is a Reznor model VDAP225; with a 225,000 Btuh input rating, and 83% combustion efficiency. There is also a heating only, natural gas furnace located on the mezzanine above the first floor restroom, which serves the restroom below. It has a 40,000 Btuh input rating, with a 92.5% efficiency; it is manufactured by Coleman.

The second floor is heated and cooled by five Coleman natural gas furnaces, with outdoor electric condensing units. Four of the furnaces are located in mechanical closets on the second floor, and one unit (which serves the weight room) is located above the ceiling in the weight room. The furnaces range between 36,000 Btuh and 100,000 Btuh heating input, with efficiencies ranging from 91% to 94%. The respective outdoor condensing units range in size from 1.5 tons to 4 tons, and are located along the south wall of the building, near stair tower #2.

3.3.4 Lighting/Electrical Systems

The garage has (19) 400 W metal halide light fixtures controlled by switches near the northeast entrance. About half of the lights are left on 24/7, the other half are only used when the space is occupied. The second floor of the facility uses predominantly two bulb, 4 ft T-8 fixtures rated for 59 W each. There are some miscellaneous light fixtures throughout the building, such as 50 W incandescent bulbs on ceiling fans in two of the offices. Exterior lighting consists of 70 W, 100 W, and 250 W high pressure sodium wall and soffit lighting controlled by timers.

3.3.5 Control Systems

There is no centralized control system. The four unit heaters serving the garage, and the heating only furnace serving the first floor restroom are controlled by digital, non-programmable thermostats, which have heating setpoints of 63°F. Each second floor heating/cooling system is controlled by a dedicated programmable thermostat in the space which it serves. The occupied programmed times vary slightly, but generally operate in occupied mode from about 6:00 AM until midnight. The cooling setpoints were generally 75°F during occupied and 80°F during unoccupied hours. Heating setpoints are not known since the units were in cooling mode during the site visit.

3.3.6 Plumbing System

The building has one restroom on the first floor, and one each men's and women's restrooms on the second floor. In total, there are three toilets, two urinals, four sinks, and three showers in the restrooms. There is also an additional sink in the kitchen on the second floor. All toilets use 1.6 gallons per flush (gpf), while urinals use 1.0 gpf. Sinks are fitted with aerators and showers use low flow rated shower heads. The garage also has two 1.5" water connections for fire hoses.

4.0 ENERGY CONSERVATION MEASURES

Stratford received a bid from Hess to supply electricity at a contract rate of $0.09 per kWh, and will be switching to Hess as its electricity supplier for all three buildings. It should be noted that the calculations for the ECMs were completed using the current rate structure under the existing utility service providers. After the change to Hess is in effect, the electrical energy savings for the following ECMs will remain the same; however, potential changes in rate structure will impact the dollar savings of the measures, and consequently the payback period.

4.1 Borough Hall

4.1.1 BH ECM-1 Increase Roof Insulation

The Borough Hall has a flat metal deck roof which is original to building construction in 1973. The roof is in fairly good condition and is recoated every year; however, it has limited insulation since building standards were not as high at the time the building was constructed. Adding insulation to the roof will increase the thermal properties of the building, and reduce the annual heating and cooling energy usage. This measure proposes installing 6" thick fiberglass blanket or batt insulation to the roof. A reduction in natural gas heating energy, and electric cooling energy will result from the insulation upgrade.

The energy saving calculation for this measure quantified the existing heat loss through the roof using the heat load equation; based on the roof area, approximate U-value of the existing roof, and the temperature difference between the indoor and outdoor air temperature. Local bin temperature data was used to calculate the heating and cooling energy usage based on the changing temperature difference throughout the year. The proposed annual energy usage was then calculated in the same manner, assuming R-19 insulation was added. The insulation increased the R-value of the roof from about 4 to 23. Since drawings of the building were not available, the existing roof R-value was estimated based on typical components of a roof of that era, and the materials observed during the site visit.

Installation of this measure should be performed by adding the fiberglass blanket or batt insulation on the underside of the roof, above the drop ceiling. Some added costs have been included for disturbance to the existing ceiling.

Insulation has a life expectancy of about 24 years according to ASHRAE. The total savings over the life of the project will be 2,360 kWh, 9,360 therms, and $14,400.

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

BH ECM-1 Increase Roof Insulation

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
3,400	0	140	390	600	3.2	N/A	5.7	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.1.2 BH ECM-2 Back Office Night Setback

In addition to the furnace with an outdoor condensing unit, the back office is cooled by a split system air conditioner. The unit has a recessed ceiling insert style evaporator and outdoor condensing unit, which are controlled by a manual thermostat on the wall in the space. The main heating systems in the building are controlled by programmable thermostats automatically set back during unoccupied hours; however, the manual thermostat which controls the split system is generally not set back throughout the night. During the site visit, the thermostat was set to about 74°F. Installing a programmable thermostat will allow the unit to be programmed to a higher temperature during unoccupied hours, reducing the load on the split system AC unit, saving energy.

The energy saving calculation for this measure quantified the existing energy used to cool the space using a block load building model. Only the area served by the split system was modeled, to isolate the amount of energy used by this unit. The existing building model assumed the space setpoint of about 74°F during both occupied and unoccupied hours. This model was then compared to a nearly identical model, where the space was assumed to be cooled to 80°F during unoccupied hours. Occupied hours were assumed to be 40 hours per week. The difference between the existing and proposed cooling energy usage was calculated, resulting in the annual energy savings.

Implementation of this measure will require replacement of the manual thermostat with a programmable model. Additional energy savings could also be realized with installation of a programmable thermostat, assuming that there are times when the manual thermostat is turned down much lower than the typical 74°F setpoint. A programmable thermostat will only allow such an override to exist until the next programmed setback time, at which point the setpoint will automatically be reset to the programmed value.

Programmable thermostats have a life expectancy of about 15 years according to ASHRAE. The total savings over the life of the project will be 9,000 kWh and $1,500.

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

BH ECM-2 Back Office Night Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
200	0	600	0	100	6.2	N/A	2.0	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.1.3 BH ECM-3 Window Replacement

The windows are single pane glass with aluminum frames, which are original to the 1973 construction. The windows have poor thermal properties when compared to modern energy saving windows. Replacing the windows with double pane glass, more thermally efficient models will reduce heat loss through the glass, and reduce air infiltration around the aging window frames; which will lead to heating and cooling energy savings.

The energy saving calculations for this measure quantified the existing and proposed heat loss through the windows based on window area and perimeter, window U-value, air infiltration rate, and indoor and outdoor air temperature difference. A bin temperature model was used based on local annual weather data. The existing windows were estimated to have a U-value of 1.05, with an air infiltration of 0.35 CFM/LF. The proposed windows are estimated to have a U-value of 0.5, with an air infiltration of 0.2 CFM/LF. U values and air infiltration rates are based on ASHRAE standards for the type of windows in the building. The difference between the existing and proposed annual energy usage was the annual energy savings.

This measure shows an unfavorable payback period due to the high cost of replacement windows, and is not recommended. Replacing all the windows at once requires a large initial investment, and may be cost prohibitive. A potential alternative would be to replace windows when necessary with more thermally efficient models, or as part of a larger project, if certain areas of the building are remodeled.

Windows have a life expectancy of about 30 years according to the manufacturer. The total savings over the life of the project will be 5,700 kWh, 6,000 therms, and $9,000.

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

BH ECM-3 Window Replacement

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
8,600	0	190	200	300	0.1	N/A	>25	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

This measure is not recommended.

4.1.4 BH ECM-4 Install Instantaneous DHW Heater

Domestic hot water (DHW) is currently produced by a 30 gallon gas fired hot water heater located in the basement mechanical room. The only use for DHW in the building is sinks, mainly for washing hands. The existing hot water heater maintains 30 gallons water hot at all times, which leads to standby losses and wastes energy. This measure assessed installing point of use electric hot water heaters at each of the four sinks in the building. This will eliminate standby losses of the tank and building piping system, and only heat the necessary amount of hot water consumed by the end user.

The energy saving calculation for this measure quantified existing annual natural gas usage for DHW, based on the summer minimum monthly gas usage. During the summer when all heat is shut off, DHW is the only use for natural gas; therefore, it is assumed that this is the baseline monthly gas usage due to DHW. Multiplying the baseline month by 12 months, annual gas usage is found. The gas usage is then multiplied by the efficiency, to determine the annual DHW heating demand. The standby losses of the existing hot water heater and piping system are then quantified, since the energy savings of the new unit will result from elimination of standby losses with a new instantaneous system. The energy used to heat the water was calculated using the heat load equation; assuming hot water temperature was 120°F, average room temperature was 70°F, and the 30 gallon tank and 5 gallon piping system are susceptible to 2.5% of stored capacity losses per hour (per ASHRAE fundamentals). The standby losses are assumed to be eliminated from the proposed system; therefore, the proposed DHW heating demand is the result of the

existing demand, less the standby losses. The proposed DHW annual energy usage is quantified by converting the DHW heating demand to electric energy usage. The annual energy savings is the difference between the existing annual natural gas usage, and proposed electrical energy usage.

Despite electrical energy being more expensive than natural gas, this measure still results in energy savings due to the elimination of standby losses in the system. This measure still proposes electric point of use heaters, because installing natural gas lines and venting of the four proposed units will require much higher installation costs. A central tankless natural gas DHW heater would be another possible option, but was not evaluated due to the end use of DHW. Washing hands generally requires short, quick bursts of hot water, but a central tankless system will not supply the necessary "instantaneous" response.

This measure was evaluated and the savings were less than $100; therefore, it is not recommended as part of the study. See Appendix G for calculations.

Instantaneous DHW Heaters have a life expectancy of about 21 years according to ASHRAE. The total savings over the life of the project will be 800 therms, and $600.

4.1.5 BH ECM-5 Replace Urinals & Flush Valves with Low Flow Types

There is one urinal in the Borough Hall which uses 3 gallons per flush; new low flow urinals use less than 1 gallon per flush. Although restroom usage in the building is not extremely high, the urinal is used numerous times per day. It is recommended that the existing urinal is fitted with a low flow valve.

The energy savings model calculated existing and proposed water usage based on a per-flush basis. There are three men who work fulltime in the building, and visitors who pass through the building. Based on the building occupancy, and overall water usage in the building, it is estimated that the urinal is used about eight flushes per day.

Plumbing fixtures have a life expectancy of about 20 years according to the manufacturer. The total savings over the life of the project will be 120 kgals and $2,000.

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

BH ECM-5 Replace Urinals & Flush Valves with Low Flow Types

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		kgals	Total				
$	kW	kWh	Water	$		$	Years	Years
600	0	0	6	100	1	N/A	6.0	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.1.6 BH ECM-6 Replace Toilets & Flush Valves with Low Flow Types

There are three toilets in the Borough Hall, each use 5.5 gallons per flush. New low flow toilets use 1.6 gallons per flush. Savings in water usage will be realized by upgrading to the new models. This measure assessed upgrading the existing toilets to low flow models.

The energy savings model calculated existing and proposed water usage based on a per-flush basis. It is assumed that each of the six full time employees in the building flushes a toilet one time each per day, averaging to about two flushes per toilet daily.

Plumbing fixtures have a life expectancy of about 20 years according to the manufacturer. The total savings over the life of the project will be 180 kgals and $2,000.

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

BH ECM-6 Replace Toilets & Flush Valves with Low Flow Types

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		kgals	Total	ROI			
$	kW	kWh	Water	$		$	Years	Years
1,400	0	0	9	100	-0.4	N/A	>25	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

This measure is not recommended.

4.1.7 BH ECM-7 Lighting Replacements

The lighting system has not undergone significant upgrades since construction. An inventory of all existing light fixtures and controls was taken in the building (see Appendix C). The majority of the lights are 4 ft, two and four lamp T-12 fluorescent fixtures; there are also various U shaped T-12 fixtures and some incandescent bulbs in certain areas. Existing lighting in the building is inefficient compared to new lighting technology. This measure considered replacing the existing inefficient T-12 fixtures with high performance T-8 lights with electronic ballasts. Incandescent fixtures should be replaced with CFLs, all proposed lighting replacements are assumed to be on a one for one basis.

The existing energy usage of the lights was quantified based on the fixtures inventory, fixture demand, and approximate runtime of the lights in each area of the building. Runtimes were estimated based on the occupancy of the space. The proposed energy usage was calculated assuming annual runtime and light count stays the same, but fixture demand is reduced to that of the proposed T-8 or CFLs. Appendix J provides the complete list of lights to be replaced, existing and proposed fixture types, and fixture runtimes. The difference between existing and proposed annual energy usage was calculated, resulting in the estimated energy savings.

The calculations for this measure identify the energy savings for each type of light fixture in the different areas of the building. The energy savings and corresponding payback periods vary, depending on the fixture types, and operation of each area. Areas with long payback periods are generally a result of minimal use, and could possibly be omitted to reduce the initial cost of the project.

Lighting fixtures have a life expectancy of about 15 years according to the manufacturer. The total savings over the life of the project will be 59,100 kWh and $10,500.

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

BH ECM-7 Lighting Replacements

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
6,200	3	3,940	0	800	0.9	300	7.8	7.4

* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting Application. See section 5.0 for other incentive opportunities.

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

4.1.8 BH ECM-8 Install Occupancy Sensors

All of the lights are currently controlled by wall switches, some of which are on when the space is unoccupied. Energy savings could be realized by installing occupancy sensors, which would allow lights in unoccupied areas to be automatically shut off. Occupancy sensors will generally stay on for about 10 minutes once activated, and can typically result in energy savings of 25-30%. This measure assessed installing occupancy sensors in the majority of the building; Appendix K includes a complete list of areas where occupancy sensors are recommended.

The energy savings calculation for this measure determined the existing energy usage using the same existing fixture demand and annual runtime described in BH ECM-7. The proposed energy usage was found assuming the same fixture demand, with a reduced annual runtime for the areas where occupancy sensors are recommended. For most of the offices, it was assumed runtime would be reduced by an average of 30%, based on field observations during the site visit for the applicable areas. The difference between existing and proposed energy usage was calculated; the difference is the annual energy savings.

As discussed in BH ECM-7, the calculations are broken down by each different area and type of light fixture; therefore, areas with attractive savings and payback can be targeted if installation of occupancy sensors is not desired in all areas.

Lighting controls have a life expectancy of about 15 years according to the manufacturer. The total savings over the life of the project will be 46,350 kWh and $9,000.

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

BH ECM-8 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
4,800	0	3,090	0	600	0.7	500	8.0	7.2

* Incentive shown is per the New Jersey Smart Start Program, Lighting Controls application. See section 5.0 for other incentive opportunities.

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

4.1.9 BH ECM-9 Lighting Replacement & Occupancy Sensors

This measure combines BH ECM-7 and BH ECM-8 to more accurately represent the cost savings associated with implementing both ECMs. Because of interactive effects, the savings for lighting controls and replacement lighting is not cumulative.

Lighting replacements and controls have a life expectancy of about 15 years according to the manufacturer. The total savings over the life of the project will be 89,250 kWh and $16,500.

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

BH ECM-9 Lighting Replacement & Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
11,000	0	5,950	0	1,100	0.5	800	10.0	9.3

* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting & Lighting Controls Applications. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.2 Justice Facility

4.2.1 JF ECM-1 Install Door Seals

The two entrances to the Justice Facility have excessive gaps around the exterior allowing excessive air infiltration into the building causing heat loss/gain which must be made up by the heating/cooling system. The back door, near the police processing area, was a concern to the staff, who noted the draft is uncomfortable during the winter months. It is recommended that new door seals be installed on the doors, which will increase comfort in the space and reduce heating and cooling energy.

The calculation for this measure assumed that installing a new door seal will reduce the current air infiltration by 80%. It is estimated that currently there is an infiltration rate of about 1 CFM/LF due to the faulty seals. This is based on Ashram's definition of an excessive door leak, which is 1 CFM/LF.

As good practice, all doors should be checked over time as the seals may wear or become damaged. Small gaps which are easily fixed should be addressed on a regular basis.

Door seals have a life expectancy of about 10 years according to ASHRAE. The total savings over the life of the project will be 4,400 kWh, 600 therms, and $2,000.

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

JF ECM-1 Install Door Seals

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
200	0	440	60	200	6.9	N/A	1.0	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.2.2 JF ECM-2 Building Setback

Heating and cooling are managed by manual thermostats, which control the natural gas furnaces and outdoor electric AC units. According to facility staff, the thermostats are not manually turned back when the building is unoccupied; therefore, the facility is heated and cooled to the thermostat setting 24/7. The building is only generally occupied between 8:00 AM and 5:00 PM on weekdays, on nights and weekends the only occupancy will be police officers stopping through the building sporadically, and one person in the control room. Heating and cooling the entire building when it is not necessary is wasting energy. It is recommended that programmable thermostats be installed to control the furnaces and AC units to allow the temperature to be setback on nights and weekends.

It should be noted that the HVAC systems in the building do not evenly distribute conditioned air to the building. Facility staff noted that the back of the building (closest to the HVAC units and where the thermostats are located) are tempered favorably, and the front of the building (at the end of the air supply ducts) is hot during the summer and cold in the winter. During the site visit, the second floor thermostats were set to 60°F or below, and the space near the back of the building was 62°F and the front much warmer, at around 70°F or above. Due to this issue, thermostats are often set extremely low in the summer, or high in the winter, which overheats and overcools parts of the buildings. As part of this measure, a complete air balancing of the system is also recommended, to eliminate the unbalanced heating and cooling. This will allow the temperature in the space to be more evenly distributed, so the recommended programmable thermostats can perform temperature setback, while still providing comfort in the space.

The energy saving calculation for this measure uses a block load building model to quantify the heating and cooling loads for the building. Local bin temperature data was used to compare the existing heating and cooling energy to the proposed energy usage, with the proposed temperature setback times. The existing model was assumed to be heated or cooled to 67°F or 65°F, respectively. The heating setpoint was estimated based on discussion with facility staff, cooling space temperature was estimated based on the existing thermostat setpoints and field observation. The proposed model assumes the space will be set back to occupied/unoccupied heating setpoints of 67°F/62°F, and cooling setpoints of 72°F/80°F. Proposed occupied hours are assumed to be 45 hours per week, during normal business hours.

The estimate for this measure includes the cost to perform an air balancing effort on the HVAC systems. It should also be noted that moving the location of the thermostats to points more centrally located between the front and back of the building could provide added mitigation for the issues with the temperature difference between the front and back of the building.

Programmable thermostats have a life expectancy of about 15 years according to ASHRAE. The total savings over the life of the project will be 67,500 kWh, 4,650 therms, and $18,000.

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

JF ECM-2 Building Setback

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
5,100	0	4,500	310	1,200	2.6	N/A	4.3	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.2.3 JF ECM-3 Install "On Demand" Condensing DHW Heater

The Justice Facility currently uses a 40 gallon gas fired hot water heater for DHW, which is located in the outdoor mechanical closet. The building has a small demand for DHW, consisting of restroom sinks. There is also a shower in the building; however, it is never used according to facility staff, and was being used as storage during the site visit. Replacing the existing DHW heater with a condensing, tankless "on demand" hot water heater, will eliminate standby losses of the 40 gallon tank, and increase the heating efficiency, saving energy.

The existing annual natural gas usage due to domestic hot water was determined from utility data, as described in BH ECM-4. From the existing natural gas usage, along with the existing heater efficiency of about 80%, the baseline heat load was established. The heat load due to standby losses was also calculated as described in BH ECM-4. The proposed natural gas usage is then calculated, assuming a new efficiency of 92%, with no standby losses.

Implementation of this measure has a long payback due to the initial cost of the proposed system, and low domestic hot water demand. The proposed system is expensive due to flue modifications and materials which must be used for a condensing style heater.

Tankless hot water heaters have a life expectancy of about 21 years according to ASHRAE. The total savings over the life of the project will be 1,050 therms, and $2,100.

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

JF ECM-3 Install "On Demand" Condensing DHW Heater

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
5,600	0	0	50	100	-0.7	300	>25	>25

* Incentive shown is per the New Jersey Smart Start Program, Gas Water Heating Application. See section 5.0 for other incentive opportunities.

This measure is not recommended.

4.2.4 JF ECM-4 Exterior Lighting Timers

Three exterior lights are left on 24/7. The lights have no known switch, and seem to be hard wired to be left on continuously. This wastes energy, since there is no need for the lights during daytime hours. This measure proposes installing timers, to allow the lights to turn off automatically, saving energy.

The existing and proposed annual energy usage was determined based on fixture wattage and annual runtime. Proposed runtime is assumed to be 11 hours per day, which is the schedule for other exterior lights in the building.

Lighting controls have a life expectancy of about 15 years according to ASHRAE. The total savings over the life of the project will be 22,650 kWh and $3,000.

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

JF ECM-4 Exterior Lighting Timers

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
300	0	1,510	0	200	12.6	N/A	1.5	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.2.5 JF ECM-5 Install Occupancy Sensors

Lights in the Justice Facility are currently controlled by switches, some of which are left on 24/7. Energy savings could be realized by installing occupancy sensors, which would allow lights to be automatically shut off based on occupancy. These measures assessed installing occupancy sensors in many of the private offices and secure areas in the building; but leaves areas like the courtroom and police processing area on manual controls, for safety purposes. Appendix Q contains a complete list of areas where occupancy sensors are recommended.

The energy savings calculation for this measure calculated the existing annual energy usage based on estimated runtime and wattage of each fixture. The proposed energy usage was found assuming the same fixture demand, with a reduced annual runtime for areas where occupancy sensors are recommended. For most of the areas, it was assumed runtime would be reduced by an average of 30%. The difference between existing and proposed energy usage results in the annual energy savings.

As discussed in BH ECM-7, occupancy sensor calculations are broken down by each different area and type of light fixture, so that areas with attractive savings and payback can be targeted if installation of occupancy sensors is not desired in all areas.

Lighting controls have a life expectancy of about 15 years according to ASHRAE. The total savings over the life of the project will be 91,800 kWh and $16,500.

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

JF ECM-5 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
5,000	0	6,120	0	1,100	2.3	700	4.5	3.9

* Incentive shown is per the New Jersey Smart Start Program, Lighting Controls Application. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.3 Fire Station

4.3.1 FS ECM-1 Replace Unit Heaters with Infrared Heaters

The fire station garage is heated by four natural gas unit heaters, each has an input rating of 225,000 Btuh and combustion efficiency of 83%. This type of unit heats the air and uses a fan to blow the warm air down onto the space below. These heaters are not energy efficient for high bay applications because not all of the warm air reaches the occupied area, and often stratification will occur. Replacing the unit heaters with gas fired infrared (IR) heaters was assessed. IR heaters have higher heating efficiencies and effectiveness than unit heaters, which will result in energy savings.

The effectiveness is the ratio between amount of heat produced and the amount of heat actually reaching the occupied space. IR heaters have an effectiveness of 100%, while a typical unit heater's effectiveness is around 85%. IR heaters use infrared wavelengths to distribute heat directly to the surface of the occupied space, while unit heaters use fans to deliver heated air. Based on nameplate data for the existing unit heaters, a heating efficiency of about 80% was used for existing calculations. Based on manufacturer data, IR heaters have efficiencies of around 85%.

For the energy saving calculation for this measure, a block load building model was constructed for the garage portion of the building. Natural gas usage necessary to heat the space was reconciled with other areas of the building to match the historical utility data. Using the existing heater effectiveness and efficiency, the baseline heating load was determined. The proposed natural gas usage was then calculated using the proposed efficiency and effectiveness. Additional electrical energy savings was credited, since the proposed units use less electricity than the existing models due to elimination of the fans which distribute heat. Existing and proposed electrical energy usage was based on nameplate and manufacturer electrical data. The difference between the existing and proposed cases was determined to provide annual electrical energy savings.

The cost estimate for this measure assumes the unit heaters will be replaced with an IR model with a similar natural gas input rating, which was 225 MBTU. A layout of the new heaters will have to be designed by the heater installer so that all areas of the production floor are incorporated by the IR heaters. This type of heating system can have various configurations, depending on the tube length and orientation of the heater model selected.

Infrared tube heaters have a life expectancy of about 18 years according to ASHRAE. The total savings over the life of the project will be 52,560 kWh, 4,500 therms, and $14,400.

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

FS ECM-1 Replace Unit Heaters with Infrared Heaters

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
22,500	0	2,920	250	800	-0.33	N/A	>25	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

This measure is not recommended.

4.3.2 FS ECM-2 Building Setback

The second floor is heated and cooled by gas fired furnaces with outdoor condensing units controlled by programmable thermostats located in the area they serve. The thermostats operation vary slightly, but generally are in occupied mode from 6:00 AM until 1:00 AM, seven days a week; despite being occupied very little throughout the day. Actual building occupancy is very sporadic, and throughout the majority of the day there may only be a few people in the building. Heating and cooling the entire space all day is wasting a significant amount of energy. This measure proposes installing new programmable thermostats with a timed temporary override, which should be programmed to the unoccupied setback temperature for the majority of the day. It is proposed that the existing occupied temperature setpoint should only be scheduled during events which happen weekly, such as the Tuesday night meetings. The proposed thermostats will allow the occupants of a space to temporarily override the unoccupied setpoint. The temporary override will set the unit to the manually overridden temperature for three hours after the change occurs, at which point it will automatically be reset to the setback temperature.

The energy saving calculation for this measure used a block load building model to determine the heating and cooling loads for the second floor. Bin temperature data was used to compare the existing heating and cooling energy to the proposed energy usage, with the expanded temperature setback times. The existing model assumed the building was heated and cooled to the occupied setpoints for 133 hours per week, while the proposed case assumes the equipment in the building will operate at the occupied setpoints about 10 hours per week per HVAC unit.
Cost estimate and operation was based on a Robert Shaw model 9920i thermostat. It is assumed that the new thermostats will use the same connections and require minimal changes to be installed.

Programmable thermostats have a life expectancy of about 15 years according to ASHRAE. The total savings over the life of the project will be 54,600 kWh, 8,250 therms, and $21,000.

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

FS ECM-2 Building Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
2,300	0	3,640	550	1,400	7.96	N/A	1.7	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.3.3 FS ECM-3 Install "On Demand" Condensing HW Heater

The DHW system is currently served by a 100 gallon gas fired hot water heater located in the outdoor mechanical closet. There is not a large demand for DHW; however, the 100 gallon capacity heater is used due to the occasional use of showers. Replacing the system with a condensing, tankless "on demand" hot water heater will eliminate standby losses and increase heating efficiency.

The energy saving calculation for this measure uses the same method described in section 4.2.3. The only change for this calculation is the standby losses are increased due to the larger 100 gallon tank.

The cost estimate for this measure assumes a 199,000 Btuh system will be installed based on a preliminary review of the hot water system. A detailed system design should be performed before purchasing a tankless DHW heater to correctly size the unit to deliver ample hot water.

Tankless hot water heaters have a life expectancy of about 21 years according to ASHRAE. The total savings over the life of the project will be 2,730 therms and $4,200.

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

FS ECM-3 Install "On Demand" Condensing HW Heater

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
7,100	0	0	130	200	-0.38	300	>25	>25

* Incentive shown is per the New Jersey Smart Start Program, Gas Water Heating Application. See section 5.0 for other incentive opportunities.

This measure is not recommended.

4.3.4 FS ECM-4 Metal Halide Lighting Replacement

The garage contains (19) 400W metal halide lights. This type of light is inefficient compared to new high bay fluorescent technology. This measure proposes replacing the metal halides with high bay T-5 light fixtures, which consume less energy than the existing fixtures and have equal or greater light output with higher light quality.

For the energy saving calculation, the existing electrical energy usage of the garage lights was calculated based on existing light count, existing fixture wattage, and runtime. Ten of the lights are left on 24/7, the remaining lights were estimated to operate about 20 hours per week. The proposed energy usage was calculated assuming the same light count and annual runtime, but using the wattage of the proposed fixtures. The proposed replacements for the 400 W metal halides are 4 ft fluorescent fixtures with four, 54 W T5HO bulbs, which use 233 W per fixture. The difference between the existing and proposed annual energy usage resulted in the annual energy savings.

It is assumed the fixtures will be changed out on a one for one basis. An additional benefit of the high bay fluorescent fixtures is the fluorescent lamps will maintain a much higher light output over the life of the lamps. Metal halide lamps will reduce to about 60% of the initial rated light output at half of the rated lamp life.

Lighting fixtures have a life expectancy of about 15 years according to ASHRAE. The total savings over the life of the project will be 325,800 kWh, and $52,500.

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

FS ECM-4 Metal Halide Lighting Replacement

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
8,400	4.3	21,720	0	3,500	5.31	1,900	2.4	1.9

* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting Application. See section 5.0 for other incentive opportunities.

This measure is recommended.

4.3.5 FS ECM-5 Install Occupancy Sensors

Some lights on the second floor are controlled by switches on the wall, and are often left on during unoccupied periods. Installing occupancy sensors in these areas would allow the lights to automatically shut off during unoccupied periods. Occupancy sensors will generally stay on for about 10 minutes once they are activated, and can typically lead to energy savings of 25%-30%. The areas which have been selected as good candidates for occupancy sensors are the second floor hallways, HVAC hall closet, Chief's office, and weight room.

The energy savings was calculated using the existing fixture demand and annual runtime for each area. The proposed energy usage was found assuming the same fixture demand, with a reduced annual runtime for the areas where occupancy sensors are recommended. For most areas, it was assumed runtime would be reduced by an average of 30%. This is most likely a conservative estimate for areas which currently operate 24/7, such as the hallways. The difference between existing and proposed energy usage was the annual energy saving.

Lighting controls have a life expectancy of about 15 years according to ASHRAE. The total savings over the life of the project will be 26,700 kWh, and $4,500.

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

FS ECM-5 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
1,300	0	1,780	0	300	2.49	100	4.3	4.0

* Incentive shown is per the New Jersey Smart Start Program, Lighting Controls Application. See section 5.0 for other incentive opportunities.

This measure is recommended.

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.

Combining incentives #2 and #3 will provide a total of $0.18/ kWh and $1.8/therm not to exceed 50% of total project cost. Additional incentives for #2 and #3 are increased by $0.005/kWh and $0.05/therm for each percentage increase above the 15% minimum target to 20%, calculated with the EPA Portfolio Manager benchmarking tool, not to exceed 50% 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

The 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 by 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

5.2.1.1 Borough Hall

The building is eligible for all three incentives available from the New Jersey P4P program. Incentive #1 is for the development of an energy reduction plan and will pay $.05/ square foot of the building footprint, which equates to about $125. Implementation of the energy conservation measures discussed in this report is expected to reduce the building's energy usage by over 15% which qualifies it for both incentives #2 and #3. Combining incentives #2 and #3 will provide maximum savings of $0.18/ kWh and $1.80/ therm not to exceed 50% of the total project cost. The building is projected to save about 6,680 kWh which amounts to about $1,200 in incentives. The building is also projected to save about 630 therms of natural gas. With New Jersey's current incentive structure, this would qualify for about $1,100 in incentive money. Combining all incentives in the P4P program would amount to approximately $2,500, reducing the overall payback of the project from 11.5 years to 10.8 years. See appendix W for calculations.

5.2.1.2 Justice Facility

The building is eligible for all three incentives available from the New Jersey P4P program. Incentive #1 is for the development of an energy reduction plan and will pay $.05/ square foot of the building footprint,

which equates to about $350. Implementation of the energy conservation measures discussed in this report is expected to reduce the building's energy usage by over 15% which qualifies it for both incentives #2 and #3. Combining incentives #2 and #3 will provide maximum savings of $0.18/ kWh and $1.80/ therm not to exceed 50% of the total project cost. The building is projected to save about 12,570 kWh which amounts to about $2,300 in incentives. The building is also projected to save about 420 therms of natural gas. With New Jersey's current incentive structure, this would qualify for about $800 in incentive money. Combining all incentives in the P4P program would amount to approximately $3,400, reducing the overall payback of the project from 5.8 years to 4.6 years. See appendix W for calculations.

5.2.1.3 Fire Station

The building is eligible for all three incentives available from the New Jersey P4P program. Incentive #1 is for the development of an energy reduction plan and will pay $.05/ square foot of the building footprint, which equates to about $600. Implementation of the energy conservation measures discussed in this report is expected to reduce the building's energy usage by over 15% which qualifies it for both incentives #2 and #3. Combining incentives #2 and #3 will provide maximum savings of $0.18/ kWh and $1.80/ therm not to exceed 50% of the total project cost. The building is projected to save about 30,060 kWh which amounts to about $5,400 in incentives. The building is also projected to save about 930 therms of natural gas. With New Jersey's current incentive structure, this would qualify for about $1,700 in incentive money. Combining all incentives in the P4P program would amount to approximately $7,700, reducing the overall payback of the project from 6.7 years to 5.5 years. See appendix W for calculations.

5.2.2 New Jersey Smart Start Program

Incentives cannot be accepted under multiple NJCEP programs, however, if individual measures are chosen to be installed, instead of using the pay for performance program described above, the following incentives are available.

5.2.2.1 Borough Hall

The building is eligible to receive incentives for lighting controls and lighting replacements. The total incentives for which the building is eligible amounts to $800.

5.2.2.2 Justice Facility

The building is eligible to receive incentives for a gas water heater replacement and lighting controls. The total incentives for which the building is eligible amounts to $1,000.

5.2.2.3 Fire Station

The building is eligible to receive incentives for a gas water heater replacement, lighting controls, and lighting replacements. The total incentives for which the building is eligible amounts to $2,300.

5.2.3 Energy Efficient and Conservation Block Grant

The Stratford Borough Hall, Justice Facility, and Fire Station are all 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 ARRA Initiative "Energy Efficiency Programs through the Clean Energy Program"

The Stratford Borough Hall, Justice Facility, and Fire Station all pay the Societal Benefits Charge, which make them ineligible to receive this incentive.

6.0 ALTERNATIVE ENERGY SCREENING EVALUATION

6.1 Geothermal

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

The three buildings of Stratford Borough all use gas-fired furnaces with electric outdoor condensing units to meet their HVAC needs, 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, implementation of a geothermal heat pump system would require accessible land on which the ground loops could be buried; there is a limited amount of open land at the location of the Stratford Borough Hall, Justice Facility, and Fire Station.

6.2 Solar

6.2.1 Photovoltaic Rooftop Solar Power Generation

The three Stratford Borough buildings were 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. All three building's roofs have sufficient room to install a solar cell array, but they 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 X.

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 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/ SREC per year and this number was utilized in the cash flow for this report.

6.2.1.1 Borough Hall

The building had a maximum electricity demand of 16.2 kW and a minimum of 5.5 kW, over the previous 12 months. The monthly average over the observed 12 month period was 10.6 kW. The existing load does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array; therefore, a 10 kW system size was selected for the calculations. The system costs for PV installations were derived from the most recent NYSERDA (New York State Energy Research and Development Agency) estimates of total cost of system installation. It should be noted that the cost of installation is approximately $8 per watt or $8,000 per kW of installed system. This has increased in the past few years due to the rise in national demand for PV power generator systems. Other cost considerations will also need to be considered. PV panels have an approximate 20 year life span; however, the inverter device that converts DC electricity to AC has a life span of 10 to 12 years and will need to be replaced multiple times during the useful life of the PV system.

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

Borough Hall 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
80,000	0	12,500	0	2,300	2,300	7,500	6,100	>25	8.6

*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 Borough Hall has a flat roof, solar cells work best when they are south facing, with no surrounding obstructions (mostly trees and other buildings) that could cast shadows over the panels. To maximize the potential of the cells there are mounts that can be used to orient the solar cells south, but this adds to the implementation costs.

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.

6.2.1.2 Justice Facility

The building had a maximum electricity demand of 31.5 kW and a minimum of 13.5 kW, over the previous 12 months. The monthly average over the observed 12 month period was 22.5 kW. The existing load does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array; therefore, a 20 kW system size was selected for the calculations. See the previous section on the Borough Hall PV rooftop solar power generation for details on the system and system cost.

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

Justice Facility Photovoltaic (PV) Rooftop Solar Power Generation – 20 kW System

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive*	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		Natural Gas	Total					
$	kW	kWh	Therms	$	$	$	$	Years	Years
160,000	0	25,000	0	4,500	4,500	15,000	12,200	>25	8.7

*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 Justice Facility has a mansard type roof with one side facing mainly south. Solar cells work best when they are south facing, with no surrounding obstructions (mostly trees and other buildings) that could cast shadows over the panels. This area would be ideal for placement of the solar cells.

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.

6.2.1.3 Fire Station

The building had a maximum electricity demand of 36.7 kW and a minimum of 21.4 kW, over the previous 12 months. The monthly average demand over the observed 12 month period was 28.4 kW. The existing load does not justify the use of the maximum incentive cap of 50 kW of installed PV solar array; therefore, a 25 kW system size was selected for the calculations. See the previous section on the Borough Hall PV rooftop solar power generation for details on the system and system cost.

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

Fire Station Photovoltaic (PV) Rooftop Solar Power Generation – 25 kW System

Budgetary Cost	Annual Utility Savings				Total Savings	New Jersey Renewable Energy Incentive*	New Jersey Renewable SREC**	Payback (without incentive)	Payback (with incentives)
	Electricity		Natural Gas	Total					
$	kW	kWh	Therms	$	$	$	$	Years	Years
200,000	0	31,260	0	5,300	5,300	18,800	15,200	>25	8.8

*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 Fire Station has a mansard type roof with one side facing predominately southeast. Solar cells work best when they are south facing, with no surrounding obstructions (mostly trees and other buildings) that could cast shadows over the panels. There are no obstructions around the southeastern facing side, which would serve as a good location for the cells.

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 in all three of the Stratford Borough buildings is presently produced by natural gas fired water heaters; a solar DHW system would save on the sites natural gas utility bills. Energy savings from possible solar hot water systems at the Stratford Borough facilities are included in Appendix Y.

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, Stratford does not pay federal taxes and, therefore, would not benefit from this program.

Installation of a solar thermal hot water plant is not recommended at this time, due to high installation cost of the system, in conjunction with low hot water demand by all three of the Stratford Borough buildings.

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 Stratford Borough area, the map shown in the appendices indicates a mean annual wind speed of about 10 miles per hour. The borough does not currently have any wind turbines on its premises. Due to the low average wind speed in the area, wind turbines are not recommended for any of the Stratford Borough facilities.

A wind speed map and aerial site photo are included in appendix Z.

6.4 Combined Heat and Power Generation (CHP)

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

Any proposed CHP project will need to consider many factors, such as existing system load, use of thermal energy produced, system size, natural gas fuel availability, and proposed plant location. The buildings do not have an excessively large electricity demand, and do 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 any of the buildings to incorporate an absorption chiller. 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 buildings of Stratford Borough require minimal heating which 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.

None of the Stratford Borough buildings has a large enough electricity demand to warrant participation in such a program.

7.0 EPA PORTFOLIO MANAGER

The United State 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.

Full EPA Energy Star Portfolio Manager Reports for each building are located in Appendix AA. The user name and password for the EPA Portfolio Manager Account has been provided to John Keenan, the Stratford Borough Clerk.

7.1 Borough Hall

The Borough Hall is considered a high energy consumer by the Portfolio Manager with a Site Energy Usage Index (EUI) of 106 kBTU/ft^2/year. Several factors contribute to the unfavorable EUI, including, but not limited to, wasted energy from poor wall insulation, lack of air conditioning controls, and inefficient lighting. By implementing the measures discussed in this report, it is expected that the EUI can be reduced to approximately 71 kBTU/ft^2/year; the national average for this building type is 77 kBTU/ft^2/year. The EPA Portfolio Manager was unable to generate an energy rating score for this building because the utility data provided was over 120 days old. This number represents how energy efficient a building is on a scale from 1 to 100 with 100 being the best. In order for a building to receive and energy star label, this energy benchmark rating must be at least 75. As energy use decreases from the implementation of the proposed ECMs, this rating will increase.

7.2 Justice Facility

The Justice Facility is considered a low energy consumer by the Portfolio Manager with a Site Energy Usage Index (EUI) of 60 kBTU/ft^2/year, which is already under the national average for this type of building, which is 78 kBTU/ft^2/year. The favorable EUI is most likely a factor of, but not limited to, the addition of insulation, efficient heating and air condition units, and efficient lighting which was installed as part of the 2000 renovations. By implementing the measures discussed in this report, it is expected that the EUI can be further reduced to approximately 48 kBTU/ft^2/year. The EPA Portfolio Manager was unable to generate an energy rating score for this building because the utility data provided was over 120 days old.

7.3 Fire Station

The Fire Station is also considered a low energy consumer by the Portfolio Manager with a Site Energy Usage Index (EUI) of 61 kBTU/ft^2/year; which is well below the national average for this building type which is 77 kBTU/ft^2/year. By implementing the measures discussed in this report, it is expected that the EUI can further be reduced to approximately 45 kBTU/ft^2/year. The EPA Portfolio Manager was unable to generate an energy rating score for this building because the utility data provided was over 120 days old.

8.0 CONCLUSIONS & RECOMMENDATIONS

The energy audit conducted by CHA of three facilities at the Borough of Stratford, in Stratford, New Jersey identified potential ECMs for insulation upgrades, night setback, restroom fixture upgrades, lighting replacement with occupancy sensors, door seals, exterior lighting upgrades, and building temperature setback. Potential annual savings of $8,800 may be realized for the recommended ECMs, with a summary of the costs, savings, and paybacks as follows:

8.1 Borough Hall

BH ECM-1 Increase Roof Insulation

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
3,400	0	140	390	600	3.2	N/A	5.7	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

BH ECM-2 Back Office Night Setback

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
200	0	600	0	100	6.2	N/A	2.0	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

BH ECM-5 Replace Urinals & Flush Valves with Low Flow Types

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		kgals	Total	ROI			
$	kW	kWh	Water	$		$	Years	Years
600	0	0	6	100	1	N/A	6.0	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

BH ECM-9 Lighting Replacement & Occupancy Sensors

Budgetary Cost	Annual Utility Savings					Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total	ROI			
$	kW	kWh	Natural Gas	$		$	Years	Years
11,000	0	5,950	0	1,100	0.5	800	10.0	9.3

* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting & Lighting Controls Applications. See section 5.0 for other incentive opportunities.

8.2 Justice Facility

JF ECM-1 Install Door Seals

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
200	0	440	60	200	6.9	N/A	1.0	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

JF ECM-2 Building Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
5,100	0	4,500	310	1,200	2.6	N/A	4.3	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

JF ECM-4 Exterior Lighting Timers

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
300	0	1,510	0	200	12.6	N/A	1.5	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

JF ECM-5 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
5,000	0	6,120	0	1,100	2.3	700	4.5	3.9

* Incentive shown is per the New Jersey Smart Start Program, Lighting Controls Application. See section 5.0 for other incentive opportunities.

8.3 Fire Station

FS ECM-2 Building Setback

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
2,300	0	3,640	550	1,400	7.96	N/A	1.7	N/A

* There is no incentive available through the New Jersey Smart Start program for this ECM. See section 5.0 for other incentive opportunities.

FS ECM-4 Metal Halide Lighting Replacement

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
8,400	4.3	21,720	0	3,500	5.31	1,900	2.4	1.9

* Incentive shown is per the New Jersey Smart Start Program, Prescriptive Lighting Application. See section 5.0 for other incentive opportunities.

FS ECM-5 Install Occupancy Sensors

Budgetary Cost	Annual Utility Savings				ROI	Potential Incentive*	Payback (without incentive)	Payback (with incentive)
	Electricity		Therms	Total				
$	kW	kWh	Natural Gas	$		$	Years	Years
1,300	0	1,780	0	300	2.49	100	4.3	4.0

* Incentive shown is per the New Jersey Smart Start Program, Lighting Controls Application. See section 5.0 for other incentive opportunities

APPENDIX A

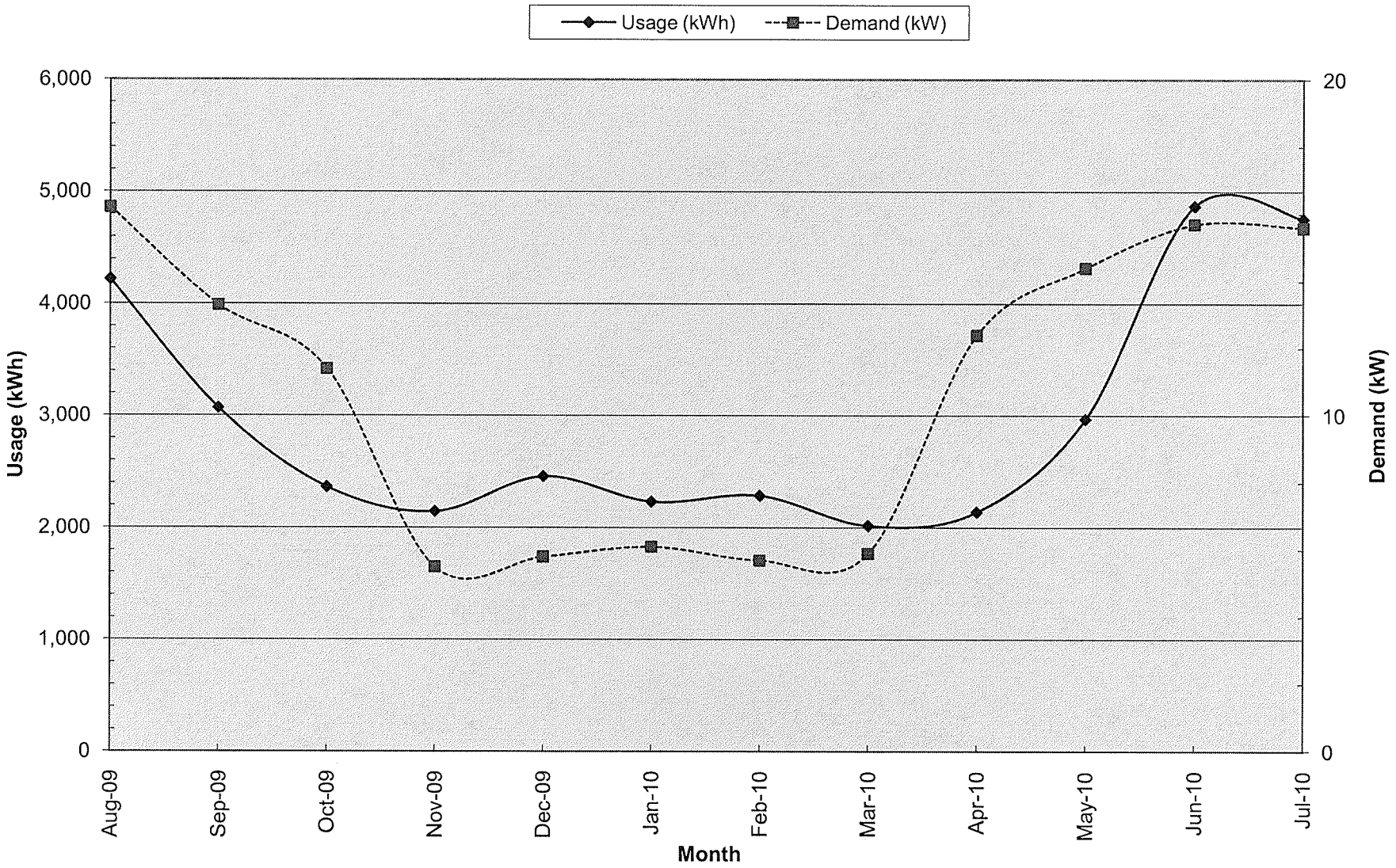
Utility Usage Analysis

New Jersey BPU Energy Audit Program
CHA Project No.: 22072
Stratford Borough
Atlantic City Electric

307 Union Ave - Borough Hall
Account No.: 0064 1529 9996
Meter No.: 33047229

			Charges						Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Peak Saver Cred ($)	Supply	Delivery	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
August-09	4,219	16.2	$ 837.28	$ 4.28	$ 613.67	$ 227.89	$ 105.27	$ 732.01	0.1985	0.1735	6.50
September-09	3,068	13.3	$ 592.07	$ -	$ 399.65	$ 192.42	$ -	$ 592.07	0.1930	0.1930	-
October-09	2,363	11.4	$ 406.55	$ -	$ 282.29	$ 124.26	$ 60.14	$ 346.41	0.1720	0.1466	5.28
November-09	2,145	5.5	$ 333.34	$ -	$ 239.03	$ 94.31	$ 21.33	$ 312.01	0.1554	0.1455	3.88
December-09	2,457	5.8	$ 384.01	$ -	$ 274.83	$ 109.18	$ 22.72	$ 361.29	0.1563	0.1470	3.92
January-10	2,232	6.1	$ 347.01	$ -	$ 249.31	$ 97.90	$ 19.97	$ 327.04	0.1555	0.1465	3.27
February-10	2,286	5.7	$ 354.74	$ -	$ 254.39	$ 100.35	$ 19.33	$ 335.41	0.1552	0.1467	3.39
March-10	2,018	5.9	$ 320.32	$ -	$ 226.95	$ 93.37	$ 22.14	$ 298.18	0.1587	0.1478	3.75
April-10	2,141	12.4	$ 364.45	$ -	$ 229.76	$ 134.69	$ -	$ 364.45	0.1702	0.1702	-
May-10	2,969	14.4	$ 526.56	$ 4.28	$ 370.22	$ 160.62	$ 84.05	$ 442.51	0.1774	0.1490	5.84
June-10	4,872	15.7	$ 993.65	$ 4.28	$ 679.29	$ 318.64	$ -	$ 993.65	0.2040	0.2040	-
July-10	4,759	15.6	$ 957.49	$ 5.56	$ 709.08	$ 256.97	$ 106.69	$ 850.80	0.2012	0.1788	6.84
Total	35,529	16.2	$6,417				$462	$5,956	0.1806	0.1676	3.61
Last 12 Months	35,529	16.2	$6,417				$462	$5,956	0.1806	0.1676	3.61

Electric Usage - Stratford Borough Hall



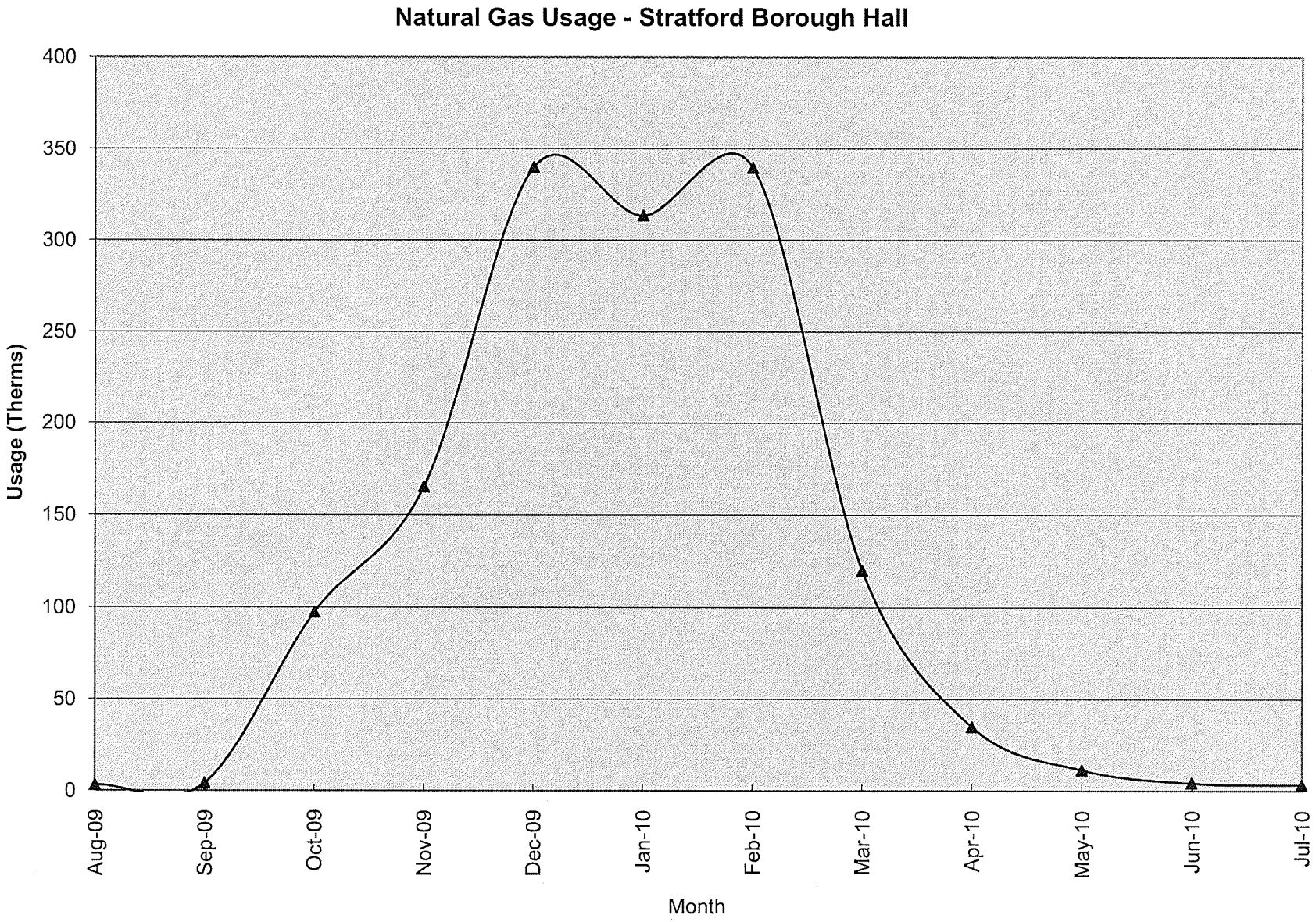
Stratford Borough Hall Utilities
Elec Chart

New Jersey BPU Energy Audit Program
CHA Project No.: 22072
Stratford Borough
South Jersey Gas Service

307 Union Ave - Borough Hall
Account No.: 2 04 38 1870 0 05
Meter No.:

Month	Therms	Charges ($)	($/therm)
August-09	3	$ 22.75	$ 7.39
September-09	4	$ 24.39	$ 5.95
October-09	97	$ 145.19	$ 1.49
November-09	165	$ 230.96	$ 1.40
December-09	340	$ 457.63	$ 1.35
January-10	313	$ 424.48	$ 1.35
February-10	340	$ 459.08	$ 1.35
March-10	120	$ 174.99	$ 1.46
April-10	35	$ 63.38	$ 1.82
May-10	11	$ 32.75	$ 2.90
June-10	4	$ 24.07	$ 5.84
July-10	3	$ 23.99	$ 7.79

Total	1,436	$	2,084	$	1.45
Most Recent 12 Mo	1,436	$	2,084	$	1.45



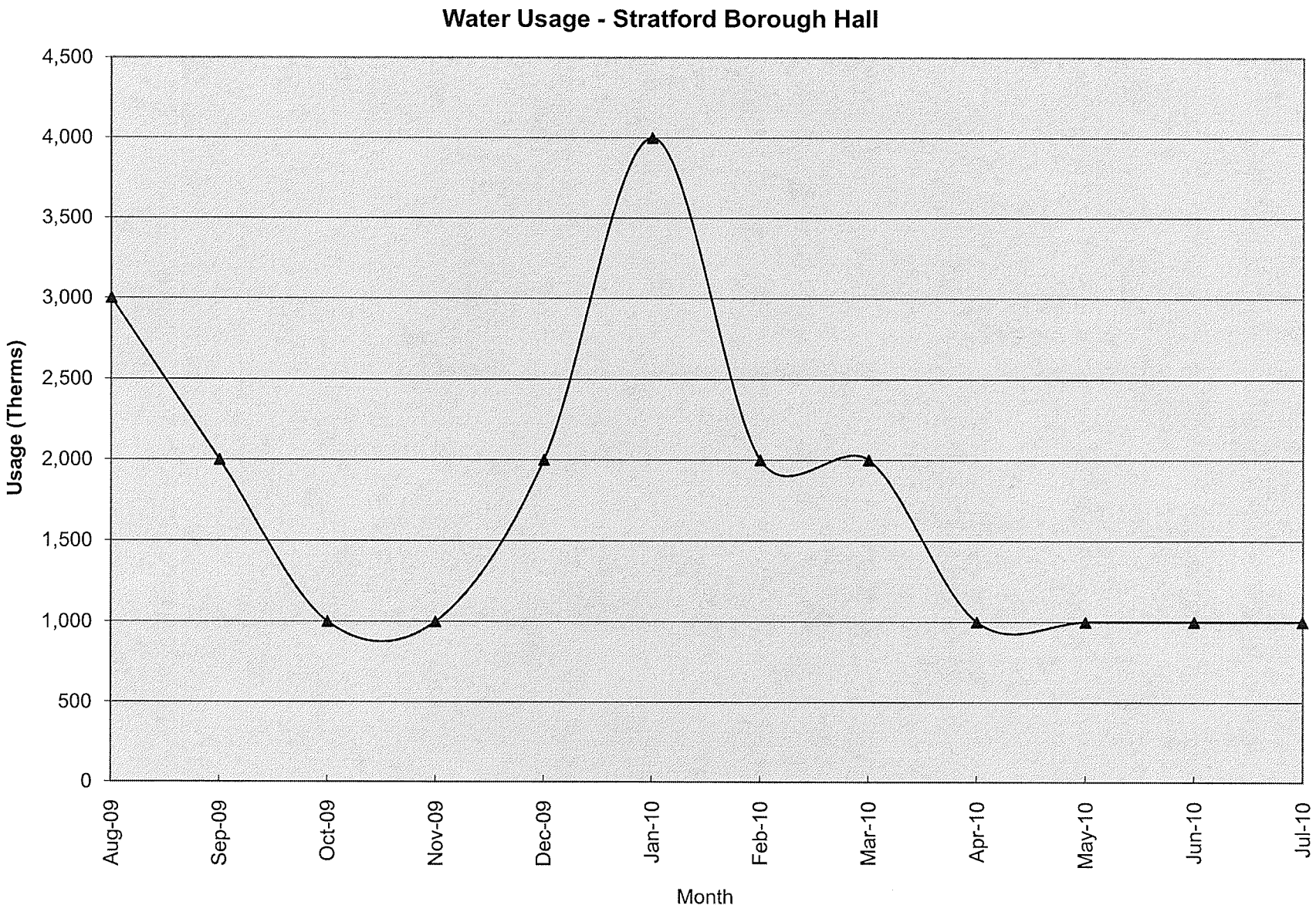
Stratford Borough Hall Utilities
Gas Chart

New Jersey BPU Energy Audit Program
CHA Project No.: 22072
Stratford Borough
New Jersey American Water

307 Union Ave - Borough Hall
Account No.: 18-0657858-7
Meter No.: 2006054216

Month	Usage (gallons)	Charges ($)	Rate ($/1000 Gal)
August-09	3,000	$26.25	$ 8.75
September-09	2,000	$20.57	$ 10.29
October-09	1,000	$14.79	$ 14.79
November-09	1,000	$14.79	$ 14.79
December-09	2,000	$20.59	$ 10.30
January-10	4,000	$32.16	$ 8.04
February-10	2,000	$20.59	$ 10.30
March-10	2,000	$20.59	$ 10.30
April-10	1,000	$14.79	$ 14.79
May-10	1,000	$14.79	$ 14.79
June-10	1,000	$14.79	$ 14.79
July-10	1,000	$14.79	$ 14.79

Total	21,000	$229.49	$ 10.93
Most Recent Yr	21,000	$229.49	$ 10.93



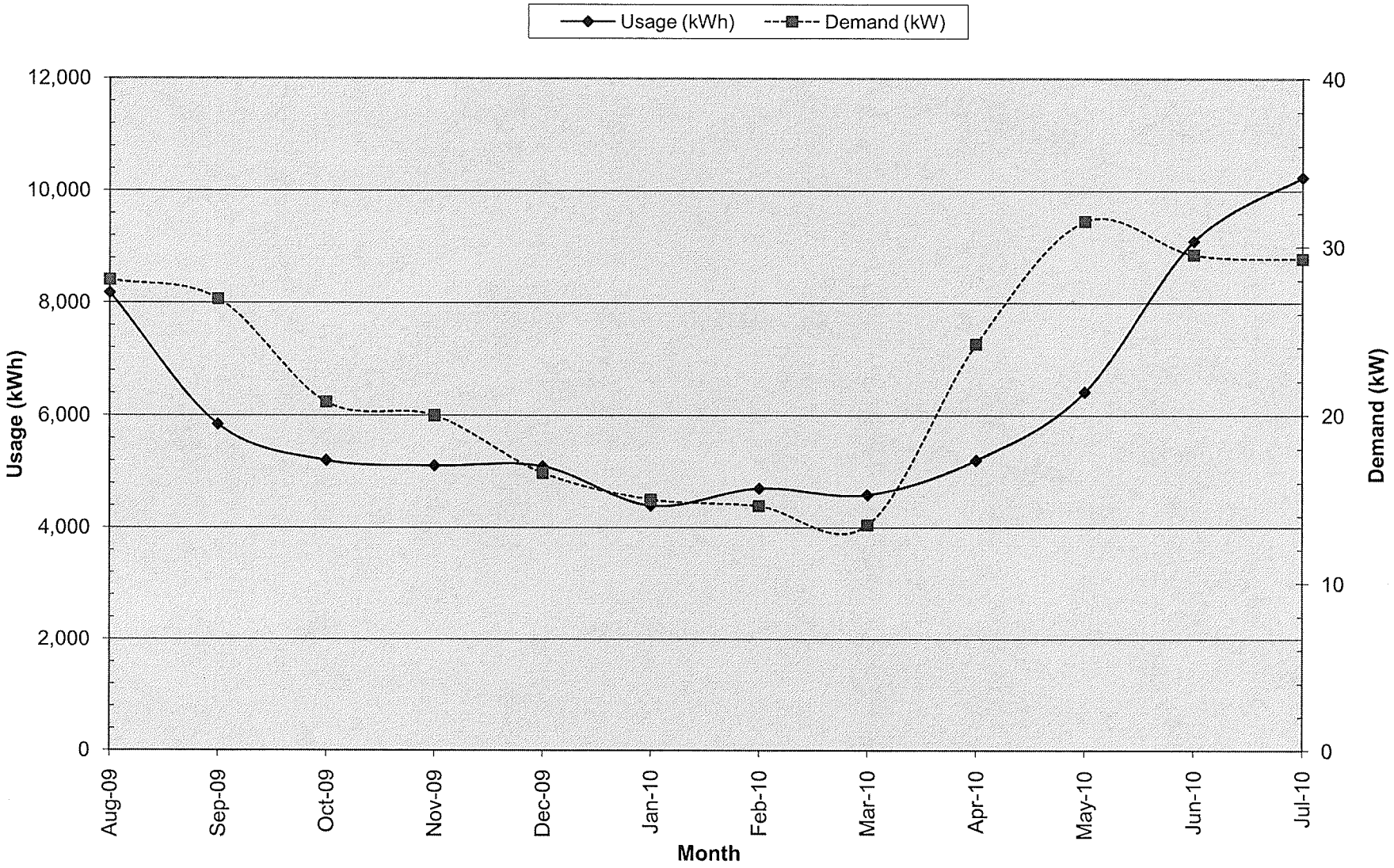
Stratford Borough Hall Utilities
Water Chart

New Jersey BPU Energy Audit Program
CHA Project No.: 22072
Stratford Borough
Atlantic City Electric

315 Union Ave - Justice Facility
Account No.: 0064 1529 9962
Meter No.: 6363882

			Charges					Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Supply	Delivery	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
August-09	8,178	28.03	$ 1,463.08	$ 1,103.91	$ 359.17	$ 194.28	$ 1,268.80	0.1789	0.1551	6.93
September-09	5,843	26.89	$ 1,125.46	$ 784.38	$ 341.08	$ 204.59	$ 920.87	0.1926	0.1576	7.61
October-09	5,203	20.79	$ 897.72	$ 594.71	$ 303.01	$ 173.25	$ 724.47	0.1725	0.1392	8.33
November-09	5,111	19.99	$ 886.43	$ 584.90	$ 301.53	$ 173.25	$ 713.18	0.1734	0.1395	8.67
December-09	5,098	16.6	$ 920.62	$ 588.82	$ 331.80	$ 196.35	$ 724.27	0.1806	0.1421	11.83
January-10	4,396	15.0	$ 773.88	$ 504.61	$ 269.27	$ 155.93	$ 617.95	0.1760	0.1406	10.38
February-10	4,702	14.6	$ 837.21	$ 540.74	$ 296.47	$ 173.25	$ 663.96	0.1781	0.1412	11.84
March-10	4,587	13.5	$ 841.04	$ 531.14	$ 309.90	$ 184.80	$ 656.24	0.1834	0.1431	13.69
April-10	5,209	24.2	$ 889.86	$ 593.44	$ 296.42	$ 167.48	$ 722.38	0.1708	0.1387	6.91
May-10	6,418	31.5	$ 1,118.99	$ 759.32	$ 359.67	$ 220.98	$ 898.01	0.1744	0.1399	7.01
June-10	9,106	29.5	$ 1,713.52	$ 1,290.13	$ 423.39	$ 236.95	$ 1,476.57	0.1882	0.1622	8.02
July-10	10,248	29.3	$ 1,852.67	$ 1,440.59	$ 412.08	$ 213.00	$ 1,639.67	0.1808	0.1600	7.27
Total	74,099	31.5	$13,320			$2,294	$11,026	0.1798	0.1488	8.50
Last 12 Months	74,099	31.5	$13,320			$2,294	$11,026	0.1798	0.1488	8.50

Electric Usage - Stratford Justice Facility



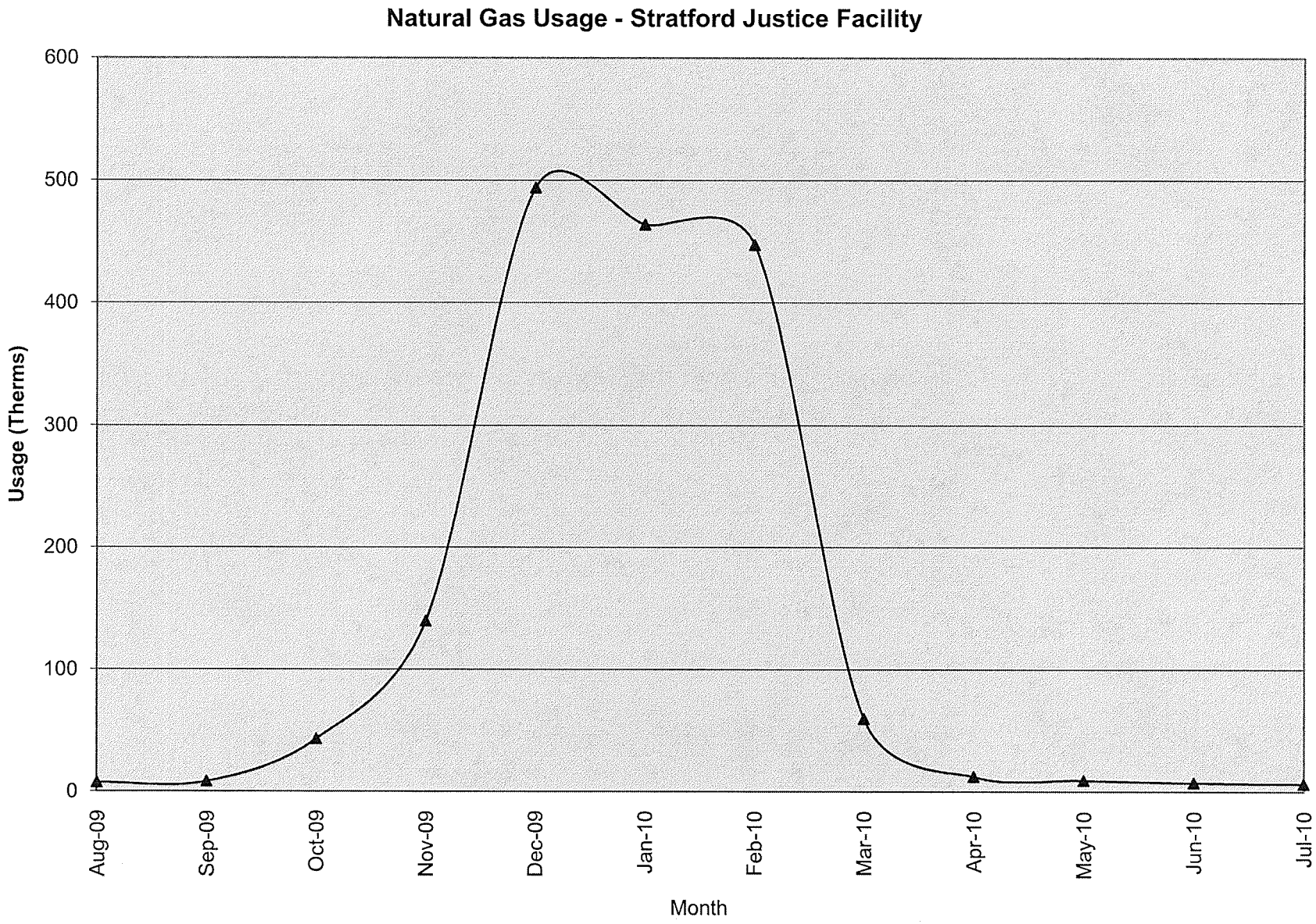
Stratford Justice Facility Utilities
Elec Chart

New Jersey BPU Energy Audit Program
CHA Project No.: 22072
Stratford Borough
South Jersey Gas Service

315 Union Ave - Justice Facility
Account No.: 2 04 38 1850 1 7
Meter No.:

Month	Therms	Charges ($)	($/therm)
August-09	7	$ 28.89	$ 4.02
September-09	8	$ 30.07	$ 3.67
October-09	43	$ 75.32	$ 1.75
November-09	140	$ 198.01	$ 1.42
December-09	494	$ 655.66	$ 1.33
January-10	464	$ 619.64	$ 1.34
February-10	447	$ 598.75	$ 1.34
March-10	60	$ 96.51	$ 1.62
April-10	12	$ 34.09	$ 2.77
May-10	9	$ 30.10	$ 3.25
June-10	7	$ 28.09	$ 3.89
July-10	6	$ 27.95	$ 4.54

Total	1,698	$	2,423	$ 1.43
Most Recent 12 Mo	1,698	$	2,423	$ 1.43



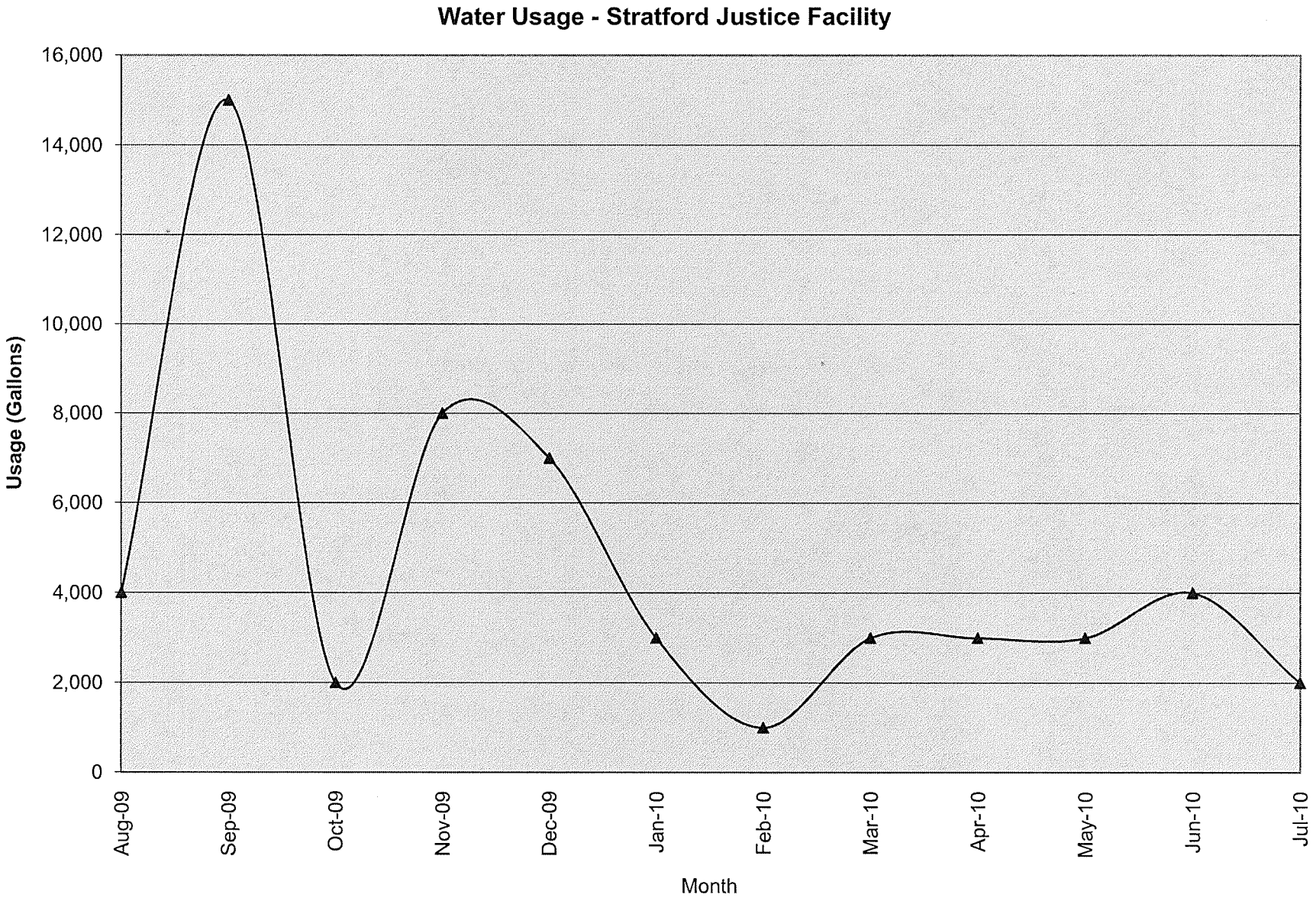
Stratford Justice Facility Utilities
Gas Chart

New Jersey BPU Energy Audit Program
CHA Project No.: 22072
Stratford Borough
New Jersey American Water

315 Union Ave - Justice Facility
Account No.: 18-1238243-8
Meter No.: E037240275

Month	Usage (gallons)	Charges ($)	Rate ($/1000 Gal)
August-09	4,000	$32	$ 8.00
September-09	15,000	$96	$ 6.38
October-09	2,000	$21	$ 10.30
November-09	8,000	$55	$ 6.92
December-09	7,000	$50	$ 7.08
January-10	3,000	$26	$ 8.79
February-10	1,000	$15	$ 14.79
March-10	3,000	$26	$ 8.79
April-10	3,000	$26	$ 8.79
May-10	3,000	$26	$ 8.79
June-10	4,000	$32	$ 8.04
July-10	2,000	$21	$ 10.30

Total	55,000	$426	$ 7.75
Most Recent Yr	55,000	$426	$ 7.75



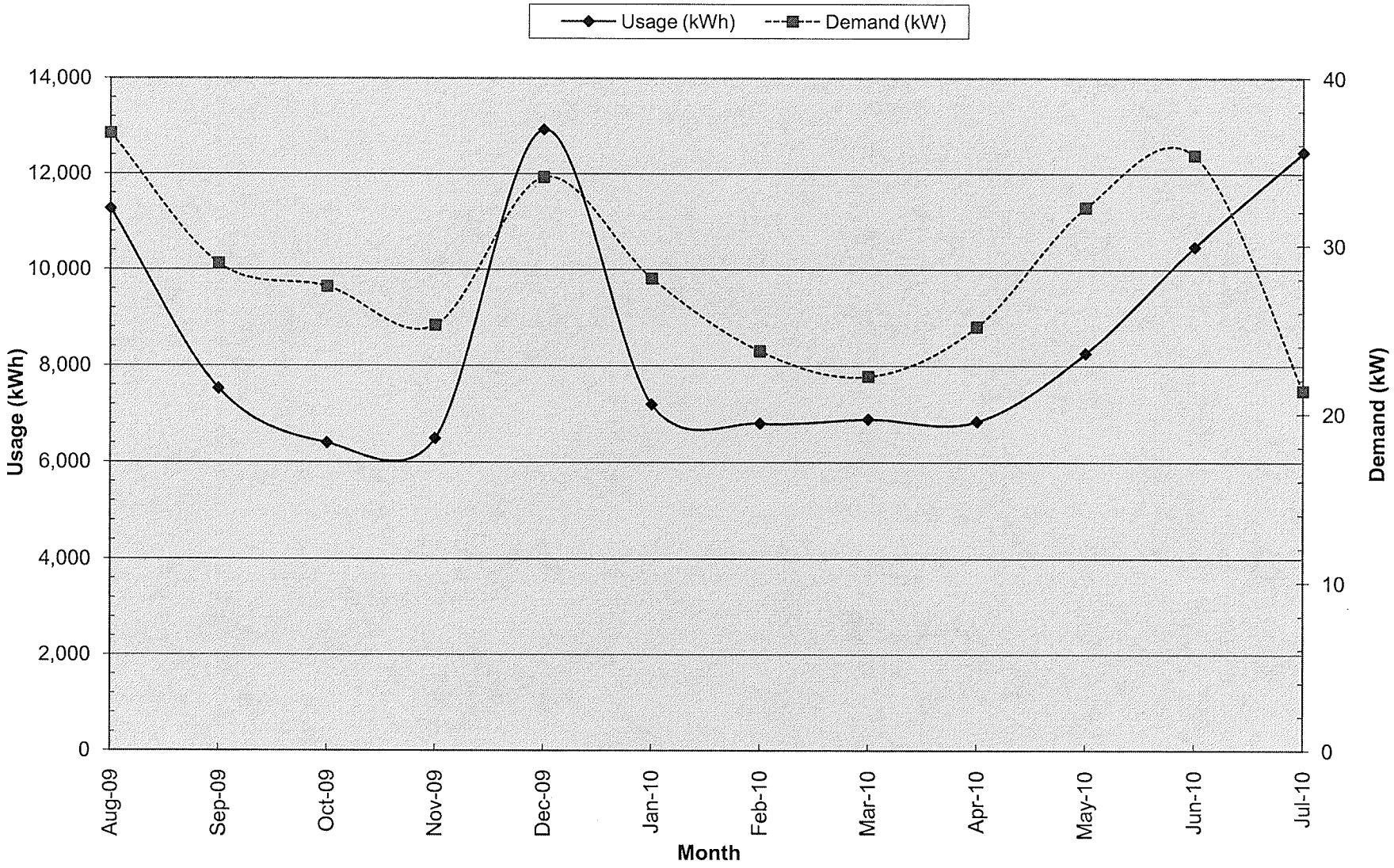
Stratford Justice Facility Utilities
Water Chart

New Jersey BPU Energy Audit Program
CHA Project No.: 22072
Stratford Borough
Atlantic City Electric

307 Union Ave - Fire Station
Account No.: 0064 2769 9951
Meter No.: 84898632

			Charges					Unit Costs		
Month	Consumption (kWh)	Demand (kW)	Total ($)	Supply	Delivery	Demand ($)	Consumption ($)	Blended Rate ($/kWh)	Consumption ($/kWh)	Demand ($/kW)
August-09	11,269	36.72	$ 1,968.75	$ 1,517.77	$ 450.98	$ 254.51	$ 1,714.24	0.1747	0.1521	6.93
September-09	7,524	28.92	$ 1,380.64	$ 1,000.00	$ 380.64	$ 223.46	$ 1,157.18	0.1835	0.1538	7.73
October-09	6,399	27.56	$ 1,073.07	$ 729.23	$ 343.84	$ 203.54	$ 869.53	0.1677	0.1359	7.39
November-09	6,495	25.27	$ 1,084.58	$ 739.48	$ 345.10	$ 203.54	$ 881.04	0.1670	0.1356	8.05
December-09	12,930	34.1	$ 1,942.17	$ 1,440.58	$ 501.59	$ 267.74	$ 1,674.43	0.1502	0.1295	7.85
January-10	7,204	28.1	$ 1,142.19	$ 810.33	$ 331.86	$ 183.18	$ 959.01	0.1585	0.1331	6.53
February-10	6,809	23.7	$ 1,123.23	$ 772.19	$ 351.04	$ 203.54	$ 919.69	0.1650	0.1351	8.58
March-10	6,895	22.2	$ 1,153.45	$ 784.47	$ 368.98	$ 217.10	$ 936.35	0.1673	0.1358	9.77
April-10	6,848	25.2	$ 1,118.08	$ 774.80	$ 343.28	$ 196.76	$ 921.32	0.1633	0.1345	7.81
May-10	8,262	32.3	$ 1,376.23	$ 969.07	$ 407.16	$ 247.28	$ 1,128.95	0.1666	0.1366	7.66
June-10	10,475	35.4	$ 1,966.21	$ 1,486.49	$ 479.72	$ 283.87	$ 1,682.34	0.1877	0.1606	8.02
July-10	12,451	21.4	$ 2,184.60	$ 1,740.70	$ 443.90	$ 213.51	$ 1,971.09	0.1755	0.1583	9.98
Total	103,561	36.7	$17,513			$2,698	$14,815	0.1691	0.1431	7.92
Last 12 Months	103,561	36.7	$17,513			$2,698	$14,815	0.1691	0.1431	7.92

Electric Usage - Stratford Fire Station



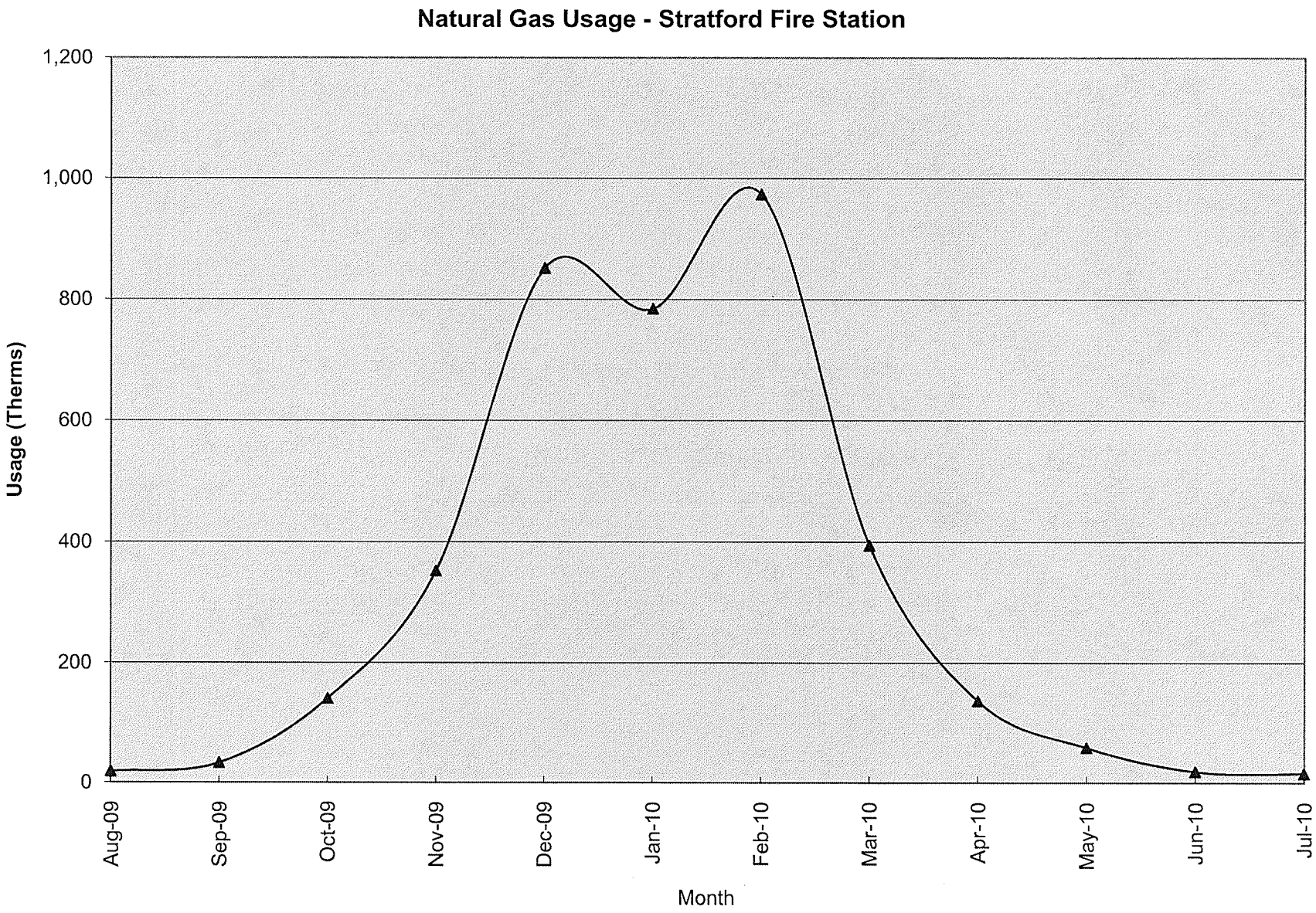
Stratford Fire Station Utilities
Elec Chart

New Jersey BPU Energy Audit Program
CHA Project No.: 22072
Stratford Borough
South Jersey Gas Service

311 E Laurel Rd - Fire Station
Account No.: 2 04 38 2679 0 06
Meter No.:

Month	Therms	Charges ($)	($/therm)
August-09	18	$ 45.08	$ 2.44
September-09	33	$ 64.08	$ 1.96
October-09	140	$ 200.56	$ 1.43
November-09	352	$ 470.91	$ 1.34
December-09	851	$ 1,115.09	$ 1.31
January-10	785	$ 1,035.38	$ 1.32
February-10	974	$ 1,281.19	$ 1.32
March-10	394	$ 530.20	$ 1.35
April-10	137	$ 195.20	$ 1.43
May-10	59	$ 94.08	$ 1.61
June-10	19	$ 42.81	$ 2.31
July-10	15	$ 39.93	$ 2.59

Total	3,777	$	5,115	$ 1.35
Most Recent 12 Mo	3,777	$	5,115	$ 1.35



Stratford Fire Station Utilities
Gas Chart

APPENDIX B

Equipment Inventories

New Jersey BPU Energy Audit Program
CHA # 22072
Borough of Stratford

307 Union Ave - Borough Hall

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size/Efficiency	Location	Areas Served	Date Installed	Remaining Useful Life (years)	Other Info.
Furnace	1	Gibson	C5BA-030C-A	C5D070709102	HVAC / NG & Electric		Utility Room	Front Offices	2008	16	
Furnace	1	Gibson	C5BA-030C-A	C5D070709103	HVAC / NG & Electric		Utility Room	Lobby & Back Offices	2008	16	
Furnace	1	Gibson	G2FD035H14G	C5D070709104	HVAC / NG & Electric		Utility Room	Clerk & Mayor's Office	2008	16	
Furnace	1	Gibson	C5BA-030C-A	C5D070709105	HVAC / NG & Electric		Utility Room	Confrence Room	2008	16	
Outdoor AC Condenser	1	Coleman	AC024M1021CG	WON5632290	AC Condenser	2 ton	On Grade near basement stairs		1992	8	
Outdoor AC Condenser	1	Coleman	BRCS0301BD	40301077	AC Condenser	2.5 ton	On Grade near basement stairs		1992	8	
Outdoor AC Condenser	1	Arcoaire	AG030GB2	L991369195	AC Condenser	2.5 ton	On Grade near basement stairs		1992	8	
Outdoor AC Condenser	1	HEIL	CA5024QKB1	L920365189	AC Condenser	2 ton	On Grade near basement stairs		1992	8	
Outdoor AC Condenser	1	Colemen	BRCS0241BD		AC Condenser	2 ton	On Grade along rear wall	Back Offices	1992	8	Serves Split System in Celing
Split System Ceiling Insert	1	EMI			AC recessed ceiling evaporator / electric	2 ton	Back Office Ceiling	Back Offices	2004	9	
DHW Heater	1	Mor-Flo	G61-30T33-3NV	9846103544	DHW Heater / NG	33,000 Btu/Hr input / 30 Gallon / 80%	Utility Room	Entire Building	2004	14	Energy Guide - 258 Therms/Yr
Ducted Room AC	1	Everstar	MPK-10CR-1	Not Shown	Electric	10,000 Btu/Hr / 9.5 EER	Side Office	Side Office	2008	8	
Ducted Room AC	1	Everstar	MPK-10CR-1	Not Shown	Electric	10,000 Btu/Hr / 9.5 EER	Tax Collector Office	Tax Collector Office	2008	8	

New Jersey BPU Energy Audit Program
CHA # 22072
Borough of Stratford

315 Union Ave - Justice Facility

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size/Efficiency	Location	Areas Served	Date Installed	Remaining Useful Life (years)	Other Info.
Furnace	1	Bryant Plus 90	350MAV048100	4799A02599	Furnace / NG	100,000 Btu/Hr Input / 93%	HVAC Room	1st Floor	2000	8	Single T-stat for 1st floor
Furnace	1	Bryant Plus 90	350MAV048100		Furnace / NG	100,000 Btu/Hr Input / 93%	HVAC Room	1st Floor	2000	8	Single T-stat for 1st floor
Furnace	1	Bryant Plus 90	350MAV060100	Not Accessible	Furnace / NG	100,000 Btu/Hr Input / 93%	Attic Crawlspace	2nd Floor	2000	8	Individual T-stat
Furnace	1	Bryant Plus 90	350MAV060100	Not Accessible	Furnace / NG	100,000 Btu/Hr Input / 93%	Attic Crawlspace	2nd Floor	2000	8	Individual t-stat
Outdoor AC Condenser	1	Bryant	550AN042-D	3999E05473	Condenser / Electric	3.5 Ton / 14 SEER	On Grade along wall	1st Floor	2000	5	
Outdoor AC Condenser	1	Bryant	550AN042-D	0300E04796	Condenser / Electric	3.5 Ton / 14 SEER	On Grade along wall	1st Floor	2000	5	
Outdoor AC Condenser	1	Bryant	550AN060-B	2598E05192	Condenser / Electric	5 Ton / 14 SEER	On Grade along wall	2nd Floor	2000	5	
Outdoor AC Condenser	1	Bryant	550AN060-B	2598E05172	Condenser / Electric	5 Ton / 14 SEER	On Grade along wall	2nd Floor	2000	5	
Ductless Split System	1	Sanyo	C3632	76194	Split AC Condenser / Electric	3 Ton / 10.8 SEER	On Grade along wall	Courtroom	2000	5	Serves Split System in Celing
Ductless Split System	1	Sanyo	XS3632		AC recessed ceiling evaporator / electric	980 CFM	Courtroom Ceiling	Courtroom	2000	5	AC from outdoor Condensing unit
DHW Heater	1	HotPoint	HG40T1A	HPNG 0999A04040	DHW Heater / NG	40 Gal / 30,000 Btu/Hr Input / 80%	HVAC Room	Entire Building	2000	5	

New Jersey BPU Energy Audit Program
CHA # 22072
Borough of Stratford

311 E. Laurel Rd - Fire Station

Description	QTY	Manufacturer Name	Model No.	Serial No.	Equipment Type / Utility	Capacity/Size/Efficiency	Location	Areas Served	Date Installed	Remaining Useful Life (years)	Other Info.
Unit Heaters	4	Reznor	VDAP225	BDE79Y3N22247X	Unit Heater / NG	225,000 Btu/Hr Input / 83%	Garage Ceiling	Garage	2004	7	
DHW Heater	1	Bradford White Corp	PDV100S2503NA	AK5288174	DHW Heater / NG	250,000 Btu/Hr Input / 100gal / 80%	Outdoor Utility Closet	Entire Building	2004	14	
Furnace	1	Colemen	FC9S040A12UP11A	W0L4048002	Furnace / NG	40,000 Btu/Hr Input / 92.5%	Storage Above restroom in garage	1st Floor Restroom	2004	12	
Furnace/AC 1	1	Colemen	G1FA036S17G	(S)XHNS250664	Furnace / NG	36,000 Btu/Hr Input / 91%	2nd Floor Hall Closet	2nd Floor Offices	2004	12	AC via outdoor condenser
Furnace/AC 2	1	Colemen	FC9S100C20UP11A	WKNM004457	Furnace / NG	100,000 Btu/Hr Input / 94%	2nd Floor Rec Rm Closet	2nd Floor Hall	2004	12	AC via outdoor condenser
Furnace/AC 3	1	Colemen	GM9S080C16UP11G	W0M4203883	Furnace / NG	80,000 Btu/Hr Input / 93.7%	2nd Floor Rec Rm Closet	2nd Floor	2004	12	AC via outdoor condenser
Furnace/AC 4	1	Colemen	GM9S060B12UP11G	WOM4208371	Furnace / NG	60,000 Btu/Hr Input / 91.6%	2nd Floor Rec Rm Closet	2nd Floor	2004	12	AC via outdoor condenser
Furnace/AC 5	1	Colemen	Not Accessible	Not Accessible	Furnace / NG	Not Accessible	Attic Crawlspace above Weight Rm	Weight Room	2004	12	AC via outdoor condenser
Oudoor AC Condenser	1	Colemen	HABA-T048SG	W0D5890134	Condenser / Electric	4 Tons /	On Grade along side wall		2004	9	R22
Oudoor AC Condenser	1	Colemen	HABA-T036SG	W0B5531349	Condenser / Electric	3 Tons /	On Grade along side wall		2004	9	R22
Oudoor AC Condenser	1	Colemen	AC018M1021CA	WHNM042409	Condenser / Electric	1.5 Tons /	On Grade along side wall		2004	9	R22
Oudoor AC Condenser	1	Colemen	HABA-T042SG	WkNM030287	Condenser / Electric	3.5 Tons /	On Grade along side wall		2004	9	R22
Oudoor AC Condenser	1	Colemen	HABA-T036SG	W0B5531359	Condenser / Electric	3 Tons /	On Grade along side wall		2004	9	R22
Generator	1	Olympian	D17L1	No Nameplate	Backup Generator / Diesel	No Nameplate	On Grade	Entire Building	2004	14	Runs about 3 hrs/wk

APPENDIX C

Lighting Inventories

Stratford Borough
CHA #22072
Building: Borough Hall

Light Inventory

		EXISTING CONDITIONS			
Area Description	**Floor**	**Number of Fixtures**	**Fixture Code**	**Watts per Fixture**	**Exist Control**
Conference Room	1st	4	FU2ES	82	switch
Mayor's Office	1st	2	FU2ES	82	switch
Mayor's Bathroom	1st	1	I60/1	60	switch
Clerk's Office	1st	2	FU2ES	82	switch
Clerk's Office	1st	4	H60/1	60	switch
Back Office	1st	17	F42SS	94	switch
Front Desk	1st	2	FU2ES	82	switch
Breakroom/Storage	1st	2	F42SS	94	switch
Side Office	1st	4	F42ES	80	switch
Tax Collector Office	1st	2	F42ES	80	switch
Ladie's Restroom	1st	1	F42ES	80	switch
Men's Restroom	1st	1	F42ES	80	switch
Lobby	1st	3	FU2ES	82	switch
Stairwell		1	F42ES	80	switch
Basement Hall	Base	2	F44ES	160	switch
Records room 1	Base	2	F44SS	188	switch
Records room 2	Base	3	F42SS	94	switch
Records room 3	Base	3	F44SS	188	switch
Classroom/Confrence room	Base	7	F44SS	188	switch
Emergency Operations Center	Base	4	F44SS	188	switch
TOTALS -		**67**		**2,124.0**	

Stratford Borough
CHA #22072
Building: Justice Facility

Light Inventory

		EXISTING CONDITIONS			
Area Description	**Floor**	**Number of Fixtures**	**Fixture Code**	**Watts per Fixture**	**Exist Control**
Lobby	1st	4	FU2ILL	59	switch
Police Secretary	1st	2	F44ILL	112	switch
Court Clerk	1st	6	F44ILL	112	switch
Clerk File Chamber	1st	1	F44ILL	112	switch
Courtroom	1st	21	FU2ILL	59	switch
Prosecutor Room	1st	2	F44ILL	112	switch
Corridor	1st	4	F44ILL	112	switch
Public Defender	1st	1	F44ILL	112	switch
Janitor Closet	1st	1	FU2ILL	59	switch
Restroom	1st	1	F44ILL	112	switch
Police Processing Area	1st	7	F44ILL	112	switch
Police Processing Area	1st	5	H50/1	50	switch
Holding Cell	1st	1	F44ES	160	switch
Chiefs Office	2nd	1	I60/4	240	switch
Chiefs Office	2nd	4	HLV65/1	75	switch
Chiefs Closet	2nd	2	F41ES	50	switch
Back stairwell	2nd	3	F42ILL	59	switch
Center cubicles	2nd	8	F42ILL	59	switch
Evidence Storage	2nd	2	F41ES	50	switch
Office 1	2nd	1	I60/4	240	switch
Office 1	2nd	4	HLV65/1	75	switch
Office 2	2nd	1	I60/4	240	switch
Office 2	2nd	4	HLV65/1	75	switch
Office 3	2nd	1	I60/4	240	switch
Office 3	2nd	4	HLV65/1	75	switch
Office 4	2nd	1	I60/4	240	switch
Office 4	2nd	4	HLV65/1	75	switch
Office 5	2nd	1	I60/4	240	switch
Office 5	2nd	4	HLV65/1	75	switch
Confrence Room	2nd	13	HLV65/1	75	switch
Front Stairwell	2nd	6	CFQ13/1	17	switch
Back Entrance	Ext	1	HPS100/1	138	None
Back Wall of Building	Ext	2	H90/1	90	None
TOTALS -		**123**		**2,056.0**	

Stratford Borough
CHA #22072
Building: Fire Station

Light Inventory

			EXISTING CONDITIONS			
Area Description	**Floor**		**Number of Fixtures**	**Fixture Code**	**Watts per Fixture**	**Exist Control**
Garage	1st	8	19	MH400/1	458	switch
Exterior Soffit Lights	Ground	3	16	HPS100/1	138	Timer
Exterior Wall Lights	Ground	3A	9	HPS70/1	95	Timer
Exterior Parking Lot Lights	Ground	3B	4	HPS250/1	295	Timer
Air System Room	1st	1	2	F42ILL	59	switch
Storage #1	1st	1	3	F42ILL	59	switch
Utility Room	1st	5	1	CFT13/2	31	switch
Toilet Room #1	1st	4	1	FC12/2	62	switch
Toilet Room #1	1st	6	1	I90/2	180	switch
Dispatch Desk	1st	2	1	F41SS	57	switch
Hallway	2nd	1	9	F42ILL	59	switch
Kitchen	2nd	1	4	F42ILL	59	switch
Mens Room	2nd	1	3	F42ILL	59	switch
Womens Room	2nd	1	2	F42ILL	59	switch
Stair Tower #1	2nd	1	1	F42ILL	59	switch
Stair Tower #1 elevator	2nd	1	1	F42ILL	59	switch
Office 1	2nd	1	2	F42ILL	59	switch
Office 1	2nd	7	4	I50/1	50	switch
HVAC Hall Closet	2nd	1	1	F42ILL	59	switch
Chief's Office	2nd	1	4	F42ILL	59	switch
Ladies Aux Office	2nd	1	2	F42ILL	59	switch
Office 2	2nd	1	2	F42ILL	59	switch
Recreational Room	2nd	1	5	F42ILL	59	switch
Recreational Room	2nd	7	12	I50/1	50	switch
Meeting Room	2nd	1	6	F42ILL	59	switch
HVAC Rec Room closet	2nd	1	1	F42ILL	59	switch
Weight Room	2nd	1	4	F42ILL	59	switch
Stair Tower #2	2nd	1	1	F42ILL	59	switch
TOTALS -			**121**		**2,478.0**	

APPENDIX D

BH ECM-1 Increase Roof Insulation

Stratford Borough
CHA #22072
Building: Borough Hall

BH ECM-1 Increase Roof Insulation

Existing Roof Area	1,250	sf
Existing U-value	0.28	Btu/hr/(sf*F)
Existing R-value	3.6	
Proposed R-value	23	
Proposed U-value	0.04	Btu/hr/(sf*F)
Heating System Efficiency	80%	
Cooling System Efficiency	1.20	kW/ton
Heating "On" Temp	55	F

Existing Cooling

Existing Cooling Load Temp Diff.	73	F
Existing Max. Roof Cooling Load	6,327	Btu/hr

Proposed Cooling

Proposed Cooling Load	1,008	Btu/hr
Occupied Cooling Setpoint	72	F
Unoccupied Cooling Setpoint	80	F

Existing Heating

Existing Heating Load Temp Diff.	69	F
Existing Max. Roof Heating Load	5,980	Btu/hr

Proposed Heating

Proposed Heating Load	953	Btu/hr
Occupied Heating Setpoint	68	F
Unoccupied Heating Setpoint	60	F

Existing Heating Total	37,105,985	Btu/yr
Proposed Heating Total	5,910,688	Btu/yr
Savings	31,195,298	Btu/yr
Input	390	**therms**
Existing Cooling Total	164	kWh/yr
Proposed Cooling Total	26	kWh/yr
Savings	138	kWh/yr

				Occupied				Unoccupied							
Avg Outdoor Air Temp. Bins °F	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Heat Gain	Proposed Heat Gain	Existing Heat Loss	Proposed Heat Loss	Existing Cooling Load	Existing Heating Load	Proposed Cooling Load	Proposed Heating Load
				(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(Btu/hr)	(kWh/yr)	(Btu/yr)	(kWh/yr)	(Btu/yr)
102.5	0	0	0	10,590	1,687	-	-	7,813	1,244	-	-	-	-	-	-
97.5	0	0	0	8,854	1,410	-	-	6,076	968	-	-	-	-	-	-
92.5	36	9	27	7,118	1,134	-	-	4,340	691	-	-	18	-	3	-
87.5	123	29	94	5,382	857	-	-	2,604	415	-	-	40	-	6	-
82.5	477	114	363	3,646	581	-	-	868	138	-	-	73	-	12	-
77.5	656	156	500	1,910	304	-	-	-	-	-	-	30	-	5	-
72.5	742	177	565	174	28	-	-	-	-	-	-	3	-	0	-
67.5	784	187	597	-	-	-	-	-	-	-	-	-	-	-	-
62.5	983	234	749	-	-	-	-	-	-	-	-	-	-	-	-
57.5	625	149	476	-	-	-	-	-	-	-	-	-	-	-	-
52.5	438	104	334	-	-	5,382	857	-	-	2,604	415	-	1,430,308	-	227,837
47.5	559	133	426	-	-	7,118	1,134	-	-	4,340	691	-	2,795,924	-	445,368
42.5	671	160	511	-	-	8,854	1,410	-	-	6,076	968	-	4,521,040	-	720,166
37.5	1,067	254	813	-	-	10,590	1,687	-	-	7,813	1,244	-	9,041,625	-	1,440,259
32.5	685	163	522	-	-	12,326	1,963	-	-	9,549	1,521	-	6,993,841	-	1,114,063
27.5	369	88	281	-	-	14,063	2,240	-	-	11,285	1,798	-	4,408,110	-	702,177
22.5	321	76	245	-	-	15,799	2,517	-	-	13,021	2,074	-	4,391,989	-	699,609
17.5	184	44	140	-	-	17,535	2,793	-	-	14,757	2,351	-	2,836,971	-	451,907
12.5	40	10	30	-	-	19,271	3,070	-	-	16,493	2,627	-	686,177	-	109,303
7.5	0	0	0	-	-	21,007	3,346	-	-	18,229	2,904	-	-	-	-
2.5	0	0	0	-	-	22,743	3,623	-	-	19,965	3,180	-	-	-	-
-2.5	0	0	0	-	-	24,479	3,899	-	-	21,701	3,457	-	-	-	-
-7.5	0	0	0	-	-	26,215	4,176	-	-	23,438	3,733	-	-	-	-
TOTALS	**8,760**	**2,086**	**6,674**									**164**	**37,105,985**	**26**	**5,910,688**

Stratford Borough
CHA #22072
Building: Borough Hall

BH ECM-1 Increase Roof Insulation

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
Fiberglass Blankets or Batts	1,250	SF	$ 0.48	$ 0.55		$ 594	$ 848	$ -	$ 1,442	
6-1/4" R-19 with paper or foil backing						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
Ceiling Disturbance	1	LS	$ 500	$ 500		$ 495	$ 617	$ -	$ 1,112	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 2,554	Subtotal
$ 383.16	15% Contingency
$ 440.63	Contractor 15% O&P
$ -	Engineering
$ 3,378	**Total**

APPENDIX E

BH ECM-2 Back Office Split System Night Setback

Stratford Borough
CHA #22072
Building: Borough Hall

BH ECM-2 Back Office Split System Night Setback

Building Footprint	312	SF	Ex Occupied Clng Temp.	74	°F	Ex Occupied Htg Temp.	68	°F	
Heating Efficiency	80%		Ex Unoccupied Clng Temp.	74	°F	Ex Unoccupied Htg Temp.	68	°F	Cooling Energy Savings 595 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.	68	°F	
Internal Gains	6,202	btu/h	Occupied Cooling UA	-642	btu/hr/°F	Occupied Heating UA	201	btu/hr/°F	
Unoc Internal Gain factor	0.03		Unoccupied Cooling UA	-529	btu/hr/°F	Unoccupied Heating UA	201	btu/hr/°F	
Ave Occ Internal Gain Factor	0.7		Cooling Occ Enthalpy Setpoint	27.5	Btu/lb				
			Cooling Unocc Enthalpy Setpoint	27.6	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
A		B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	K	L
102.5	49.1	0	0	0	-18,292	-29,150	-4,342	-15,078	-29,150	-186	-18,292	-29,150	-4,342	-11,904	-29,150	-186	0	0
97.5	42.5	0	0	0	-15,083	-20,243	-4,342	-12,433	-20,243	-186	-15,083	-20,243	-4,342	-9,259	-20,243	-186	0	0
92.5	39.5	36	9	27	-11,874	-16,195	-4,342	-9,788	-16,195	-186	-11,874	-16,195	-4,342	-6,613	-16,195	-186	100	91
87.5	36.6	123	29	94	-8,664	-12,281	-4,342	-7,142	-12,281	-186	-8,664	-12,281	-4,342	-3,968	-12,281	-186	258	228
82.5	34	477	114	363	-5,455	-8,772	-4,342	-4,497	-8,772	-186	-5,455	-8,772	-4,342	-1,323	-8,772	-186	700	585
77.5	31.6	656	156	500	-2,246	-5,533	-4,342	-1,852	-5,533	-186	-2,246	-5,533	-4,342	0	0	-186	568	199
72.5	29.2	742	177	565	0	0	-4,342	0	0	-186	0	0	-4,342	0	0	-186	87	87
67.5	27	784	187	597	0	0	-4,342	101	162	-186	101	162	-4,342	101	162	-186	81	76
62.5	24.5	983	234	749	0	0	-4,342	1,106	1,781	-186	1,106	1,781	-4,342	1,106	1,781	-186	102	34
57.5	21.4	625	149	476	2,112	3,401	-4,342	2,112	3,401	-186	2,112	3,401	-4,342	2,112	3,401	-186	0	0
52.5	18.7	438	104	334	3,118	5,020	-4,342	3,118	5,020	-186	3,118	5,020	-4,342	3,118	5,020	-186	0	0
47.5	16.2	559	133	426	4,124	6,640	-4,342	4,124	6,640	-186	4,124	6,640	-4,342	4,124	6,640	-186	0	0
42.5	14.4	671	160	511	5,129	8,259	-4,342	5,129	8,259	-186	5,129	8,259	-4,342	5,129	8,259	-186	0	0
37.5	12.6	1,067	254	813	6,135	9,879	-4,342	6,135	9,879	-186	6,135	9,879	-4,342	6,135	9,879	-186	0	0
32.5	10.7	685	163	522	7,141	11,498	-4,342	7,141	11,498	-186	7,141	11,498	-4,342	7,141	11,498	-186	0	0
27.5	8.6	369	88	281	8,147	13,118	-4,342	8,147	13,118	-186	8,147	13,118	-4,342	8,147	13,118	-186	0	0
22.5	6.8	321	76	245	9,152	14,737	-4,342	9,152	14,737	-186	9,152	14,737	-4,342	9,152	14,737	-186	0	0
17.5	5.5	184	44	140	10,158	16,357	-4,342	10,158	16,357	-186	10,158	16,357	-4,342	10,158	16,357	-186	0	0
12.5	4.1	40	10	30	11,164	17,976	-4,342	11,164	17,976	-186	11,164	17,976	-4,342	11,164	17,976	-186	0	0
7.5	2.6	0	0	0	12,170	19,595	-4,342	12,170	19,595	-186	12,170	19,595	-4,342	12,170	19,595	-186	0	0
2.5	1	0	0	0	13,175	21,215	-4,342	13,175	21,215	-186	13,175	21,215	-4,342	13,175	21,215	-186	0	0
-2.5	0	0	0	0	14,181	22,834	-4,342	14,181	22,834	-186	14,181	22,834	-4,342	14,181	22,834	-186	0	0
-7.5	-1.5	0	0	0	15,187	24,454	-4,342	15,187	24,454	-186	15,187	24,454	-4,342	15,187	24,454	-186	0	0
TOTALS		8,760	2,086	6,674													1,895	1,299

Existing Building Ventilation & Infiltration (occ)	**300 cfm**
Overheat Ventilation Factor	**1.00**
Additional ventilation to offset overheat	**0 cfm**
Existing Building Ventilation & Infiltration (unocc)	**300 cfm**

Stratford Borough
CHA #22072
Building: Borough Hall

BH ECM-2 Back Office Split System Night Setback

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Programmable thermostat	1	ea	$ 80	$ 100	$ -	$ 79	$ 123	$ -	$ 203	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 203	Subtotal
$ 20	10% Contingency
$ -	Contractor 0% O&P
$ -	0% Engineering
$ 223	**Total**

Stratford Borough
CHA #22072
Building: Borough Hall

Reconcile Thermal Model

Building Footprint	312 SF	Ex Occupied Clng Temp.	74 °F	Ex Occupied Htg Temp.	68 °F		
Heating Efficiency	80%	Ex Unoccupied Clng Temp.	74 °F	Ex Unoccupied Htg Temp.	68 °F		
Cooling Efficiency	1.20 kW/ton	Occupied Cooling UA	(642) btu/hr/°F	Occupied Heating UA	201 btu/hr/°F		
Internal Gains	6,202 btu/h	Unoccupied Cooling UA	(529) btu/hr/°F	Unoccupied Heating UA	201 btu/hr/°F		
Unoc Internal Gain factor	0.03	Cooling Occ Enthalpy Setpoint	27.5 Btu/lb				
Ave Occ Internal Gain Factor	0.7	Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb				
Economizer available (Y/N)	Yes						

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	-18,292	-29,150	-4,342	-15,078	-29,150	-186	0	0	0	0
97.5	42.5	0	0	0	-15,083	-20,243	-4,342	-12,433	-20,243	-186	0	0	0	0
92.5	39.5	36	9	27	-11,874	-16,195	-4,342	-9,788	-16,195	-186	0	100	100	0
87.5	36.6	123	29	94	-8,664	-12,281	-4,342	-7,142	-12,281	-186	0	258	258	0
82.5	34.0	477	114	363	-5,455	-8,772	-4,342	-4,497	-8,772	-186	0	700	700	0
77.5	31.6	656	156	500	-2,246	-5,533	-4,342	-1,852	-5,533	-186	0	568	568	0
72.5	29.2	742	177	565	0	0	-4,342	0	0	-186	0	87	87	0
67.5	27.0	784	187	597	0	0	-4,342	101	162	-186	0	81	81	0
62.5	24.5	983	234	749	0	0	-4,342	1,106	1,781	-186	0	102	102	0
57.5	21.4	625	149	476	2,112	3,401	-4,342	2,112	3,401	-186	0	0	0	34
52.5	18.7	438	104	334	3,118	5,020	-4,342	3,118	5,020	-186	0	0	0	38
47.5	16.2	559	133	426	4,124	6,640	-4,342	4,124	6,640	-186	0	0	0	67
42.5	14.4	671	160	511	5,129	8,259	-4,342	5,129	8,259	-186	0	0	0	102
37.5	12.6	1,067	254	813	6,135	9,879	-4,342	6,135	9,879	-186	0	0	0	144
32.5	10.7	685	163	522	7,141	11,498	-4,342	7,141	11,498	-186	0	0	0	150
27.5	8.6	369	88	281	8,147	13,118	-4,342	8,147	13,118	-186	0	0	0	93
22.5	6.8	321	76	245	9,152	14,737	-4,342	9,152	14,737	-186	0	0	0	91
17.5	5.5	184	44	140	10,158	16,357	-4,342	10,158	16,357	-186	0	0	0	58
12.5	4.1	40	10	30	11,164	17,976	-4,342	11,164	17,976	-186	0	0	0	14
7.5	2.6	0	0	0	12,170	19,595	-4,342	12,170	19,595	-186	0	0	0	0
2.5	1.0	0	0	0	13,175	21,215	-4,342	13,175	21,215	-186	0	0	0	0
-2.5	0.0	0	0	0	14,181	22,834	-4,342	14,181	22,834	-186	0	0	0	0
-7.5	-1.5	0	0	0	15,187	24,454	-4,342	15,187	24,454	-186	0	0	0	0
TOTALS		8,760	2,086	6,674								1,895	1,895	845
					59,478	102,809	-99,856	71,510	104,752	-4,280				

Existing Building Ventilation & Infiltration (occ)	300 cfm
Overheat Ventilation Factor	1.00
Additional ventilation to offset overheat	0 cfm
Existing Building Ventilation & Infiltration (unocc)	300 cfm
Economizer Ventilation (from AHU's)	cfm

Energy Use Indices (calculated)

	Base Case
Cooling	1,895
Target ->	1,485
	127.6%

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	**Project No.:**	CHA #22072		
Location		**Site Elevation:**	460 Feet	**Specific Volume**	14.00 CF/#
Building Name	Borough Hall	**Date:**	09/07/10		
Engineer:	M. Devlin				

Building/Facility Designation Stratford Borough Hall - Back Office

Outdoor Winter Design DB Temperature	-1 *F	**Indoor Winter Design DB Temperature**	68 *F
Outdoor Summer Design DB Temperature	90 *F	**Indoor Summer Design DB Temperature**	74 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 #/#	**Indoor Air (70*F) Humidity Ratio**	0.0079 #/#

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	4.5	

Roofs (Select One)		R Value	Roof Type
	Tectum Deck, 3.3" Insul., BU Roof	13.0	1
	Steel Deck, 5" Insul., BU Roof	18.2	1
	Attic Roof with 6" Insul.	25.0	4
	4" HW Concrete Deck, BU Roof	2.7	2
	Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
	Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
	Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
	Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
	Wood Deck, 6" insulation, Felt & Membrane	18.0	
x	U value calculator	3.6	

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	

	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	312 SF										
Occupied Area	312 SF							**Return Plenum?**	n		

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	10 Ft	12.0 Ft	12.0 Ft	0 SF	0 SF	120 SF
East Exposure	1 Ft	1.0 Ft	12.0 Ft	0 SF	0 SF	1 SF
South Exposure	1 Ft	1.0 Ft	12.0 Ft	0 SF	0 SF	1 SF
West Exposure	20 Ft	12.0 Ft	12.0 Ft	36 SF	21 SF	183 SF

Occupied Forced Ventilation	250 cfm	0.9 AC/hr
Unoccupied Forced Ventilation	250 cfm	0.9 AC/hr

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	Project No.:	CHA #22072		
Location		Site Elevation:	460 Feet	Specific Volume	14.00 CF/#
Building Name	Borough Hall	Date:	09/07/10		
Engineer:	M. Devlin				

Building/Facility Designation: Stratford Borough Hall - Back Office

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

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

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	120	0.22	20 °F	1.0	538 Btu/hr
East Exposure	12	0.22	39 °F	1.0	105 Btu/hr
South Exposure	12	0.22	27 °F	1.0	73 Btu/hr
West Exposure	183	0.22	22 °F	1.0	902 Btu/hr
Roof	312	0.28	73 °F	1.0	6,327 Btu/hr
Fenestration	36	1.05	16 °F		605 Btu/hr
Doors	21	0.14	27 °F		79 Btu/hr
Ceiling	312	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	312	0.04	0 °F		0 Btu/hr
					8,628 Btu/h

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

							Room Heat Gain
Lights	2.00 w/sf x	312 Occ Area =	0.6 kW x 3.4x		1.0 RAF =		2,130 Btu/h
Plug Load	0.08 w/sf x	312 Occ Area =	0.0 kW x 3.4x		1.0 RAF =		85 Btu/h
People	6 people x	255 btu/person x	100% time in space =				1,530 Btu/h
Computer Work Stations	6 Units x	120 W/Unit x	3414 =				2,457 Btu/h
Equipment	kW x 3.413 =						0 Btu/h
Misc.							0 Btu/h
							6,202 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain
Walls	327 SF	0.10 CFM/SF		1.04	16 °F	590 Btu/h
Doors	21 SF	0.20 CFM/LF	0.95 LF/SF	1.04	16 °F	72 Btu/h
Windows	36 SF	0.35 CFM/LF	1.22 LF/SF	1.04	16 °F	278 Btu/h
Ventilation	250 cfm			1.04	16 °F	4,509 Btu/h
						5,449 Btu/h
Infiltration	52 cfm	0.2 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	0	0.22	20	1.0	0 Btu/hr
East Exposure	-11	0.22	39	1.0	-96 Btu/hr
South Exposure	-11	0.22	27	1.0	-67 Btu/hr
West Exposure	0	0.22	22	1.0	0 Btu/hr
Roof	312	0.28	73	0.0	0 Btu/hr
					-163 Btu/h

INTERNAL HEAT GAINS

Lights	2.00 w/sf x	312 Occ Area =	0.6 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	1,804	Internal Gains to Room	6,202
Conduction to Room	8,628	Internal Gains to Plenum	0
Conduction to Plenum	-163		
Ventilaton and Infiltration	5,449		
Sub Total	15,718	Sub Total	6,202

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	Project No.:	CHA #22072		
Location		Site Elevation:	460 Feet	Specific Volume	14.00 CF/#
Building Name	Borough Hall	Date:	09/07/10		
Engineer:	M. Devlin				

Building/Facility Designation: Stratford Borough Hall - Back Office

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	290 SF	0.10 CFM/SF	4,629	0.0042 ##/#	570 Btu/h
Doors	21 SF	0.20 CFM/LF	4,629	0.0042 ##/#	79 Btu/h
Windows	36 SF	0.35 CFM/LF	4,629	0.0042 ##/#	302 Btu/h
Ventilation	250 cfm		4,629	0.0042 ##/#	4,910 Btu/h
People	6 people	1.00 time in space		250 Btu/hr/person	1,500 Btu/h
					7,360 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	
Temperature Dependent Gains	15,718	7,360	23,078	
Temperature Indep. Gains	6,202		6,202	SHR= 0.75
Total	21,920	7,360	29,280	

Building Cooling Load: 2.4 Tons at 128 SF/Ton

Building Air Flow to Condition Space based on a 12*F Temp Rise is: 1,763 CFM; 5.65 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	120	0.22	69	1,855 Btu/h
East Exposure	1	0.22	69	15 Btu/h
South Exposure	1	0.22	69	15 Btu/h
West Exposure	183	0.22	69	2,829 Btu/h
Fenestration	36	1.05	69	2,608 Btu/h
Roof	312	0.28	69	5,980 Btu/h
Doors	21	0.14	69	202 Btu/h
Ceiling	312	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	312	0.04	30	374 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	305 SF	0.10 CFM/SF	1.04	69	31 cfm	2,197 Btu/h
Doors	21 SF	0.20 CFM/LF	1.04	69	4 cfm	288 Btu/h
Windows	36 SF	0.35 CFM/LF	1.04	69	15 cfm	1,109 Btu/h
Ventilation Load	250 cfm		1.04	69	250 cfm	19,446 Btu/h
Total Ventilation & Infiltration Load					300 cfm	23,040 Btu/h

Building Heating Load	36,919	btu/h
		118.3 btu/sf

APPENDIX F

BH ECM-3 Window Replacement

Stratford Borough
CHA #22072
Building: Borough Hall

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

BH ECM-3 Window Replacement

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.

	Occupied Cooling Hours per Week	82	Hours		
	Occupied Heating Hours per Week	45	Hours		
Given	Heating Energy Cost	$1.45	$/therm		
	Cooling Cost	$0.181	$/kWh		
	Occupied Cooling Setpoint Temperature	70.0	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	62.0	Degrees F	Unoccupied	(Assumption)
	Window Area	150	sq.ft.		(From window survey)
	Window Perimeter	220	ft		(From window survey)
	Proposed U factor	0.50	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		
	Building Balance Pt	60	*F		
Assumptions	Existing U factor	1.05	Btu/(h*sqft*degf)		(From ASHRAE Fundamentals)
	Existing Air Infiltration	0.35	cfm/ft		(From ASHRAE Fundamentals)
	Heating System Efficiency	80%			
	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	36	17.6	0.0	0.0	74,739	0	0	77,950	0	0
Cooling	36.6	87.5	123	60.0	0.0	0.0	198,613	0	0	230,958	0	0
Cooling	33.5	82.5	477	232.9	0.0	0.0	550,164	0	0	645,526	0	0
Cooling	31.6	77.5	656	320.3	0.0	0.0	453,972	0	0	676,923	0	0
Cooling	30.3	72.5	742	362.2	0.0	0.0	171,162	0	0	602,491	0	0
Cooling	27.9	67.5	784	382.8	0.0	0.0	0	0	0	318,297	0	0
Cooling	24.6	62.5	983	479.9	0.0	0.0	0	0	0	0	0	0
Heating	21.6	57.5	625	0.0	167.4	457.6	0	332,227	389,180	0	146,180	171,239
Heating	18.7	52.5	438	0.0	117.3	320.7	0	343,693	575,778	0	151,225	253,342
Heating	16.2	47.5	559	0.0	149.7	409.3	0	580,137	1,121,599	0	255,260	493,503
Heating	14.3	42.5	671	0.0	179.7	491.3	0	866,219	1,810,568	0	381,136	796,650
Heating	12.4	37.5	1,067	0.0	285.8	781.2	0	1,647,515	3,617,330	0	724,906	1,591,625
Heating	10.4	32.5	685	0.0	183.5	501.5	0	1,231,073	2,796,213	0	541,672	1,230,334
Heating	8.7	27.5	369	0.0	98.8	270.2	0	756,565	1,761,583	0	332,889	775,096
Heating	7	22.5	321	0.0	86.0	235.0	0	739,403	1,754,526	0	325,338	771,991
Heating	5.4	17.5	184	0.0	49.3	134.7	0	470,408	1,133,015	0	206,979	498,526
Heating	3.9	12.5	40	0.0	10.7	29.3	0	112,388	273,983	0	49,451	120,552
Heating	2.5	7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	1.2	2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
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	1,856	1,328	3,631	1,448,651	7,079,628	15,233,773 btu	2,552,146	3,115,036	6,702,860 btu

Cooling Load =	(1448651) + (2552146) =		4,000,796 btu
Cooling Energy =	(4000796)/(12000) * (1.20) =		400 kWh
Cooling Energy Cost =	(400.08) x ($0.181) =	$	72.25
Heating Load =	(22313401) + (9817896) =		32,131,297 btu
Heating Energy =	(32131297)/(80%)/(100000) =		402 therms
Heating Energy Cost =	(401.64) x ($1.450) =	$	582

Stratford Borough
CHA #22072
Building: Borough Hall

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

BH ECM-3 Window Replacement

Operation	OA Enthalpy	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	36	17.6	0.0	0.0	35,590	0	0	44,543	0	0
Cooling	36.6	87.5	123	60.0	0.0	0.0	94,578	0	0	131,976	0	0
Cooling	33.5	82.5	477	232.9	0.0	0.0	261,983	0	0	368,872	0	0
Cooling	31.6	77.5	656	320.3	0.0	0.0	216,177	0	0	386,813	0	0
Cooling	30.3	72.5	742	362.2	0.0	0.0	81,506	0	0	344,281	0	0
Heating	27.9	67.5	784	382.8	0.0	0.0	0	0	0	181,884	0	0
Heating	24.6	62.5	983	479.9	0.0	0.0	0	0	0	0	0	0
Heating	21.6	57.5	625	0.0	167.4	457.6	0	158,203	185,324	0	83,531	97,851
Heating	18.7	52.5	438	0.0	117.3	320.7	0	163,663	274,180	0	86,414	144,767
Heating	16.2	47.5	559	0.0	149.7	409.3	0	276,256	534,095	0	145,863	282,002
Heating	14.3	42.5	671	0.0	179.7	491.3	0	412,485	862,175	0	217,792	455,228
Heating	12.4	37.5	1,067	0.0	285.8	781.2	0	784,531	1,722,538	0	414,232	909,500
Heating	10.4	32.5	685	0.0	183.5	501.5	0	586,225	1,331,530	0	309,527	703,048
Heating	8.7	27.5	369	0.0	98.8	270.2	0	360,269	838,849	0	190,222	442,912
Heating	7	22.5	321	0.0	86.0	235.0	0	352,097	835,488	0	185,907	441,138
Heating	5.4	17.5	184	0.0	49.3	134.7	0	224,004	539,531	0	118,274	284,872
Heating	3.9	12.5	40	0.0	10.7	29.3	0	53,518	130,468	0	28,257	68,887
Heating	2.5	7.5	0	0.0	0.0	0.0	0	0	0	0	0	0
Heating	1.2	2.5	0	0.0	0.0	0.0	0	0	0	0	0	0
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	1,856	1,328	3,631	689,834	3,371,251	7,254,178 btu	1,458,369	1,780,021	3,830,206 btu

	Conduction	Infiltration		
Cooling Load =	(689834) + (	1458369) =		2,148,203 btu
	Cooling Load			
Cooling Energy =	(2148203)/(	12000) * (1.20) =		215 kWh
	Cooling Energy	Cooling Cost		
Cooling Energy Cost =	(214.82) x (	$0.181) =	$	38.80
	Conduction	Infiltration		
Heating Load =	(10625429) + (	5610226) =		16,235,655 btu
	Heating Load	Heat Content		
Heating Energy =	(16235655)/(	80%) / (100000) =		203 therms
	Heating Energy	Heating Cost		
Heating Energy Cost =	(202.95) x (	$1.450) =	$	294

Summary

EXISTING COOLING ENERGY	400.08	kWh	$	72.25
EXISTING HEATING ENERGY	401.64	therms	$	582.38
EXISTING ENERGY COST			$	654.63

PROPOSED COOLING ENERGY	214.82	kWh	$	38.80
PROPOSED HEATING ENERGY	202.95	therms	$	294.27
PROPOSED ENERGY COST			$	333.07

COOLING ENERGY SAVINGS	185.26	kWh	$	33.46
HEATING ENERGY SAVINGS	198.70	therms	$	288.11
ENERGY COST SAVINGS			$	321.57

46.3% of existing
49.5% of existing
49.1% of existing

Comments

Stratford Borough
CHA #22072
Building: Borough Hall

BH ECM-3 Window Replacement

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Steel Single Fixed Windows						$ -	$ -	$ -	$ -	
9'x2'	10	ea	$ 477	$ 60		$ 4,722	$ 740	$ -	$ 5,463	
						$ -	$ -	$ -	$ -	
Trim Set	10	ea	$ 33	$ 25		$ 327	$ 309	$ -	$ 635	
						$ -	$ -	$ -	$ -	
Window Removal						$ -	$ -	$ -	$ -	
Aluminum, including trim, to 25 S.F.	10	ea		$ 24		$ -	$ 296	$ -	$ 296	
						$ -	$ -	$ -	$ -	

$ 6,394	Subtotal
$ 1,279	20% Contingency
$ 959	15% Contractor O&P
$ -	Engineering
$ 8,632	**Total**

APPENDIX G

BH ECM-4 Install Instantaneous DHW Heaters

Stratford Borough
CHA #22072
Building: Borough Hall

ECM-4: Install Instantaneous DHW Heater

Summary

* Replace 33 MBH, 30 Gal Gas-Fired DHW Heater w/ Instantaneous, Electric Point of Use HW Heaters

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	4	Therms/month	Calculated from utility bill
Total Annual Utility Demand by Water Heater	4,200	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	80%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	3,360	MBTU/yr	
Existing Tank Size	30	Gallons	Per manufacturer nameplate
Hot Water Piping System Capacity	5	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	°F	Per building personnel
Room Temperature	70	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.4	MBH	
Annual Standby Hot Water Load	3,194	MBTU/yr	
New Tank Size	0	Gallons	Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Hot Water Piping System Capacity	5	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	°F	
Room Temperature	70	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.1	MBH	
Annual Standby Hot Water Load	456	MBTU/yr	
Total Annual Hot Water Demand	623	MBTU/yr	
Proposed Avg. Hot water heater efficiency	93%		per Manufacturer
Proposed Electricity Use	196	kWh	Standby Losses and inefficient DHW heater eliminated
Natural Gas Cost	$1.45	$/Therm	
Electricity Cost	$0.18	$/kWh	
Existing Operating Cost of DHW	$61	$/yr	
Proposed Operating Cost of DHW	$35	$/yr	

Savings Summary:

Utility	Energy Savings	Cost Savings
Therms/yr	42	$61
kWh/yr	-196	-$35
Total		$25

Stratford Borough
CHA #22072
Building: Borough Hall

BH ECM-4: Install Instantaneous DHW Heater

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Gas-Fired DHW Heater Removal	1	LS		$ 50		$ -	$ 62	$ -	$ 62	
						$ -	$ -	$ -	$ -	
Electric Instantaneous Tankless Water Heater	4	EA	$ 293	$ 200		$ 1,158	$ 987	$ -	$ 2,146	
Miscellaneous Electrical	4	EA	$ 250			$ 990	$ -	$ -	$ 990	
Miscellaneous Piping and Valves	1	LS	$ 250			$ 248	$ -	$ -	$ 248	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 3,445	Subtotal
$ 344	10% Contingency
$ 379	Contractor 10% O&P
$ -	0% Engineering
$ 4,168	**Total**

APPENDIX H

BH ECM-5 Replace Urinals & Flush Valves with Low Flow Types

Stratford Borough
CHA #22072
Building: Borough Hall

ECM-5 Replace Urinals & Flush Valves with Low Flow Types

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$10.93	$ / kGal
Urinals in Building	1	
Average Flushes / Urinal (per Day)	8	3 men 3 times/day
Average Gallons / Flush	3.0	Gal

PROPOSED CONDITIONS		
Proposed Urinals to be Replaced	1	
Proposed Gallons / Flush	1.0	Gal
Proposed Material Cost	$360	
Proposed Installation Cost	$269	
Total cost of new urinals & valves	$629	

SAVINGS		
Current Urinal Water Use	9	kGal / year
Proposed Urinal Water Use	3	kGal / year
Water Savings	6	kGal / year
Cost Savings	$64	/ year
Simple Payback	9.9	years

APPENDIX I

BH ECM-6 Replace Toilets & Flush Valves with Low Flow Types

Stratford Borough
CHA #22072
Building: Borough Hall

BH ECM-6 Replace Toilets & Flush Valves with Low Flow Types

EXISTING CONDITIONS		
Cost of Water / 1000 Gallons	$10.93	$ / kGal
Toilets in Building	3	
Average Flushes / Toilet (per Day)	2	6 people, 1 flush each
Average Gallons / Flush	5.5	Gal

PROPOSED CONDITIONS		
Proposed Toilets to be Replaced	3	
Proposed Gallons / Flush	1.6	Gal
Proposed Material Cost of new Flush Valves	$835	
Proposed Installation cost of new Flush Valves	$139	
Total cost of new toilets & valves	$2,921	

SAVINGS		
Current Toilet Water Use	12	kGal / year
Proposed Toilet Water Use	4	kGal / year
Water Savings	9	kGal / year
Cost Savings	$93	/ year
Simple Payback	31.3	years

APPENDIX J

BH ECM-7 Lighting Replacements

Stratford Borough
CHA #22072
Building: Borough Hall

BH ECM-7 Lighting Replacements

Building Schedule:
Existing conditions (Offices): 45 hrs/week
Supply Electric Rate $ 0.166 /kWh
Demand Rate $ 3.61 /kW

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

		EXISTING CONDITIONS										RETROFIT CONDITIONS								COST ANALYSIS					
Area Description	Floor	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
Conference Room	1st	4	FU2ES	82		83.64	0.328	switch	5	1,825	599	4	FU2ILL	59	0.236	switch	5	1,825	431	0.1	168	$ 32	$ 389	12.1
Mayor's Office	1st	2	FU2ES	82		83.64	0.164	switch	3	1,095	180	2	FU2ILL	59	0.118	switch	3	1,095	129	0.0	50	$ 10	$ 194	18.6
Mayor's Bathroom	1st	1	I60/1	60		61.2	0.06	switch	1	365	22	1	CFT13/1	17	0.017	switch	1	365	6	0.0	16	$ 4	$ 40	8.9
Clerk's Office	1st	2	FU2ES	82		83.64	0.164	switch		2,340	384	2	FU2ILL	59	0.118	switch	0	2,340	276	0.0	108	$ 20	$ 194	9.7
Clerk's Office	1st	4	H60/1	60		61.2	0.24	switch		2,340	562	4	H60/1	60	0.24	switch	0	2,340	562	-	-	$ -	$ -	
Back Office	1st	17	F42SS	94		95.88	1.598	switch		2,340	3,739	17	F42ILL	59	1.003	switch	0	2,340	2,347	0.6	1,392	$ 259	$ 1,653	6.4
Front Desk	1st	2	FU2ES	82		83.64	0.164	switch		2,340	384	2	FU2ILL	59	0.118	switch	0	2,340	276	0.0	108	$ 20	$ 194	9.7
Breakroom/Storage	1st	2	F42SS	94		95.88	0.188	switch		2,340	440	2	F42ILL	59	0.118	switch	0	2,340	276	0.1	164	$ 30	$ 194	6.4
Side Office	1st	4	F42ES	80		81.6	0.32	switch		2,340	749	4	F42ILL	59	0.236	switch	0	2,340	552	0.1	197	$ 37	$ 389	10.6
Tax Collector Office	1st	2	F42ES	80		81.6	0.16	switch		2,340	374	2	F42ILL	59	0.118	switch	0	2,340	276	0.0	98	$ 18	$ 194	10.6
Ladie's Restroom	1st	1	F42ES	80		81.6	0.08	switch		2,340	187	1	F42ILL	59	0.059	switch	0	2,340	138	0.0	49	$ 9	$ 97	10.6
Men's Restroom	1st	1	F42ES	80		81.6	0.08	switch		2,340	187	1	F42ILL	59	0.059	switch	0	2,340	138	0.0	49	$ 9	$ 97	10.6
Lobby	1st	3	FU2ES	82		83.64	0.246	switch		2,340	576	3	FU2ILL	59	0.177	switch	0	2,340	414	0.1	161	$ 30	$ 292	9.7
																							$ -	
Stairwell		1	F42ES	80		81.6	0.08	switch	24	8,760	701	1	F42ILL	59	0.059	switch	24	8,760	517	0.0	184	$ 32	$ 97	3.1
Basement Hall	Base	2	F44ES	160		163.2	0.32	switch	3	1,095	350	2	F44ILL	112	0.224	switch	3	1,095	245	0.1	105	$ 22	$ 208	9.6
Records room 1	Base	2	F44SS	188		191.76	0.376	switch	1	365	137	2	F44ILL	112	0.224	switch	1	365	82	0.2	55	$ 16	$ 208	13.1
Records room 2	Base	3	F42SS	94		95.88	0.282	switch	1	365	103	3	F42ILL	59	0.177	switch	1	365	65	0.1	38	$ 11	$ 292	26.6
Records room 3	Base	3	F44SS	188		191.76	0.564	switch	1	365	206	3	F44ILL	112	0.336	switch	1	365	123	0.2	83	$ 24	$ 312	13.1
Classroom/Confrence room	Base	7	F44SS	188		191.76	1.316	switch	3	1,095	1,441	7	F44ILL	112	0.784	switch	3	1,095	858	0.5	583	$ 121	$ 729	6.0
Emergency Operations Center	Base	4	F44SS	188		191.76	0.752	switch	3	1,095	823	4	F44ILL	112	0.448	switch	3	1,095	491	0.3	333	$ 69	$ 416	6.0
TOTALS -		67		2,124.0	0		7.5				12,143	67			4.9				8,202	2.6	3,941	$ 774	$ 6,193	8.0

New Jersey Smart Start Incentive Program	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
					$ -	$ -
High Efficiency Fluorescent Fixtures	18	EA	$15	$270	$ 6,193	$ 5,923
				$270	$6,193	$5,923

Total ECM Cost w/ Incentives	$5,923

APPENDIX K

BH ECM-8 Install Occupancy Sensors

Stratford Borough
CHA #22072
Building: Borough Hall

BH ECM-8 Install Occupancy Sensors

Building Schedule:
Existing conditions (master switch): 45 hrs/week
Retrofit conditions (motion sensors): hrs/week

Cost of Electricity: 0.181 $/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
Conference Room	4	FU2ES	82	0	83.64	0.3	5	1,825	599	Yes	1	1,278	419	180	$ 32	$ 185	5.7
Mayor's Office	2	FU2ES	82	0	83.64	0.164	3	1,095	180	Yes	1	767	126	54	$ 10	$ 185	19.0
Mayor's Bathroom	1	I60/1	60	0	61.2	0.06	1	365	22	Yes	1	256	15	7	$ 1	$ 185	155.9
Clerk's Office	2	FU2ES	82	0	83.64	0.164		2,340	384	Yes	1	1,638	269	115	$ 21	$ 185	8.9
Clerk's Office	4	H60/1	60	0	61.2	0.24		2,340	562	No		2,340	562	-	$ -	$ -	
Back Office	17	F42SS	94	0	95.88	1.6		2,340	3,739	Yes	2	1,638	2,618	1,122	$ 203	$ 370	1.8
Front Desk	2	FU2ES	82	0	83.64	0.164		2,340	384	Yes	1	1,638	269	115	$ 21	$ 185	8.9
Breakroom/Storage	2	F42SS	94	0	95.88	0.188		2,340	440	Yes	1	1,638	308	132	$ 24	$ 185	7.8
Side Office	4	F42ES	80	0	81.6	0.32		2,340	749	Yes	1	1,638	524	225	$ 41	$ 185	4.6
Tax Collector Office	2	F42ES	80	0	81.6	0.16		2,340	374	Yes	1	1,638	262	112	$ 20	$ 185	9.1
Ladie's Restroom	1	F42ES	80	0	81.6	0.1		2,340	187	Yes	1	1,638	131	56	$ 10	$ 185	18.2
Men's Restroom	1	F42ES	80	0	81.6	0.08		2,340	187	Yes	1	1,638	131	56	$ 10	$ 185	18.2
Lobby	3	FU2ES	82	0	83.64	0.246		2,340	576	No		2,340	576	-	$ -	$ -	
																$ -	
Stairwell	1	F42ES	80	0	81.6	0.08	24	8,760	701	No		8,760	701	-	$ -	$ -	
Basement Hall	2	F44ES	160	0	163.2	0.3	3	1,095	350	Yes	2	767	245	105	$ 19	$ 370	19.5
Records room 1	2	F44SS	188	0	191.76	0.376	1	365	137	Yes	1	256	96	41	$ 7	$ 185	24.9
Records room 2	3	F42SS	94	0	95.88	0.282	1	365	103	Yes	1	256	72	31	$ 6	$ 185	33.2
Records room 3	3	F44SS	188	0	191.76	0.564	1	365	206	Yes	1	256	144	62	$ 11	$ 185	16.6
Classroom/Confrence room	7	F44SS	188	0	191.76	1.316	3	1,095	1,441	Yes	3	767	1,009	432	$ 78	$ 555	7.1
Emergency Operations Center	4	F44SS	188	0	191.76	0.8	3	1,095	823	Yes	6	767	576	247	$ 45	$ 1,110	24.9
TOTALS -	67			0		7.5			12,143		26.0		9,052	3,092	$ 558	$ 4,810	8.6

New Jersey Smart Start Incentive Program	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
					$ -	$ -
Occupancy Sensor Wall Mounted	26	EA	$20	$520	$ 4,810	$ 4,290
				$520	$4,810	$4,290

Total ECM Cost w/ Incentives	**$4,290**

APPENDIX L

BH ECM-9 Lighting Replacement & Occupancy Sensors

Stratford Borough
CHA #22072
Building: Borough Hall

BH ECM-9 Lighting Replacements & Occupancy Sensors

Building Schedule:
Existing conditions (Offices): 45 hrs/week
Supply Electric Rate $ 0.168 /kWh
Demand Rate $ 3.61 /kW

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

			EXISTING CONDITIONS										RETROFIT CONDITIONS									COST ANALYSIS				
Area Description	Floor		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	Motion sensor Yes or No	Number of Sensors Required	Daily Hours	Annual Hours	Annual kWh	kW saved	Annual kWh Saved	Annual $ Saved	Retrofit Cost	Simple Payback
Conference Room	1st	4	4	FU2ES	82		83.64	0.328	switch	5	1,825	599	4	FU2ILL	59	0.236	Yes	1	5	1,278	301	0.1	297	$ 54	$ 574	10.7
Mayor's Office	1st	4	2	FU2ES	82		83.64	0.164	switch	3	1,095	180	2	FU2ILL	59	0.118	Yes	1	3	767	90	0.0	89	$ 17	$ 379	22.4
Mayor's Bathroom	1st	6	1	I60/1	60		61.2	0.06	switch	1	365	22	1	CFT13/1	17	0.017	Yes	1	1	256	4	0.0	18	$ 5	$ 225	46.8
Clerk's Office	1st	4	2	FU2ES	82		83.64	0.164	switch		2,340	384	2	FU2ILL	59	0.118	Yes	1	0	1,638	193	0.0	190	$ 34	$ 379	11.2
Clerk's Office	1st	5	4	H60/1	60		61.2	0.24	switch		2,340	562	4	H60/1	60	0.24	No	0	0	2,340	562	-	-	$ -	$ -	
Back Office	1st	2	17	F42SS	94		95.88	1.598	switch		2,340	3,739	17	F42ILL	59	1.003	Yes	2	0	1,638	1,643	0.6	2,096	$ 377	$ 2,023	5.4
Front Desk	1st	4	2	FU2ES	82		83.64	0.164	switch		2,340	384	2	FU2ILL	59	0.118	Yes	1	0	1,638	193	0.0	190	$ 34	$ 379	11.2
Breakroom/Storage	1st	2	2	F42SS	94		95.88	0.188	switch		2,340	440	2	F42ILL	59	0.118	Yes	1	0	1,638	193	0.1	247	$ 44	$ 379	8.6
Side Office	1st	1	4	F42ES	80		81.6	0.32	switch		2,340	749	4	F42ILL	59	0.236	Yes	1	0	1,638	387	0.1	362	$ 64	$ 574	8.9
Tax Collector Office	1st	1	2	F42ES	80		81.6	0.16	switch		2,340	374	2	F42ILL	59	0.118	Yes	1	0	1,638	193	0.0	181	$ 32	$ 379	11.8
Ladie's Restroom	1st	1	1	F42ES	80		81.6	0.08	switch		2,340	187	1	F42ILL	59	0.059	Yes	1	0	1,638	97	0.0	91	$ 16	$ 282	17.5
Men's Restroom	1st	1	1	F42ES	80		81.6	0.08	switch		2,340	187	1	F42ILL	59	0.059	Yes	1	0	1,638	97	0.0	91	$ 16	$ 282	17.5
Lobby	1st	4	3	FU2ES	82		83.64	0.246	switch		2,340	576	3	FU2ILL	59	0.177	No	0	0	2,340	414	0.1	161	$ 30	$ 292	9.7
			0	0					0					0			0	0		-				$ -	
Stairwell		1	1	F42ES	80		81.6	0.08	switch	24	8,760	701	1	F42ILL	59	0.059	No	0	24	8,760	517	0.0	184	$ 32	$ 97	3.1
Basement Hall	Base	3	2	F44ES	160		163.2	0.32	switch	3	1,095	350	2	F44ILL	112	0.224	Yes	2	3	767	172	0.1	179	$ 34	$ 578	17.0
Records room 1	Base	8	2	F44SS	188		191.76	0.376	switch	1	365	137	2	F44ILL	112	0.224	Yes	1	1	256	57	0.2	80	$ 20	$ 393	19.7
Records room 2	Base	2	3	F42SS	94		95.88	0.282	switch	1	365	103	3	F42ILL	59	0.177	Yes	1	1	256	45	0.1	58	$ 14	$ 477	33.5
Records room 3	Base	8	3	F44SS	188		191.76	0.564	switch	1	365	206	3	F44ILL	112	0.336	Yes	1	1	256	86	0.2	120	$ 30	$ 497	16.6
Classroom/Confrence room	Base	8	7	F44SS	188		191.76	1.316	switch	3	1,095	1,441	7	F44ILL	112	0.784	Yes	3	3	767	601	0.5	840	$ 164	$ 1,284	7.8
Emergency Operations Center	Base	8	4	F44SS	188		191.76	0.752	switch	3	1,095	823	4	F44ILL	112	0.448	Yes	6	3	767	343	0.3	480	$ 94	$ 1,526	16.3
TOTALS -			67		2,124.0	0		7.5				12,143	67			4.9					6,189	2.6	5,954	$ 1,111	$ 11,003	9.9

New Jersey Smart Start Incentive Program	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
					$ -	$ -
Occupancy Sensor Wall Mounted	26	EA	$20	$520	$ 4,810	$ 4,290
High Efficiency Fluorescent Fixtures	18	EA	$15	$270	$ 6,193	$ 5,923
				$790	$11,003	$10,213

Total ECM Cost w/ Incentives	$10,213

APPENDIX M

JF ECM-1 Install Door Seals

Stratford Borough
CHA #22072
Building: Justice Facility

This is a stand alone calculation, does not need block load

JF ECM-1 Install Door Seals

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

Heating System Efficiency	80%	Ex Occupied Clng Temp.	65 °F	Ex Occupied Htg Temp.	67 °F		
Cooling System Efficiency	1.24 kW/ton	Ex Unoccupied Clng Temp.	65 °F	Ex Unoccupied Htg Temp.	67 °F		
Linear Feet of Door Edge	40	Cooling Occ Enthalpy Setpoint	25.0 Btu/lb	Electricity	$ 0.18	$/kWh	
Existing Infiltration Factor*	1 cfm/LF	Cooling Unocc Enthalpy Setpoint	25.0 Btu/lb	Natural Gas	$ 1.43	$/therm	
Proposed Infiltration Factor*	0.2 cfm/LF						

*Infiltration Factor per Carrier Handbook of Air Conditioning System Design based on average door seal gap calculated below.

					EXISTING LOADS		PROPOSED LOADS		COOLING ENERGY		HEATING ENERGY	
					Occupied	Unoccupied	Occupied	Unoccupied				
Avg Outdoor Air Temp. Bins °F	Avg Outdoor Air Enthalpy	Existing Equipment Bin Hours	Occupied Equipment Bin Hours	Unoccupied Equipment Bin Hours	Door Infiltration Load BTUH	Door Infiltration Load BTUH	Door Infiltration Load BTUH	Door Infiltration Load BTUH	Existing Cooling Energy kWh	Proposed Cooling Energy kWh	Existing Heating Energy therms	Proposed Heating Energy therms
A		B	C	D	E	F	G	H	I	J	K	L
102.5	0.0	0	0	0	4,500	4,500	900	900	0	0	0	0
97.5	0.0	0	0	0	4,500	4,500	900	900	0	0	0	0
92.5	49.1	36	10	26	-4,338	-4,338	-868	-868	16	3	0	0
87.5	42.5	123	33	90	-3,150	-3,150	-630	-630	40	8	0	0
82.5	39.5	477	128	349	-2,610	-2,610	-522	-522	129	26	0	0
77.5	36.6	656	176	480	-2,088	-2,088	-418	-418	142	28	0	0
72.5	34.0	742	199	543	-1,620	-1,620	-324	-324	124	25	0	0
67.5	31.6	784	210	574	-1,188	-1,188	-238	-238	96	19	0	0
62.5	29.2	983	263	720	194	194	39	39	0	0	2	0
57.5	27.0	625	167	458	410	410	82	82	0	0	3	1
52.5	24.5	438	117	321	626	626	125	125	0	0	3	1
47.5	21.4	559	150	409	842	842	168	168	0	0	6	1
42.5	18.7	671	180	491	1,058	1,058	212	212	0	0	9	2
37.5	16.2	1,067	286	781	1,274	1,274	255	255	0	0	17	3
32.5	14.4	685	183	502	1,490	1,490	298	298	0	0	13	3
27.5	12.6	369	99	270	1,706	1,706	341	341	0	0	8	2
22.5	10.7	321	86	235	1,922	1,922	384	384	0	0	8	2
17.5	8.6	184	49	135	2,138	2,138	428	428	0	0	5	1
12.5	6.8	40	11	29	2,354	2,354	471	471	0	0	1	0
7.5	5.5	0	0	0	2,570	2,570	514	514	0	0	0	0
2.5	4.1	0	0	0	2,786	2,786	557	557	0	0	0	0
-2.5	2.6	0	0	0	3,002	3,002	600	600	0	0	0	0
-7.5	1.0	0	0	0	3,218	3,218	644	644	0	0	0	0
TOTALS		8,760	2,346	6,414					547	109	75	15

Existing Door Infiltration	40 cfm
Existing Unoccupied Door Infiltration	40 cfm
Proposed Door Infiltration	8 cfm
Proposed Unoccupied Door Infiltration	8 cfm

Savings	60 therms	$	86
	437 kWh	$	79
		$	165

Door	Width (ft)	Height (ft)	Linear Feet (LF)	gap (in)	gap location	LF of gap	% door w/ gap	Average gap for door (in)
Front	3	7	20	0.25	bottom/seam	5	25%	0.0625
Back	3	7	20	0.5	bottom/seam	5	25%	0.125
Total	**6**	**14**	**40**	**0.375**		**10**	**25%**	**0.094**

Note: Doors labeled 'a', 'b', etc. are a part of the same door assembly.

Stratford Borough
CHA #22072
Building: Justice Facility

JF ECM-1 Install Door Seals

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
Door Seals	40	LF	$ 2.50	$ 1.50		$ 99	$ 74	$ -	$ 173	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$	173	Subtotal
$	35	20% Contingency
$	-	Contractor 0% O&P
$	-	0% Engineering
$	**208**	**Total**

APPENDIX N

JF ECM-2 Building Setback

Stratford Borough
CHA #22072
Building: Justice Facility

JF ECM-2 Building Setback

Building Footprint	7,000 SF	Ex Occupied Clng Temp.	65 °F	Ex Occupied Htg Temp.	67 °F	**Heating Energy Savings**	305 **therms**
Heating Efficiency	80%	Ex Unoccupied Clng Temp.	65 °F	Ex Unoccupied Htg Temp.	67 °F	**Cooling Energy Savings**	4,902 **kWh**
Cooling Efficiency	1.24 kW/ton	Prop Occupied Clng Temp.	72 °F	Prop Occupied Htg Temp.	67 °F		
Building Balance Temp.	60 °F	Prop Unoccupied Clng Temp.	80 °F	Prop Unoccupied Htg Temp.	62 °F		
Internal Gains	31,557 btu/h	Occupied Cooling UA	1,584 btu/hr/°F	Occupied Heating UA	510 btu/hr/°F		
Unoc Internal Gain factor	0.6	Unoccupied Cooling UA	816 btu/hr/°F	Unoccupied Heating UA	510 btu/hr/°F		
Ave Occ Internal Gain Factor	0.7	Cooling Occ Enthalpy Setpoint	25 Btu/lb				
Prop Occ Hrs/Wk	45	Cooling Unocc Enthalpy Setpoint	25 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	Existing Occupied Equipment Bin Hours	Existing 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	-59,393	-103,369	-22,090	-30,591	-103,369	-18,934	-48,306	-103,369	-22,090	-18,354	-103,369	-18,934	0	0	0	0
97.5	42.5	0	0	0	-51,474	-75,061	-22,090	-26,512	-75,061	-18,934	-40,387	-75,061	-22,090	-14,276	-75,061	-18,934	0	0	0	0
92.5	39.5	36	10	26	-43,555	-62,193	-22,090	-22,433	-62,193	-18,934	-32,468	-62,193	-22,090	-10,197	-62,193	-18,934	409	365	0	0
87.5	36.6	123	33	90	-35,636	-49,754	-22,090	-18,354	-49,754	-18,934	-24,549	-49,754	-22,090	-6,118	-49,754	-18,934	1,176	1,024	0	0
82.5	34	477	128	349	-27,717	-38,603	-22,090	-14,276	-38,603	-18,934	-16,630	-38,603	-22,090	-2,039	-38,603	-18,934	3,759	3,171	0	0
77.5	31.6	656	176	480	-19,798	-28,309	-22,090	-10,197	-28,309	-18,934	-8,711	-28,309	-22,090	0	0	-18,934	4,125	2,013	0	0
72.5	29.2	742	199	543	-11,879	-18,015	-22,090	-6,118	-18,015	-18,934	-792	-18,015	-22,090	0	0	-18,934	3,485	1,903	0	0
67.5	27	784	210	574	-3,960	-8,578	-22,090	-2,039	-8,578	-18,934	0	0	-22,090	0	0	-18,934	2,504	1,602	0	0
62.5	24.5	983	263	720	2,293	4,632	-22,090	2,293	4,632	-18,934	2,293	4,632	-22,090	0	0	-18,934	1,306	1,821	0	0
57.5	21.4	625	167	458	4,841	9,779	-22,090	4,841	9,779	-18,934	4,841	9,779	-22,090	2,293	4,632	-18,934	333	697	0	0
52.5	18.7	438	117	321	7,388	14,926	-22,090	7,388	14,926	-18,934	7,388	14,926	-22,090	4,841	9,779	-18,934	0	0	14	-17
47.5	16.2	559	150	409	9,936	20,073	-22,090	9,936	20,073	-18,934	9,936	20,073	-22,090	7,388	14,926	-18,934	0	0	71	32
42.5	14.4	671	180	491	12,484	25,220	-22,090	12,484	25,220	-18,934	12,484	25,220	-22,090	9,936	20,073	-18,934	0	0	150	103
37.5	12.6	1,067	286	781	15,031	30,367	-22,090	15,031	30,367	-18,934	15,031	30,367	-22,090	12,484	25,220	-18,934	0	0	342	267
32.5	10.7	685	183	502	17,579	35,514	-22,090	17,579	35,514	-18,934	17,579	35,514	-22,090	15,031	30,367	-18,934	0	0	285	237
27.5	8.6	369	99	270	20,126	40,661	-22,090	20,126	40,661	-18,934	20,126	40,661	-22,090	17,579	35,514	-18,934	0	0	189	163
22.5	6.8	321	86	235	22,674	45,808	-22,090	22,674	45,808	-18,934	22,674	45,808	-22,090	20,126	40,661	-18,934	0	0	195	173
17.5	5.5	184	49	135	25,222	50,955	-22,090	25,222	50,955	-18,934	25,222	50,955	-22,090	22,674	45,808	-18,934	0	0	130	117
12.5	4.1	40	11	29	27,769	56,102	-22,090	27,769	56,102	-18,934	27,769	56,102	-22,090	25,222	50,955	-18,934	0	0	32	29
7.5	2.6	0	0	0	30,317	61,249	-22,090	30,317	61,249	-18,934	30,317	61,249	-22,090	27,769	56,102	-18,934	0	0	0	0
2.5	1	0	0	0	32,865	66,396	-22,090	32,865	66,396	-18,934	32,865	66,396	-22,090	30,317	61,249	-18,934	0	0	0	0
-2.5	0	0	0	0	35,412	71,543	-22,090	35,412	71,543	-18,934	35,412	71,543	-22,090	32,865	66,396	-18,934	0	0	0	0
-7.5	-1.5	0	0	0	37,960	76,690	-22,090	37,960	76,690	-18,934	37,960	76,690	-22,090	35,412	71,543	-18,934	0	0	0	0
TOTALS		8,760	2,346	6,414													17,098	12,596	1,409	1,104
																	17,098		1,409	

Existing Building Ventilation & Infiltration (occ) 953 cfm
Overheat Ventilation Factor 1.00
Additional ventilation to offset overheat 0 cfm
Existing Building Ventilation & Infiltration (unocc) 953 cfm

Stratford Borough
CHA #22072
Building: Justice Facility

JF ECM-2 Building Setback

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Programmable thermostats	4	ea	$ 100	$ 150	$ -	$ 396	$ 740	$ -	$ 1,136	
						$ -	$ -	$ -	$ -	
System Air Balancing	4	ea		$ 593		$ -	$ 2,927	$ -	$ 2,927	
Includes mat & labor						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 4,063	Subtotal
$ 609.52	15% Contingency
$ 467.30	Contractor 10% O&P
$ -	0% Engineering
$ 5,140	**Total**

Stratford Borough
CHA #22072
Building: Justice Facility

Reconcile Thermal Model

Building Footprint	7,000 SF	Ex Occupied Clng Temp.	65 °F	Ex Occupied Htg Temp.	67 °F
Heating Efficiency	80%	Ex Unoccupied Clng Temp.	65 °F	Ex Unoccupied Htg Temp.	67 °F
Cooling Efficiency	1.2 kW/ton	Occupied Cooling UA	(1,584) btu/hr/°F	Occupied Heating UA	510 btu/hr/°F
Internal Gains	31,557 btu/h	Unoccupied Cooling UA	(816) btu/hr/°F	Unoccupied Heating UA	510 btu/hr/°F
Unoc Internal Gain factor	0.6	Cooling Occ Enthalpy Setpoint	25 Btu/lb		
Ave Occ Internal Gain Factor	0.7	Cooling Unocc Enthalpy Setpoint	25 Btu/lb		
Economizer available (Y/N)	Yes				

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	-59,393	-103,369	-22,090	-30,591	-103,369	-18,934	0	0	0	0
97.5	42.5	0	0	0	-51,474	-75,061	-22,090	-26,512	-75,061	-18,934	0	0	0	0
92.5	39.5	36	10	26	-43,555	-62,193	-22,090	-22,433	-62,193	-18,934	0	409	409	0
87.5	36.6	123	33	90	-35,636	-49,754	-22,090	-18,354	-49,754	-18,934	0	1,176	1,176	0
82.5	34.0	477	128	349	-27,717	-38,603	-22,090	-14,276	-38,603	-18,934	0	3,759	3,759	0
77.5	31.6	656	176	480	-19,798	-28,309	-22,090	-10,197	-28,309	-18,934	0	4,125	4,125	0
72.5	29.2	742	199	543	-11,879	-18,015	-22,090	-6,118	-18,015	-18,934	0	3,485	3,485	0
67.5	27.0	784	210	574	-3,960	-8,578	-22,090	-2,039	-8,578	-18,934	0	2,504	2,504	0
62.5	24.5	983	263	720	2,293	4,632	-22,090	2,293	4,632	-18,934	0	1,306	1,306	0
57.5	21.4	625	167	458	4,841	9,779	-22,090	4,841	9,779	-18,934	0	333	333	0
52.5	18.7	438	117	321	7,388	14,926	-22,090	7,388	14,926	-18,934	0	0	0	14
47.5	16.2	559	150	409	9,936	20,073	-22,090	9,936	20,073	-18,934	0	0	0	71
42.5	14.4	671	180	491	12,484	25,220	-22,090	12,484	25,220	-18,934	0	0	0	150
37.5	12.6	1,067	286	781	15,031	30,367	-22,090	15,031	30,367	-18,934	0	0	0	342
32.5	10.7	685	183	502	17,579	35,514	-22,090	17,579	35,514	-18,934	0	0	0	285
27.5	8.6	369	99	270	20,126	40,661	-22,090	20,126	40,661	-18,934	0	0	0	189
22.5	6.8	321	86	235	22,674	45,808	-22,090	22,674	45,808	-18,934	0	0	0	195
17.5	5.5	184	49	135	25,222	50,955	-22,090	25,222	50,955	-18,934	0	0	0	130
12.5	4.1	40	11	29	27,769	56,102	-22,090	27,769	56,102	-18,934	0	0	0	32
7.5	2.6	0	0	0	30,317	61,249	-22,090	30,317	61,249	-18,934	0	0	0	0
2.5	1.0	0	0	0	32,865	66,396	-22,090	32,865	66,396	-18,934	0	0	0	0
-2.5	0.0	0	0	0	35,412	71,543	-22,090	35,412	71,543	-18,934	0	0	0	0
-7.5	-1.5	0	0	0	37,960	76,690	-22,090	37,960	76,690	-18,934	0	0	0	0
TOTALS		8,760	2,346	6,414								17,098	17,098	1,409

Existing Building Ventilation & Infiltration (occ)	953	cfm
Overheat Ventilation Factor	1.00	
Additional ventilation to offset overheat	0	cfm
Existing Building Ventilation & Infiltration (unocc)	953	cfm
Economizer Ventilation (from AHU's)		cfm

Energy Use Indices (calculated)

	Base Case
Heating	1,409
Target ->	1,698
	83.0%

	Base Case
Cooling	17,098
Target ->	21,347
	80.1%

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	**Project No.:**	CHA #22072		
Location		**Site Elevation:**	460 Feet	**Specific Volume**	14.00 CF/#
Building Name	Justice Facility	**Date:**	09/07/10		
Engineer:	M. Devlin				

Building/Facility Designation Justice Facility

Outdoor Winter Design DB Temperature	-1 *F	**Indoor Winter Design DB Temperature**	68 *F
Outdoor Summer Design DB Temperature	90 *F	**Indoor Summer Design DB Temperature**	72 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 #/#	**Indoor Air (70*F) Humidity Ratio**	0.0079 #/#

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	24.9	

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	33.3	

Windows (Select One)

		U Value
	Aluminum Frame, 1/8" SP Glazing	1.05
	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
x	Plastic Frame, 1/2" DP Glazing	0.53

	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	3,000 SF		
Occupied Area	7,000 SF	**Return Plenum?**	n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	85 Ft	20.0 Ft	20.0 Ft	108 SF	0 SF	1,593 SF
East Exposure	41 Ft	20.0 Ft	20.0 Ft	65 SF	21 SF	734 SF
South Exposure	85 Ft	20.0 Ft	20.0 Ft	107 SF	0 SF	1,594 SF
West Exposure	41 Ft	20.0 Ft	20.0 Ft	50 SF	21 SF	749 SF

Occupied Forced Ventilation	300 cfm	0.3 AC/hr
Unoccupied Forced Ventilation	300 cfm	0.3 AC/hr

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	Project No.:	CHA #22072		
Location		Site Elevation:	460 Feet	Specific Volume	14.00 CF/#
Building Name	Justice Facility	Date:	09/07/10		
Engineer:	M. Devlin				

Building/Facility Designation: Justice Facility

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF		Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	108	38	btu/h/sf	0.8	0.75	Glass Type C	2,451 Btu/hr
East Exposure	65	216	btu/h/sf	0.8	0.31	Glass Type C	3,482 Btu/hr
South Exposure	107	109	btu/h/sf	0.8	0.58	Glass Type C	5,386 Btu/hr
West Exposure	50	216	btu/h/sf	0.8	0.29	Glass Type C	2,506 Btu/hr
							13,825 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	1,593	0.04	20 °F	1.0	1,277 Btu/hr
East Exposure	734	0.04	39 °F	1.0	1,148 Btu/hr
South Exposure	1,594	0.04	27 °F	1.0	1,725 Btu/hr
West Exposure	749	0.04	22 °F	1.0	661 Btu/hr
Roof	3,000	0.03	73 °F	1.0	6,577 Btu/hr
Fenestration	329	0.53	18 °F		3,139 Btu/hr
Doors	42	0.14	27 °F		158 Btu/hr
Ceiling	7,000	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	7,000	0.04	0 °F		0 Btu/hr
					14,684 Btu/h

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

								Room Heat Gain
Lights	1.00	w/sf x	7,000	Occ Area =	7.0 kW x 3.4x		1.0 RAF =	23,891 Btu/h
Plug Load	0.08	w/sf x	7,000	Occ Area =	0.6 kW x 3.4x		1.0 RAF =	1,911 Btu/h
People	10	people x	255	btu/person x	50%	time in space =		1,275 Btu/h
People	30	people x	256	btu/person x	5%	time in space =		384 Btu/h
Computer Work Stations			10	Units x	120	W/Unit x 3414 =		4,096 Btu/h
Equipment		kW x 3.413 =						0 Btu/h
Misc.								0 Btu/h
								31,557 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor		Perimeter Ratio		Coef	Temp. Diff.	Room Heat Gain
Walls	4,669 SF	0.10	CFM/SF			1.04	18 °F	9,474 Btu/h
Doors	42 SF	0.50	CFM/LF	0.95	LF/SF	1.04	18 °F	406 Btu/h
Windows	329 SF	0.35	CFM/LF	1.44	LF/SF	1.04	18 °F	3,373 Btu/h
Ventilation	300 cfm					1.04	18 °F	6,087 Btu/h
								19,341 Btu/h
Infiltration	653 cfm	0.6	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	0	0.04	20	1.0	0 Btu/hr
East Exposure	0	0.04	39	1.0	0 Btu/hr
South Exposure	0	0.04	27	1.0	0 Btu/hr
West Exposure	0	0.04	22	1.0	0 Btu/hr
Roof	3,000	0.03	73	0.0	0 Btu/hr
					0 Btu/h

INTERNAL HEAT GAINS

						Room Heat Gain
Lights	1.00	w/sf x	7,000	Occ Area =	7.0 kW x3413x	0.00 RAF =	0 Btu/h
Misc.							0 Btu/h
						0 Btu/h

SENSIBLE HEAT GAINS - TEMP. DEPENDENT		SENSIBLE HEAT GAINS - TEMP. INDEPENDENT	
Solar	13,825	Internal Gains to Room	31,557
Conduction to Room	14,684	Internal Gains to Plenum	0
Conduction to Plenum	0		
Ventilaton and Infiltration	19,341		
Sub Total	47,849	Sub Total	31,557

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	Project No.:	CHA #22072		
Location		Site Elevation:	460 Feet	Specific Volume	14.00 CF/#
Building Name	Justice Facility	Date:	09/07/10		
Engineer:	M. Devlin				

Building/Facility Designation: Justice Facility

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	3,000 SF	0.10 CFM/SF	4,629	0.0042 ##/##	5,892 Btu/h
Doors	42 SF	0.50 CFM/LF	4,629	0.0042 ##/##	393 Btu/h
Windows	329 SF	0.35 CFM/LF	4,629	0.0042 ##/##	3,265 Btu/h
Ventilation	300 cfm		4,629	0.0042 ##/##	5,892 Btu/h
People	10 people	0.50 time in space		250 Btu/hr/person	1,250 Btu/h
					16,691 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	
Temperature Dependent Gains	47,849	16,691	64,540	
Temperature Indep. Gains	31,557		31,557	SHR= 0.83
Total	79,406	16,691	96,097	

Building Cooling Load: 8.0 Tons at 874 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is: 6,339 CFM; 0.91 CFM/sf

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	1,593	0.04	69	4,418 Btu/h
East Exposure	734	0.04	69	2,036 Btu/h
South Exposure	1,594	0.04	69	4,421 Btu/h
West Exposure	749	0.04	69	2,078 Btu/h
Fenestration	329	0.53	69	12,066 Btu/h
Roof	3,000	0.03	69	6,234 Btu/h
Doors	42	0.14	69	406 Btu/h
Ceiling	7,000	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	3,000	0.04	30	3,600 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	4,669 SF	0.10 CFM/SF	1.04	69	467 cfm	33,725 Btu/h
Doors	42 SF	0.50 CFM/LF	1.04	69	20 cfm	1,445 Btu/h
Windows	329 SF	0.35 CFM/LF	1.04	69	166 cfm	12,008 Btu/h
Ventilation Load	300 cfm		1.04	69	300 cfm	23,403 Btu/h
Total Ventilation & Infiltration Load					953 cfm	70,581 Btu/h

Building Heating Load: 105,840 btu/h

15.1 btu/sf

APPENDIX O

JF ECM-3 Install "On Demand" Condensing DHW Heater

Stratford Borough
CHA #22072
Building: Justice Facility

JF ECM-3: Install "On Demand" Condensing DHW Heater

Summary

* Replace 250 MBH, 100 Gal Gas-Fired DHW Heater w/ On Demand, Condensing, Gas-Fired DHW Heater

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	7	Therms/month	Calculated from utility bill
Total Annual Utility Demand by Water Heater	8,400	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	80%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	6,720	MBTU/yr	
Existing Tank Size	40	Gallons	Per manufacturer nameplate
Hot Water Piping System Capacity	5	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	°F	Per building personnel
Room Temperature	68	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.5	MBH	
Annual Standby Hot Water Load	4,271	MBTU/yr	
New Tank Size	0	Gallons	Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Hot Water Piping System Capacity	5	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	°F	
Room Temperature	68	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.1	MBH	
Annual Standby Hot Water Load	475	MBTU/yr	
Total Annual Hot Water Demand	2,924	MBTU/yr	
Proposed Avg. Hot water heater efficiency	92%		Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Proposed Fuel Use	32	Therms/Yr	Standby Losses and inefficient DHW heater eliminated
Utility Cost	$1.43	$/Therm	
Existing Operating Cost of DHW	$120	$/yr	
Proposed Operating Cost of DHW	$46	$/yr	

Savings Summary:

Utility	Energy Savings	Cost Savings
Therms/yr	52	$75

Stratford Borough
CHA #22072
Building: Justice Facility

JF ECM-3: Install "On Demand" Condensing DHW Heater

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Gas-Fired DHW Heater Removal	1	LS		$ 50		$ -	$ 62	$ -	$ 62	
						$ -	$ -	$ -	$ -	
Tankless Gas-Fired DHW Heater	1	EA	$ 2,300	$ 280		$ 2,277	$ 346	$ -	$ 2,623	
Miscellaneous Electrical	1	LS	$ 250			$ 248	$ -	$ -	$ 248	
Venting Kit	1	EA	$ 450	$ 650		$ 446	$ 802	$ -	$ 1,248	
Miscellaneous Piping and Valves	1	LS	$ 250			$ 248	$ -	$ -	$ 248	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 4,427	Subtotal
$ 664	15% Contingency
$ 509	Contractor 10% O&P
$ -	0% Engineering
$ 5,600	**Total**

New Jersey Smart Start Incentive Program	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIV	Cost W/ INCENTIV
					$ -	$ -
Tankless Gas-Fired DHW Heater	1	EA	$300	$300	$ 2,623	$ 2,323
				$300	$2,623	$2,323

Total ECM Cost w/ Incentives	**$5,300**

APPENDIX P

JF ECM-4 Exterior Lighting Timers

Stratford Borough
CHA #22072
Building: Justice Facility

JF ECM-4 Exterior Lighting Timers

Building Schedule:
Existing conditions (master switch): 24 hrs/day
Retrofit conditions (motion sensors): 11 hrs/day

Cost of Electricity: 0.149 $/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	Timer Yes or No	Annual Hours	Annual kWh	Annual kWh Saved	Annual $ Saved	Retrofit Cost	Simple Payback
Back Entrance	1	HPS100/1	138	0	140.76	0.1		8,760	1,209	Yes	4,015	554	655	$ 97	$ 150	1.5
Back Wall of Building	2	H90/1	90	0	91.8	0.18		8,760	1,577	Yes	4,015	723	854	$ 127	$ 150	1.2
TOTALS -	3			0		0.3			2,786			1,277	1,509	$ 225	$ 300	1.3

APPENDIX Q

JF ECM-5 Install Occupancy Sensors

Stratford Borough
CHA #22072
Building: Justice Facility

JF ECM-5 Install Occupancy Sensors

Building Schedule:
Existing conditions (master switch): 60 hrs/week
Retrofit conditions (motion sensors): hrs/week

Cost of Electricity: 0.180 $/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	Floor	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
Lobby	1st	4	FU2ILL	59	0	60.18	0.2	24	8,760	2,067	No	2	8,760	2,067	-	$ -	$ -	
Police Secretary	1st	2	F44ILL	112	0	114.24	0.224	24	8,760	1,962	Yes	1	6,132	1,374	589	$ 106	$ 185	1.7
Court Clerk	1st	6	F44ILL	112	0	114.24	0.672		3,120	2,097	Yes	2	2,184	1,468	629	$ 113	$ 370	3.3
Clerk File Chamber	1st	1	F44ILL	112	0	114.24	0.112		3,120	349	Yes	1	2,184	245	105	$ 19	$ 185	9.8
Courtroom	1st	21	FU2ILL	59	0	60.18	1.239		3,120	3,866	No		3,120	3,866	-	$ -	$ -	
Prosecutor Room	1st	2	F44ILL	112	0	114.24	0.2		3,120	699	Yes	1	2,184	489	210	$ 38	$ 185	4.9
Corridor	1st	4	F44ILL	112	0	114.24	0.448		3,120	1,398	No	2	3,120	1,398	-	$ -	$ -	
Public Defender	1st	1	F44ILL	112	0	114.24	0.112		3,120	349	Yes	1	2,184	245	105	$ 19	$ 185	9.8
Janitor Closet	1st	1	FU2ILL	59	0	60.18	0.059		3,120	184	Yes	1	2,184	129	55	$ 10	$ 185	18.6
Restroom	1st	1	F44ILL	112	0	114.24	0.112		3,120	349	Yes	1	2,184	245	105	$ 19	$ 185	9.8
Police Processing Area	1st	7	F44ILL	112	0	114.24	0.8	24	8,760	6,868	No	1	8,760	6,868	-	$ -	$ -	
Police Processing Area	1st	5	H50/1	50	0	51	0.25	24	8,760	2,190	No	1	8,760	2,190	-	$ -	$ -	
Holding Cell	1st	1	F44ES	160	0	163.2	0.16	5	1,825	292	No		1,825	292	-	$ -	$ -	
Chiefs Office	2nd	1	I60/4	240	0	244.8	0.24		3,120	749	Yes	1	2,184	524	225	$ 40	$ 185	4.6
Chiefs Office	2nd	4	HLV65/1	75	0	76.5	0.3		3,120	936	Yes	1	2,184	655	281	$ 50	$ 185	3.7
Chiefs Closet	2nd	2	F41ES	50	0	51	0.1		3,120	312	Yes	1	2,184	218	94	$ 17	$ 185	11.0
Back stairwell	2nd	3	F42ILL	59	0	60.18	0.177	24	8,760	1,551	Yes	1	6,132	1,085	465	$ 84	$ 185	2.2
Center cubicles	2nd	8	F42ILL	59	0	60.18	0.472		3,120	1,473	Yes	3	2,184	1,031	442	$ 79	$ 555	7.0
Evidence Storage	2nd	2	F41ES	50	0	51	0.1	2	730	73	Yes	1	511	51	22	$ 4	$ 185	47.0
Office 1	2nd	1	I60/4	240	0	244.8	0.2		3,120	749	Yes	1	2,184	524	225	$ 40	$ 185	4.6
Office 1	2nd	4	HLV65/1	75	0	76.5	0.3		3,120	936	Yes	1	2,184	655	281	$ 50	$ 185	3.7
Office 2	2nd	1	I60/4	240	0	244.8	0.24		3,120	749	Yes	1	2,184	524	225	$ 40	$ 185	4.6
Office 2	2nd	4	HLV65/1	75	0	76.5	0.3		3,120	936	Yes	1	2,184	655	281	$ 50	$ 185	3.7
Office 3	2nd	1	I60/4	240	0	244.8	0.2		3,120	749	Yes	1	2,184	524	225	$ 40	$ 185	4.6
Office 3	2nd	4	HLV65/1	75	0	76.5	0.3		3,120	936	Yes	1	2,184	655	281	$ 50	$ 185	3.7
Office 4	2nd	1	I60/4	240	0	244.8	0.24		3,120	749	Yes	1	2,184	524	225	$ 40	$ 185	4.6
Office 4	2nd	4	HLV65/1	75	0	76.5	0.3		3,120	936	Yes	1	2,184	655	281	$ 50	$ 185	3.7
Office 5	2nd	1	I60/4	240	0	244.8	0.2		3,120	749	Yes	1	2,184	524	225	$ 40	$ 185	4.6
Office 5	2nd	4	HLV65/1	75	0	76.5	0.3		3,120	936	Yes	1	2,184	655	281	$ 50	$ 185	3.7
Confrence Room	2nd	13	HLV65/1	75	0	76.5	0.975		3,120	3,042	No		3,120	3,042	-	$ -	$ -	
Front Stairwell	2nd	6	CFQ13/1	17	0	17.34	0.102	24	8,760	894	Yes	1	6,132	625	268	$ 48	$ 185	3.8
TOTALS -		120			0		9.8			40,123		33.0		34,003	6,120	$ 1,100	$ 4,995	4.5

New Jersey Smart Start Incentive Program	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
						$ -
Occupancy Sensor Wall Mounted	33	EA	$20	$660	$ 4,995	$ 4,335
				$660	$4,995	$4,335

Total ECM Cost w/ Incentives	$4,335

APPENDIX R

FS ECM-1 Replace Unit Heaters with Infrared Heaters

253	Therms/yr
2,919	kWh/yr

ook - Fundamentals for Unit Heaters

ook - Fundamentals for Infrared Heaters

	PROPOSED LOADS							
	Occupied			Unoccupied				
ain	Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Unoccupied Envelope Load BTUH	Ventilation Load BTUH	Internal Gain BTUH	Existing Heating Energy Therms	Proposed Heating Energy Therms
	K	L	M	N	O	P	M	N
	0	0	-21,020	0	0	-13,603	0	0
	0	0	-21,020	0	0	-13,603	0	0
	0	0	-21,020	0	0	-13,603	0	0
	0	0	-21,020	0	0	-13,603	0	0
	0	0	-21,020	0	0	-13,603	0	0
	0	0	-21,020	0	0	-13,603	0	0
	0	0	-21,020	0	0	-13,603	0	0
	0	0	-21,020	0	0	-13,603	0	0
	1,331	836	-21,020	1,331	836	-13,603	0	0
	5,766	3,624	-21,020	5,766	3,624	-13,603	0	0
	10,201	6,411	-21,020	10,201	6,411	-13,603	0	0
	14,637	9,199	-21,020	14,637	9,199	-13,603	76	63
	19,072	11,987	-21,020	19,072	11,987	-13,603	160	133
	23,507	14,774	-21,020	23,507	14,774	-13,603	364	302
	27,943	17,562	-21,020	27,943	17,562	-13,603	304	252
	32,378	20,349	-21,020	32,378	20,349	-13,603	201	167
	36,813	23,137	-21,020	36,813	23,137	-13,603	208	173
	41,249	25,925	-21,020	41,249	25,925	-13,603	138	115
	45,684	28,712	-21,020	45,684	28,712	-13,603	34	28
	50,119	31,500	-21,020	50,119	31,500	-13,603	0	0
	54,555	34,287	-21,020	54,555	34,287	-13,603	0	0
	58,990	37,075	-21,020	58,990	37,075	-13,603	0	0
	63,426	39,863	-21,020	63,426	39,863	-13,603	0	0
							1,486	**1,233**
							1,486	

Avg. OA Temp °F	Heating Hrs	Assumed % Time of Operation	hrs of Operation
102.5	0	0%	0
97.5	0	0%	0
92.5	0	0%	0
87.5	0	0%	0
82.5	0	0%	0
77.5	0	0%	0
72.5	0	0%	0
67.5	0	0%	0
62.5	0	8%	0
57.5	0	0%	0
52.5	0	0%	0
47.5	559	13%	70
42.5	671	25%	168
37.5	1067	38%	400
32.5	685	50%	343
27.5	369	63%	231
22.5	321	75%	241
17.5	184	88%	161
12.5	40	100%	40
7.5	0	100%	0
2.5	0	100%	0
-2.5	0	100%	0
-7.5	0	100%	0
	3,896	42%	1653

Stratford Borough
CHA #22072
Building: Fire Station

ECM-1: Replace Unit Heaters with Infrared Heaters

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Unit Heater Removal	4	EA		$ 450		$ -	$ 2,221	$ -	$ 2,221	
50' NG Infrared Tube Heater 225 MBH	4	EA	$ 2,000	$ 500		$ 7,920	$ 2,468	$ -	$ 10,388	Includes Controls
Miscellaneous Gas Piping, Valves, etc.	4	EA	$ 200	$ 250		$ 792	$ 1,234	$ -	$ 2,026	
4" Class B Vent Piping	80	LF	$ 6.70	$ 10		$ 531	$ 987	$ -	$ 1,518	Use Common Vents
4" Chimney Cap	4	EA	$ 11	$ 10		$ 44	$ 49	$ -	$ 93	Use Common Vents
Roof Flashing	4	EA	$ 28	$ 10		$ 111	$ 49	$ -	$ 160	Use Common Vents
Miscellaneous electrical	1	LS		$ 500		$ -	$ 617	$ -	$ 617	

Note: Unit selections and budgetary pricing are per Space Ray LTS series infrared tube heaters.

$17,023	Subtotal
$2,553	15% Contingency
$2,937	15% Contractor O&P
$0	0% Engineering
$22,513	**Total**

Stratford Borough
CHA #22072
Building: Fire Station

Reconcile Thermal Model

Building Footprint	5,580 SF	Ex Occupied Clng Temp.	74 °F	Ex Occupied Htg Temp.	64 °F
Heating Efficiency	83%	Ex Unoccupied Clng Temp.	74 °F	Ex Unoccupied Htg Temp.	64 °F
Unit Heater Effectiveness	85%	Occupied Cooling UA	(17,477) btu/hr/°F	Occupied Heating UA	887 btu/hr/°F
Cooling Efficiency	1.20 kW/ton	Unoccupied Cooling UA	(17,461) btu/hr/°F	Unoccupied Heating UA	887 btu/hr/°F
Internal Gains	30,029 btu/h	Cooling Occ Enthalpy Setpoint	27.5 Btu/lb		
Unoc Internal Gain factor	0.45	Cooling Unocc Enthalpy Setpoint	27.5 Btu/lb		
Ave Occ Internal Gain Factor	0.7				
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	-498,098	-50,177	-21,020	-497,649	-50,177	-13,603	0	0	0	0
97.5	42.5	0	0	0	-410,713	-34,845	-21,020	-410,342	-34,845	-13,603	0	0	0	0
92.5	39.5	36	3	33	-323,327	-27,876	-21,020	-323,036	-27,876	-13,603	0	1,315	1,315	0
87.5	36.6	123	10	113	-235,941	-21,139	-21,020	-235,729	-21,139	-13,603	0	3,336	3,336	0
82.5	34.0	477	40	437	-148,556	-15,100	-21,020	-148,422	-15,100	-13,603	0	5,479	5,479	0
77.5	31.6	656	55	601	-61,170	-9,524	-21,020	-61,115	-9,524	-13,603	0	5,567	5,567	0
72.5	29.2	742	62	680	0	0	-21,020	0	0	-13,603	0	1,055	1,055	0
67.5	27.0	784	65	719	0	0	-21,020	0	0	-13,603	0	1,115	1,115	0
62.5	24.5	983	82	901	1,331	836	-21,020	1,331	836	-13,603	0	1,185	1,185	0
57.5	21.4	625	52	573	5,766	3,624	-21,020	5,766	3,624	-13,603	0	302	302	0
52.5	18.7	438	37	402	10,201	6,411	-21,020	10,201	6,411	-13,603	0	16	16	0
47.5	16.2	559	47	512	14,637	9,199	-21,020	14,637	9,199	-13,603	0	0	0	76
42.5	14.4	671	56	615	19,072	11,987	-21,020	19,072	11,987	-13,603	0	0	0	160
37.5	12.6	1,067	89	978	23,507	14,774	-21,020	23,507	14,774	-13,603	0	0	0	364
32.5	10.7	685	57	628	27,943	17,562	-21,020	27,943	17,562	-13,603	0	0	0	304
27.5	8.6	369	31	338	32,378	20,349	-21,020	32,378	20,349	-13,603	0	0	0	201
22.5	6.8	321	27	294	36,813	23,137	-21,020	36,813	23,137	-13,603	0	0	0	208
17.5	5.5	184	15	169	41,249	25,925	-21,020	41,249	25,925	-13,603	0	0	0	138
12.5	4.1	40	3	37	45,684	28,712	-21,020	45,684	28,712	-13,603	0	0	0	34
7.5	2.6	0	0	0	50,119	31,500	-21,020	50,119	31,500	-13,603	0	0	0	0
2.5	1.0	0	0	0	54,555	34,287	-21,020	54,555	34,287	-13,603	0	0	0	0
-2.5	0.0	0	0	0	58,990	37,075	-21,020	58,990	37,075	-13,603	0	0	0	0
-7.5	-1.5	0	0	0	63,426	39,863	-21,020	63,426	39,863	-13,603	0	0	0	0
TOTALS		8,760	730	8,030								22,368	22,368	1,486

Existing Building Ventilation & Infiltration (occ)	516 cfm
Overheat Ventilation Factor	1.00
Additional ventilation to offset overheat	0 cfm
Existing Building Ventilation & Infiltration (unocc)	516 cfm
Economizer Ventilation (from AHU's)	cfm

Energy Use Indices (calculated)

	Base Case
Heating	1,486
Other Areas of Building	2,329
Target ->	3,777
	101%

	Base Case
Cooling	22,368
Target ->	103,561
	21.6%

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	**Project No.:**	CHA #22072		
Location	NJ	**Site Elevation:**	460 Feet	**Specific Volume**	14.00 CF/#
Building Name	Fire Station	**Date:**	09/08/10		
Engineer:	M. Devlin				

Building/Facility Designation Stratford Fire Station/Garage

Outdoor Winter Design DB Temperature	-1 *F	**Indoor Winter Design DB Temperature**	64 *F
Outdoor Summer Design DB Temperature	90 *F	**Indoor Summer Design DB Temperature**	74 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 #/#	**Indoor Air (70*F) Humidity Ratio**	0.0079 #/#

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	5.3	

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	1.6	

Windows (Select One)

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

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

BUILDING CHARACTERISTICS

Roof Area	5,580 SF		
Occupied Area	5,580 SF	**Return Plenum?**	n

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	62 Ft	18.5 Ft	17.0 Ft	11 SF	0 SF	1,136 SF
East Exposure	98 Ft	18.5 Ft	17.0 Ft	0 SF	812 SF	1,001 SF
South Exposure	62 Ft	18.5 Ft	17.0 Ft	0 SF	0 SF	1,147 SF
West Exposure	98 Ft	18.5 Ft	17.0 Ft	0 SF	672 SF	1,141 SF

Occupied Forced Ventilation	0 cfm	0.0 AC/hr
Unoccupied Forced Ventilation	0 cfm	0.0 AC/hr

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	Project No.:	CHA #22072		
Location	NJ	Site Elevation:	460 Feet	Specific Volume	14.00 CF/#
Building Name	Fire Station	Date:	09/08/10		
Engineer:	M. Devlin				

Building/Facility Designation: Stratford Fire Station/Garage

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	11	38 btu/h/sf	0.8	0.75	Glass Type C	252 Btu/hr
East Exposure	0	216 btu/h/sf	0.8	0.31	Glass Type C	0 Btu/hr
South Exposure	0	109 btu/h/sf	0.8	0.58	Glass Type C	0 Btu/hr
West Exposure	0	216 btu/h/sf	0.8	0.29	Glass Type C	0 Btu/hr
						252 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	1,043	0.19	20 °F	1.0	3,936 Btu/hr
East Exposure	854	0.19	39 °F	1.0	6,284 Btu/hr
South Exposure	1,054	0.19	27 °F	1.0	5,369 Btu/hr
West Exposure	994	0.19	22 °F	1.0	4,126 Btu/hr
Roof	5,580	0.62	73 °F	1.0	251,444 Btu/hr
Fenestration	11	0.62	16 °F		110 Btu/hr
Doors	1,484	0.14	27 °F		5,596 Btu/hr
Ceiling	5,580	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	5,580	0.04	0 °F		0 Btu/hr
					276,865 Btu/h

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

							Room Heat Gain
Lights	1.50 w/sf x	5,580 Occ Area =	8.4 kW x 3.4x		1.0 RAF =		28,567 Btu/h
Plug Load	0.05 w/sf x	5,580 Occ Area =	0.3 kW x 3.4x		1.0 RAF =		952 Btu/h
People	20 people x	255 btu/person x	10% time in space =				510 Btu/h
Computer Work Stations		Units x	120 W/Unit x	3414 =			0 Btu/h
Equipment		kW x 3.413 =					0 Btu/h
Misc.							0 Btu/h
							30,029 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor		Perimeter Ratio		Coef	Temp. Diff.	Room Heat Gain
Walls	3,945 SF	0.10	CFM/SF			1.04	16 °F	7,115 Btu/h
Doors	1,484 SF	0.20	CFM/LF	0.24	LF/SF	1.04	16 °F	1,270 Btu/h
Windows	11 SF	0.20	CFM/LF	1.51	LF/SF	1.04	16 °F	60 Btu/h
Ventilation	0 cfm					1.04	16 °F	0 Btu/h
								8,445 Btu/h
Infiltration	468 cfm	0.3	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	93	0.19	20	1.0	351 Btu/hr
East Exposure	147	0.19	39	1.0	1,082 Btu/hr
South Exposure	93	0.19	27	1.0	474 Btu/hr
West Exposure	147	0.19	22	1.0	610 Btu/hr
Roof	5,580	0.62	73	0.0	0 Btu/hr
					2,517 Btu/h

INTERNAL HEAT GAINS

						Room Heat Gain
Lights	1.50 w/sf x	5,580 Occ Area =	8.4 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	252	Internal Gains to Room	30,029
Conduction to Room	276,865	Internal Gains to Plenum	0
Conduction to Plenum	2,517		
Ventilaton and Infiltration	8,445		
Sub Total	288,079	Sub Total	30,029

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	Project No.:	CHA #22072		
Location	NJ	Site Elevation:	460 Feet	Specific Volume	14.00 CF/#
Building Name	Fire Station	Date:	09/08/10		
Engineer:	M. Devlin				

Building/Facility Designation: Stratford Fire Station/Garage

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	6,060 SF	0.10 CFM/SF	4,629	0.0042 ##/##	11,901 Btu/h
Doors	1,484 SF	0.20 CFM/LF	4,629	0.0042 ##/##	1,383 Btu/h
Windows	11 SF	0.20 CFM/LF	4,629	0.0042 ##/##	65 Btu/h
Ventilation	0 cfm		4,629	0.0042 ##/##	0 Btu/h
People	20 people	0.10 time in space		250 Btu/hr/person	500 Btu/h
					13,849 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	
Temperature Dependent Gains	288,079	13,849	301,928	
Temperature Indep. Gains	30,029		30,029	SHR= 0.96
Total	318,108	13,849	331,957	

Building Cooling Load: 27.7 Tons at 202 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is: 25,196 CFM (4.52 CFM/sf)

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	1,136	0.19	65	13,931 Btu/h
East Exposure	1,001	0.19	65	12,276 Btu/h
South Exposure	1,147	0.19	65	14,067 Btu/h
West Exposure	1,141	0.19	65	13,993 Btu/h
Fenestration	11	0.62	65	446 Btu/h
Roof	5,580	0.62	-5	-17,222 Btu/h
Doors	1,484	0.14	65	13,472 Btu/h
Ceiling	5,580	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	5,580	0.04	30	6,696 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	4,425 SF	0.10 CFM/SF	1.04	65	442 cfm	30,022 Btu/h
Doors	1,484 SF	0.20 CFM/LF	1.04	65	70 cfm	4,776 Btu/h
Windows	11 SF	0.20 CFM/LF	1.04	65	3 cfm	226 Btu/h
Ventilation Load	0 cfm		1.04	65	0 cfm	0 Btu/h
Total Ventilation & Infiltration Load					516 cfm	35,024 Btu/h

Building Heating Load: 92,684 btu/h (16.6 btu/sf)

APPENDIX S

FS ECM-2 Building Setback

Stratford Borough
CHA #22072
Building: Fire Station

ECM-2 Building Setback

Building Footprint	6,580 SF	Ex Occupied Clng Temp.	74 °F	Ex Occupied Htg Temp.	68 °F	Heating Energy Savings	547 therms		
Heating Efficiency	80%	Ex Unoccupied Clng Temp.	80 °F	Ex Unoccupied Htg Temp.	60 °F	Cooling Energy Savings	3,637 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	12,066 btu/h	Occupied Cooling UA	6,831 btu/hr/°F	Occupied Heating UA	808 btu/hr/°F				
Unoc Internal Gain factor	0.7	Unoccupied Cooling UA	5,906 btu/hr/°F	Unoccupied Heating UA	808 btu/hr/°F				
Ave Occ Internal Gain Factor	0.7	Cooling Occ Enthalpy Setpoint	27.5 Btu/lb						
Exist Equp Occ Hrs/Wk	133	Cooling Unocc Enthalpy Setpoint	31 Btu/lb						
Prop Equip Occ Hrs/Wk	10								

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	Existing Occupied Equipment Bin Hours	Existing Unoccupied Equipment Bin Hours	Proposed Occupied Equipment Bin Hours	Proposed 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	0	0	-194,686	-62,762	-8,460	-132,881	-52,592	-8,460	-194,686	-62,762	-8,460	-132,881	-52,592	-8,460	0	0	0	0
97.5	42.5	0	0	0	0	0	-160,531	-43,585	-8,460	-103,352	-33,415	-8,460	-160,531	-43,585	-8,460	-103,352	-33,415	-8,460	0	0	0	0
92.5	39.5	36	29	8	2	34	-126,375	-34,868	-8,460	-73,823	-24,698	-8,460	-126,375	-34,868	-8,460	-73,823	-24,698	-8,460	564	399	0	0
87.5	36.6	123	97	26	7	116	-92,220	-26,441	-8,460	-44,294	-16,272	-8,460	-92,220	-26,441	-8,460	-44,294	-16,272	-8,460	1,415	892	0	0
82.5	34	477	378	99	28	449	-58,064	-18,887	-8,460	-14,765	-8,717	-8,460	-58,064	-18,887	-8,460	-14,765	-8,717	-8,460	3,543	1,675	0	0
77.5	31.6	656	519	137	39	617	-23,909	-11,913	-8,460	0	0	-8,460	-23,909	-11,913	-8,460	0	0	-8,460	2,415	695	0	0
72.5	29.2	742	587	155	44	698	0	0	-8,460	0	0	-8,460	0	0	-8,460	0	0	-8,460	628	628	0	0
67.5	27	784	621	163	47	737	404	349	-8,460	0	0	-8,460	404	349	-8,460	0	0	-8,460	617	660	0	0
62.5	24.5	983	778	205	59	924	4,446	3,835	-8,460	0	0	-8,460	4,446	3,835	-8,460	0	0	-8,460	187	783	0	0
57.5	21.4	625	495	130	37	588	8,487	7,322	-8,460	2,021	1,743	-8,460	8,487	7,322	-8,460	2,021	1,743	-8,460	0	0	38	-31
52.5	18.7	438	347	91	26	412	12,529	10,809	-8,460	6,062	5,230	-8,460	12,529	10,809	-8,460	6,062	5,230	-8,460	0	0	68	19
47.5	16.2	559	443	116	33	526	16,570	14,296	-8,460	10,104	8,717	-8,460	16,570	14,296	-8,460	10,104	8,717	-8,460	0	0	139	77
42.5	14.4	671	531	140	40	631	20,612	17,783	-8,460	14,145	12,204	-8,460	20,612	17,783	-8,460	14,145	12,204	-8,460	0	0	230	156
37.5	12.6	1,087	845	222	64	1,003	24,653	21,269	-8,460	18,187	15,691	-8,460	24,653	21,269	-8,460	18,187	15,691	-8,460	0	0	466	349
32.5	10.7	685	542	143	41	644	28,695	24,756	-8,460	22,229	19,177	-8,460	28,695	24,756	-8,460	22,229	19,177	-8,460	0	0	364	288
27.5	8.8	369	292	77	22	347	32,737	28,243	-8,460	26,270	22,664	-8,460	32,737	28,243	-8,460	26,270	22,664	-8,460	0	0	231	190
22.5	6.8	321	254	67	19	302	36,778	31,730	-8,460	30,312	26,151	-8,460	36,778	31,730	-8,460	30,312	26,151	-8,460	0	0	231	195
17.5	5.5	184	146	38	11	173	40,820	35,216	-8,460	34,353	29,638	-8,460	40,820	35,216	-8,460	34,353	29,638	-8,460	0	0	150	129
12.5	4.1	40	32	8	2	38	44,861	38,703	-8,460	38,395	33,124	-8,460	44,861	38,703	-8,460	38,395	33,124	-8,460	0	0	36	32
7.5	2.6	0	0	0	0	0	48,903	42,190	-8,460	42,436	36,611	-8,460	48,903	42,190	-8,460	42,436	36,611	-8,460	0	0	0	0
2.5	1	0	0	0	0	0	52,944	45,677	-8,460	46,478	40,098	-8,460	52,944	45,677	-8,460	46,478	40,098	-8,460	0	0	0	0
-2.5	0	0	0	0	0	0	56,986	49,164	-8,460	50,519	43,585	-8,460	56,986	49,164	-8,460	50,519	43,585	-8,460	0	0	0	0
-7.5	-1.5	0	0	0	0	0	61,027	52,650	-8,460	54,561	47,072	-8,460	61,027	52,650	-8,460	54,561	47,072	-8,460	0	0	0	0
TOTALS		8,760	6,935	1,825		8,239													9,368	5,731	1,952	1,405
																			9,368	9320	1,952	848

Existing Building Ventilation & Infiltration (occ)	646 cfm
Overheat Ventilation Factor	1.00
Additional ventilation to offset overheat	0 cfm
Existing Building Ventilation & Infiltration (unocc)	646 cfm

Stratford Borough
CHA #22072
Building: Fire Station

ECM-2 Building Setback

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Programmable thermostat w/ timed temp override	5	ea	$ 210	$ 85	$ -	$ 1,040	$ 524	$ -	$ 1,564	Based on Robert Shaw 9920i
Reprogram T-Stat	5	ea	$ -	$ 50	$ -	$ -	$ 309	$ -	$ 309	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 1,872	Subtotal
$ 187	10% Contingency
$ 206	Contractor 10% O&P
$ -	0% Engineering
$ 2,266	**Total**

Stratford Borough
CHA #22072
Building: Fire Station

Reconcile Thermal Model (Upstairs)

Building Footprint	5,580 SF	Ex Occupied Clng Temp.	74 °F	Ex Occupied Htg Temp.	68 °F
Heating Efficiency	80%	Ex Unoccupied Clng Temp.	80 °F	Ex Unoccupied Htg Temp.	60 °F
Cooling Efficiency	1.20 kW/ton	Occupied Cooling UA	(6,831) btu/hr/°F	Occupied Heating UA	808 btu/hr/°F
Internal Gains	12,086 btu/h	Unoccupied Cooling UA	(5,906) btu/hr/°F	Unoccupied Heating UA	808 btu/hr/°F
Unoc Internal Gain factor	0.7	Cooling Occ Enthalpy Setpoint	27.5 Btu/lb		
Ave Occ Internal Gain Factor	0.7	Cooling Unocc Enthalpy Setpoint	31 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	-194,686	-62,762	-8,460	-132,881	-52,592	-8,460	0	0	0	0
97.5	42.5	0	0	0	-160,531	-43,585	-8,460	-103,352	-33,415	-8,460	0	0	0	0
92.5	39.5	36	29	8	-126,375	-34,868	-8,460	-73,823	-24,698	-8,460	0	564	564	0
87.5	36.6	123	97	26	-92,220	-26,441	-8,460	-44,294	-16,272	-8,460	0	1,415	1,415	0
82.5	34.0	477	378	99	-58,064	-18,887	-8,460	-14,765	-8,717	-8,460	0	3,543	3,543	0
77.5	31.6	656	519	137	-23,909	-11,913	-8,460	0	0	-8,460	0	2,415	2,415	0
72.5	29.2	742	587	155	0	0	-8,460	0	0	-8,460	0	628	628	0
67.5	27.0	784	621	163	404	349	-8,460	0	0	-8,460	0	617	617	0
62.5	24.5	983	778	205	4,446	3,835	-8,460	0	0	-8,460	0	187	187	0
57.5	21.4	625	495	130	8,487	7,322	-8,460	2,021	1,743	-8,460	0	0	0	38
52.5	18.7	438	347	91	12,529	10,809	-8,460	6,062	5,230	-8,460	0	0	0	68
47.5	16.2	559	443	116	16,570	14,296	-8,460	10,104	8,717	-8,460	0	0	0	139
42.5	14.4	671	531	140	20,612	17,783	-8,460	14,145	12,204	-8,460	0	0	0	230
37.5	12.6	1,067	845	222	24,653	21,269	-8,460	18,187	15,691	-8,460	0	0	0	466
32.5	10.7	685	542	143	28,695	24,756	-8,460	22,229	19,177	-8,460	0	0	0	364
27.5	8.6	369	292	77	32,737	28,243	-8,460	26,270	22,664	-8,460	0	0	0	231
22.5	6.8	321	254	67	36,778	31,730	-8,460	30,312	26,151	-8,460	0	0	0	231
17.5	5.5	184	146	38	40,820	35,216	-8,460	34,353	29,638	-8,460	0	0	0	150
12.5	4.1	40	32	8	44,861	38,703	-8,460	38,395	33,124	-8,460	0	0	0	36
7.5	2.6	0	0	0	48,903	42,190	-8,460	42,436	36,611	-8,460	0	0	0	0
2.5	1.0	0	0	0	52,944	45,677	-8,460	46,478	40,098	-8,460	0	0	0	0
-2.5	0.0	0	0	0	56,986	49,164	-8,460	50,519	43,585	-8,460	0	0	0	0
-7.5	-1.5	0	0	0	61,027	52,650	-8,460	54,561	47,072	-8,460	0	0	0	0
TOTALS		8,760	6,935	1,825								9,368	9,368	1,952

Existing Building Ventilation & Infiltration (occ)	646 cfm
Overheat Ventilation Factor	1.00
Additional ventilation to offset overheat	0 cfm
Existing Building Ventilation & Infiltration (unocc)	646 cfm
Economizer Ventilation (from AHU's)	cfm

Energy Use Indices (calculated)

	Base Case
Heating	1,952
Other Areas of Building	1,863
Target ->	3,777
	101%

	Base Case
Cooling	9,368
Target ->	10,920
	85.8%

	Electricity Breakdown
Building annual kWh	103,561
Lighting	66,751
Misc use in Garage / Equipment use	25,890
Upstairs Cooling	10,920

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	**Project No.:**	CHA #22072		
Location	NJ	**Site Elevation:**	460 Feet	**Specific Volume**	14.00 CF/#
Building Name	Fire Station	**Date:**	09/08/10		
Engineer:	M. Devlin				

Building/Facility Designation Stratford Fire Station/Upstairs

Outdoor Winter Design DB Temperature	-1 *F	**Indoor Winter Design DB Temperature**	68 *F
Outdoor Summer Design DB Temperature	90 *F	**Indoor Summer Design DB Temperature**	74 *F
Outdoor Summer Design WB Temperature	73 *F	**Indoor Summer Design WB Temperature**	60 *F
Outdoor Summer Humidity Ratio	0.0121 #/#	**Indoor Air (70*F) Humidity Ratio**	0.0079 #/#

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	22.8	

Roofs (Select One)		R Value	Roof Type
	Tectum Deck, 3.3" Insul., BU Roof	13.0	1
	Steel Deck, 5" Insul., BU Roof	18.2	1
	Attic Roof with 6" Insul.	25.0	4
	4" HW Concrete Deck, BU Roof	2.7	2
	Ceiling, 3" Insulation, 4" Concrete Deck, BU Roof	14.9	4
	Ceiling, 4" Concrete Deck, 3" Insulation, BU Roof	18.5	13
	Ceiling, 4" Concrete Deck, 6" Insulation, BU Roof	21.7	14
	Ceiling, Wood Deck, 6" Insulation, Felt & Membrane	22.7	10
	Wood Deck, 6" insulation, Felt & Membrane	18.0	
x	U value calculator	22.5	

Windows (Select One)		U Value
	Aluminum Frame, 1/8" SP Glazing	1.05
	Aluminum Frame, 1/4" DP Glazing	0.60
	Aluminum Frame, 3/16" DP Glazing	0.62
	Aluminum Frame, 1/2" DP Glazing	0.50
	Skylights	0.90
x	Wood Frame, 1/2" DP Glazing Casement Window	0.55

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

BUILDING CHARACTERISTICS

Roof Area	6,000 SF			
Occupied Area	5,580 SF	**Return Plenum?**	n	

	Gross Wall Length	Average Wall Height	Ceiling Height	Window Area	Door Area	Net Wall Area
North Exposure	62 Ft	10.0 Ft	17.0 Ft	24 SF	1 SF	595 SF
East Exposure	98 Ft	10.0 Ft	17.0 Ft	120 SF	0 SF	860 SF
South Exposure	62 Ft	10.0 Ft	17.0 Ft	24 SF	0 SF	596 SF
West Exposure	98 Ft	10.0 Ft	17.0 Ft	132 SF	0 SF	848 SF

Occupied Forced Ventilation	275 cfm	0.3 AC/hr
Unoccupied Forced Ventilation	275 cfm	0.3 AC/hr

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	Project No.:	CHA #22072		
Location	NJ	Site Elevation:	460 Feet	Specific Volume	14.00 CF/#
Building Name	Fire Station	Date:	09/08/10		
Engineer:	M. Devlin				

Building/Facility Designation: Stratford Fire Station/Upstairs

COOLING HEAT GAINS TO THE ROOM - SENSIBLE

SOLAR GAINS

WINDOWS	AREA (SF)	SHGF	Shade Coef	Cooling Load Factor		Solar Heat Gain
North Exposure	24	38 btu/h/sf	0.8	0.75	Glass Type C	547 Btu/hr
East Exposure	120	216 btu/h/sf	0.8	0.31	Glass Type C	6,428 Btu/hr
South Exposure	24	109 btu/h/sf	0.8	0.58	Glass Type C	1,214 Btu/hr
West Exposure	132	216 btu/h/sf	0.8	0.29	Glass Type C	6,615 Btu/hr
						14,804 Btu/h

CONDUCTION

	NET AREA (SF)	U-VALUE	Cooling Load Temp. Dif.	Return Air Factor	Room Heat Gain
North Exposure	1,029	0.04	20 °F	1.0	903 Btu/hr
East Exposure	1,546	0.04	39 °F	1.0	2,647 Btu/hr
South Exposure	1,030	0.04	27 °F	1.0	1,221 Btu/hr
West Exposure	1,534	0.04	22 °F	1.0	1,481 Btu/hr
Roof	6,000	0.04	73 °F	1.0	19,441 Btu/hr
Fenestration	300	0.55	16 °F		2,640 Btu/hr
Doors	1	0.14	27 °F		4 Btu/hr
Ceiling	5,580	0.14	0 °F		0 Btu/hr
Partition		0.05	0 °F		0 Btu/hr
Floor	5,580	0.62	20 °F		68,889 Btu/hr
					97,226 Btu/h

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

							Room Heat Gain
Lights	0.50 w/sf x	5,580 Occ Area =	2.8 kW x 3.4x	1.0 RAF =	9,522 Btu/h
Plug Load	0.05 w/sf x	5,580 Occ Area =	0.3 kW x 3.4x	1.0 RAF =	952 Btu/h
People	30 people x	255 btu/person x	5% time in space =		383 Btu/h
Computer Work Stations		3 Units x	120 W/Unit x	3414 =	1,229 Btu/h
Equipment		kW x 3.413 =			0 Btu/h
Misc.					0 Btu/h
					12,086 Btu/h

VENTILATION AND INFILTRATION

		Infiltration Factor	Perimeter Ratio	Coef	Temp. Diff.	Room Heat Gain
Walls	5,139 SF	0.10 CFM/SF		1.04	16 °F	9,269 Btu/h
Doors	1 SF	0.00 CFM/LF	4.00 LF/SF	1.04	16 °F	0 Btu/h
Windows	300 SF	0.20 CFM/LF	1.35 LF/SF	1.04	16 °F	1,457 Btu/h
Ventilation	275 cfm			1.04	16 °F	4,960 Btu/h
						15,687 Btu/h
Infiltration	595 cfm	0.6 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	-434	0.04	20	1.0	-381 Btu/hr
East Exposure	-686	0.04	39	1.0	-1,174 Btu/hr
South Exposure	-434	0.04	27	1.0	-514 Btu/hr
West Exposure	-686	0.04	22	1.0	-663 Btu/hr
Roof	6,000	0.04	73	0.0	0 Btu/hr
					-2,732 Btu/h

INTERNAL HEAT GAINS

Lights	0.50 w/sf x	5,580 Occ Area =	2.8 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	14,804	Internal Gains to Room	12,086
Conduction to Room	97,226	Internal Gains to Plenum	0
Conduction to Plenum	-2,732		
Ventilaton and Infiltration	15,687		
Sub Total	124,984	Sub Total	12,086

HEAT GAIN/LOSS WORKSHEET

Project Name:	Stratford Borough	**Project No.:**	CHA #22072		
Location	NJ	**Site Elevation:**	460 Feet	**Specific Volume**	14.00 CF/#
Building Name	Fire Station	**Date:**	09/08/10		
Engineer:	M. Devlin				

Building/Facility Designation Stratford Fire Station/Upstairs

LATENT COOLING LOADS

Infiltration

		Infiltration Factor	Air Density	Humidity Ratio Dif.	Room Heat Gain
Walls	3,760 SF	0.10 CFM/SF	4,629	0.0042 ##/##	7,384 Btu/h
Doors	1 SF	0.00 CFM/LF	4,629	0.0042 ##/##	0 Btu/h
Windows	300 SF	0.20 CFM/LF	4,629	0.0042 ##/##	1,587 Btu/h
Ventilation	275 cfm		4,629	0.0042 ##/##	5,401 Btu/h
People	30 people	0.05 time in space		250 Btu/hr/person	375 Btu/h
					14,746 Btu/h

Cooling Load Summary

	Sensible	Latent	Total	
Temperature Dependent Gains	124,984	14,746	139,731	
Temperature Indep. Gains	12,086		12,086	SHR= 0.90
Total	137,070	14,746	151,816	

Building Cooling Load 12.7 Tons at 441 SF/Ton

Building Air Flow to Condition Space based on a 12°F Temp Rise is **11,161 CFM** / **2.00 CFM/sf**

HEATING CALCULATION

CONDUCTION

	NET AREA (SF)	U-VALUE	Heating Load Temp. Dif.	Room Heat Gain
North Exposure	595	0.04	69	1,802 Btu/h
East Exposure	860	0.04	69	2,605 Btu/h
South Exposure	596	0.04	69	1,805 Btu/h
West Exposure	848	0.04	69	2,569 Btu/h
Fenestration	300	0.55	69	11,385 Btu/h
Roof	6,000	0.04	69	18,375 Btu/h
Doors	1	0.14	69	10 Btu/h
Ceiling	5,580	0.14	0	0 Btu/h
Partition	0	0.05	0	0 Btu/h
Floor	5,580	0.62	5	17,222 Btu/h

Ventilation and Infiltration

		Infiltration Factor	Coef	Temp. Difference	Air Flow	Room Heat Gain
Walls	2,899 SF	0.10 CFM/SF	1.04	69	290 cfm	20,879 Btu/h
Doors	1 SF	0.00 CFM/LF	1.04	69	0 cfm	0 Btu/h
Windows	300 SF	0.20 CFM/LF	1.04	69	81 cfm	5,819 Btu/h
Ventilation Load	275 cfm		1.04	69	275 cfm	21,391 Btu/h
Total Ventilation & Infiltration Load					646 cfm	48,090 Btu/h

Building Heating Load 103,863 **btu/h**

18.6 btu/sf

APPENDIX T

FS ECM-3 Install "On Demand" Condensing DHW Heater

Stratford Borough
CHA #22072
Building: Fire Station

ECM-3: Install "On Demand" Condensing HW Heater

Summary

* Replace 250 MBH, 100 Gal Gas-Fired DHW Heater w/ On Demand, Condensing, Gas-Fired DHW Heater

Item	Value	Units	Formula/Comments
Avg. Monthly Utility Demand by Water Heater	17	Therms/month	Calculated from utility bill
Total Annual Utility Demand by Water Heater	20,400	MBTU/yr	1therm = 100 MBTU
Existing DHW Heater Efficiency	80%		Per manufacturer nameplate
Total Annual Hot Water Demand (w/ standby losses)	16,320	MBTU/yr	
Existing Tank Size	100	Gallons	Per manufacturer nameplate
Hot Water Piping System Capacity	10	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	°F	Per building personnel
Room Temperature	68	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	1.2	MBH	
Annual Standby Hot Water Load	10,439	MBTU/yr	
New Tank Size	0	Gallons	Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Hot Water Piping System Capacity	10	Gallons	Estimated Per existing system (includes HWR piping)
Hot Water Temperature	120	°F	
Room Temperature	68	°F	
Standby Losses (% by Volume)	2.5%		(2.5% of stored capacity per hour, per U.S. Department of Energy)
Standby Losses (Heat Loss)	0.1	MBH	
Annual Standby Hot Water Load	949	MBTU/yr	
Total Annual Hot Water Demand	6,830	MBTU/yr	
Proposed Avg. Hot water heater efficiency	92%		Based on Takagi Flash T-H1 instantaneous, condensing DHW Heater
Proposed Fuel Use	74	Therms	Standby Losses and inefficient DHW heater eliminated
Utility Cost	$1.35	$/Therm	
Existing Operating Cost of DHW	$275	$/yr	
Proposed Operating Cost of DHW	$101	$/yr	

Savings Summary:

Utility	Energy Savings	Cost Savings
Therms/yr	130	$175

Stratford Borough
CHA #22072
Building: Fire Station

ECM-3: Install "On Demand" Condensing HW Heater

Multipliers	
Material:	0.99
Labor:	1.23
Equipment:	1.10

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
						$ -	$ -	$ -	$ -	
Gas-Fired DHW Heater Removal	1	LS		$ 50		$ -	$ 62	$ -	$ 62	
						$ -	$ -	$ -	$ -	
Tankless Gas-Fired DHW Heater	1	EA	$ 2,500	$ 280		$ 2,475	$ 346	$ -	$ 2,821	199,000 Btuh
Miscellaneous Electrical	1	LS	$ 500			$ 495	$ -	$ -	$ 495	
Venting Kit	1	EA	$ 450	$ 650		$ 446	$ 802	$ -	$ 1,248	
Miscellaneous Piping and Valves	1	LS	$ 500			$ 495	$ -	$ -	$ 495	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	
						$ -	$ -	$ -	$ -	

$ 5,120	Subtotal
$ 1,024	20% Contingency
$ 922	Contractor 15% O&P
$ -	0% Engineering
$ 7,065	**Total**

New Jersey Smart Start Incentive Program	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIV	Cost W/ INCENTIV
					$ -	$ -
Tankless Gas-Fired DHW Heater	1	EA	$300	$300	$ 2,821	$ 2,521
				$300	$2,821	$2,521

Total ECM Cost w/ Incentives	**$6,765**

APPENDIX U

FS ECM-4 Metal Halide Lighting Replacement

Stratford Borough
CHA #22072
Building: Fire Station

ECM-4 MH Light Replacement

The Fire Station garage is lit by inefficient metal halide light fixtures.
Replacing the lights with high performance fluorescent fixtures will lead to energy savings.

Building Schedule:
Existing conditions (Offices): 20 hrs/week
Supply Electric Rate $ 0.143 /kWh
Demand Rate $ 7.92 /kW

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

			EXISTING CONDITIONS										RETROFIT CONDITIONS								COST ANALYSIS				
Area Description	Floor		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
Garage (Always on)	1st	8	10	MH400/1	458		467.16	4.58	switch	24	8,760	40,121	10	F44GHL	234	2.34	switch	24	8,760	20,498	2.2	19,622	$ 3,021	$ 4,395	1.5
Garage	1st	8	9	MH400/1	458		467.16	4.122	switch		1,040	4,287	9	F44GHL	234	2.106	switch	0	1,040	2,190	2.0	2,097	$ 492	$ 3,956	8.0
TOTALS -			19		916.0	0		8.7				44,408	19			4.4				22,689	4.3	21,719	$ 3,512	$ 8,351	2.4

New Jersey Smart Start Incentive Program	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
High Efficiency Fluorescent Fixtures	19	EA	$100	$1,900	$ 8,351	$ 6,451
				$1,900	$8,351	$6,451

Total ECM Cost w/ Incentives	$6,451

APPENDIX V

FS ECM-5 Install Occupancy Sensors

Stratford Borough
CHA #22072
Building: Fire Station

ECM-5 - Install Occupancy Sensors

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

Building Schedule:
Existing conditions (master switch): 4 hrs/week
Retrofit conditions (motion sensors): 3 hrs/week

Cost of Electricity: 0.169 $/kWh

*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
Hallway	9	F42ILL	59	0	60.18	0.5	24	8,760	4,652	Yes	4	6,132	3,256	1,395	$ 236	$ 740	3.1
HVAC Hall Closet	1	F42ILL	59	0	60.18	0.1	24	8,760	517	Yes	1	6,132	362	155	$ 26	$ 185	7.1
Chief's Office	4	F42ILL	59	0	60.18	0.2	3	1,095	258	Yes	1	767	181	78	$ 13	$ 185	14.1
Weight Room	4	F42ILL	59	0	60.18	0.2	6	2,190	517	Yes	1	1,533	362	155	$ 26	$ 185	7.1
TOTALS -	**18**			**0**		**1.1**			**5,944**				**4,160.6**	**1,783**	**$ 302**	**$ 1,295**	4.3

New Jersey Smart Start Incentive Program	QTY	UNIT	$ / UNIT	TOTAL SAVINGS	Cost W/O INCENTIVE	Cost W/ INCENTIVE
						$ -
Occupancy Sensor Wall Mounted	7	EA	$20	$140	$ 1,295	$ 1,155
				$140	$1,295	$1,155

Total ECM Cost w/ Incentives	**$1,155**

APPENDIX W

New Jersey Pay For Performance Incentive Program

Stratford Borough
CHA #22072
Building: Borough Hall

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)	2,500
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)	$6,417	$2,082
Existing Usage (from utility)	35,529	1,436
Proposed Savings	6,677	631
Existing Total MMBtus	265	
Proposed Savings MMBtus	86	
% Energy Reduction	**32.4%**	
Proposed Annual Savings	$3,645	

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

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$125
Incentive #2	$734	$694	$1,428
Incentive #3	$467	$441	$909
Total All Incentives	**$1,202**	**$1,135**	**$2,462**

Total Project Cost	$41,956

		Allowable Incentive
% Incentives #1 of Utility Cost*	1.5%	$125
% Incentives #2 of Project Cost**	3.4%	$1,428
% Incentives #3 of Project Cost**	2.2%	$909
Total Eligible Incentives***	**$2,462**	
Project Cost w/ Incentives	$39,494	

Project Payback (years)	
w/o Incentives	w/ Incentives
11.5	10.8

* 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

Stratford Borough
CHA #22072
Building: Justice Facility

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)	7,000
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)	$13,320	$2,423
Existing Usage (from utility)	74,099	1,698
Proposed Savings	12,568	417
Existing Total MMBtus	423	
Proposed Savings MMBtus	85	
% Energy Reduction	**20.0%**	
Proposed Annual Savings	$2,810	

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

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$350
Incentive #2	$1,383	$459	$1,842
Incentive #3	$880	$292	$1,172
Total All Incentives	**$2,262**	**$751**	**$3,364**

Total Project Cost	$16,243

		Allowable Incentive
% Incentives #1 of Utility Cost*	2.2%	$350
% Incentives #2 of Project Cost**	11.3%	$1,842
% Incentives #3 of Project Cost**	7.2%	$1,172
Total Eligible Incentives***	**$3,364**	
Project Cost w/ Incentives	$12,879	

Project Payback (years)	
w/o Incentives	w/ Incentives
5.8	4.6

* 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

Stratford Borough
CHA #22072
Building: Fire 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)	12,000
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)	$17,513	$5,115
Existing Usage (from utility)	103,561	3,777
Proposed Savings	30,058	929
Existing Total MMBtus	731	
Proposed Savings MMBtus	195	
% Energy Reduction	**26.7%**	
Proposed Annual Savings	$6,176	

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

	Incentives $		
	Elec	Gas	Total
Incentive #1	$0	$0	$600
Incentive #2	$3,306	$1,022	$4,328
Incentive #3	$2,104	$650	$2,754
Total All Incentives	**$5,411**	**$1,672**	**$7,682**

Total Project Cost	$41,490

		Allowable Incentive
% Incentives #1 of Utility Cost*	2.7%	$600
% Incentives #2 of Project Cost**	10.4%	$4,328
% Incentives #3 of Project Cost**	6.6%	$2,754
Total Eligible Incentives***	**$7,682**	
Project Cost w/ Incentives	$33,807	

Project Payback (years)	
w/o Incentives	w/ Incentives
6.7	5.5

* 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 X

Photovoltaic (PV) Rooftop Solar Power Generation

Borough of Stratford
Borough Hall

Cost of Electricity	$0.181	$/kWh
System Capacity	10.0	kW

Photovoltaic (PV) Rooftop Solar Power Generation

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
$80,000	**0.0**	**12,500**	**0**	**$2,300**	**0**	**$2,300**	**$7,500**	**$6,100**	**34.8**	**8.6**

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

Borough Hall

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 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:	39.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	18.1 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.61	895	162.00
2	4.20	932	168.69
3	4.78	1124	203.44
4	5.23	1155	209.06
5	5.44	1211	219.19
6	5.48	1133	205.07
7	5.55	1171	211.95
8	5.41	1155	209.06
9	5.23	1106	200.19
10	4.60	1034	187.15
11	3.59	821	148.60
12	3.17	766	138.65
Year	4.69	12503	2263.04

Output Hourly Performance Data

About the Hourly Performance Data

*

Output Results as Text

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

Borough of Stratford
Justice Facility

Cost of Electricity	$0.180	$/kWh
System Capacity	20.0	kW

Photovoltaic (PV) Rooftop Solar Power Generation

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
$160,000	**0.0**	**25,000**	**0**	**$4,500**	**0**	**$4,500**	**$15,000**	**$12,200**	**35.6**	**8.7**

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

Justice Facility

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	20.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	15.4 kW
Array Type:	Fixed Tilt
Array Tilt:	39.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	18.0 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.61	1789	322.02
2	4.20	1864	335.52
3	4.78	2248	404.64
4	5.23	2309	415.62
5	5.44	2423	436.14
6	5.48	2266	407.88
7	5.55	2343	421.74
8	5.41	2310	415.80
9	5.23	2212	398.16
10	4.60	2068	372.24
11	3.59	1642	295.56
12	3.17	1533	275.94
Year	4.69	25006	4501.08

Output Hourly Performance Data

About the Hourly Performance Data

*

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Borough of Stratford
Fire Station

Cost of Electricity	$0.169	$/kWh
System Capacity	25.0	kW

Photovoltaic (PV) Rooftop Solar Power Generation

Budgetary Cost	Annual Utility Savings				Estimated Maintenance Savings	Total Savings	New Jersey Renewable * Energy Incentive	New Jersey Renewable ** SREC	Payback (without incentive)	Payback (with incentive)
$	kW	kWh	therms	$	$	$	$	$	Years	Years
$200,000	**0.0**	**31,260**	**0**	**$5,300**	**0**	**$5,300**	**$18,750**	**$15,200**	**37.7**	**8.8**

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

Fire Station

Station Identification	
City:	Atlantic_City
State:	New_Jersey
Latitude:	39.45° N
Longitude:	74.57° W
Elevation:	20 m
PV System Specifications	
DC Rating:	25.0 kW
DC to AC Derate Factor:	0.770
AC Rating:	19.2 kW
Array Type:	Fixed Tilt
Array Tilt:	39.5°
Array Azimuth:	180.0°
Energy Specifications	
Cost of Electricity:	16.9 ¢/kWh

Results			
Month	Solar Radiation (kWh/m²/day)	AC Energy (kWh)	Energy Value ($)
1	3.61	2237	378.05
2	4.20	2329	393.60
3	4.78	2811	475.06
4	5.23	2886	487.73
5	5.44	3028	511.73
6	5.48	2832	478.61
7	5.55	2928	494.83
8	5.41	2888	488.07
9	5.23	2765	467.29
10	4.60	2585	436.87
11	3.59	2053	346.96
12	3.17	1916	323.80
Year	4.69	31258	5282.60

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)

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Cautions for Interpreting the Results

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

Because weather patterns vary from year-to-year, the values in the tables are better indicators of long-term performance than performance for a particular month or year. PV performance is largely proportional to the amount of solar radiation received, which may vary from the long-term average by ± 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.

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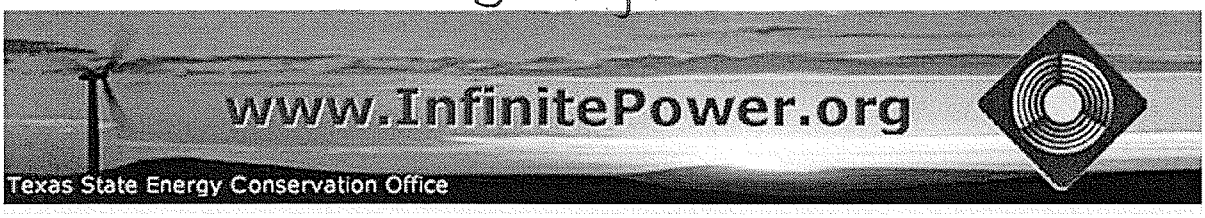
APPENDIX Y

Solar Thermal Domestic Hot Water Plant

Borough Hall



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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)	58
? Capacity (gallons)	30	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	14.23	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	50
Energy Use			
1060		? 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
1325 BTU/hr	? Power Into Water Heater	1082 BTU/hr
Cost		
$ 1.45 /Therm	? Utility Rates	$ .1 /kWh
$ 168.301	? Yearly Water Heating Cost	$ 277.596
How Does Solar Compare?		
? Solar Water Heater Cost: $ 6200		? Percentage Solar: 70
52.6266 years for gas	? Payback Time for Solar System	31.9065 years for electric

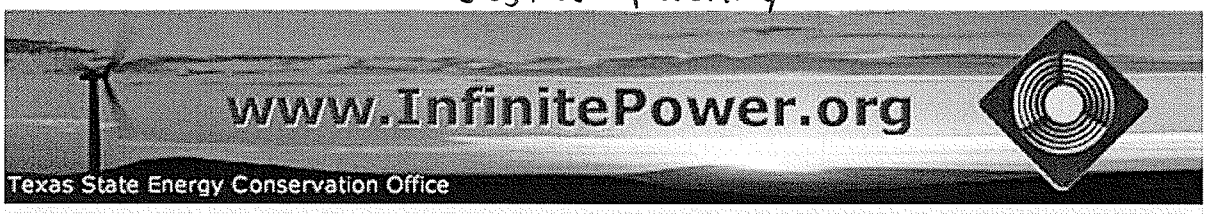
Stratford Borough
CHA# 22072
Building: Borough Hall

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	1	ea			$ 3,600			$ 3,924	$ 3,924	Eco Distributing Co
80 GallonStorage Tanks	1	ea	$ 350	$ 200		$ 342	$ 241	$ -	$ 583	Means
15 Gallon Drip Tank	1	ea	$ 150	$ 78		$ 181	$ 85	$ -	$ 266	Means

$ 4,773	Subtotal
$ 477	10% Contingency
$ 477	10% Contractor O&P
$ 477	10% Engineering
$ 6,205	**Total**

Justice Facility



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Interactive Energy Calculators

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

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

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

Solar Water Heating Calculator

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

Water Heater Characteristics			
Physical		**Thermal**	
? Diameter (feet)	1.5	? Water Inlet Temperature (Degrees F)	58
? Capacity (gallons)	40	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	17.79	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	50
Energy Use			
1060		? 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
1325 BTU/hr	? Power Into Water Heater	1082 BTU/hr
Cost		
$ 1.43 /Therm	? Utility Rates	$ 0.08 /kWh
$ 165.980	? Yearly Water Heating Cost	$ 222.077(
How Does Solar Compare?		
? Solar Water Heater Cost: $ 6200		? Percentage Solar: 70
53.3626 years for gas	? Payback Time for Solar System	39.8831 years for electric

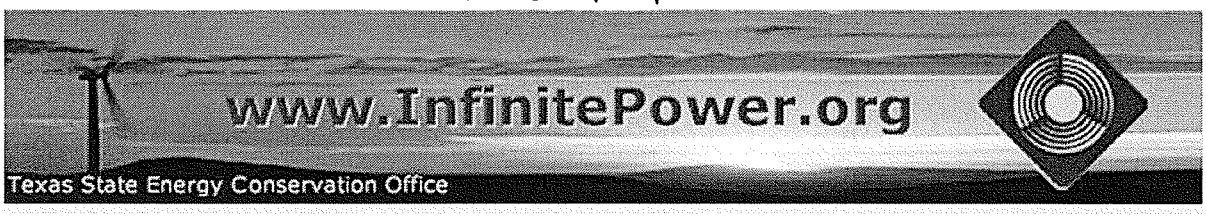
Stratford Borough
CHA# 22072
Building: Justice Facility

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	1	ea			$ 3,600			$ 3,924	$ 3,924	Eco Distributing Co
80 GallonStorage Tanks	1	ea	$ 350	$ 200		$ 342	$ 241	$ -	$ 583	Means
15 Gallon Drip Tank	1	ea	$ 150	$ 78		$ 181	$ 85	$ -	$ 266	Means

$ 4,773	Subtotal
$ 477	10% Contingency
$ 477	10% Contractor O&P
$ 477	10% Engineering
$ 6,205	**Total**

Fire Hall



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Interactive Energy Calculators

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

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

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

Solar Water Heating Calculator

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

Water Heater Characteristics			
Physical		**Thermal**	
? Diameter (feet)	1.5	? Water Inlet Temperature (Degrees F)	58
? Capacity (gallons)	100	? Ambient Temperature (Degrees F)	70
? Surface Area (calculated - sq ft)	39.18	? Hot Water Temperature (Degrees F)	120
? Effective R-value	NaN	? Hot Water Usage (Gallons per Day)	50
Energy Use			
1060		? 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
1325 BTU/hr	? Power Into Water Heater	1082 BTU/hr
Cost		
$ 1.35 /Therm	? Utility Rates	$ .1 /kWh
$ 156.694	? Yearly Water Heating Cost	$ 277.596
How Does Solar Compare?		
? Solar Water Heater Cost: $ 6200		? Percentage Solar: 70
56.5249 years for gas	? Payback Time for Solar System	31.9065 years for electric

Stratford Borough
CHA# 22072
Building: Fire Hall

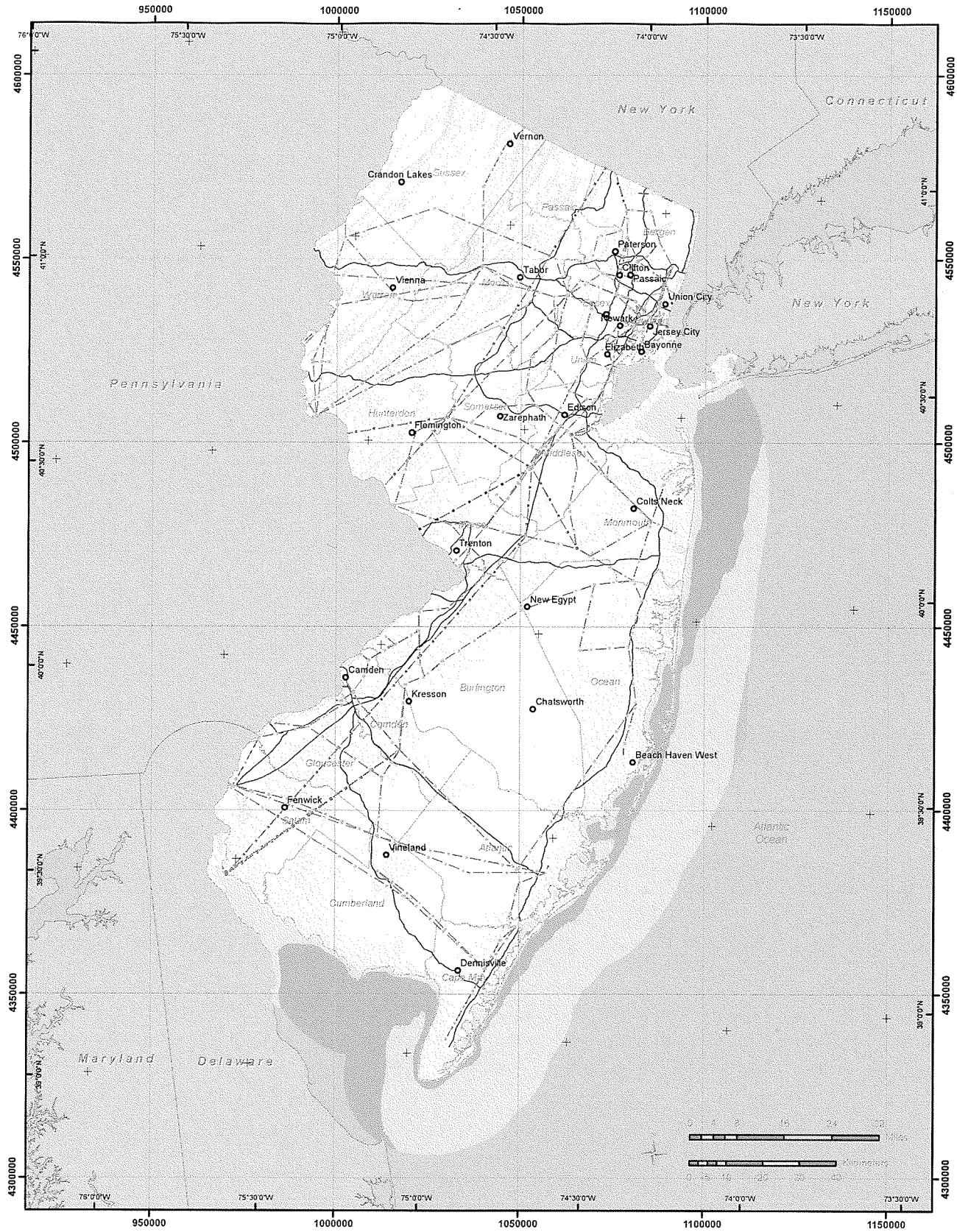
Multipliers	
Material:	0.98
Labor:	1.21
Equipment:	1.09

Description	QTY	UNIT	UNIT COSTS			SUBTOTAL COSTS			TOTAL COST	REMARKS
			MAT.	LABOR	EQUIP.	MAT.	LABOR	EQUIP.		
Synergy Solar Thermal System	1	ea			$ 3,600			$ 3,924	$ 3,924	Eco Distributing Co
80 GallonStorage Tanks	1	ea	$ 350	$ 200		$ 342	$ 241	$ -	$ 583	Means
15 Gallon Drip Tank	1	ea	$ 150	$ 78		$ 181	$ 85	$ -	$ 266	Means

$ 4,773	Subtotal
$ 477	10% Contingency
$ 477	10% Contractor O&P
$ 477	10% Engineering
$ 6,205	**Total**

APPENDIX Z

Wind



Wind Resource of New Jersey

Mean Annual Wind Speed at 30 Meters

Features

- City
- Interstate Highway
- County Boundary
- Water Body

Generalized Transmission Line

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

Mean Speed at 30 m

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

AWS Truewind

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

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

AWS Truewind, LLC

APPENDIX AA

EPA Portfolio Manager

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Borough Hall

Building ID: 2435007
For 12-month Period Ending: July 31, 2010[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: September 09, 2010

Facility
Borough Hall
307 Union Avenue
Stratford, NJ 08084

Facility Owner
Borough of Stratford
307 Union Ave
Stratford, NJ 08084

Primary Contact for this Facility
John Keenan
307 Union Ave
Stratford, NJ 08084

Year Built: 1973
Gross Floor Area (ft²): 2,500

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

Site Energy Use Summary[3]

Electricity - Grid Purchase(kBtu)	121,225
Natural Gas (kBtu)[4]	143,500
Total Energy (kBtu)	264,725

Energy Intensity[5]

Site (kBtu/ft²/yr)	106
Source (kBtu/ft²/yr)	222

Emissions (based on site energy use)

Greenhouse Gas Emissions ($MtCO_2e$/year)	26

Electric Distribution Utility
Pepco - Atlantic City Electric Co

National Average Comparison

National Average Site EUI	77
National Average Source EUI	182
% Difference from National Average Source EUI	22%
Building Type	Office

Stamp of Certifying Professional

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

Certifying Professional
N/A

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

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

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

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, Licensed Professional facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

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	Borough Hall	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		☐
Type	Office	Is this an accurate description of the space in question?		☐
Location	307 Union Avenue, Stratford, NJ 08084	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		☐

Borough Hall (Office)

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	☑
Gross Floor Area	2,500 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		☐
Weekly operating hours	40 Hours	Is this the total number of hours per week that the Office space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		☐
Workers on Main Shift	6	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100. The normal worker density ranges between 0.3 and 10 workers per 1000 square feet (92.8 square meters)		☐
Number of PCs	6	Is this the number of personal computers in the Office?		☐
Percent Cooled	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical cooling equipment?		☐
Percent Heated	50% or more	Is this the percentage of the total floor space within the facility that is served by mechanical heating equipment?		☐

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: Pepco - Atlantic City Electric Co

Fuel Type: Electricity

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

Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
07/01/2010	07/31/2010	4,759.00
06/01/2010	06/30/2010	4,872.00
05/01/2010	05/31/2010	2,969.00
04/01/2010	04/30/2010	2,141.00
03/01/2010	03/31/2010	2,018.00
02/01/2010	02/28/2010	2,286.00
01/01/2010	01/31/2010	2,232.00
12/01/2009	12/31/2009	2,457.00
11/01/2009	11/30/2009	2,145.00
10/01/2009	10/31/2009	2,363.00
09/01/2009	09/30/2009	3,068.00
08/01/2009	08/31/2009	4,219.00
Electric Consumption (kWh (thousand Watt-hours))		**35,529.00**
Electric Consumption (kBtu (thousand Btu))		**121,224.95**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**121,224.95**
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)
07/01/2010	07/31/2010	3.00
06/01/2010	06/30/2010	4.00
05/01/2010	05/31/2010	11.00
04/01/2010	04/30/2010	35.00
03/01/2010	03/31/2010	120.00
02/01/2010	02/28/2010	340.00
01/01/2010	01/31/2010	313.00
12/01/2009	12/31/2009	340.00
11/01/2009	11/30/2009	165.00
10/01/2009	10/31/2009	97.00

09/01/2009	09/30/2009	4.00
08/01/2009	08/31/2009	3.00
Natural Gas Consumption (therms)		**1,435.00**
Natural Gas Consumption (kBtu (thousand Btu))		**143,500.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**143,500.00**
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
Borough Hall
307 Union Avenue
Stratford, NJ 08084

Facility Owner
Borough of Stratford
307 Union Ave
Stratford, NJ 08084

Primary Contact for this Facility
John Keenan
307 Union Ave
Stratford, NJ 08084

General Information

Borough Hall	
Gross Floor Area Excluding Parking: (ft²)	2,500
Year Built	1973
For 12-month Evaluation Period Ending Date:	July 31, 2010

Facility Space Use Summary

Borough Hall	
Space Type	Office
Gross Floor Area(ft²)	2,500
Weekly operating hours	40
Workers on Main Shift	6
Number of PCs	6
Percent Cooled	50% or more
Percent Heated	50% or more

Energy Performance Comparison

	Evaluation Periods		Comparisons		
Performance Metrics	**Current** (Ending Date 07/31/2010)	**Baseline** (Ending Date 07/31/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	106	106	41	N/A	77
Source (kBtu/ft²)	222	222	86	N/A	182
Energy Cost					
$/year	$ 8,501.13	$ 8,501.13	$ 3,281.95	N/A	$ 6,181.76
$/ft²/year	$ 3.40	$ 3.40	$ 1.31	N/A	$ 2.47
Greenhouse Gas Emissions					
$MtCO_2e$/year	26	26	10	N/A	19
$kgCO_2e$/ft²/year	10	10	4	N/A	7

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

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

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Justice Facility

Building ID: 2435428
For 12-month Period Ending: July 31, 2010[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: September 10, 2010

Facility
Justice Facility
315 Union Avenue
Stratford, NJ 08084

Facility Owner
Borough of Stratford
307 Union Ave
Stratford, NJ 08084

Primary Contact for this Facility
John Keenan
307 Union Ave
Stratford, NJ 08084

Year Built: 1959
Gross Floor Area (ft²): 7,000

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	252,826
Natural Gas (kBtu)[4]	169,700
Total Energy (kBtu)	422,526
Energy Intensity[5]	
Site (kBtu/ft²/yr)	60
Source (kBtu/ft²/yr)	146
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	48
Electric Distribution Utility	
Pepco - Atlantic City Electric Co	
National Average Comparison	
National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	-7%
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.

Certifying Professional
N/A

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

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

Notes:
1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
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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.

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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	Justice Facility	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	315 Union Avenue, Stratford, NJ 08084	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		☐
Justice Facility (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	7,000 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: Pepco - Atlantic City Electric Co

Fuel Type: Electricity		
Meter: Electric (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
07/01/2010	07/31/2010	10,248.00
06/01/2010	06/30/2010	9,106.00
05/01/2010	05/31/2010	6,418.00
04/01/2010	04/30/2010	5,209.00
03/01/2010	03/31/2010	4,587.00
02/01/2010	02/28/2010	4,702.00
01/01/2010	01/31/2010	4,396.00
12/01/2009	12/31/2009	5,098.00
11/01/2009	11/30/2009	5,111.00
10/01/2009	10/31/2009	5,203.00
09/01/2009	09/30/2009	5,843.00
08/01/2009	08/31/2009	8,178.00
Electric Consumption (kWh (thousand Watt-hours))		**74,099.00**
Electric Consumption (kBtu (thousand Btu))		**252,825.79**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**252,825.79**
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)**
07/01/2010	07/31/2010	6.00
06/01/2010	06/30/2010	7.00
05/01/2010	05/31/2010	9.00
04/01/2010	04/30/2010	12.00
03/01/2010	03/31/2010	60.00
02/01/2010	02/28/2010	447.00
01/01/2010	01/31/2010	464.00
12/01/2009	12/31/2009	494.00
11/01/2009	11/30/2009	140.00
10/01/2009	10/31/2009	43.00

09/01/2009	09/30/2009	8.00
08/01/2009	08/31/2009	7.00
Natural Gas Consumption (therms)		**1,697.00**
Natural Gas Consumption (kBtu (thousand Btu))		**169,700.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**169,700.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

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

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

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same 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
Justice Facility
315 Union Avenue
Stratford, NJ 08084

Facility Owner
Borough of Stratford
307 Union Ave
Stratford, NJ 08084

Primary Contact for this Facility
John Keenan
307 Union Ave
Stratford, NJ 08084

General Information

Justice Facility	
Gross Floor Area Excluding Parking: (ft²)	7,000
Year Built	1959
For 12-month Evaluation Period Ending Date:	July 31, 2010

Facility Space Use Summary

Justice Facility	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft²)	7,000
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 07/31/2010)	**Baseline** (Ending Date 07/31/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft²)	60	60	0	N/A	78
Source (kBtu/ft²)	146	146	0	N/A	157
Energy Cost					
$/year	$ 15,743.56	$ 15,743.56	N/A	N/A	$ 20,344.56
$/ft²/year	$ 2.25	$ 2.25	N/A	N/A	$ 2.91
Greenhouse Gas Emissions					
$MtCO_2e$/year	48	48	0	N/A	62
$kgCO_2e$/ft²/year	7	7	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.

OMB No. 2060-0347

STATEMENT OF ENERGY PERFORMANCE
Fire Station

Building ID: 2435425
For 12-month Period Ending: July 31, 2010[1]
Date SEP becomes ineligible: N/A

Date SEP Generated: September 10, 2010

Facility
Fire Station
311 East Laurel Road
Stratford, NJ 08084

Facility Owner
Borough of Stratford
307 Union Ave
Stratford, NJ 08084

Primary Contact for this Facility
John Keenan
307 Union Ave
Stratford, NJ 08084

Year Built: 2005
Gross Floor Area (ft²): 12,000

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

Site Energy Use Summary[3]	
Electricity - Grid Purchase(kBtu)	353,350
Natural Gas (kBtu)[4]	377,700
Total Energy (kBtu)	731,050
Energy Intensity[5]	
Site (kBtu/ft²/yr)	61
Source (kBtu/ft²/yr)	131
Emissions (based on site energy use)	
Greenhouse Gas Emissions ($MtCO_2e$/year)	74
Electric Distribution Utility	
Pepco - Atlantic City Electric Co	
National Average Comparison	
National Average Site EUI	78
National Average Source EUI	157
% Difference from National Average Source EUI	-16%
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.

Certifying Professional
N/A

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

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

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

The government estimates the average time needed to fill out this form is 6 hours (includes the time for entering energy data, Licensed Professional facility inspection, and notarizing the SEP) and welcomes suggestions for reducing this level of effort. Send comments (referencing OMB control number) to the Director, Collection Strategies Division, U.S., EPA (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460.

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	Fire 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	311 East Laurel Road, Stratford, NJ 08084	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		☐
Fire Station (Other)				
CRITERION	**VALUE AS ENTERED IN PORTFOLIO MANAGER**	**VERIFICATION QUESTIONS**	**NOTES**	☑
Gross Floor Area	12,000 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: Pepco - Atlantic City Electric Co

Fuel Type: Electricity		
Meter: Electric (kWh (thousand Watt-hours)) **Space(s):** Entire Facility **Generation Method:** Grid Purchase		
Start Date	**End Date**	**Energy Use (kWh (thousand Watt-hours))**
07/01/2010	07/31/2010	12,451.00
06/01/2010	06/30/2010	10,475.00
05/01/2010	05/31/2010	8,262.00
04/01/2010	04/30/2010	6,848.00
03/01/2010	03/31/2010	6,895.00
02/01/2010	02/28/2010	6,809.00
01/01/2010	01/31/2010	7,204.00
12/01/2009	12/31/2009	12,930.00
11/01/2009	11/30/2009	6,495.00
10/01/2009	10/31/2009	6,399.00
09/01/2009	09/30/2009	7,524.00
08/01/2009	08/31/2009	11,269.00
Electric Consumption (kWh (thousand Watt-hours))		**103,561.00**
Electric Consumption (kBtu (thousand Btu))		**353,350.13**
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		**353,350.13**
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)**
07/01/2010	07/31/2010	15.00
06/01/2010	06/30/2010	19.00
05/01/2010	05/31/2010	59.00
04/01/2010	04/30/2010	137.00
03/01/2010	03/31/2010	394.00
02/01/2010	02/28/2010	974.00
01/01/2010	01/31/2010	785.00
12/01/2009	12/31/2009	851.00
11/01/2009	11/30/2009	352.00
10/01/2009	10/31/2009	140.00

09/01/2009	09/30/2009	33.00
08/01/2009	08/31/2009	18.00
Natural Gas Consumption (therms)		**3,777.00**
Natural Gas Consumption (kBtu (thousand Btu))		**377,700.00**
Total Natural Gas Consumption (kBtu (thousand Btu))		**377,700.00**
Is this the total Natural Gas consumption at this building including all Natural Gas meters?		☐

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

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

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same 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
Fire Station
311 East Laurel Road
Stratford, NJ 08084

Facility Owner
Borough of Stratford
307 Union Ave
Stratford, NJ 08084

Primary Contact for this Facility
John Keenan
307 Union Ave
Stratford, NJ 08084

General Information

Fire Station	
Gross Floor Area Excluding Parking: (ft^2)	12,000
Year Built	2005
For 12-month Evaluation Period Ending Date:	July 31, 2010

Facility Space Use Summary

Fire Station	
Space Type	Other - Fire Station/Police Station
Gross Floor Area(ft^2)	12,000
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 07/31/2010)	**Baseline** (Ending Date 07/31/2010)	**Rating of 75**	**Target**	**National Average**
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site ($kBtu/ft^2$)	61	61	0	N/A	78
Source ($kBtu/ft^2$)	131	131	0	N/A	157
Energy Cost					
$/year	$ 22,627.71	$ 22,627.71	N/A	N/A	$ 28,971.79
$/$ft^2$/year	$ 1.89	$ 1.89	N/A	N/A	$ 2.42
Greenhouse Gas Emissions					
$MtCO_2e$/year	74	74	0	N/A	95
$kgCO_2e/ft^2$/year	6	6	0	N/A	8

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.

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